Gastrointestinal Radiology
Fecal Microbiota Transplantation via Fluoroscopy-Guided Nasojejunal Catheter Placement: Indications, Technique, and the Role of Radiology

All Day Location: GI Community, Learning Center

Participants
Julien S. Wonderlick, MD, Burlington, VT (Presenter) Nothing to Disclose
Robert D’Agostino, MD, Burlington, VT (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. Review imaging diagnosis and treatment options for recurrent/refractory Clostridium difficile colitis.  
2. Present techniques for fluoroscopic-guided fecal microbiota transplantation (FMT) via balloon-occlusive nasojejunal tube, with emphasis on skills and equipment traditionally used for enteroclysis.  
3. Discuss indications, advantages and disadvantages with respect to colonoscopic FMT, and potential future role of radiology in nasojejunal FMT.

TABLE OF CONTENTS/OUTLINE
I. Pathophysiology, imaging diagnosis, and treatment options for recurrent or refractory Clostridium difficile colitis.  
II. Indications and contraindications for fecal microbiota transplantation (FMT) for treatment of refractory C. difficile colitis, and specifically FMT via image-guided balloon-occlusive nasojejunal tube placement. Discussion will include advantages and disadvantages of nasojejunal FMT with respect to colonoscopic FMT.  
III. Anatomy relevant to nasojejunal catheter placement, with correlation to fluoroscopic imaging.  
IV. Procedural technique and common pitfalls encountered during placement of balloon-occlusive nasojejunal catheter for FMT or enteroclysis, including similarities to enteroclysis and special considerations for FMT.  
V. Post-procedure outcomes and potential complications.  
VI. Potential future role of radiology in nasojejunal FMT.
Revealing Hidden Liver Disorders on MR Imaging: The Transient Hepatic Signal Intensity Differences (THID)

All Day Location: GI Community, Learning Center

Participants
Francesco Mungai, MD, Florence, Italy (Presenter) Nothing to Disclose
Valentina Berti, MD, Florence, Italy (Abstract Co-Author) Nothing to Disclose
Stefano Colagrande, Firenze, Italy (Abstract Co-Author) Grant, Bayer AG Grant, Bracco Group Grant, Novartis AG Grant, sanofi-aventis Group Grant, Eli Lilly and Company

TEACHING POINTS
Regional variations in the balance between hepatic arterial, portal venous, and third inflow sources of hepatic blood flow can be observed on contrast-enhanced MR images during arterial phase. They are called "transient hepatic signal intensity differences" (THID) and represent the equivalent of what is identified as "Transient Hepatic Attenuation Differences" (THAD) during hepatic artery phase on CT. Transient hepatic intensity differences can be visualized on arterial phase MR imaging and sometimes represent important signs of liver disorders. Their appearances directly correlate with underlying pathogenic mechanism. Understanding of these phenomena is important not to miss critical diagnosis.

TABLE OF CONTENTS/OUTLINE
This review intends to show the range of appearance on MR imaging of such arterial phenomena and to correlate with their morphology, cause and pathogenesis. We illustrate the four different morphologic types of THID: sectorial, lobar multisegmental, polymorphous, diffuse. For each of them we explain the pathogenic mechanism, causes and possible long-term consequences, taking into account the peculiar vascularity and structure of the liver.
TEACHING POINTS

Goals: To review the imaging features related to the surgical manipulation of the biliary tract, illustrated with clinical cases from our radiology department, focusing on:

- preoperative findings associated with a higher risk of iatrogenic injuries;
- postoperative description and classification of such lesions.

TABLE OF CONTENTS/OUTLINE

- Epidemiology of the iatrogenic biliary tract injuries.
- Role of imaging in the pre and postoperative evaluation of the biliary tree.
- Patient-related risk factors for iatrogenic lesions identifiable by imaging.
- Biliary strictures after cholecystectomy.
- Biliary stricture after biliodigestive derivations.
- Biliary stricture after liver transplantation.
- Hemobilia.
- Classification of iatrogenic bile duct injury (Bismuth - Corlette, Stewart-Way, Strasberg and Hannover).
- Illustrated teaching cases (abdominal US, CT and MR), emphasizing the imaging features that may contribute to the diagnosis.
Skin Deep - Imaging and Diagnosis of Superficial Abdominal Wall Pathology

All Day Location: GI Community, Learning Center

Participants
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TEACHING POINTS
Pathology of the superficial abdominal wall includes a broad spectrum of disease, and is commonly encountered during routine imaging studies. Consequently, it is imperative to understand the clinical and radiologic features of these diseases in order to facilitate appropriate diagnosis and management. The purpose of this educational exhibit is to: Introduce the viewer to common and uncommon pathology of the abdominal wall. Review the lesions individually, including clinical presentation and natural history. We will focus on the imaging characteristics of each lesion using representative cases. We will identify the pertinent imaging features of each entity to enable focused differential diagnosis.

TABLE OF CONTENTS/OUTLINE
1. Background Introduction: Understanding the complex and multifarious collection of abdominal wall pathology. 2. Case-based review of each lesion, including clinical presentation, natural history, imaging features and "pertinent pearl" for each entity, which may include but are not limited to: Abscess Hematoma Sebaceous cyst Metastases Lymphoma Lap-port metastases Endometrioma Intramuscular Lipoma Hibernoma Sister Mary Joseph's Nodule Leiomyosarcoma Desmoid tumor 3. Summary and pertinent discriminating features 4. Conclusion and take-home points: what should I remember?
TEACHING POINTS

1. The replaced common hepatic artery (RCHA) is rare anatomic variation and classified into three subtypes depending on the presence of pancreas penetration and relationship between RCHA and main portal vein (MPV) or superior mesenteric vein (SMV).  
2. The RCHA is closely associated with morbidity and mortality of hepatobiliary or pancreaticoduodenectomy. Thus, radiologists should be detect this rare anatomic variation correctly and comment to surgeons about the whole course of RCHA from SMA take off to hepatic hilum (RCHA type), presence of pancreatic penetration, and other associated findings such as circumportal pancreas or obstruction of main pancreatic duct.

TABLE OF CONTENTS/OUTLINE

1. Overall incidence of the RCHA.  
2. Classification of the RCHA.  
   2.1. Type A: RCHA penetrating pancreas parenchyma and crossing the dorsal aspect of the SMV.  
   2.2. Type B: RCHA without penetration of pancreas parenchyma and crossing the dorsal aspect of the MPV or SMV.  
   2.3. Type C: RCHA without penetration of pancreas parenchyma and crossing the ventral aspect of the MPV or SMV.  
3. Statistical analysis of the distance between SMA orifice to RCHA bifurcation according to the presence of pancreas penetration and each subtypes.  
4. Clinical implication in hepatobiliary resection or pancreaticoduodenectomy.  
5. Conclusion
Intratumoral Calcification in the Abdominopelvic Tumors

All Day Location: GI Community, Learning Center

Participants
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TEACHING POINTS
1. To describe the pattern of intratumoral calcification according to the location, number and morphology of the calcification.
2. To illustrate the imaging features of categorized abdominopelvic tumors focused on the pattern of intratumoral calcification.

TABLE OF CONTENTS/OUTLINE
1. Pathophysiology of calcification
   - Pathologic calcification: metastatic calcification vs. dystrophic calcification
2. Imaging of calcification
   - Imaging modality: CR/CT (X-ray), US, and MR
   - Pattern of intratumoral calcification according to the location, number and morphology of calcification
3. Categorized abdominopelvic tumors depending on the pattern of the intratumoral calcification
   - Mucinous adenocarcinoma
   - Mucinous cystic neoplasm
   - Metastasis
   - Hemangioma
   - Mature teratoma
   - Other tumors
4. Summary and conclusion
Sonography of Gastrointestinal Tract Diseases; Correlation with Endoscopy or CT/MR Imaging Findings

All Day Location: GI Community, Learning Center

Participants
Seong Jin Park, MD, PhD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
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TEACHING POINTS
This review focuses on sonographic imaging findings of GI tract lesions, compared with endoscopy or CT/MR imaging findings. Neoplastic, non-neoplastic pathologies and postoperative complications will be illustrated, and the differentiated sonographic imaging characteristics of these entities will be highlighted.

TABLE OF CONTENTS/OUTLINE
1. Normal appearance of the GI tract
2. Spectrum of GI tract diseases
   1) Upper GI tract disease: gastritis, advanced gastric cancer, malignant ulcer, gastrointestinal stromal tumor, and gastric phytobezoar
   2) Non-neoplastic small bowel and colon disease: Crohn's disease, tuberculosis, ulcerative colitis, CMV colitis, bowel ischemia, ischemic colitis, and vasculitis
   3) Neoplastic small bowel and colon disease: lymphoma, and adenocarcinoma
   4) Post-op complications: afferent loop syndrome, duodenal stump leakage, and anastomosis site dehiscence
3. Radiological findings of GI tract diseases, including ultrasonography, CT, MR, PET-CT and correlation with endoscopy
4. Clinical significance
Combined Hepatocellular and Cholangiocarcinoma of the Liver: Minimum Knowledge of Pathology and Variation in Imaging Features

All Day Location: GI Community, Learning Center

Participants
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TEACHING POINTS
To explain the current knowledge of histopathology of combined hepatocellular and cholangiocarcinoma (cHC-CC) with special emphasis on the stem cell features
To review the variable imaging feature of cHC-CC with emphasis on the contrast enhancement pattern on computed tomography and magnetic resonance imaging

TABLE OF CONTENTS/OUTLINE
To explain the pathological features of cHC-CC; classical type and 3 subtypes with stem-cell features (typical subtype, intermediate cell subtype, and cholangiolocellular subtype)
To review the imaging feature of classical type of cHC-CC
To review the imaging feature of cHC-CC with stem cell features
New Alternatives for the Ultrasonographic Assessment of Liver Fibrosis

All Day Location: GI Community, Learning Center

Participants
Vanessa Murad, MD, Bogota, Colombia (Presenter) Nothing to Disclose
Javier A. Romero, MD, Bogota, Colombia (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
- Review the new role of the radiologist in the diagnosis of liver fibrosis: For decades US has been limited to morphological evaluation of the liver being useful in the diagnosis of advanced stages of fibrosis or cirrhosis. Introduce new alternatives such as ultrasound elastography for the diagnosis and monitoring of liver fibrosis: There are new techniques such as ultrasound elastography, which allows a pathophysiological approach through assessing biomechanical properties like the stiffness of the tissue. Explain the usefulness of elastography in the diagnosis and monitoring of hepatic fibrosis: The value of liver stiffness in kPa correlates appropriately with the degree of liver fibrosis, allowing the detection of early changes in morphologically regular liver.

TABLE OF CONTENTS/OUTLINE
- Hepatic fibrosis general concepts.
- Diagnosis of liver fibrosis.
- Ultrasound elastography: a new reality. Types of elastography and functioning.
- Elastography utility in the diagnosis of liver fibrosis: Demonstrative cases of our institution.
A Checklist Approach to the CT Evaluation of a Suspected Pancreatic Mass: The Use of an iPad as an Interface to a Critical Pathway Approach at the Detection and Definition of a Suspected Pancreatic Mass

All Day Location: GI Community, Learning Center

Awards
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Participants
Elliot K. Fishman, MD, Owings Mills, MD (Presenter) Research support, Siemens AG Advisory Board, Siemens AG Research support, General Electric Company Advisory Board, General Electric Company Co-founder, HipGraphics, Inc
Pamela T. Johnson, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Karen M. Horton, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
After a “hands on” experience with this program the user will:
1. have a better understanding of a structured approach to the evaluation of a suspected pancreatic mass
2. have a more complete understanding of the various questions that need to be considered when evaluation of a suspected mass on CT is performed
3. understand how “check-lists” may be a valuable tool for Radiologists analyzing CT scans
4. understand how a systematic approach to CT scan analysis can improve our accuracy in specific clinical applications like “suspected pancreatic tumor”

TABLE OF CONTENTS/OUTLINE
The program is developed to presented on an iPad or iPhone(Apple Inc). The user interface is designed for ease of use without the need for a lengthy training session. Published guidelines for user interface with Apple mobile devises are followed. The Application will be downloadable for free from the Apple Store. As shown on the PDF enclosed with this submission the program provides a series of questions ranging from exam quality (? dual phase) to patient age and sex to whether or not the common duct or pancreatic duct are dilated.Each question is linked to additional questions or pearls which will help with the differential diagnosis and staging if a tumor is present. The program is designed to be integrated into daily workflow and to improve both efficiency and accuracy.

Honored Educators

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Elliot K. Fishman, MD - 2012 Honored Educator
Elliot K. Fishman, MD - 2014 Honored Educator
Non-neoplastic Diseases of Duodenum

All Day Location: GI Community, Learning Center

FDA

Discussions may include off-label uses.

Participants
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TEACHING POINTS
To review its anatomic location and relationship among various adjacent organs. To review primary and secondary inflammatory disease entities involving duodenum. To understand the importance of duodenum which radiologists and clinicians often neglect.

TABLE OF CONTENTS/OUTLINE
Neoplastic Diseases of Duodenum

All Day Location: GI Community, Learning Center

FDA Discussions may include off-label uses.

Awards
Certificate of Merit

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TEACHING POINTS
To review its anatomic location and relationship among various adjacent organs. To review primary and secondary neoplastic disease entities involving duodenum. To understand the importance of duodenum which radiologists and clinicians often neglect.

TABLE OF CONTENTS/OUTLINE
1. Primary benign tumors
   1) adenomatous polyp
   2) Peutz-Jegher's syndrome
   3) Cronkhite-Canada syndrome
   4) Brunner's gland adenoma
   5) lipoma

2. Primary malignant tumors
   1) GIST
   2) carcinoid
   3) neuroendocrine tumor
   4) lymphoma
   5) plasmacytoma
   6) Ampulla of Vater cancer
   7) duodenal adenocarcinoma
   8) sarcomatoid cancer

3. Secondary metastatic tumors
   1) direct invasion; from stomach, pancreas, biliary tree, colon, and kidney
   2) hematogenous metastasis
Splenic Ectopia: Not Just Pulp Fiction - The Spectrum of Appearances of Ectopic Splenic Tissue

All Day Location: GI Community, Learning Center

Participants
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Silvia D. Chang, MD, Vancouver, BC (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
To review the embryology and pathophysiology of congenital and acquired splenic ectopia respectively To review the variable multimodality imaging appearances and locations of ectopic splenic tissue, including wandering spleen, polysplenia, splenic rests, and splenosis. To discuss the potential pitfalls and mimics of splenic ectopia and approach to diagnosis

TABLE OF CONTENTS/OUTLINE
Embryology and pathophysiology of congenital and acquired causes of ectopic splenic tissue respectively. Review of imaging features and multimodality case examples of the spectrum of appearances of splenic ectopia (including wandering spleen, polysplenia, splenic rests, and abdominal/pelvic/thoracic splenosis) Case examples of mimicking pathology (including lymphoma, carcinomatosis, metastases) Review of the role of clinical history, cross-sectional imaging and nuclear medicine in making the diagnosis and differentiating from more sinister pathology.
Solid Pseudopapillary Neoplasm of the Pancreas: Minimum Knowledge in Pathology to Understand Variation of Imaging Features

All Day Location: GI Community, Learning Center

Participants
Utaro Motosugi, MD, Yamanashi, Japan (Presenter) Nothing to Disclose
Hiroshi Yamaguchi SR, Hidaka-Shi, Japan (Abstract Co-Author) Nothing to Disclose
Hiroyuki Morisaka, MD, Kofu, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Pathological key phrase that can explain the variation of imaging features of solid pseudopapillary neoplasms (SPNs) is "Poorly cohesive tumor cells". That leads degeneration of tumor, resulting in hemorrhage/ cystic change/ and dystrophic calcification. The purposes of this exhibit are to describe minimum knowledge in pathology that are useful to understand the variations of imaging findings for pancreatic SPNs; and to review ultrasound, CT, and MR imaging features with the correlation of histological features of SPNs. Discussion cover the differential diagnoses that should be considered for each type of imaging features.

TABLE OF CONTENTS/OUTLINE
- Cytology best describe the pathological characteristics of SPNs: poorly cohesive tumor cells and pseudo-papillary structure
- SPNs are typically well-circumscribed gross appearance. However, the tumor often infiltrate the adjacent non-neoplastic pancreas, which can make unclear tumor margin on images. - SPNs can be completely solid with/without calcification, even if the size is large.
- Calcification can be observed at the edge of the cystic part or right on the solid part, although both are led by degeneration of the tumor cells. - Degeneration and cystic changes can happen wherever in the tumor, which makes combined solid and cystic features, or completely cystic appearance in imaging.
'So You've Lost Something Inside Someone?'

All Day Location: GI Community, Learning Center

Participants
Philip C. Louden, MD, Charlottesville, VA (Presenter) Nothing to Disclose
Brian M. Trotta, MD, Charlottesville, VA (Abstract Co-Author) Nothing to Disclose
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Sebastian Feuerlein, MD, Charlottesville, VA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
To review the (most commonly used/standard) OR procedures regarding counting of surgical materials and instruments. To recognize the clinical implications of retained foreign bodies. To review the radiographic appearance of commonly used surgical instruments. To understand the importance of immediate communication regarding positive or negative findings following an OR miscount study.

TABLE OF CONTENTS/OUTLINE
1. Details involved in an OR miscount study a. Incidence of miscount during surgical intervention b. Counting requirements for procedure areas - Before procedure begins - Before the wound closure begins - At skin closure or end of procedure - At time of permanent relief of scrub or circulating personnel c. Criteria for initiating an OR miscount study2. Potential complications of a retained surgical foreign body and the importance of being able to recognize a surgical foreign body on radiographs3. Radiographic appearance of commonly used surgical instruments a. Sponges, patties, and gauze b. Cotton balls c. Suture materials d. Drains e. Miscellaneous - Bovie tip and cautery tip cleaner - Cotton tipped applicator - Ligating clips - Vessel loop silicone4. Importance of prompt radiographic interpretation and communication of findings to the surgical team
Pre-operative Imaging Evaluation of Pancreatic Tumors: What the Surgeons Want to Know before Resection

All Day Location: GI Community, Learning Center

Participants
Riccardo De Robertis, MD, Verona, Italy (Presenter) Nothing to Disclose
Paolo Tinazzi Martini, MD, Peschiera del Garda, Italy (Abstract Co-Author) Nothing to Disclose
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Claudio Bassi, Verona, Italy (Abstract Co-Author) Nothing to Disclose
Paolo Pederzoli, Peschiera del Garda, Italy (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To combine thorough understanding of the technical aspects of pancreatic surgery with pre-operative imaging findings; 2. To provide practical examples regarding imaging features that should be always evaluated before pancreatic resection (relationships with peri-pancreatic vessels, assessment of anatomical variants, prediction of pancreatic texture to prevent post-operative fistula, and assessment of feasibility of enucleation).

TABLE OF CONTENTS/OUTLINE
1. Evaluation of vascular involvement (type of vessel, linear and circumferential involvement) to assess resectability and plan vascular resection; 2. Description of anatomical variants (vascular, biliary, parenchymal and ductal) relevant for surgery; 3. Prediction of pancreatic texture to stratify the risk of post-operative fistula; 4. Assessment of enucleation feasibility.
Primary Colorectal Cancer Genomics: Influence of Mutational Status in the Location of the Tumor

All Day Location: GI Community, Learning Center

Participants
Cinthia Cruz, MD, Boston, MA (Presenter) Nothing to Disclose
James H. Thrall, MD, Boston, MA (Abstract Co-Author) Board Member, Mobile Aspects, Inc; Board Member, WorldCare International Inc; Consultant, WorldCare International Inc; Shareholder, Antares Pharma, Inc; Shareholder, iBio, Inc; Shareholder, Peregrine Pharmaceuticals, Inc
Debra A. Gervais, MD, Chestnut Hill, MA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Single nucleotide polymorphisms are sporadic genetic point mutations known in colorectal cancer, the most frequently observed have been associated to specific therapy responses. Plenty studies have analyzed the molecular features of the distinct tumors per genotype, and have described different distributions in the colon according to the traits. Established associations of anatomical site of the primary lesion would allow us to guide biopsies and treatment and must be soon added to general teaching on colorectal cancer. The purpose of this exhibit is 1. To illustrate the commonly presence of mutations in colorectal cancer and their distinct site of involvement in the colon. 2. Analyze the patterns of distribution of the most commonly observed mutations and demonstrate associations to clinical applications.

TABLE OF CONTENTS/OUTLINE
Imaging and pathologic characteristics of colorectal cancer. Mutants versus Wild type tumors features and differences among distinct mutations. Correlation of the location of the primary colonic tumors with the most common colorectal sporadic mutations: KRAS, TP53, BRAF, PIK3C, APC and NRAS (descending order). Association of genotypes to therapy response and clinical relevance discussion.

Honored Educators
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Debra A. Gervais, MD - 2012 Honored Educator
Texture Analysis: Primer and Review of Applications for Imaging Genomics of Colorectal Cancer Primary Tumors

All Day Location: GI Community, Learning Center

Participants
Cinthia Cruz, MD, Boston, MA (Presenter) Nothing to Disclose
Synho Do, PhD, Boston, MA (Abstract Co-Author) Nothing to Disclose
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TEACHING POINTS
Texture analysis is a post-processing algorithm that relies on patterns of contrast on computed tomography (CT) images that are only discriminated by further characterization of each region in an image. The approach quantifies intuitive features that cannot be perceived by observer qualitative analysis, as a function of spatial variation in pixel intensities or gray levels. Energy measures are used to detect differences in textures. Sporadic point gene mutations (single nucleotide polymorphisms) have been associated with distinct colorectal tumors behaviors and responses to therapy, amongst the most commonly known: KRAS, TP53, NRAS and BRAF. Assessment of tumor texture per genotype is another parameter that can help identify clinically meaningful differences between tumors using an accessible, non-invasive modality such as CT. Understanding how Texture filters work on CT. Discuss findings in recent texture energy analysis in association with genetic traits in CRC. Explore the potential for texture analysis in primary colorectal cancer lesions

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Debra A. Gervais, MD - 2012 Honored Educator
LI-RADS - Ultrasound Recommendations for Sonographic Screening and Surveillance of Hepatocellular Carcinoma: Initial Proposal

All Day Location: GI Community, Learning Center

Awards
Certificate of Merit

Participants
Aya Kamaya, MD, Stanford, CA (Abstract Co-Author) Nothing to Disclose
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Claude B. Sirlin, MD, San Diego, CA (Abstract Co-Author) Research Grant, General Electric Company; Speakers Bureau, Bayer AG; Consultant, Bayer AG ; ;

TEACHING POINTS
After viewing this exhibit, learners should: Know that the American College of Radiology has convened a working group of experts to develop an Ultrasound Liver Imaging Reporting and Data System (US LI-RADS) for screening/surveillance in patients at risk for developing hepatocellular carcinoma (HCC) Become familiar with the proposed US LI-RADS categories, algorithm, and management recommendations Recognize examples belonging to each US LI-RADS category Become familiar with the recommended ultrasound technique and reporting for HCC screening and surveillance

TABLE OF CONTENTS/OUTLINE
Introduction Ultrasound screening/surveillance for HCC The need for standardization Flow chart summarizing proposed US LI-RADS categories Illustrated description of each US LI-RADS category with management recommendations Illustrated lexicon of proposed terminology Recommended technique and reporting for ultrasound screening/surveillance

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Katherine E. Maturen, MD - 2014 Honored Educator
TEACHING POINTS

The aortomesenteric space (AMS), located between the superior mesenteric artery (SMA) and the aorta, is mostly familiar to radiologists in the context of syndromes associated with a narrow aortomesenteric angle (i.e. nutcracker and SMA syndromes). The normal and pathologic anatomy of the AMS itself has received scanty attention. The purpose of this exhibit is to discuss and illustrate the spectrum of normal and abnormal structures that can be seen in the AMS on cross-sectional imaging. Viewers of this exhibit will1. Learn about the normal structures located in the AMS, and their variable appearance2. Learn about the spectrum of significant findings indicative of disease that can be seen in the AMS.

TABLE OF CONTENTS/OUTLINE

1. Illustration of common (duodenum, left renal vein, pancreatic uncinate process, jejunal vein(s)) and less common structures that can be normally located in the AMS, and the spectrum of their appearances.2. Illustration of pathologic structures that can be seen in the AMS, subdivided into vascular (varices, superior mesenteric vein in malrotation, other vessels) and nonvascular (lymph nodes, right paraduodenal hernia, miscellaneous) entities.
Critical Imaging Findings Prior to Liver Transplantation: What the Surgeon May Not Know that He Needs to Know

All Day Location: GI Community, Learning Center

Participants
Ronald H. Wachsberg, MD, Newark, NJ (Presenter) Nothing to Disclose
Dorian J. Wilson, MD, Newark, NJ (Abstract Co-Author) Nothing to Disclose
Lloyd Brown, MD, Newark, NJ (Abstract Co-Author) Nothing to Disclose
Baburao Konuru, MD, NEWARK, NJ (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

Viewers of this exhibit will:
1. Review critical imaging findings (e.g. portal vein thrombosis) that the surgeon needs to be aware of when deciding whether and how liver transplantation can be performed
2. Learn about lesser-known issues (e.g. enlarged caudate lobe encircling the inferior vena cava) that can substantially impact how the transplant operation is performed
3. Become aware of conditions (e.g. vascular steal syndromes) associated with cirrhosis that have been the focus of recent attention, and may preclude or modify the transplant operation

TABLE OF CONTENTS/OUTLINE

Hepatic malignancy
Portal vein thrombosis
Splenic artery aneurysm
Enlarged caudate lobe
Collaterals following hepatic arterial occlusion
Presence and location of surgical shunts and TIPS
Celiac stenosis/occlusion
Superior mesenteric artery stenosis/occlusion
Celiacomesenteric trunk
Portopulmonary hypertension
TEACHING POINTS

Gadoxetate disodium-enhanced MR imaging and diffusion-weighted imaging became common practice for the evaluation of focal liver lesions. Diagnosis of hepatocellular carcinoma (HCC) using the MR imaging has been reported with frequency and its imaging features have become widely understood. Meanwhile, the MR imaging are also useful for the diagnosis of a variety of malignant liver tumors other than HCC. The purpose of this presentation is to become familiar with the image findings of malignant liver tumors other than HCC on diffusion-weighted and gadoxetate disodium-enhanced MR images.

TABLE OF CONTENTS/OUTLINE

This article describes the clinical features and imaging findings on gadoxetate disodium-enhanced MR images of common and uncommon liver malignancies other than HCC and makes further reference to the hot topics concerning these diseases.

1. Metastatic liver tumors - Organic anion transporting polypeptide 1B3 (OATP1B3) expression in the metastatic liver tumors
2. Intrahepatic cholangiocarcinoma - Hypervascular cholangiocellular carcinoma and its histopathological features
3. Combined hepatocellular and cholangiocarcinoma - Image findings of cholangiolocellular subtype
4. Hepatic angiosarcoma
5. Hepatic lymphoma
Beyond Hemangioma; Rare Mesenchymal Tumors of the Liver

All Day Location: GI Community, Learning Center

Participants
Kareem Ahmed, MBBCch, Houston, TX (Abstract Co-Author) Nothing to Disclose
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Khaled M. Elsayes, MD, Ann Arbor, MI (Presenter) Nothing to Disclose

TEACHING POINTS
- To review epidemiology and pathophysiology of various mesenchymal liver tumors.
- To illustrate characteristic multimodality imaging features, clinical presentation and differential diagnoses of these tumors.
- To correlate imaging features with pathological findings.
- To describe pitfalls associated with diagnosis of these tumors and their mimics.

TABLE OF CONTENTS/OUTLINE
- Introduction
- Epidemiology
- Pathophysiology
- Relevant clinical picture
- Review of imaging findings with pathologic correlation
- Differential diagnoses
- Mimics and clues to correct diagnosis. Summary: Mesenchymal hepatic tumors are rare tumors with radiological features that may overlap with other more commonly encountered hepatic lesions. In this exhibit, we illustrate characteristic radiological, pathological and clinical features of these tumors that help differentiate them from other lesions. We will discuss a broad spectrum of mesenchymal liver tumors including cavernous hemangioma, mesenchymal hamartoma, angiomylipoma, epithelioid hemangioendothelioma, angiosarcoma, malignant fibrous histiocytoma, and others.

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Awards
Certificate of Merit

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TEACHING POINTS

The purpose of this exhibit is: To describe and clarify the confusing terminology previously used with respect to mesenteric lipodystrophy, mesenteric panniculitis and sclerosing mesenteritis To present, using a multi-modality approach, the radiological features of each entity with an emphasis on findings that allow their differentiation from each other and from alternative diagnoses, in particular malignancy To update the reader on new developments in the understanding of these entities, with an emphasis on systemic inflammatory disorders and associations with malignancy

TABLE OF CONTENTS/OUTLINE

Review and clarification of the historical, and confusing variation in terminology used by radiologists and pathologists in describing idiopathic inflammatory disease of the mesenteric fat Review of the pathophysiology of mesenteric lipodystrophy, mesenteric panniculitis and sclerosing mesenteritis, including an update on current understanding of their relationship to idiopathic inflammatory disorders such as IgG4-related disease Multimodality illustration of the radiological findings encountered, including significant complications of the disease process, with a focus on MDCT and MR features Description of radiologic features that may aid the radiologist in differentiating such entities from malignancy (lymphoma, neuroendocrine neoplasia) Summary
Not Just Another Collection! Imaging Characteristics of Abdominal and Pelvic Collections

All Day Location: GI Community, Learning Center

Participants
Jay Patel, MD, Morristown, NJ (Presenter) Nothing to Disclose
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TEACHING POINTS
1. Clinical history and specific imaging characteristics including Hounsfield Units are key to differentiating various abdominal and pelvic fluid collections.
2. Common treatment option for an abdominal/pelvic fluid collection includes aspiration and drainage.
3. Intervention for an abdominal/pelvic fluid collection should be evaluated on a case by case bases since not all collections require intervention.

TABLE OF CONTENTS/OUTLINE
Fluid collections are routinely encountered in the abdomen and pelvis and are often reported as just an "abnormal collection". The purpose of this presentation is to review a variety of these collections and discuss the causes, key clinical and imaging characteristics and potential treatment options of these collections. Interventions such as aspiration and drainage will be discussed with emphasis on the appropriate indications for performing an intervention. Cases to be presented include:
• Biloma
• Urinoma
• Hematoma
• Lymphangioma
• Abscess
• Ascites
• Seroma
• Pancreatic pseudocyst
Beyond Hernias: Multimodality Imaging Review of Abdominal Wall Pathology

Awards
Certificate of Merit

Participants
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Grant E. Lattin JR, MD, APO, AE (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. Review anatomy of the anterior abdominal wall.
2. Assist the practicing radiologist in identifying and accurately characterizing abnormalities of the abdominal wall via review of pertinent cases.

TABLE OF CONTENTS/OUTLINE
- Anterior abdominal wall anatomy.
- Review of anterior abdominal wall abnormalities including discussion of clinical presentation, etiology, treatment options, and imaging characteristics.
- Traumatic
- Congenital
- Inflammatory
- Neoplastic
- Iatrogenic

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Grant E. Lattin JR, MD - 2012 Honored Educator
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Evelyn Y. Anthony, MD, Winston-Salem, NC (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Review the most common causes of rectal bleeding diagnosed by imaging. Create a limited differential diagnosis based on patient age from neonate to older adult.

TABLE OF CONTENTS/OUTLINE
The differential diagnosis for rectal bleeding will be compared across the lifespan encompassing the following age groups: neonates, infants, toddlers, school-aged children, teenagers, young adults, and older adults. Neonate: Midgut volvulus, necrotizing enterocolitis Infant: Necrotizing enterocolitis, intussusception, midgut volvulus, milk protein allergy, Hirschsprung's colitis Toddler: Intussusception, Meckel's diverticulum, Hirschsprung's colitis Children: Polyps, intussusception, Meckel's diverticulum, perforated appendicitis Teenagers: Inflammatory bowel disease (ulcerative colitis) Young Adults: Polyps, inflammatory bowel disease (ulcerative colitis) Older Adults: Tumor/polyps, diverticulosis, ischemic colitis
Interpreting Body MRI Cases: What You Need to Know to Get Started

All Day Location: GI Community, Learning Center

Participants
Flavius F. Guglielmo, MD, Philadelphia, PA (Presenter) Nothing to Disclose
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Hassan M. Ahmad, MD, Chalfont, PA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
For the uninitiated radiologist, interpreting body MRI cases for the first time can be difficult. This basic primer helps to get started and reviews (1) a typical body MR protocol, (2) how to reorder pulse sequences, (3) the different gadolinium agents, (4) the importance of each sequence and how to be an "MR Pathologist" using sequences to evaluate findings.

TABLE OF CONTENTS/OUTLINE
The typical body MRI protocol
Appropriately reorder sequences on PACS
Understand the different gadolinium agents ECSA, HSCA vs BPA
Indications
Mechanism of action
3D GRE sequence timing
High-relaxivity agents
ECSA, HSCA vs BPA
Gadoxetate limitations
Pulse sequence order relative to contrast
Understand each sequence's importance and using sequences to be an "MR pathologist" to evaluate findings
Dual GRE
In-phase decreased SI: Iron in the liver, spleen, pancreas; air, calcium, metal
Opp-phase decreased SI: Fatty liver and fat/water containing adrenal, liver, kidney, ovarian and spine lesions
T2WI: cysts, fluid, edema, fibrosis, solid lesions
FS 3D GRE
Precontrast: blood, protein, copper, melanin, fat
Postcontrast: inflammation, neoplasm, vascular structures, fibrosis
DWI
High b-value: neoplasm, inflammation
Low b-value: edema, fluid
BSSFP: fluid and flowing blood
Localizer sequence: identifies and localizes spine lesions
Causes of False-negatives in CT Colonography for Colorectal Cancer Screening

Participants
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Moritaka Suga, Kumamoto, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
In CT colonography (CTC) for colorectal cancer screening, it is important to understand the causes of false-negatives in order to achieve high examination accuracy. Common causes of false-negatives are the lack of ability to interpret lesions and the flat lesion which cannot be visualized in CTC. False-negatives can be avoided with greater understanding of the pitfalls in interpretation of lesions from images and improvements in bowel preparation and colon insufflation. The purpose of this exhibit is: To investigate the causes of false-negatives in CTC To calculate the frequency of the causes of false-negatives in CTC

TABLE OF CONTENTS/OUTLINE
To divide into the following categories according to the causes of false-negatives in CTC: 1) human error (lesion could be identified on review) 2) limited ability of CTC to indicate lesions (lesion could not be identified on review); 3) residual fluid or fecal matter (bowel preparation issues) 4) poor intestinal distention Analysis on the causes of false-negatives based on lesion size - ≥ 6 mm - ≥ 10 mm Summary
TEACHING POINTS

- Review imaging features of chronic calcific pancreatitis.
- Describe atypical and typical features of pancreatic masses that may calcify.
- Illustrate a pattern recognition approach to help reach a specific diagnosis.

TABLE OF CONTENTS/OUTLINE

- Discuss the pathophysiology of chronic calcific pancreatitis.
- Describe the etiology and illustrate classic and atypical calcific pancreatic entities including: serous and mucinous cystic neoplasms, calcified metastases, chronic calcific pancreatitis, and neuroendocrine tumors.
- Discuss current surgical and non-surgical management.
- Illustrate pattern recognition approach utilized for differential diagnoses.

Summary

Calcifications of the pancreas are frequently encountered at CT. Entities such as chronic calcific pancreatitis related to alcohol use typically is the source. However, there are certain patterns of calcifications that manifest with pancreatic tumors. The purpose of this exhibit is therefore to illustrate the key imaging features and patterns of pancreatic calcifications with an emphasis on pattern recognition approach for the spectrum of these pathologies. Implications of these various imaging findings on patient management will also be described.

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Abdominal-Pelvic Imaging: Recognition of Slings, Sphincters, and Stimulators

All Day Location: GI Community, Learning Center

Participants
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Chandana G. Lall, MD, Orange, CA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Understand basic surgical anatomy and procedure of placement of omental and urethral slings & types of slings for female stress urinary incontinence Recognize typical appearance of surgical slings, gastric/bladder stimulators, and urethral/anal sphincters: on imaging Familiarize radiologists with the clinical functioning, proper anatomical positioning & potential complications of slings, gastric/bladder stimulators & urethral/anal sphincters

TABLE OF CONTENTS/OUTLINE
General 1) Placement of slings 2) Stress incontinence surgery Slings1) Anatomy and radiation planning of omental slings 2)) Bladder neck slings3) Mid- urethral slings4) Detection of slings on CT and MR imaging 5) Complication of sling procedures Artificial Sphincters1) Why is it used and what are the components 2) Recognition of complications of sphincters on CT/MR imaging3) Types of artificial sphincters including female artificial urinary sphincters, lower esophageal artificial sphincterStimulators 1) Gastric/sacral plexus stimulators 2) Why is it used clinically3) Detection on CT/MR imaging Urethral bulking agents1) Why is it used clinically2) components and materials used3) imaging characteristics

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Sadhna Verma, MD - 2013 Honored Educator
Chandana G. Lall, MD - 2013 Honored Educator
Hepatocellular and Cholangiocellular Carcinoma: A Spectrum of Disease

TEACHING POINTS

Hepatocellular and cholangiocellular carcinomas (HCC and CCC respectively) are increasingly thought to represent a spectrum of diseases with different degrees of pure HCC or CCC elements rather than tumors of separate origins. Therefore, understanding the imaging features of all variants needs to be recognized by the radiologist on CT or MRI in order to make an accurate diagnosis. In this presentation we display cases of histologically proven pure HCC, CCC and mixed HCC-CCC tumors and discuss the imaging findings.

1. Cholangiocellular carcinoma (CCC) must be distinguished from HCC, since the prognosis and treatment vary significantly.
2. Biphenotypic tumors with features of both HCC and CCC (combined tumors) are influenced by the degree of glandular differentiation histologically. Key imaging findings present in these tumors will be discussed.
3. Tumor markers and immunohistochemistry (IHC) results relevant to the reporting liver radiologist will be reviewed.
4. Local and distant extent of tumor burden will also be reviewed to highlight more malignant features.

TABLE OF CONTENTS/OUTLINE

1. Illustrate various phenotypic features of combined HCC-CCC tumors.
2. To correlate MR and CT imaging findings with histopathologic/IHC markers of biphenotypics tumors.
3. To review current guidelines and classifications of HCC, CCC and combined HCC-CCC.
Non-lithiasic Biliary Obstruction: Beyond the Stones

All Day Location: GI Community, Learning Center

Participants
Renata R. Almeida, Rio de Janeiro, Brazil (Presenter) Nothing to Disclose
Bernardo C. Bizzo, MD, Rio De Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
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Leonardo K. Bittencourt, MD, PhD, Rio De Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Disorders of the biliary tract affect a significant portion of the worldwide population, and the overwhelming majority of cases are attributable to lithiasis (gallstones). Most of these disorders are related to obstruction of the biliary system, which may cause jaundice, fecal acholia, choluria, itching and cholangitis. When this obstruction is chronic, it can progress to secondary biliary cirrhosis and even cancer. However, there are several other causes of bile ducts obstruction, such as inflammatory, neoplastic, bleeding, congenital, traumatic and due to parasitic infection. In this presentation, we aim to discuss the main non-lithiasic biliary tree obstruction causes and their imaging findings on MDCT and MR imaging.

TABLE OF CONTENTS/OUTLINE
• Anatomical description and schematic drawings of the main non-lithiasic biliary tree obstruction causes and it's radiological characteristics. Organization of these causes in differential diagnoses include congenital, inflammatory, vascular, neoplastic and iatrogenic causes. • A quick review on the most common causes of non-lithiasic biliary tree obstruction, it's complications and differential diagnosis. • Review the main imaging findings of non-lithiasic biliary tree obstruction and its complications on abdominal MDCT and MRI.
**TEACHING POINTS**

The diagnosis of small bowel tumors is a difficult process as the tumors are rare, making up only 3-6% of all gastrointestinal neoplasms, compounded by typically non-specific clinical presentations. The advent of MRI enterography as well as capsule endoscopy has improved diagnostic accuracy of small bowel tumors, and evaluation via MRI has burgeoned in the past decade. In this educational exhibit, we will perform a systematic review of the techniques and pitfalls of small bowel tumor diagnosis by MRI, in an image rich format. Upon completion of this education exhibit, participants should:

1. Know the major categories of small bowel neoplasm as well as the major subtypes within each category.
2. Develop a systematic approach to interpreting MRI of small bowel tumors and be able to provide a differential based on MRI findings.
3. Be familiar with the basic MR enterography examination and understand ways to optimize MR enterography when trying to detect and differentiate small bowel tumors.

**TABLE OF CONTENTS/OPTLINE**

- Review the epidemiology and standard diagnostic work up for known or suspect small bowel tumors
- Review standard MR enterography protocols as well as unique sequences.
- Small bowel tumors will be subdivided by tissue of origin and defining MR characteristic delineated. This will be done in an image rich format.

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Aytekin Oto, MD - 2013 Honored Educator
The Many Faces of the Gallbladder: A Pictorial Journey Through Atypical Presentations of Gallbladder Pathology

All Day Location: GI Community, Learning Center

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Alison R. Schonberger, BA, MS, Valhalla, NY (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Differentiate normal and abnormal appearance of gallbladder across US, CT, MRI, and nuclear medicine scans. Understand the pathophysiology of atypical and rare gallbladder diseases and their imaging and pathologic correlate. Identify imaging pearls that will aid in diagnosis and clinical management and avoid potential imaging and diagnostic pitfalls.

TABLE OF CONTENTS/OUTLINE
Normal gallbladder anatomy and appearance on US, CT, MRI, and nuclear medicine studies. Pictorial review of rarer pathology uncommonly encountered in clinical practice but should be recognized by the adept radiologist to avoid morbidity and mortality. Our multi-modality, multi-disciplinary cases enhance the learning for radiologists in all stages of training and include the following: Acute and gangrenous cholecystitis Emphysematous cholecystitis and sonographic differentiation from porcelain gallbladder, pneumobilia, and WES sign Perforated gallbladder Bouveret syndrome Gallbladder trauma and hemobilia Gallbladder hyperplastic cholestasis and atypical adenomyomatosis Gallbladder adenocarcinoma Renal cell and melanoma mets to gallbladder Biliary atresia Gallbladder volvulus Biliary cystadenoma mimicking gallbladder pathology Summary of pearls and pitfalls of interpreting the gallbladder.
Beyond the Mucosa: Using MR to Diagnose Lesions Sometimes Missed by Endoscopic Studies

All Day Location: GI Community, Learning Center

Participants
Paula Gentile, MD, Niteroi, Brazil (Presenter) Nothing to Disclose
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Leonardo K. Bittencourt, MD, PhD, Rio De Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Submucosal abnormalities of the gastrointestinal tract encompass a wide variety of benign and malignant lesions, whether of intra or extramural origin. Although endoscopic studies enable luminal biopsy, they can only suspect abnormalities that arise from the mucosa or that protrude into the intestinal lumen. Cross-sectional imaging such as MR enterography allows the evaluation of the intestinal wall layers as well as the adjacent tissues and structures that may be bulging into the bowel. In addition, imaging studies provide a more comprehensive analysis of associated conditions, which may aid in the final diagnosis.

TABLE OF CONTENTS/OUTLINE
Anatomic description and schematic drawings of the normal bowel wall and of the categories of mucosal and submucosal lesions. A review of the main causes of lesions missed in endoscopic studies that can be assessed by cross-sectional imaging.
Abdominopelvic Actinomycosis, When Should We Think About It?

All Day Location: GI Community, Learning Center

TEACHING POINTS

1. To describe the overview of the different species of Actinomyces.
2. To review the three main clinicopathologic presentations of actinomycosis.
3. To show some cases of abdominal-pelvic actinomycosis mimicking malignant neoplasm, diagnosed in our institution.

TABLE OF CONTENTS/OUTLINE

1. Etiopathogenesis of actinomycosis.
2. Main clinicopathologic presentations: - Cervicofacial - Abdominopelvic - Pulmonary
3. Review of imaging findings - MTCT - MR4

The major teaching points of this exhibit are:

- Due to its low virulence, bacteria of the genus Actinomyces requires a break in the integrity of the mucous membranes.
- Tubo-ovarian abscess appear as thick-walled cystic lesions with wall enhancement and are very suggestive of pelvic actinomycosis.
- Sometimes, pelvic actinomycosis can present as low signal T1 and T2 pseudotumoral masses which enhance avidly and may invade the adjacent structures causing obstruction.
Portal Steal Phenomenon in Liver Transplant Recipients: the "Wrong" and Winding Road

All Day Location: GI Community, Learning Center

Participants
Bohyun Kim, MD, Suwon, Korea, Republic Of (Presenter) Nothing to Disclose
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Sung Gyu Lee, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To describe pathophysiology of the portal steal phenomenon and its significance in liver transplant recipients. To illustrate diverse pathways of portal steal.
2. To present essential checklists in diagnosing portal steal on various imaging modalities at different stage of liver transplantation.

TABLE OF CONTENTS/OUTLINE
1. Introduction of the portal steal phenomenon (1) Pathophysiology of the portal steal phenomenon (2) Significance of the portal steal phenomenon in liver transplantation recipients with liver cirrhosis.
2. Diverse pathways of the portal steal (1) Intrahepatic (2) Extraperitoneal pathways (3) Intraperitoneal pathways (4) Extraperitoneal pathways i. Abdominal wall ii. Retroperitoneum.
3. Essential checklists in diagnosing of portal steal on various imaging modalities at different stage of liver transplantation (1) Detecting the portal steal during the pre-transplantation work-up (2) Intra-operative monitoring of the portal steal before and after the intervention (3) Surveillance for the persistent or recurrent portal steal after liver transplantation.
MRI to the Rescue: Diagnosis of Bile Leak Status Post Cholecystectomy

All Day Location: GI Community, Learning Center

Participants
Amandeep Singh, MD, New Hyde Park, NY (Presenter) Nothing to Disclose
Barak Friedman, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Paul-Michel Dossous, MD, New Hyde Park, NY (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

The learner will accomplish the following goals: 1. Understand the role of functional MRI in diagnosing bile leak in post cholecystectomy patients. 2. Learn the utility of higher spatial resolution in identifying small biliary leaks and the portal venous, arterial and biliary anatomy for pre-operative planning. 3. Understand the role of radiologists in diagnosis and management of bile leak.

TABLE OF CONTENTS/OUTLINE

- Epidemiology and clinical presentation of bile leak in post cholecystectomy patients
- Role and advantage of functional MRI in diagnosing bile leak
- Review of imaging findings including portal venous, arterial and biliary anatomy and variants - Sample cases
- Management of bile leak
- Summary and conclusion
Participants
Suzanne L. Palmer, MD, San Gabriel, CA (Presenter) Nothing to Disclose
Peter Crookes, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Adhesion formation is the most important, long term complication of abdominal surgery with an increased lifelong risk of developing bowel obstruction, infertility and chronic pain. The incidence increases to up to 93% after the second surgery. Surgery is the treatment for adhesion related, high grade bowel obstruction, but it can make the problem worse. In the appropriately selected patient, intentional progressive pneumoperitoneum (IPP) can be a useful tool to preoperatively thin and lyse abdominal adhesions. By understanding the potential usefulness of IPP and having the ability to perform it correctly, the radiologist can offer their surgical colleagues a preoperative way to minimize the impact of adhesions.

TABLE OF CONTENTS/OUTLINE
Background on abdominal adhesions
Historic use of IPP
Utilizing the experience at our institution: a. Review appropriate patient selection; B. Review risks and complications; C. Describe procedure, including optimal catheter placement and infusion of air; D. Provide examples of imaging during infusion of air; E. Present surgical outcomes. Summary
Hilar Cholangiocarcinoma: What the Surgeon Wants to Know from the Staging MRI

All Day Location: GI Community, Learning Center

Participants
Marta Drake Perez, MD, Santander, Spain (Presenter) Nothing to Disclose
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Alexandra de Diego Diez, Santander, Spain (Abstract Co-Author) Nothing to Disclose
Francisco Gonzalez Sanchez, Santander, Spain (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
To recall the general features of hilar cholangiocarcinomas, emphasizing the bad prognosis of the tumor and the importance of the pre-surgical staging. To describe how to report a staging MRI of a hilar cholangiocarcinoma, highlighting the main findings that determine resectability.

TABLE OF CONTENTS/OUTLINE
> Update on general features of hilar cholangiocarcinoma. - Definition and classification - Prognosis and treatment options
> Imaging approach: US, CT, MRI, ERCP, PET - MRI sequences, and their role in staging hilar cholangiocarcinoma T1, in-phase and out-of-phase T2 Diffusion MR Cholangiopancreatography Dynamic contrast-enhanced MRI - Resectability criteria by MRI Intrahepatic biliary ducts: Bismuth-Corlette classification Intraparenchymal affectation Vascular hilar affectation Metastatic disease
Complications of Meckel’s Diverticula in Adults

All Day Location: GI Community, Learning Center

Participants
Ami Gokli, MD, Staten Island, NY (Presenter) Nothing to Disclose
Steven Peti, MD, Staten Island, NY (Abstract Co-Author) Nothing to Disclose
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Iakovos Koutras, MD, Staten Island, NY (Abstract Co-Author) Nothing to Disclose
Douglas G. Walled, MD, Staten Island, NY (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To discuss disease of Meckel’s diverticulum in adults. 2. To review the pathophysiology and anatomy of Meckel’s diverticulum. 3. To illustrate the various complications.

TABLE OF CONTENTS/OUTLINE
Introduction Pathophysiology Diagnosis Obstruction Inflammatory Disease Hemorrhage Neoplasm Summary
Title - Delisted - Why Do Candidates Become Ineligible for Liver Transplantation?

All Day Location: GI Community, Learning Center

Participants
Amitjeet Kalirao, DO, Minneapolis, MN (Presenter) Nothing to Disclose
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TEACHING POINTS
A) To learn criteria for transplant listing in patients with hepatocellular carcinoma (HCC), including Milan Criteria
B) To review the imaging findings that render candidates ineligible for transplant as well as the relative incidence of each finding
C) Learn best practice in imaging methods for accurate detection of tumor burden of HCC

TABLE OF CONTENTS/OUTLINE
I. Introduction and review of national data on liver transplant waiting list to emphasize liver organ shortage and need for accurate imaging evaluation
II. Review of Milan Criteria including history and current role
III. Review local data on 598 patients why they are delisted from transplant list
   A) Delisted based on non-imaging criteria - Too ill for transplant - Requested off the list - Sobriety failure - Comorbid disease/advanced age - Non-compliance
   B) Delisted based on imaging criteria (with imaging examples from our institution of each subcategory) - Venous invasion by HCC - Metastatic HCC - HCC exceed combined number and size criteria - Other malignancies - Single HCC exceeds size threshold
IV. Describe best practice imaging methods (CT, MRI, bone scan) to detect imaging findings
V. Summary and Conclusion
Awards
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Participants
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Gregory M. Grimaldi, MD, Manhasset, NY (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. Understand the different etiologies of large bowel perforation and the imaging findings associated with these etiologies.
2. Recognize the pitfalls in diagnosing large bowel perforation, mimics of large bowel perforation and the benefit of contrast enema or rectal contrast-enhanced CT in equivocal cases.

TABLE OF CONTENTS/OUTLINE
1. Imaging approach - Sensitivity and specificity of imaging modalities in detecting large bowel perforation and utilizing rectal and oral contrast.
2. General imaging findings - inflammatory changes, extraluminal fluid or enteric contrast collections, mural thickening, extraluminal air and its location and interruption of the colonic wall.
3. Etiologies and associated findings (case review) - Malignancy, Diverticulitis, Ischemic, Stercoral perforation, Volvulus, Trauma, Iatrogenic, Intussusception, Toxic megacolon.
4. Pitfalls in diagnosis (including specific cases) - extraluminal stool that looks like a loop of bowel, extraluminal gas or fluid that are mistaken for intraluminal contents, bowel thickening which may be a consequence of peritonitis due to perforation of another portion of bowel, large amount of gas which may not lead you to perforation site and etiologies that can mimic each other (ie. inflammatory bowel disease and diverticulitis).
5. The utilization of contrast enema or rectal CECT in equivocal cases.
**Awards**

Certificate of Merit

**Participants**

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**TEACHING POINTS**

1) Review the pathophysiology of atypical imaging appearances of hepatic steatosis.  
2) Review the unusual imaging patterns of hepatic steatosis on US, CT and MR.  
3) Illustrate atypical imaging patterns of hepatic steatosis that can mimic clinically relevant conditions.

**TABLE OF CONTENTS/OUTLINE**

1) Physiopathology and causes of Hepatic steatosis.  
2) Anatomic / physiopathologic basis for atypical fatty deposition.  
4) Atypical steatosis mimic: inflammatory - infectious - neoplastic - vascular disease.

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Christine O. Menias, MD - 2013 Honored Educator  
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Christine O. Menias, MD - 2015 Honored Educator
Eosinophilic Esophagitis: Imaging Features with Endoscopic and Pathologic Correlation

All Day Location: GI Community, Learning Center

Participants
Christine O. Menias, MD, Scottsdale, AZ (Presenter) Nothing to Disclose
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Venkata S. Katabathina, MD, San Antonio, TX (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Review of the epidemiology, clinical presentation, histopathology and management of eosinophilic esophagitis
To review the spectrum of the imaging features of eosinophilic esophagitis on fluoroscopy and cross-sectional imaging
To illustrate the endoscopic and pathologic features of eosinophilic esophagitis

TABLE OF CONTENTS/OUTLINE
Epidemiology, clinical presentation, histopathology and management of eosinophilic esophagitis
Eosinophilic esophagitis imaging appearance
Ringed esophagus
Esophageal fibrotic strictures
Complications: esophageal perforation
Discussion of differential diagnosis and pitfalls of imaging features
Eosinophilic esophagitis (EoE), a chronic relapsing antigen-driven disease, is associated with characteristic esophageal histopathology, including ≥15 intraepithelial eosinophils in at least one high-power field, and alterations in the epithelium. Patients present with nonspecific symptoms of GE reflux and dysphagia. Currently, the pathologic changes in EoE are characteristic but not pathognomonic: The radiologist’s recognition of this entity is useful on fluoroscopy as barium swallows are frequently ordered to evaluate for these symptoms. The purpose of this exhibit is to illustrate key imaging features associated with this condition and provide endoscopic and pathologic correlation for these findings.

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Quantitative Evaluation of the Liver Using MRI: Current and Developing Techniques

All Day Location: GI Community, Learning Center

Participants
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Kathryn J. Fowler, MD, Chesterfield, MO (Abstract Co-Author) Research support, Bracco Group

TEACHING POINTS
1. List current and developing MRI techniques used to make quantitative estimates of physical hepatic attributes including steatosis, hemosiderosis, fibrosis and blood flow.2. Conceptually understand the basic mechanism of contrast used to generate each quantitative image.3. Know the clinical indications for estimating each attribute and the advantages and disadvantages of the various techniques of measuring each estimate

TABLE OF CONTENTS/OUTLINE
Demographics and management of diffuse liver disease
Quantifying fat Dual Echo Multiecho MR Spectroscopy Which is best in practice?
Quantifying iron Signal Intensity Ratios Dual Echo Multiecho Where is it used in practice?
Quantifying fibrosis and inflammation Histopathology MR Elastography Diffusion Weighted Imaging Hepatobiliary contrast/Dual contrast imaging Dynamic Contrast imaging Current clinical practice
Quantifying Hepatic and Portal Vein flow Clinical Utility 4D Phase flow imaging
Spectrum of Xanthogranulomatous Processes in the Abdomen and Pelvis: Pathogenesis, Imaging Features and Differential Diagnosis - A Pictorial Essay

All Day Location: GI Community, Learning Center

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Amisha R. Khicha, MD, Wichita, KS (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Provide a pathological overview of Xanthogranulomatous inflammation. Illustrate various locations which can be involved by this process in the abdomen and pelvis. Describe multimodality work up and imaging features of this process in various abdominopelvic organs. Identify potential pitfalls and mimics as well as provide clues to correct diagnosis.

TABLE OF CONTENTS/OUTLINE
- Introduction
- Pathology
- Organ systems involvement and their clinical features
- Imaging Features: US, CT and MR
- Pitfalls and mimics
- Conclusion

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Be Careful: Normal Variants and Non-Pathologic Abdominal CT Findings That Mimic Disease

All Day Location: GI Community, Learning Center

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TEACHING POINTS
1. Help radiologist to be familiar with possible pitfalls in CT abdominal that may simulate pathology, in order to avoid unnecessary additional interventions based on inappropriate imaging diagnosis
2. To emphasize the importance of knowing clinical information

TABLE OF CONTENTS/OUTLINE
These pitfalls are divided in five groups: 1. Anatomic variants Muscle and visceral anatomic variants. According to the organ affected we will show possible diagnostic pitfalls in CT imaging of the liver, spleen, kidney, pancreas, adrenal, ureteral and gastrointestinal tract. 2. Benign postoperative changes Deviation of normal structures (ovarian transposition...), postoperative cyst (pseudocysts, peritoneal inclusion cyst, lymphocele...), fat associated changes (fat necrosis, epiploplasty...) Other: mesh plug, pelvic breast implant, ureteral reimplantation, radiation changes... 3. Abdominal fat disorders Intraabdominal fat is a metabolically active tissue that may be a great mimicker. 4. Abdominal non pathologic cystic lesions Cisterna chyli, peribiliary cysts, biliary hamartomatosis, retrocaval ureter... 5. Calcifications, foreign bodies and gas It is important to know the wide variety of CT abdominal pitfalls in order to distinguish mimicking lesions from real organic lesions. Without clinical information, we could misdiagnose these findings.
It Does Not Belong to You Anymore! Abnormalities of Umbilical Remnants in the Abdomen and Pelvis

All Day Location: GI Community, Learning Center

Participants
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Carolina L. Vaz, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

1. Describe and illustrate the embryologic and clinical features of umbilical remnants: meckel's diverticulum and urachal remnants.  
2. Discuss about imaging protocols, how to detect and when to suspect of complications of umbilical remnants in the adult on CT and MRI.  
3. Umbilical remnants in the adult are a frequent finding in clinical practice, being generally asymptomatic. However, complications such as Meckel's diverticulitis or urachal carcinoma may pose a diagnostic challenge, and should be therefore well recognized by the common radiologist.

TABLE OF CONTENTS/OUTLINE

Embryology of the umbilical structures: emphasis on the development of the allantois and omphalomesenteric duct.  
Simplified scheme of umbilical remnant abnormalities: diverticulum, cyst, sinus, patent duct.  
Clinical presentation, imaging protocols for CT and MRI, imaging findings of asymptomatic umbilical remnants.  
Cross Sectional Imaging of the Spleen; Pearls and Pitfalls

Participants
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Christine O. Menias, MD, Scottsdale, AZ (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
- Describe most commonly encountered pearls pathognomonic for specific splenic pathologies.
- Illustrate various imaging pitfalls of the spleen that can lead to erroneous diagnoses.
- Describe relevant technical background, pathophysiology and hemodynamics of these pitfalls.

TABLE OF CONTENTS/OUTLINE
1. Classic Signs
2. Diagnostic pitfalls
   a. Mistaking benign lesions for malignant lesions
   b. Mistaking malignant lesions for benign lesions
2. Technical pitfalls
   a. CT, US, MR specific issues that create difficulties in diagnosis
   b. Technique pitfalls
3. Atypical presentations of common benign lesions
4. Atypical presentations of common malignant lesions
5. Organization according to imaging findings

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Christine O. Menias, MD - 2013 Honored Educator
Christine O. Menias, MD - 2014 Honored Educator
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Clinical Utility of PET-MRI in Evaluation and Follow-up of Colorectal Neoplasms

All Day Location: GI Community, Learning Center

Participants
Ammar A. Chaudhry, MD, Corona, CA (Presenter) Nothing to Disclose
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TEACHING POINTS
1. Review physical principles and techniques of PET-MRI (positron emission tomography-magnetic resonance imaging).
2. Discuss clinical utility of using functional information obtained from a PET scan and structural information obtained from MR imaging in evaluating colorectal neoplasms.

TABLE OF CONTENTS/OUTLINE
1. Physical principles and techniques of PET-MRI: review image acquisition and postprocessing.
2. Utility of PET-MRI in oncology: role in initial tumor diagnosis, treatment planning and post-treatment follow-up.
3. Role of PET-MRI in evaluation of mimics including infectious and inflammatory conditions.
4. Pearls and Pitfalls: Common pitfalls and controversies regarding PET-MRIs.
5. Future of PET-MRI: Discuss current challenges facing PET-MRI in radiology.
Early Detection Strategy for Pelvic Recurrence of Rectal Cancer

All Day Location: GI Community, Learning Center

FDA Discussions may include off-label uses.

Participants
Joo Hee Kim, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose

TEACHING POINTS
1. To understand pelvic recurrence patterns after rectal cancer surgery
2. To discuss imaging modalities for early detection of pelvic recurrence
3. To determine the resectability of the recurrent rectal cancer on pelvic MRI
4. To assess the high risk factors of pelvic recurrence on preoperative MR imaging and postoperative clinical data.

TABLE OF CONTENTS/OUTLINE
- Patterns of pelvic recurrence after rectal cancer surgery
- Imaging modalities for early detection of pelvic recurrence
- Tumor resectability of the recurrent rectal cancer on pelvic MRI
- High risk factors of pelvic recurrence on preoperative MRI and postoperative clinical data
- Techniques of high resolution pelvic MR and PET-CT
The Middle Paraduodenal Hernia

All Day Location: GI Community, Learning Center

Participants
Srividya Anandan, MD, Burlington, MA (Presenter) Nothing to Disclose
Francis J. Scholz, MD, Burlington, MA (Abstract Co-Author) Owner, FSpoon Company

TEACHING POINTS
- Neither left nor right, the MIDDLE paraduodenal hernia (PDH) represents a rarely mentioned but equally important type of PDH. The MIDDLE PDH highlights the etiology of all PDHs as congenital rotation anomalies caused by entrapment of a portion of proximal small bowel (SB) behind the mesocolon. Wide separation of stomach from transverse colon by SB loops is a clue to the Middle PDH. By laparoscopy a surgeon may miss the MIDDLE PDH unless warned by the radiologist of its presence.

TABLE OF CONTENTS/OUTLINE
Review anatomy and etiology of paraduodenal hernias with special attention to the MIDDLE PDH. Explain and illustrate imaging characteristics of MIDDLE PDH with multiple examples from KUB, Barium and CT including laparoscopic images of a MIDDLE PDH showing only a subtle bulge in the central retroperitoneum. Highlight imaging features of wide separation of stomach and colon and intraperitoneal vasculature distortion for radiologic diagnosis of MIDDLE PDHs.
Soft Tissue Venous Malformation in Adults, An Ongoing Nomenclature Dilemma

All Day Location: GI Community, Learning Center

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TEACHING POINTS

1. Venous malformations (VM) are the most common subtype of vascular anomalies (VA), often misclassified as soft tissue hemangioma (STH) by many adult body imaging radiologists even though both entities have different patient demographics, histological and clinical significance. Proper classification is essential. Treatment involves different multidisciplinary teams. Surgeons, dermatologists, radiologists, interventional radiologists and primary care physicians play varying roles in each entity.

2. Knowledge of VA imaging features on different modalities gives radiologists the key role in differentiating VM from other VA.

TABLE OF CONTENTS/OUTLINE

• Discuss current use of VA "mis-nomenclature"
• Discuss International Society for the Study of Vascular Anomalies (ISSVA) VA classification
• Review VA prevalence with focus on the rarity of STH in adults, given their natural history, spontaneous regression or early treatment in childhood
• Illustrate histological and radiological differences between VM and STH
• Discuss lag of adult body imaging literature compared to pediatric radiology literature in describing VA
• Discuss and illustrate cases VM in adults. Special focus on pathognomonic radiological features like enhancement pattern and presence of phleboliths
• Discuss recent VM management options
Pathways of the Spread of Neoplastic and Inflammatory Diseases Extending to the Abdominal Wall

All Day Location: GI Community, Learning Center

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Masakazu Hirakawa, MD, Beppu, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To understand the anatomy of the superior and inferior lumbar triangles, relative weaknesses of the abdominal wall caused by the absence of the external muscle layer.
2. To understand the anatomical relationship among the peritoneal folds, inguinal fossae and the umbilicus.
3. To understand the fascial anatomy of the perineum (central tendon of perineum) and its continuity to the abdominal wall.
4. To be familiar with the characteristic imaging findings of linitis plastica type metastatic diseases from poorly differentiated gastrointestinal adenocarcinoma.

TABLE OF CONTENTS/OUTLINE
1. The superior and inferior lumbar triangles as the pathways from the retroperitoneal space to the posterolateral abdominal wall: recurrent gastric cancer and abdominal wall abscess.
2. Embryologic remnants connecting with the umbilicus: peritoneal implants along the peritoneal folds and umbilical metastasis.
3. Peritoneal folds and inguinal fossa as the pathway to the femoral/inguinal regions: scrotal metastasis and Amyand's hernia.
4. The continuity of the fascia between the perineum and the anterior abdominal wall: Fournier's gangrene, anterior abdominal wall extension from perianal abscess and anal canal cancer.
On the Right Level: MRE, Endoscopy, and Fecal Calprotectin Correlation

All Day Location: GI Community, Learning Center

**Awards**
Certificate of Merit

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Ryan D. Navarro, MD, Washington, DC (Presenter) Nothing to Disclose
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Angela D. Levy, MD, Washington, DC (Abstract Co-Author) Nothing to Disclose

**TEACHING POINTS**

- Review pathophysiology and differential diagnosis of inflammatory bowel disease (IBD), consisting of Crohn's Disease (CD) and Ulcerative Colitis (UC)
- Discuss fecal calprotectin as a non-invasive biomarker for GI inflammation
- Illustrate Magnetic Resonance Enterography (MRE) and endoscopic features of IBD
- Case review of the clinical utility of combining fecal calprotectin results with MRE
- Suggested diagnostic approach and imaging pearls
- Future directions: multi-modality approach to IBD

**TABLE OF CONTENTS/OUTLINE**

1. Inflammatory Bowel Disease Pathophysiology and Clinical Presentation
   A. Risk factors and pathophysiology of IBD
   B. Classic clinical presentations
   C. Comparison of imaging modalities (SBFT, CTE, MRE) of IBD
2. MRE findings in IBD
   A. Classic presentations
   B. Distinguishing CD and UC on MRE
3. Fecal calprotectin structure, function, and surrogate marker of inflammation
4. Variable findings of IBD on MRE, illustrated with pathology proven cases of IBD from our institution
5. Diagnostic algorithm and disease activity stratification
6. Role of multi-modality approach with MRE, Inflammatory Biomarkers, and Endoscopy
7. Future/Summary Statement
Heterotopic Pancreas: Pathological Features, Imaging Appearance and Complications

Aim of this exhibit is to:
1. Describe the embryological bases and pathological features of pancreatic heterotopia.
2. Describe the imaging features of pancreatic heterotopia in different abdominal organs, including the stomach, duodenum, jejunum and spleen.
3. Discuss the different complications including pancreatitis, pseudocysts and malignant degeneration.

TABLE OF CONTENTS/OUTLINE

I. Theories explaining the development of pancreatic heterotopia and pathological features
II. Imaging appearance in the following organs:
   a. Stomach
   b. Jejunum
   c. Duodenum
   d. Spleen
III. Imaging of complications:
    a. Pancreatitis of heterotypic pancreas
    b. Groove pancreatitis
    c. Pseudocysts
    d. Malignant degeneration

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Kumaresan Sandrasegaran, MD - 2013 Honored Educator
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The Post-operative Abdomen - Surgicel Haemostatic Packing or Abscess?

All Day Location: GI Community, Learning Center

Participants
David Little, MBChB, FRCR, Bristol, United Kingdom (Presenter) Nothing to Disclose
Lynne Armstrong, MBChB, PhD, Bristol, United Kingdom (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

In the post-operative abdomen surgicel haemostatic packing can mimic abscess formation. Differentiating between the two is important in deciding whether these patients are managed conservatively or with further intervention such as drainage. The purpose of this exhibit is to:
- Raise awareness of this important differential diagnosis
- Expose radiologists to several example cases
- Review the published literature on the use of surgical haemostatic packing

TABLE OF CONTENTS/OUTLINE

What is surgical haemostatic packing? Literature review of the use of surgicel. Case examples (used to illustrate ways of helping to differentiate between abscess and surgical material) including:
- Case 1 - Left flank 'collection' following left hemicolecctomy
- Case 2 - Gall bladder fossa 'collection' following cholecystectomy
- Case 3 - Pelvic 'collection' following cystectomy
- Case 4 - Perisplenic 'collection' following partial splenectomy

Summary of how to differentiate between abscess and surgical material.
Is the Biliary Tract an Incomplete Pancreas? A Radiological Perspective

All Day Location: GI Community, Learning Center

Participants
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Larissa C. Roza, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Cinthia D. Ortega, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
- A novel approach to biliary tract pathology emphasizes the similarities to pancreatic counterparts. The biliary tract and pancreas share similar pathological conditions as exemplified by IgG4-related sclerosing cholangitis and autoimmune pancreatitis; intraductal papillary neoplasm of the bile duct (IPNB) and intraductal papillary mucinous pancreatic neoplasm (IPMN), mucinous cystic neoplasm (MCN) of biliary tract and MCN of the pancreas; and cholangiocarcinoma and pancreatic ductal adenocarcinoma. - Some radiological aspects of pancreatic conditions have similar counterparts in the biliary tract and 'vice-versa'. - To explain how to use properly the different imaging methods to evaluate biliary tract diseases with pancreatic counterparts.

TABLE OF CONTENTS/OUTLINE
- Explanation of the pathological concept of the biliary tract as an incomplete pancreas.
- Review of the pathological and radiological aspects of inflammatory conditions biliary conditions that can affect simultaneously the biliary tract and pancreas.
- Review of pathological and imaging findings of neoplasms of the biliary tract that have pancreatic counterparts.
- Summary
Ultrasonographic Findings in Inflammatory Bowel Disease: What Every Radiologist Should Know

All Day Location: GI Community, Learning Center

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Giovanni G. Cerri, PhD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To review the pathophysiology of Inflammatory bowel disease (IBD) 2. To review the sonomorphology of the intestinal wall 3. To explain the utility of ultrasound as first-line imaging technique in IBD in initial diagnosis and during the clinical course of the disease.

TABLE OF CONTENTS/OUTLINE
Table of contents/outline Pathophysiology of inflammatory bowel disease (IBD) Sonomorphology of the intestinal wall Review of imaging findings in IBD Summary and conclusion
Tumoral Infarction: Benign Mimic of Malignancy

All Day Location: GI Community, Learning Center

Participants
Santosh K. Selvarajan, MD, Philadelphia, PA (Presenter) Nothing to Disclose
Nisha Sainani, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Cheryl A. Sadow, MD, Weymouth, MA (Abstract Co-Author) Nothing to Disclose
Babitha Asha, MBBS, MD, Philadelphia, PA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Infarction of tumors, although a rare occurrence, may obscure the imaging appearance of the native tumor and pose a diagnostic dilemma. The purpose of this exhibit is to illustrate and understand the imaging appearance of infarcted tumors, discuss differential considerations in an effort to prevent unwarranted aggressive treatment measures.

TABLE OF CONTENTS/OUTLINE
We report patients who underwent invasive surgical procedures secondary to change in morphology of previously benign-appearing tumors, thought to represent malignant changes. All patients had pathology-proven tumoral infarction. On imaging, infarcted tumors can often mimic other processes; can simulate hemorrhage within tumors, can increase in size and display internal soft-tissue nodules and heterogeneous contrast enhancement, features that are commonly associated with malignancy. Moreover, it may be difficult to diagnose the native tumor on percutaneous needle biopsy if the specimen is acquired from the infarcted region.
Participants
Linda Kelahan, MD, Washington, DC (*Presenter*) Nothing to Disclose
Alexander Somwaru, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Angela D. Levy, MD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS
1. Review the pathophysiology and clinical course of stercoral colitis, emphasizing the life-threatening risks of this disease entity.
2. Demonstrate the multi-detector computed tomography (MDCT) imaging appearance of multiple cases of stercoral colitis with increasing degrees of severity and associated complications, including perforation.
3. Juxtapose MDCT imaging findings with actual gross surgical and endoscopic images for correlation.
4. Discuss the characteristic imaging findings that allow for an accurate, early diagnosis to hasten clinical intervention.

TABLE OF CONTENTS/OUTLINE
1. Pathophysiology of stercoral colitis
2. Distinguishing imaging findings of stercoral colitis illustrated through multiple cases
3. Cases demonstrating associated complications of stercoral colitis such as pneumatosis and portal venous gas, bowel obstruction, bowel wall perforation, and intrabdominal abscess
4. Gross surgical images of advanced cases of stercoral colitis
5. Endoscopic imaging findings of stercoral colitis
6. Overview of stercoral colitis management and important points to communicate to the referring clinician
Hepatobiliary Phase of Gadoxetic Acid Enhanced MR Imaging of Benign Hepatocellular Nodules Based on Molecule Background

All Day Location: GI Community, Learning Center

Awards
Magna Cum Laude
Identified for RadioGraphics

Participants
Norihide Yoneda, Kanazawa, Japan (Presenter) Nothing to Disclose
Osamu Matsui, MD, Kanazawa, Japan (Abstract Co-Author) Research Consultant, Kowa Company, Ltd Research Consultant, Otsuka Holdings Co, Ltd Research Consultant, Eisai Co, Ltd
Azusa Kitao, Kanazawa, Japan (Abstract Co-Author) Nothing to Disclose
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Dai Inoue, Kanazawa, Japan (Abstract Co-Author) Nothing to Disclose
Tetsuya Minami, MD, Kanazawa, Japan (Abstract Co-Author) Nothing to Disclose
Toshifumi Gabata, MD, Kanazawa, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To review that the molecular background of hepatocellular benign nodules originated from hepatocytes including focal nodular hyperplasia (FNH), nodular regenerative hyperplasia (NRH), hepatocellular adenoma (HCA) and dysplastic nodule (DN).
2. To review hepatobiliary phase (HB phase) of gadoxetic acid enhanced MR imaging (EOB-MRI) in hepatocellular benign nodules and correlate between EOB-MRI findings and molecular background.
3. To review how to differentiate among these lesions and from hepatocellular carcinoma.

TABLE OF CONTENTS/OUTLINE
1. Introduction
2. Review of the molecular/genetic background of hepatocellular benign lesions (FNH, NRH, HCA and dysplastic nodule)
3. Typical findings of the HB phase on EOB-MRI in hepatocellular benign lesions and correlate with molecular markers (e.g. organic anion-transporting polypeptide 1B3 (OATP1B3), beta-catenin and glutamine synthetase (GS) etc.)
4. Differential diagnosis
Review of Non-neoplastic, Benign and Malignant Neoplastic Peritoneal Processes

All Day Location: GI Community, Learning Center

Participants
Seng Thipphavong, MD, Toronto, ON (Presenter) Nothing to Disclose
Andreu F. Costa, MD,FRCPC, Halifax, NS (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
A wide spectrum of disease can involve the peritoneum, ranging from non-neoplastic to malignant processes. Diffuse peritoneal disease can often be diagnosed on imaging, especially when compared with clinical information. Differentiating between types of peritoneal neoplasms on imaging can be difficult; more often than not, diagnosis will be determined on biopsy.

TABLE OF CONTENTS/OUTLINE
Case-based Review of Benign and Malignant Pathologies of the Biliary Tree

All Day Location: GI Community, Learning Center

Participants
Seng Thipphavong, MD, Toronto, ON (Presenter) Nothing to Disclose
Andreu F. Costa, MD, FRCPC, Halifax, NS (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
A wide spectrum of disease can involve the bile ducts, ranging from infectious, inflammatory and neoplastic causes. Benign entities can mimic neoplasms, requiring careful attention to clinical and imaging points. Imaging findings can be subtle but attention to key details may avoid mistaking benign for malignant disease or vice versa.

TABLE OF CONTENTS/OUTLINE
1. Learning Objectives
2. Disclaimer
3. Case-based presentation of biliary pathologies, including: choledocholithiasis IgG4 disease congenital cysts portal biliopathy cholangiocarcinoma recurrent pyogenic cholangitis peribiliary cysts cystadenoma intraductal papillary mucinous neoplasm primary sclerosing cholangitis
4. Summary
5. References
6. Contact Information
Intra-abdominal Lymphatic Malformation: An Uncommon but Important Diagnosis

Awards
Certificate of Merit

Participants
Arkadiy Palvanov, MD, New Hyde Park, NY (Presenter) Nothing to Disclose
Alex Chau, MD, New Hyde Park, NY (Abstract Co-Author) Nothing to Disclose
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Melanie Wegener, Garden City, NY (Abstract Co-Author) Nothing to Disclose
John J. Hines JR, MD, New Hyde Park, NY (Abstract Co-Author) Nothing to Disclose
Douglas S. Katz, MD, Mineola, NY (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To review the pathophysiology of lymphangiomas.
2. To discuss the typical locations and radiographic appearance of intra-abdominal lymphangiomas.
3. To discuss and present cases of lymphangiomas in the abdomen and pelvis, with relevant cross-sectional imaging findings (US, CT and MR appearance).
4. To discuss the differential diagnosis of these lesions, pitfalls related to diagnosis and complications with pertinent imaging findings.

TABLE OF CONTENTS/OUTLINE
Embryology, histology, gross appearance and natural history of lymphangiomas.
Typical locations and appearance of intra-abdominal lymphangiomas.
Imaging findings (US, CT and MR) of intra-abdominal lymphangiomas and differential diagnosis.
Pitfalls in the cross-sectional appearance of a lymphangioma, which can potentially mimic abscess, neoplasm or lymphadenopathy.
Lesions which can mimic the appearance of a lymphangioma.
Complications of lymphangiomas and associated imaging findings.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Douglas S. Katz, MD - 2013 Honored Educator
Douglas S. Katz, MD - 2015 Honored Educator
Painting the Tunnel Walls White: A Simplified Water Soluble Oral Contrast Media Regimen for CT Evaluation of the Upper Gastrointestinal Tract

All Day Location: GI Community, Learning Center

Participants
Debbie J. Owen, MBBS, BSc, Leicester, United Kingdom (Presenter) Nothing to Disclose
Melisa Sia, Farnworth, United Kingdom (Abstract Co-Author) Nothing to Disclose
Amy Gerrish, BMedSc, MBBS, Leicester, United Kingdom (Abstract Co-Author) Nothing to Disclose
David Bowrey, MD, MBBCh, Leicester, United Kingdom (Abstract Co-Author) Nothing to Disclose
Vikas Shah, MRCP, FRCR, Leicester, United Kingdom (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Following surgery or trauma, the upper GI tract requires evaluation for the presence of staple or suture line leaks, leaks from traumatic mural tears, or fistulae. Pre-operative evaluation of the upper GI tract is also required for hiatus or diaphragmatic hernia surgery. To minimize risk of serosal irritation and aspiration pneumonitis, and for optimal CT contrast characteristics, iso-osmolar water soluble contrast media is preferred - 5% Gastrografin has these qualities. Four regimens with variations only in timing and contrast volume were developed for oesophageal, gastric, small bowel and post Roux-en-Y surgery evaluation. The volumes and timings offer a balance between ease of use, tolerability by sick patients and image quality.

TABLE OF CONTENTS/OUTLINE
Scenarios of upper GI tract requiring assessment at CT pre and post-operatively, and following trauma. Explanation of rationale of using 5% Gastrografin with reference to plasma osmolality, chemical irritation and CT density characteristics. Reasons for volumes and timings of contrast used. Illustrated outline of four oral contrast protocol regimens developed for oesophageal, gastric, small bowel and post Roux-en-Y surgery assessment. Examples of post-operative and traumatic leaks, fistulae and pre-operative hiatal hernia assessments. Pitfalls and lessons learnt from a year of use.
All About That Space: An Interactive Review of the Spaces of the Abdomen and Pelvis

All Day Location: GI Community, Learning Center

Participants
Angela Tong, MS, BS, MD, Valhalla, NY (Presenter) Nothing to Disclose
Benjamin Navot, MD, Valhalla, NY (Abstract Co-Author) Nothing to Disclose
Perry S. Gerard, MD, Valhalla, NY (Abstract Co-Author) Nothing to Disclose
Anthony G. Gilet, MD, New York, NY (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Knowledge of spaces in the abdomen and pelvis can aid in the diagnosis of various pathologies including where tumors originate to where traumatic injuries occur. We will focus on teaching the embryologic roots of where the normal anatomy originate and then present cases in such a way that uses the foundation knowledge of spaces to make diagnoses.

TABLE OF CONTENTS/OUTLINE
We will present the following: Embryologic diagrams that aid in understanding normal anatomy. CT and MRI images demonstrating ligaments and spaces of the peritoneal cavity, retroperitoneum, and the pelvis. Cases that utilizes knowledge of spaces to aid in diagnosis including: Extraperitoneal and intraperitoneal bladder rupture and mimickers Anastomotic leaks from recent surgeries Acute pancreatitis Metastasis of lymphoma and pelvic masses Abdominal aorta rupture
LI-RADS 5 Atypical Hepatocellular Carcinoma (HCC)

All Day Location: GI Community, Learning Center

Participants
Beatrice L. Madrazo, MD, Miami, FL (Presenter) Nothing to Disclose
Victor J. Casillas, MD, Miami, FL (Abstract Co-Author) Nothing to Disclose
Rosa P. Castillo, MD, Coral Gables, FL (Abstract Co-Author) Nothing to Disclose
Paul Martin, MD, Miami, FL (Abstract Co-Author) Nothing to Disclose
Cynthia Levy, MD, Miami, FL (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Learning objectives: Discuss atypical patterns of HCC on imaging studies (CT and MRI) relative to LI-RADS 5; HCC with transporters are hypertintense on hepatobiliary phase; LI-RADS represents a work in progress and HCC with atypical imaging characteristics should be recognized in patients at risk

TABLE OF CONTENTS/OUTLINE
In our quest to correctly identify HCC, we must become aware of atypical patterns of enhancement and try to comprehend the factors that result in their unusual imaging characteristics. Material and methods - our series includes 12 cases with the following atypical characteristics: 1) absence of arterial enhancement; 2) contrast retention; 3) capsular retraction; 4) premature capsular enhancement; 5) corona enhancement; 6) diffuse HCC without a perceptible mass; 7) cystic HCC; 8) presence of venous lakes; 9) hyperintense on hepatobiliary phase; and 10) exclusive neoplastic thrombus without a mass.
State-of-the-CT Imaging Techniques of the Abdomen with 3rd Generation Dual Source CT

All Day Location: GI Community, Learning Center

Participants
Marcel L. Dijkshoorn, RT, Rotterdam, Netherlands (Presenter) Consultant, Siemens AG
Francois Willemssen, MD, Hoogstraten, Belgium (Abstract Co-Author) Nothing to Disclose
Daan van der Velden, Rotterdam, Netherlands (Abstract Co-Author) Nothing to Disclose
Marcel Van Straten, PhD, Rotterdam, Netherlands (Abstract Co-Author) Research collaboration, Siemens AG
Roy S. Dwarkasing, MD, Rotterdam, Netherlands (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
To explain how enhanced x-ray tubes can reduce contrast media dose. To discuss potential for radiation dose reduction with optimized automatic kV modulation. To demonstrate minimized breathing and pulsation artifacts with ultrafast scan protocols. To illustrate optimization of protocols for obese patients. To demonstrate improvements for abdominal imaging with dual energy CT.

TABLE OF CONTENTS/OUTLINE
Introduction Enhanced technical features of 3rd generation dual source CT Radiation dose reduction by improved automatic kV modulation with more and dedicated filtered spectra. Optimization of protocols for contrast media reduction Sub-second full abdomen imaging with ultrafast scan protocols How can dual source CT improve imaging in obese patients? Dual Energy scanning and analysis Summary: Third generation dual Source CT has a number of dedicated techniques to facilitate state-of-the-art abdominal imaging. The availability of these techniques provides solutions to increase image quality and reduce radiation dose and contrast media. This exhibit will explain the individual scan techniques, illustrate which patient group or clinical questions may benefit most, and indicate potential pitfalls.
## Diagnosing Large Bowel Obstruction on CT: Pearls and Pitfalls

**All Day Location:** GI Community, Learning Center

### Participants

- **Justin R. Overcash, MD, Philadelphia, PA** *(Presenter)* Nothing to Disclose
- **Brandon Bachert, MD, Philadelphia, PA** *(Abstract Co-Author)* Nothing to Disclose
- **Susan L. Summerton, MD, Philadelphia, PA** *(Abstract Co-Author)* Nothing to Disclose
- **Mindy M. Horrow, MD, Philadelphia, PA** *(Abstract Co-Author)* Spouse, Director, Merck & Co, Inc

### Teaching Points

Illustrate the importance of identifying the location of the transition point. Recognize the importance of utilizing multiplanar imaging in diagnosing the presence and cause of a large bowel obstruction. Differentiate neoplastic and non-neoplastic causes of large bowel obstruction. Discuss and illustrate benign causes of large bowel obstruction including volvulus, hernia, intussusception, fecal impaction, stricture, and diverticulitis. Discuss mimics and pitfalls of large bowel obstruction including functional causes of obstruction such as colonic ileus and Ogilvie's syndrome, toxic megacolon, and proximal large bowel obstruction masquerading as a small bowel obstruction. Identify life threatening complications of large bowel obstruction including ischemia and bowel perforation.

### Table of Contents/Outline

1. CT findings of common causes of large bowel obstruction
   - **Malignant**
     - Adenocarcinoma
   - **Benign**
     - Diverticulitis
     - Hernias

1. Diaphragmatic
2. Parastomal
3. Inguinal
   - Volvulus
1. Cecal
2. Sigmoid
4. Intussusception
5. Masses
6. Lipoma
7. Stricture

2. Mimics and pitfalls of large bowel obstruction
   - Toxic megacolon
   - Ogilvie syndrome
   - Ileus
   - Proximal LBO mimicking small bowel obstruction
3. Complications associated with LBO
   - Ischemia
   - Perforation

### Honored Educators

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Mindy M. Horrow, MD - 2013 Honored Educator
Pathology is in Bloom: The Diagnostic Challenge and Significance of Air on Abominal/Pelvic MRI

All Day Location: GI Community, Learning Center

Participants
Yaseen Oweis, MD, MBA, Saint Louis, MO (Presenter) Nothing to Disclose
Joseph W. Owen, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Kathryn J. Fowler, MD, Chesterfield, MO (Abstract Co-Author) Research support, Bracco Group

TEACHING POINTS
1) Raise awareness for inclusion of intraabdominal gas in the MRI interpreter's search pattern.
2) Increase familiarity with the varying appearance of gas on MRI.
3) Use MRI sequences which exaggerate dephasing artifact to identify gas, and sequences which minimize artifact to better characterize gas.
4) Review multiple cases which may present with intraabdominal gas and correlate with other modalities.

TABLE OF CONTENTS/OUTLINE
Physics of Air on MR
Use of in/opposed phase imaging
Other sequences obtained in opposed phase
Pre and post contrast sequences
Delayed/hepatobiliary phase sequences
Use of nonstandard/obliqued planes to better delineate/confirm gas
Clinical cases
Pneumatosis
Free intraperitoneal air
Subcutaneous emphysema
Pneumobilia
Contained rectal perforation
Portal venous gas
Gas in postoperative seroma
Intraarticular gas
Intracranial gas
Bladder gas
Pneumothorax
Gas within enterocutaneous fistula
Perforated diverticulitis
MR Enterography in the Management of Crohn Disease and Evaluation of Treatment Response

All Day Location: GI Community, Learning Center

Participants
Lourdes Del Campo, PhD, Madrid, Spain (Presenter) Nothing to Disclose
Maria Aragones Garcia, PhD, Madrid, Spain (Abstract Co-Author) Nothing to Disclose
Pablo Rodriguez Camero, MD, Madrid, Spain (Abstract Co-Author) Nothing to Disclose
Paloma Largo Flores, MD, Madrid, Spain (Abstract Co-Author) Nothing to Disclose
Maria J. Casanova, MD, Madrid, Spain (Abstract Co-Author) Nothing to Disclose
Javier Perez Gisbert, MD, PhD, Madrid, Spain (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

Review the imaging findings in the different subtypes of Crohn's disease, inflammatory, fistulizing/perforating, reparative-regenerative and fibrostenotic. Discuss the principal radiological findings associated with active disease. Understand the different types of treatment response.

TABLE OF CONTENTS/OUTLINE

Crohn's disease is a chronic, unpredictable disorder that frequently involves the small bowel. It is characterized by bowel wall structural damage with progression from inflammation to perforating disease and fibrosis. We have evaluated the radiological findings in MR enterography in 50 patients during 3 years with different subtypes of Crohn's disease and we have controlled and evaluated their response to medical therapy. Compared with clinical symptoms scores, laboratory markers and endoscopic activity is used. MR enterography provides excellent information in the management of Crohn's disease, about bowel damage, complications, disease extent and biologic activity. Medical therapies are aimed at suppressing the immune system in these patients and they have important side effects. Cross-sectional imaging may allow better triage of patients and also a good evaluation of their response to medical treatment.
Beyond the Bowel: Extraintestinal Manifestations of Inflammatory Bowel Disease

All Day Location: GI Community, Learning Center

Participants
Jeffrey Olpin, MD, Salt Lake City, UT (Presenter) Nothing to Disclose
Maryam Rezvani, MD, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of the exhibit is: To briefly review the pathophysiology of inflammatory bowel disease To briefly review the intestinal manifestations of inflammatory bowel disease To discuss extraintestinal manifestations of inflammatory bowel disease To optimize CT and MR protocols for the detection and characterization of both intestinal and extraintestinal manifestations of inflammatory bowel disease

TABLE OF CONTENTS/OUTLINE
Pathophysiology and imaging overview of inflammatory bowel disease Crohn disease Ulcerative colitis Extraintestinal manifestations of inflammatory bowel disease Hepatobiliary system Pancreas Genitourinary system Musculoskeletal system Protocol optimization for the detection of extraintestinal manifestations of inflammatory bowel disease

Honored Educators
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Maryam Rezvani, MD - 2015 Honored Educator
The purpose of this exhibit is:
1. To familiarize radiologists with clinical indices of Crohn’s disease used by gastroenterologists, such as the Crohn’s Disease Activity Index (CDAI), Crohn’s Disease Endoscopic Index of Severity (CDEIS), and Simple Endoscopic Score for Crohn’s Disease (SES-CD).
2. To describe, compare, and contrast indices for Crohn’s disease activity that use MR enterography findings, such as the Magnetic Resonance Index of Activity (MaRIA), Sailer index for anastomotic recurrence, and Crohn’s Disease MRI Index (CDMRI), as well as the Lemann index to assess digestive tract damage in patients with Crohn’s disease.

**TABLE OF CONTENTS/OUTLINE**

Describe the need for reproducible indices of Crohn’s disease activity
Reliably distinguish active from inactive disease
Guide therapy decisions
Importance in research
Review clinical indices of Crohn’s disease
Symptom based
Endoscopy based
Review imaging based indices of Crohn’s disease using MR enterography
Describe indices
Provide examples of the relevant features and measurements
Future directions and summary
Primary and Secondary Lesions Affecting the Peritoneum. The Gamut of MDCT Imaging Patterns with PET and Pathologic Correlation

All Day Location: GI Community, Learning Center

Participants
Jared R. Garrett, MD, Shreveport, LA (Presenter) Nothing to Disclose
Husein I. Poonawala, MD, Shreveport, LA (Abstract Co-Author) Nothing to Disclose
Oluwayemisi M. Ojemakinde, MD, Shreveport, LA (Abstract Co-Author) Nothing to Disclose
Guillermo P. Sangster, MD, Shreveport, LA (Abstract Co-Author) Nothing to Disclose
Alirea Hamidian Jahromi, MD, MRCs, Shreveport, LA (Abstract Co-Author) Nothing to Disclose
Peeyush Bhargava, MD, MBA, Houston, TX (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The major teaching points of this exhibit are: 1. Familiarize the reader with relevant MDCT and PET appearances of peritoneal, mesenteric and omental diseases. 2. Provide key imaging features which to differentiate benign peritoneal lesions from peritoneal malignancies.

TABLE OF CONTENTS/OUTLINE
Primary peritoneal tumors are an unusual group of pathologic disorders that share a common anatomic site of origin and have overlapping imaging features. The isotropic strength of MDCT allows detailed assessment of the peritoneal anatomy, which is the key to understand the pathologic processes contained by or disseminated via peritoneal pathways. Correlation of morphologic evaluation in conjunction with FDG-PET metabolic activity is essential to distinguish benign peritoneal diseases from primary and secondary peritoneal malignancies. 1. Review the pathologic classification of peritoneal, mesenteric and omental diseases 2. Demonstrate multidetector computed tomography (MDCT) and positron emission tomography (PET) imaging features of common and uncommon benign diseases affecting the peritoneum, mesentery and omentum 3. Illustrate MDCT and PET appearance of primary peritoneal malignancy, secondary tumors and tumor-like lesions of the peritoneum
LI-RADS v2014 - Application and Future Directions

All Day Location: GI Community, Learning Center

Participants
Cynthia S. Santillan, MD, San Diego, CA (Presenter) Consultant, Robarts Clinical Trials Research Group
An Tang, MD, Montreal, QC (Abstract Co-Author) Speaker, Boehringer Ingelheim GmbH; Speaker, Siemens AG;
Advisory Board, Imagia
Kathryn J. Fowler, MD, Chesterfield, MO (Abstract Co-Author) Research support, Bracco Group
Jay P. Heiken, MD, Saint Louis, MO (Abstract Co-Author) Patent agreement, Medtronic, Inc; Patent agreement, Bayer AG
Thomas A. Hope, MD, San Francisco, CA (Abstract Co-Author) Advisory Committee, Guerbet SA; Research Grant, General Electric Company
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Alexander C. Kagen, MD, New York, NY (Abstract Co-Author) Speakers Bureau, Bayer AG
Mustafa R. Bashir, MD, Cary, NC (Abstract Co-Author) Research support, Siemens AG; Research support, Bayer AG; Research support, Guerbet SA; Research support, General Electric Company; Consultant, Bristol-Myers Squibb Company
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Amol Shah, MD, La Jolla, CA (Abstract Co-Author) Nothing to Disclose
Richard Kinh Gian Do, MD, PhD, New York, NY (Abstract Co-Author) Nothing to Disclose
Ania Z. Kielar, MD, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
Claude B. Sirlin, MD, San Diego, CA (Abstract Co-Author) Research Grant, General Electric Company; Speakers Bureau, Bayer AG; Consultant, Bayer AG

TEACHING POINTS
The purpose of this exhibit is:
1. To review LI-RADS v2014 with emphasis on changes from previous versions.
2. To discuss category assignment using LI-RADS, including multi-modality integration of major features and application of ancillary features.
3. To demonstrate use of LI-RADS v2014 using sample CT and MR cases in quiz format.
4. To preview future directions of LI-RADS content development, including ultrasound, contrast-enhanced ultrasound, and treatment response criteria.

TABLE OF CONTENTS/OUTLINE
Background and Significance Importance of accurate and reproducible HCC diagnosis and staging Key differences between LI-RADS and other systems for diagnosis of HCC, including AASLD and OPTN. LI-RADSv2014 Highlight changes in diagnostic algorithm Review how LI-RADS categories are assigned using the algorithm, integration of major features, application of ancillary features, and tie-breaking rules Quiz Radiologists will be presented with cases and asked to categorize them using LI-RADS. Cases will highlight aspects that are new or changed in LI-RADS v2014.
Cystic Lesions of the Liver - An Update and Comprehensive Case-based Imaging Review

All Day Location: GI Community, Learning Center

Awards
Certificate of Merit

Participants
David Bowden, MBChir, Toronto, ON (Presenter) Nothing to Disclose
Chirag Patel, MBBS, MRCP, Toronto, ON (Abstract Co-Author) Nothing to Disclose
Josee Sarrazin, MD, Toronto, ON (Abstract Co-Author) Nothing to Disclose
Laurent Milot, MD, MSc, Toronto, ON (Abstract Co-Author) Nothing to Disclose
Caitlin T. McGregor, MD, East York, ON (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: To describe, using a case-based approach, the broad spectrum of cystic liver lesions that may be encountered, including developmental, inflammatory, infectious, neoplastic (primary and secondary), post-traumatic/iatrogenic and miscellaneous entities To present, using a multimodality approach, the radiological features of each entity with an emphasis on findings that allow their differentiation and the determination of benignity vs malignancy To update the reader on newly recognised entities, in addition to the imaging characteristics of certain lesions following the use of hepatocyte-specific contrast agents To emphasize key imaging pitfalls to be avoided which may otherwise result in misdiagnosis and mismanagement

TABLE OF CONTENTS/OUTLINE
Overview of the spectrum of cystic lesions seen within each disease category Review of the pathophysiology of each entity, including recently recognised, rare sub-types of neoplasia (eg. Translocation Renal Cell Carcinoma, TRCC) and infective causes (eg. Cryptogenic Invasive Klebsiella Pneumoniae Liver Abscess Syndrome, CIKPLA) Multimodality illustration of the radiological findings encountered including US, CT, SPECT and MR imaging characteristics Summary and Further Reading
Quantification of Liver Fat Content Using MR Imaging and Spectroscopy

All Day Location: GI Community, Learning Center

Participants
Nicolas Linder, Leipzig, Germany (Presenter) Nothing to Disclose
Nikita Garnov, Leipzig, Germany (Abstract Co-Author) Nothing to Disclose
Alexander Schaudinn, MD, Leipzig, Germany (Abstract Co-Author) Nothing to Disclose
Thomas K. Kahn, MD, Leipzig, Germany (Abstract Co-Author) Nothing to Disclose
Harald F. Busse, PhD, Leipzig, Germany (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Principles of hepatic liver fat quantification using MR imaging and spectroscopy Correction for method dependent errors Comparison with other imaging methods (US, CT) and histology

TABLE OF CONTENTS/OUTLINE
Fatty liver disease and its complications ranging from hepatitis to cirrhosis are a problem of increasing importance in medical systems worldwide. With hepatic steatosis being reversible, early detection is essential. The gold standard of liver biopsy is not always applicable. Next to sonography MR imaging and spectroscopy are used in clinical routine and scientific studies to quantify liver fat in a noninvasive manner. Both MR techniques are based on the different Larmor frequency of protons in water and fat (chemical shift). MRI most frequently uses the In- and Opposed Phase Technique to quantify total liver fat, with water and fat leading to two different gradient echoes. MR spectroscopy is a voxel based method analyzing the respective proton spectrum, which is dependent on the chemical composition. Within the resonance spectrum between of 0 and 6.0 parts per million (ppm) the peaks of H(2)O, COOH, CH(2), CH(3) can be acquired and used for calculation of the liver fat content. For MR spectroscopy it is essential to place the voxel exclusively in the liver parenchyma.
Noninvasive Diagnosis of Liver Fibrosis: A Primer for Radiologists

All Day Location: GI Community, Learning Center

FDA

Discussions may include off-label uses.

Participants
Jeanne M. Horowitz, MD, Chicago, IL (Presenter) Nothing to Disclose
Sudhakar K. Venkatesh, MD, FRCR, Rochester, MN (Abstract Co-Author) Nothing to Disclose
Benjamin M. Yeh, MD, San Francisco, CA (Abstract Co-Author) Research Grant, General Electric Company; Author with royalties, Oxford University Press; Shareholder, Nextrast, Inc;
Alvin C. Silva, MD, Scottsdale, AZ (Abstract Co-Author) Nothing to Disclose
Kartik S. Jhaveri, MD, Toronto, ON (Abstract Co-Author) Speaker, Bayer AG
Frank H. Miller, MD, Chicago, IL (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. Learn how liver fibrosis and cirrhosis can be diagnosed noninvasively using ultrasound elastography and magnetic resonance elastography
2. Understand the strengths and limitations of noninvasive methods of diagnosing liver fibrosis with imaging
3. Review other techniques which may be helpful in the diagnosis of hepatic fibrosis, including diffusion weighted imaging, hepatobiliary contrast, perfusion imaging, contrast enhanced ultrasound, and textural analysis

TABLE OF CONTENTS/OUTLINE
1. Importance of early diagnosis of liver fibrosis and monitoring of fibrosis during treatment
2. Limitations of liver biopsy and serum fibrosis panels in diagnosing liver fibrosis and cirrhosis
3. Limitations of conventional ultrasound, CT, and MR in diagnosing liver fibrosis using morphologic features
4. Types of ultrasound elastography a. Transient elastography b. Acoustic radiation force impulse c. 3D shear wave elastography
5. MR elastography
6. Other techniques used in the diagnosis of hepatic fibrosis a. Diffusion weighted imaging b. Hepatobiliary contrast agents c. CT and MR perfusion imaging and fractional extracellular space d. Contrast enhanced ultrasound e. Textural analysis

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Frank H. Miller, MD - 2012 Honored Educator
Frank H. Miller, MD - 2014 Honored Educator
Livin' on the Edge - Liver Contour and Other Morphological Features of Fibrosis and Cirrhosis

All Day Location: GI Community, Learning Center

Participants
Carolina L. Vaz, Rio de Janeiro, Brazil (Presenter) Nothing to Disclose
Guilherme M. Cunha, MD, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Gabriel Bolsi, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Dafne D. Melquiades, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Cristine R. Buerger, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Leonardo K. Bittencourt, MD, PhD, Rio De Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Erick S. Hollanda, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
- Cirrhosis is a significant health problem nowadays, being associated with HCC and hepatic failure.- Morphologic criteria, based on imaging features, may suggest hepatic fibrosis or cirrhosis: liver surface nodularity, widening of fissures, expansion of gallbladder fossa, notching of the right lobe, right lobe atrophy and relative left and caudate lobe enlargement, as well as caudate-right lobe ratio.- However, there are other clinical conditions that may present with similar features, however not being entirely related to the pathogenesis of liver fibrosis/cirrhosis, such as pseudocirrhosis, sarcoidosis, primary sclerosing cholangitis, primary biliary cirrhosis, schistosomiasis, NASH and focal confluent fibrosis.- Our main objective is to discuss about imaging features related to liver fibrosis and its main differential diagnoses.

TABLE OF CONTENTS/OUTLINE
- Liver fibrosis/cirrhosis: definition, epidemiology and clinical relevance.- Pathophysiology of cirrhosis.- CT and MR protocols for chronic liver disease and associated lesions.- Imaging morphologic criteria that suggest liver fibrosis or chronic liver diseases.- Other noninvasive imaging methods: MR Elastography.- Conditions that mimic liver fibrosis on imaging appearance.- Tips and tricks to help the radiologist in evaluating abnormalities in liver morphology.
"The Perspective of the Gallbladder" - A Pictorial Investigation of Diseases Involving This Organ

All Day Location: GI Community, Learning Center

Participants

Dhivya M. Paravasthu, MBBS, MRCS, Toronto, ON (Presenter) Nothing to Disclose
Andreu F. Costa, MD, FRCP, Halifax, NS (Abstract Co-Author) Nothing to Disclose
Ania Z. Kielar, MD, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
Seng Thipphavong, MD, Toronto, ON (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

To review the multi modality imaging appearances of a variety of gall bladder pathologies. We present a series of cases as a quiz, illustrating the key imaging features of common and uncommon gallbladder pathology including mimics of tumour on different modalities of cross sectional imaging.

TABLE OF CONTENTS/OUTLINE

Objectives:• We present a review of common and uncommon pathological entities involving the gallbladder. • Cases are presented as a quiz format with key imaging findings and associated clinical implications. The list of some cases includes: 1: Acute conditions such as torsion, haemorrhage, acute cholecystitis with associated complications. 2: Non specific gallbladder thickening in a range of pathology invading Ig G4, ascites, etc. 3: Gall bladder carcinoma and associated mimics including tumefactive sludge and adenomyomatosis. 4: Metastases from leiomyosarcoma, melanoma, lymphoma etc. 5: Miscellaneous pathology including gallbladder fistula, biloma. Conclusion Knowledge of a variety of multimodality imaging appearances of focal gallbladder entities is imperative to accurate diagnosis and serves as a guide for management. With this educational exhibit we hope to demonstrate some common and rare conditions involving the gallbladder.
Participants
Christopher Lindquist, MD, Winnipeg, MB (Presenter) Nothing to Disclose
Sharon Z. Adam, MD, Chicago, IL (Abstract Co-Author) Nothing to Disclose
Julie Sanders, MD, Shreveport, LA (Abstract Co-Author) Nothing to Disclose
Carolina Parada, MD, Buenos Aires, Argentina (Abstract Co-Author) Nothing to Disclose
Nancy A. Hammond, MD, Chicago, IL (Abstract Co-Author) Nothing to Disclose
Desiree E. Morgan, MD, Birmingham, AL (Abstract Co-Author) Research support, General Electric Company
Rajesh Keswani, Chicago, IL (Abstract Co-Author) Nothing to Disclose
Frank H. Miller, MD, Chicago, IL (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

1. Pancreatic adenocarcinoma is usually detected at an advanced stage and has a poor prognosis. Radiologists can play a pivotal role in improving prognosis by detecting these tumors at an early stage. Optimal techniques with CT and MRI are important for enabling early detection.

2. Certain signs on imaging should raise suspicion even when the tumor itself is not visible.

TABLE OF CONTENTS/OUTLINE

- Pancreatic adenocarcinoma - epidemiology and prognosis. Importance of early detection
- Importance of contrast administration and optimal enhancement timing in detecting pancreatic tumors
- Role of MDCT and dual-energy CT, including importance of coronal and sagittal reconstructions
- Role of MRI - important sequences (T1 fat suppressed, DWI) and the additional value they may have in detecting hidden tumors
- Role of endoscopic sonography in the diagnosis
- Specific signs that must alert us - 'duct cut-off sign', 'double duct sign', high duct/parenchyma ratio
- Associated and premalignant lesions (e.g. IPMN) and the issue of screening high-risk patients
- Mimickers of adenocarcinoma: benign - paraduodenal pancreatitis, focal chronic pancreatitis, autoimmune pancreatitis (mainly type 1/IgG4 pancreatitis) and the "duct icicle sign"
- Benign tumors

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Frank H. Miller, MD - 2012 Honored Educator
Frank H. Miller, MD - 2014 Honored Educator
Abdominal Manifestations of Sickle Cell Disease: Complete Radiological Spectrum

All Day Location: GI Community, Learning Center

Participants
Ameya J. Baxi, MBBS, DMRD, San Antonio, TX (Presenter) Nothing to Disclose
Vijayanadh Ojili, MD, San Antonio, TX (Abstract Co-Author) Nothing to Disclose
Abhijit Sunnapwar, MD, San Antonio, TX (Abstract Co-Author) Nothing to Disclose
Kedar N. Chintapalli, MD, San Antonio, TX (Abstract Co-Author) Nothing to Disclose
Carlos S. Restrepo, MD, San Antonio, TX (Abstract Co-Author) Nothing to Disclose
Dhanashree Rajderkar, MD, Gainesville, FL (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

1. To study abdominal manifestations of sickle cell disease (SCD)
2. To discuss the role of imaging in the diagnosis and evaluation of SCD and its complications
3. To discuss imaging based differential diagnosis of abdominal manifestations of SCD

TABLE OF CONTENTS/OUTLINE

Abdominal manifestations are frequent in SCD patients, which are an important cause of morbidity and mortality. Recognizing typical imaging findings of these manifestations is essential for timely diagnosis and prevention of complications. Imaging plays a critical role in patient management. In this exhibit, we will discuss following abdominal manifestations of SCD:

Hepatobiliary: Hepatomegaly, Fibrosis Multiple transfusions related complications: Hemosiderosis/Hemochromatosis and hepatitis Infarct/abscess
Hepatic artery stenosis and vein thrombosis
Choledolithiasis, cholecystitis
Spleen: Splenomegaly, Splenic infarct
Abscess
Auto-splenectomy
Pancreas: Pancreatitis
Gastrointestinal tract: Pericolonic abscess
Mesenteric/colonic ischemia
Kidneys: Renal papillary necrosis
Enlarged kidneys
Echogenic pyramids
Interstitial nephritis
Small and echogenic kidneys - late
Renal vein thrombosis
Skeletal: Avascular necrosis
Osteomyelitis
Extramedullary hematopoiesis
Osteopenia and pathologic fractures

Honored Educators

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Carlos S. Restrepo, MD - 2012 Honored Educator
Carlos S. Restrepo, MD - 2014 Honored Educator
The Often Overlooked Scout Image on Body MRI: Case Based Review of Diagnostic Utility and Major Clinical Impact of this Sequence

All Day Location: GI Community, Learning Center

Participants
Hersh R. Patel, BS, New York, NY (Presenter) Nothing to Disclose
Nicole M. Hindman, MD, New York, NY (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To review the types of sequences used for Scout images (ie, TruFISP, HASTE, Time of Flight, etc), the variability of the regions imaged with MR Scouts (ie, chest is often included on a Scout when the targeted area is the liver) and the variability in diagnostic information obtained by these sequences.2. To demonstrate actual case-based examples of how MR Scout images are additive in interpreting the remainder of the diagnostic MR examination (for example, a desmosplastic liver lesion interpreted as a cholangiocarcinoma which subsequently went to surgery, when the primary lung tumor can be seen on the Chest scout images; a transitional cell carcinoma not seen on the scout images for a lower extremity MRA, which was subsequently picked up on follow-up, etc.).3. To emphasize the importance of incorporating a thorough review of MR scout images before completing interpretation of an MR exam.

TABLE OF CONTENTS/OUTLINE
Imaging Findings in Congenital Porto-Systemic Shunts

All Day Location: GI Community, Learning Center

Participants
Sarah Aquilina, Naxxar, Malta (Abstract Co-Author) Nothing to Disclose
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Vincenzo Carollo, MD, Palermo, Italy (Presenter) Nothing to Disclose
Luise Reichmuth, MD, Tal Qroqq, Malta (Abstract Co-Author) Nothing to Disclose
Adrian Mizzi, MD, Glasgow, United Kingdom (Abstract Co-Author) Nothing to Disclose
Roberto Miraglia, MD, Palermo, Italy (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
This educational exhibit aims to: Define and classify intra-extra-hepatic congenital portosystemic shunts (CPS) Review imaging findings of CPS on Ultrasound, CT and MRI Outline treatment options that are currently available

TABLE OF CONTENTS/OUTLINE
A. Classification of congenital portosystemic shunts: Intrahepatic (Park's classification: Types I-IV) Extrahepatic (Abernethy malformation, Morgan and Superina's classification: Types Ia, Ib, II). B. Abnormalities in embryological development of the portal vein resulting in formation of these shunts. C. Clinical presentation, complications, and associated abnormalities seen in CPS. D. Multi-modality imaging of CPS. E. The role of interventional radiology in the treatment of CPS.
Are We Really Closer to the Management of Incidental Cystic Pancreatic Lesions?

All Day Location: GI Community, Learning Center

Participants
Jin Woong Kim, MD, Jeollanamdo, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Sang Soo Shin, MD, Gwangju, Korea, Republic Of (Presenter) Nothing to Disclose
Suk Hee Heo, MD, Hwasun-Gun, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jun Hyung Hong, Gwang-Ju, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Hyo Soon Lim, MD, Jeollanam-Do, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Young Hoe Hur, Jeollanam-Do, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Yong-Yeon Jeong, MD, Chonnam, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To overview the current status of consensus guidelines for the management of incidental cystic pancreatic lesions (CPLs)
2. To discuss imaging appearances of commonly encountered CPLs
3. To discuss a relationship between incidental CPLs and the development of pancreatic adenocarcinoma

TABLE OF CONTENTS/OUTLINE
A. Nature and scope of the problem related with incidental CPLs
B. Various incidental guidelines for the management of incidental CPLs
   1. American College of Radiology guideline
   2. International Association of Pancreatology
   3. Sendai criteria
   4. Flowchart by Sahani et al.
   5. Others
C. Imaging appearances of commonly encountered CPLs
   1. Pseudocyst
   2. Serous cystic neoplasm
   3. Mucinous cystic neoplasm
   4. Intraductal papillary mucinous neoplasm
   5. Solid pseudopapillary neoplasm
   6. Cystic pancreatic neuroendocrine neoplasm
   7. Uncharacterized CPLs
D. Relationship between incidental CPLs and the development of pancreatic adenocarcinoma
   1. Incidental CPLs as a predictive sign of pancreatic adenocarcinoma
   2. Implications of imaging and clinical features
   3. International Cancer of the Pancreas Screening (CAPS) Consortium Summit
E. Suggested stepwise approach for the management of incidental CPLs
Awards
Certificate of Merit

Participants
Jin Woong Kim, MD, Jeollanamdo, Korea, Republic Of (Presenter) Nothing to Disclose
Sang Soo Shin, MD, Gwangju, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Suk Hee Heo, MD, Hwasung-Gun, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jun Hyung Hong, Gwang-Ju, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
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Young Hoe Hur, Jeollanam-Do, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Yong-Yeon Jeong, MD, Chonnam, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To describe technical factors in Multi-detector CT (MDCT) gastrography
2. To explain how to effectively interpret MDCT gastrographic images
3. To understand limitations and diagnostic pitfalls of 3D MDCT gastrography

TABLE OF CONTENTS/OUTLINE
A. Overview of MDCT gastrography
B. Technical factors in MDCT gastrography
C. Various findings of gastric cancer in MDCT gastrography with endoscopic correlation
   1. VG of early gastric cancer according to morphologic classification of Japanese Gastric Cancer Association
   2. VG findings of AGC according to Borrmann’s classification
   3. Various benign lesions and submucosal tumors of stomach in MDCT gastrography with endoscopic correlation
   4. Various diagnostic pitfalls when interpreting VG images
D. Evaluation steps of MDCT gastrographic images
   1. Detection and localization of gastric lesions on both 2D and 3D images
   2. Detectability of gastric lesions using MDCT gastrography
   3. Importance of preoperative localization of gastric cancer in terms of surgical margin
   4. T staging of gastric cancer
E. Limitations and diagnostic pitfalls of 3D MDCT gastrography
   1. Pitfalls related to technical errors
   2. Pitfalls related to evaluation
   3. Perception errors
   4. Interpretation errors
Solid Pancreatic Tumors and Tumor-like Lesions Beyond Ductal Adenocarcinoma; An Imaging-based Pattern Approach According to WHO Classification

All Day Location: GI Community, Learning Center

Participants
Jin Woong Kim, MD, Jeollanamdo, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
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Yong-Yeon Jeong, MD, Chonnam, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

1. To overview imaging findings of solid tumors and tumor-like lesions in the pancreas according to WHO classification
2. To illustrate radiologic-pathologic correlation in various solid tumor and tumor-like lesions
3. To discuss differential diagnosis of solid tumors and tumor-like lesions using an imaging-based pattern approach

TABLE OF CONTENTS/OUPLINE

1. WHO Classification of solid tumors and tumor-like lesions of pancreas
2. Imaging-based morphologic classification of solid tumors and tumor-like lesions
   A. Hypervascular
      i. Early enhancement
   B. Hypovascular
      i. Lipoma
      ii. Primary lymphoma
   C. Metastases from RCC
      ii. Delayed enhancement
      iii. Solid pseudopapillary neoplasm
      iv. Colloid carcinoma
      v. Primary leiomyosarcoma
      vi. Metastases from GI tract and breast cancer
5. Localized lymphoid hyperplasia
6. Autoimmune pancreatitis
7. Inflammatory pseudotumor (inflammatory myofibroblastic tumor)
8. Metastases from GI tract and breast cancer
9. Metastases from GI tract and breast cancer
10. Summary of useful radiologic findings in differential diagnosis of various solid tumors and tumor-like lesions in pancreas
4. Suggested diagnostic algorithms for solid pancreatic tumors and tumor-like lesions beyond ductal adenocarcinoma
Post-operative Pancreatic Fistula: What Every Radiologist Should Know

Participants
Marco Chincarini, MD, Verona, Italy (Abstract Co-Author) Nothing to Disclose
Manuel Signorini, MD, Cerea, Italy (Abstract Co-Author) Nothing to Disclose
Niccolo Faccioli, MD, Verona, Italy (Presenter) Nothing to Disclose
Giuseppe Sala, Verona, Italy (Abstract Co-Author) Nothing to Disclose
Roberto Pozzi Mucelli, Verona, Italy (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The aim of this exhibit is: 1. To review the post-surgical anatomy and the major complications after pancreatic resection 2. To discuss technique of pancreatic fistulography 3. To review the spectrum of imaging findings and the clinical impact of pancreatic fistulography after pancreatic resection.

TABLE OF CONTENTS/OUTLINE
Post-operative anatomy after partial pancreatic resection Definition and pathophysiology of post-operative pancreatic fistula Review of imaging findings Pancreatic fistulography technique The major teaching points of this exhibit are: 1. Postoperative pancreatic fistula is the most common major complication after pancreatic resection 2. Making radiologist able to perform a diagnostic fistulography 3. The most common findings during pancreatic fistulography are: fistulous tract with the intestinal lumen, fluid collections or dislocation of the drainage catheter into the anastomosed intestinal loop 4. Fistulography is useful to confirm the presence of post-operative pancreatic fistula (POPF) and to determinate further therapeutic strategies.
TEACHING POINTS

1. Review the definition, demographics, and pathophysiology of biliary cast syndrome (BCS).
2. Demonstrate the sonographic appearance of BCS.
3. Examine and compare other biliary processes that have a sonographic appearance similar to BCS.
4. Develop a differential diagnosis of other branching peri-portal or parenchymal processes that mimic BCS on Ultrasound and illustrate how to distinguish them using on ultrasound with correlative imaging using ERCP, CT, MRCP and MRI as necessary.

TABLE OF CONTENTS/OUTLINE

I. General Background of Biliary Cast Syndrome
   A. Post liver transplantation
   B. Clinical Presentation
   C. Treatment and Prognosis

II. Definition of BCS
    A. Ischemic event
    B. Strictures, sludge progresses to concretions, bilomas

III. Imaging of BCS
     A. ERCP and MRCP as "gold standard"
     B. Utility of Ultrasound: gray scale with cine, Doppler

IV. Mimics
    A. Biliary: calculi, air, blood, parasites
    B. Parenchymal: periportal fat or edema, hemorrhage, tumor
    C. Vascular
       1. Portal: thrombosis, gas
       2. Arterial: thrombosis, calcification
       3. Hepatic venous: thrombosis

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Mindy M. Horrow, MD - 2013 Honored Educator
Calcified Pancreas Masses: Using Calcifications to Narrow the Differential Diagnosis

All Day Location: GI Community, Learning Center

Participants
Sameer Ahmed, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Siva P. Raman, MD, Baltimore, MD (Presenter) Nothing to Disclose
Elliot K. Fishman, MD, Owings Mills, MD (Abstract Co-Author) Research support, Siemens AG Advisory Board, Siemens AG Research support, General Electric Company Advisory Board, General Electric Company Co-founder, HipGraphics, Inc

TEACHING POINTS
Calcifications can be a valuable tool in the diagnosis of both cystic and solid pancreatic masses, with different lesion types showing varying predilections for the development of calcifications. The pattern of calcifications (i.e. central vs. peripheral) can also be helpful in generating and narrowing a differential diagnosis. This exhibit will discuss a number of different pancreatic masses which may demonstrate calcifications, as well as detail which pancreatic lesions do not typically calcify.

TABLE OF CONTENTS/OUTLINE
Imaging technique for the pancreas on MDCT Discussion of common pancreatic lesions which calcify and the typical appearance of these calcifications Pancreatic Cystic Neoplasms Mucinous cystic neoplasm (MCN) Serous cystadenoma Solid pseudopapillary neoplasm (SPEN) Pancreatic Solid Neoplasms Pancreatic neuroendocrine tumor Acinar cell carcinoma Pancreatic metastases Conclusion

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Elliot K. Fishman, MD - 2012 Honored Educator
Elliot K. Fishman, MD - 2014 Honored Educator
Dynamic MR Imaging Applications in Pelvic Floor Dysfunction at 3T

All Day Location: GI Community, Learning Center

Participants
Halil Ozer, Ankara, Turkey (Abstract Co-Author) Nothing to Disclose
Ali Yusuf Oner, MD, Ankara, Turkey (Presenter) Nothing to Disclose
Sezai Leventoglu, Ankara, Turkey (Abstract Co-Author) Nothing to Disclose
Ali Murat Koc, MD, Ankara, Turkey (Abstract Co-Author) Nothing to Disclose
Merve Yazol, Ankara, Turkey (Abstract Co-Author) Nothing to Disclose
E. Turgut Tali, MD, GOP, Turkey (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is:
1. To review the pelvic floor anatomy
2. To explain the dynamic MR imaging technique, image analysis, spectrum of the pathologic findings and diagnostic criteria
3. To discuss the most commonly observed anatomic and functional abnormalities
Awards
Certificate of Merit

Participants
Alessandro Furlan, MD, Pittsburgh, PA (Presenter) Author, Reed Elsevier; Research Grant, General Electric Company
Marco Dioguardi Burgio, MD, Palermo, Italy (Abstract Co-Author) Nothing to Disclose
Amir Borhani, MD, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Mitchell E. Tublin, MD, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Giuseppe Brancatelli, MD, Palermo, Italy (Abstract Co-Author) Speaker, Bayer AG

TEACHING POINTS
The purpose of this exhibit is: To review common and uncommon causes of hepatic sinusoidal dilatation To describe imaging findings of sinusoidal dilatation on CT and MR liver imaging To provide a differential diagnosis of hepatic "mosaic" enhancement pattern.

TABLE OF CONTENTS/OUTLINE
Review of anatomy and function of hepatic sinusoids and pathophysiology of sinusoidal dilatation. Illustration of hepatic "mosaic" enhancement pattern and other imaging findings of sinusoidal dilatation at CT and MR imaging of the liver (e.g. large regenerative nodules), including the role of hepatobiliary contrast agents. Description of common and uncommon causes of hepatic sinusoidal dilatation. CT and/or MR imaging example of each of the listed diseases will be provided. Hepatic venous outflow obstruction Right heart failure, Pericardial effusion, Constrictive pericarditis Budd-Chiari syndrome Sinusoidal obstruction syndrome Peliosis Acute infectious/inflammatory disorder Medications (e.g. oral contraceptives, chemotherapy) Review of additional imaging findings helpful for a differential diagnosis of 'mosaic' enhancement pattern.
Participants
Andreu F. Costa, MD, FRCPC, Halifax, NS (Presenter) Nothing to Disclose
Valerie J. Keough, MD, Halifax, NS (Abstract Co-Author) Nothing to Disclose
Seng Thipphavong, MD, Toronto, ON (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Various disease entities can cause wall thickening of the small or large bowel. Imaging appearances overlap and are often nonspecific. The purpose of this exhibit is to present a variety of cases with small and large bowel thickening where the initial radiologic interpretation did not agree with the final diagnosis. Using a systematic approach, key imaging features will be discussed for each disease entity, with potential pitfalls in interpretation.

TABLE OF CONTENTS/OUTLINE
Cases will be presented in an interactive quiz format. Imaging findings will be discussed with emphasis on key differentiating features. Cases will include:1. Small bowel neoplasms: adenocarcinoma, GIST, lymphoma, post-transplant lymphoproliferative disorder, metastases2. Small and large bowel infection, ischemia and inflammatory bowel disease3. Radiation enteritis, vasculitis, graft-vs-host disease and angioedema4. Peptic ulcer disease, diverticulitis including Meckel's
The Incidental Splenic Mass: Management and Medicolegal Issues

All Day Location: GI Community, Learning Center

Awards
Certificate of Merit

Participants
Jeffrey Olpin, MD, Salt Lake City, UT (Presenter) Nothing to Disclose
Marta E. Heilbrun, MD, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is: To review CT and MR imaging features of commonly encountered incidental splenic masses with emphasis on the significant imaging overlap of focal hypodense lesions To review consensus guidelines regarding characterization and stratification of splenic masses To discuss management strategies and medicolegal issues regarding splenic incidentalomas

TABLE OF CONTENTS/OUTLINE

Overview of commonly encountered splenic incidentalomas
CT and MR findings of incidentally discovered hypodense splenic masses
Benign hypodense masses Malignant hypodense masses
Management strategies and medicolegal issues regarding incidental splenic masses Image guided biopsy Further characterization Surveillance
Imaging of Chronic Pancreatitis: From Past to Future

All Day Location: GI Community, Learning Center

Participants
Reiji Sugita, MD, Sendai, Japan (Presenter) Nothing to Disclose

TEACHING POINTS

1. To demonstrate pathology and imaging characteristics of chronic pancreatitis and to know change of imaging modalities 2. To illustrate new method for evaluation of chronic pancreatitis by MRI.

TABLE OF CONTENTS/OUTLINE

1. Knowledge of etiology, pathology, guideline, and imaging characteristics of chronic pancreatitis 2. Understanding of change of imaging modalities from past to future ERCP, CT, MRCP, EUS, direct visualization method by MRI 3. Method of direct visualization of pancreatic juice movement by MRI 4. Imaging and clinical applications of chronic pancreatitis by direct visualization of pancreatic juice movement by MRI.
**Contrast-enhanced Ultrasound (CEUS); A Problem-solving Technique in the Characterization of Hepatic Lesions**

All Day Location: GI Community, Learning Center

**Participants**
- Olwen A. Westerland, MBBS, London, United Kingdom (Presenter) Nothing to Disclose
- Sarah Natas, BSc, FRCR, London, United Kingdom (Abstract Co-Author) Nothing to Disclose
- Sofia Gourtsoyianni, MD, PhD, London, United Kingdom (Abstract Co-Author) Nothing to Disclose
- Nyree Griffin, MD, FRCR, London, United Kingdom (Abstract Co-Author) Nothing to Disclose
- Jyoti H. Parikh, BMBCh, London, United Kingdom (Abstract Co-Author) Nothing to Disclose

**TEACHING POINTS**

1. Highlight the evolving role of CEUS in the characterization of hepatic lesions.
2. Outline indications and technique of performing CEUS.
3. Provide examples of focal and generalized hepatic pathologies, with correlative MR/CT imaging.

**TABLE OF CONTENTS/OUTLINE**

The characterization of liver lesions forms a significant proportion of the hepatobiliary radiologist's workload, particularly given increasing numbers of incidentally detected lesions and a rising incidence of liver cirrhosis. MR/CT are the established imaging techniques; however, diagnosis may be challenging where MR is contraindicated or intravenous contrast cannot be administered. CEUS is gaining popularity as a non-invasive problem-solving technique, complementary to CT and MRI. It can be used as a diagnostic tool and in image-guided procedures and therapies e.g. CEUS-guided biopsy of liver lesions and percutaneous injection of ethanol/radiofrequency ablation. In this educational exhibit we will outline CEUS indications and technique and will present a broad range of case examples, including focal benign and malignant liver lesions on a background of normal liver parenchyma, cirrhosis and hepatic steatosis, and generalized pathologies e.g. granulomatous and iron-deposition disease, encountered during 5 years of experience in performing CEUS in a large, tertiary referral centre.
Participants
Leonardo K. Bittencourt, MD, PhD, Rio De Janeiro, Brazil (Presenter) Nothing to Disclose
Natalia Sabaneff, MD, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
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Andrei S. Purysko, MD, Cleveland, OH (Abstract Co-Author) Nothing to Disclose
Emerson d. Casagrande, MD, Niteroi, Brazil (Abstract Co-Author) Nothing to Disclose
Renan M. Maciel, Niteroi, Brazil (Abstract Co-Author) Nothing to Disclose
Rachel F. Muffareg, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Amanda B. Muniz SR, BDS, Niteroi, Brazil (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
- In-phase and out-of-phase T1w images are well established in routine abdominal MR imaging protocols, being mainly employed on the detection and characterization of fatty liver disease and adrenal masses. However, they also present other unique properties that can be exploited for problem-solving issues and refinement of the diagnosis. - The presence of chemical-shift artifacts allows the assessment of predominantly fatty lesions, such as small renal angiomyolipomas, that could remain otherwise undetected or mischaracterized in other sequences. - The different TE values between In and Out-of-phase acquisitions also confer the ability to assess susceptibility artifacts and iron deposits.

TABLE OF CONTENTS/OUTLINE
Heterotopic Pancreatic Rests: Imaging Features, Complications, and Unifying Concepts

All Day Location: GI Community, Learning Center

Awards
Cum Laude

Participants
David U. Kim, MD, Madison, WI (Abstract Co-Author) Nothing to Disclose
Meghan G. Lubner, MD, Madison, WI (Presenter) Grant, General Electric Company; Grant, NeuWave Medical, Inc; Grant, Koninklijke Philips NV
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TEACHING POINTS
The purpose of this exhibit is: To demonstrate the cross-sectional imaging appearance of heterotopic pancreatic rests and their associated complications. To correlate radiologic and endoscopic imaging features. To unify seemingly disparate entities including cystic dystrophy of the duodenum, paraduodenal wall cysts, and groove pancreatitis within the spectrum of complications related to heterotopic pancreatic rests.

TABLE OF CONTENTS/OUTLINE
Anatomic GI distribution and frequency of pancreatic heterotopia
Natural history of heterotopic pancreatic rests
Radiologic and endoscopic appearance of heterotopic pancreatic rests
- Uncomplicated rests in the GI tract
- Complications of heterotopic rests
  - Heterotopic pancreatitis
  - Groove pancreatitis
  - Intramural pseudocysts
  - Cystic dystrophy of the pancreas
Unifying concepts of heterotopic rests
Summary

Honored Educators
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Meghan G. Lubner, MD - 2014 Honored Educator
Meghan G. Lubner, MD - 2015 Honored Educator
Perry J. Pickhardt, MD - 2014 Honored Educator
Acute Severe Alcoholic Steatohepatitis (ASH) as the First Presentation of Alcoholic Liver Disease (ALD): Multi-modality Imaging Findings

Participants
Kelvin Cortis, MD, FRCR, Msida, Malta (Presenter) Nothing to Disclose
Sarah Aquilina, Naxxar, Malta (Abstract Co-Author) Nothing to Disclose
Adrian Mizzi, MD, Glasgow, United Kingdom (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
This educational exhibit aim to: Showcase the radiological findings of acute severe ASH, and the use of these findings to diagnose acute severe ASH in the correct clinical context. Highlight the possibility of acute severe ASH occurring in the absence of cirrhosis. Demonstrate how imaging findings can help in distinguishing acute severe ASH from other causes of acute hepatitis, and from decompensated alcoholic cirrhosis. Outline the outcomes and treatment options available in acute severe ASH.

TABLE OF CONTENTS/OUTLINE
Outline Clinical presentation Biochemical and histopathological findings Imaging findings seen Distinguishing acute severe ASH from other causes of acute hepatitis Distinguishing acute severe ASH from decompensated alcoholic cirrhosis Available treatment options and prognosis Conclusion

Acute severe ASH is diagnosed clinically in patients presenting with acute liver failure in the context of a longstanding history of alcohol misuse and no other causes for acute liver failure. Some patients might report a recent increase in their daily alcohol intake in the days or weeks prior to presentation. Imaging findings are important in supporting the diagnosis of ASH, given that percutaneous biopsy is often contraindicated in these patients in view of a low platelet count and altered coagulation.
TEACHING POINTS

The purpose of this exhibit is:

To demonstrate the wide array of anorectal pathology that can be seen at CT colonography (CTC), much of which is unique to this location. To demonstrate the diagnostic pitfalls of the anorectum at CTC, which can both mimic and obscure true pathology. To introduce strategies to minimize misdiagnosis in the anorectal region at CTC.

TABLE OF CONTENTS/OUTLINE

Differential diagnosis of anorectal abnormalities at CTC: Neoplastic disease Benign adenomas Low rectal and anal cancers Carpet lesions Submucosal tumors Hypertrophic anal papillae Internal hemorrhoids Solitary rectal ulcer syndrome Technical-related pitfalls Under-distention Residual stool Rectal balloon catheter issues Artifact from hip prostheses Strategies for reducing anorectal misdiagnosis

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Meghan G. Lubner, MD - 2014 Honored Educator
Meghan G. Lubner, MD - 2015 Honored Educator
Perry J. Pickhardt, MD - 2014 Honored Educator
Diseases of the Hepatic Sinusoid and Vein: The Imaging Findings and Diagnostic Strategy

All Day Location: GI Community, Learning Center

Participants
Shigeki Arizono, MD, Kyoto, Japan (Presenter) Nothing to Disclose
Rikiya Yamashita, MD, Kyoto, Japan (Abstract Co-Author) Nothing to Disclose
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TEACHING POINTS
1. To learn the anatomy and spectrum of diseases of sinusoid, central vein, hepatic vein to IVC. 2. To know the role of imaging in sinusoidal obstruction syndrome. 3. To understand the imaging features of acute and chronic Budd-Chiari syndrome based on temporal change in hemodynamic status. 4. To learn the complications of Budd-Chiari syndrome. 5. To learn the imaging findings of partial hepatic vein obstruction induced by various causes.

TABLE OF CONTENTS/OUTLINE
1. Anatomy of sinusoid, central vein, hepatic vein to IVC. 2. Disease spectrum by the affected regions from sinusoid to IVC. 3. Radiological findings of diseases of hepatic sinusoid and vein, especially focused on A) sinusoidal obstruction syndrome, B) Budd-Chiari syndrome, and C) partial hepatic vein obstruction. 4. Discussion and summary.
Presurgical CT Assessment of Detailed Abdominal Vascular Anatomy in the Era of Minimal Invasive Surgery

All Day Location: GI Community, Learning Center

Awards
Cum Laude

Participants
Takeshi Wada, MD, Tokyo, Japan (Presenter) Nothing to Disclose
Takuya Ueda, MD, Chuo-Ku, Japan (Abstract Co-Author) Nothing to Disclose
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Masaki Matsusako, MD, PhD, Tokyo, Japan (Abstract Co-Author) Nothing to Disclose
Yasuyuki Kunihara, MD, Tokyo, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is1. To illustrate the overview of surgical strategies of the gastric cancer and colorectal cancer.2. To demonstrate the normal anatomy and its variations of the abdominal arteries and veins. 3. To discuss what to report CT findings of abdominal vascular anatomy focused on the presurgical essential information for minimal invasive surgery.

TABLE OF CONTENTS/OUTLINE
1. The typical operative procedures of the gastric cancer and colorectal cancer.
3. Case presentations - Distal gastrectomy for gastric cancer in a patient with the variation of the gastrocolic trunk. - Right hemicolecotomy for ascending colon cancer in a patient with the variation of the gastrocolic trunk. - Sigmoidectomy for sigmoid cancer with the variation of the sigmoid arteries. - Anterior resection for rectal cancer with the variation of the sigmoid arteries.
Role of Presurgical Imaging in Diagnosis and Management of Patients with Biliary Drainage

All Day Location: GI Community, Learning Center

Participants
Makoto Sakane, MD, Suita, Japan (Presenter) Nothing to Disclose
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Mitsuaki Tatsumi, MD, PhD, Suita, Japan (Abstract Co-Author) Nothing to Disclose
Aliou A. Dia, MD, Suita, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The major teaching points of this exhibit are below: 1. To review advantages and disadvantages of each procedure for biliary drainage, which radiologists should understand. 2. To review the radiological findings related to biliary drainage. 3. To discuss how to manage those findings in the context of presurgical status.

TABLE OF CONTENTS/OUTLINE
HCC: Understanding Atypical Appearances for a More Accurate Diagnosis

All Day Location: GI Community, Learning Center

Participants
Melvy S. Mathew, MD, Chicago, IL (Presenter) Nothing to Disclose
Pritesh Patel, MD, Chicago, IL (Abstract Co-Author) Nothing to Disclose
Emily V. Ward, MD, Chicago, IL (Abstract Co-Author) Nothing to Disclose
Aytekin Oto, MD, Chicago, IL (Abstract Co-Author) Research Grant, Koninklijke Philips NV; ;
Richard L. Baron, MD, Chicago, IL (Abstract Co-Author) Speakers Bureau, Bracco Group

TEACHING POINTS
Characteristic imaging findings of hepatocellular carcinoma (HCC), arterial enhancement with washout on delayed imaging, is seen in ~60% of patients. There are several atypical CT and MRI findings associated with HCC, particularly with well-differentiated and poorly differentiated types. It is important for radiologists to be aware of these findings because the presence of these can suggest the diagnosis of HCC, even though a definitive diagnosis cannot be made by imaging. Here we present tips on the identification of these unusual imaging features.

TABLE OF CONTENTS/OUTLINE
Incidence, epidemiology and pathology of HCC
Typical imaging features
Unusual imaging appearances/variants, including helpful tips for characterization:
- Hypovascular HCC, with minimal to no arterial enhancement
- HCC seen only in delayed phase
- Persistent or progressive enhancement, seen with pelioid variant of HCC in particular, should not be confused with a benign hemangioma
- Cystic HCC
- Scirrhous HCC
- Sarcomatous HCC
- Fibrolamellar HCC
- Combined HCC-intrahepatic cholangiocarcinoma
- Spontaneous rupture of HCC
- Unforeseen regression of HCC in absence of interval treatment
- HCC showing unexpected persistent uptake on MRI in hepatobiliary phase when hepatocyte-specific contrast agent utilized

Clinical relevance of a prompt diagnosis

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Aytekin Oto, MD - 2013 Honored Educator
Magnetic Resonance Elastography Stiffness Maps: What Do They Tell Us?

All Day Location: GI Community, Learning Center

Awards
Cum Laude
Identified for RadioGraphics

Participants
Michael L. Wells, MD, Rochester, MN (Presenter) Nothing to Disclose
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Sudhakar K. Venkatesh, MD, FRCP, Rochester, MN (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Learn how a stiffness map is generated with magnetic resonance elastography (MRE) Review the reasons for increased liver stiffness and heterogeneity of stiffness map. Understand pitfalls and sources of error on stiffness maps Understand correlation between MRE and other MRI features Learn how stiffness distribution may suggest etiology of chronic liver disease.

TABLE OF CONTENTS/OUTLINE
Stiffness maps are automatically generated by an inversion algorithm installed in the scanner Increased liver stiffness in addition to liver fibrosis can result from acute inflammation, acute biliary obstruction, vascular congestion, portal hypertension, and diffuse infiltrative diseases. Focal regions of abnormal liver stiffness may be secondary to increased local perfusion, congestion, focal liver fibrosis or focal liver lesions. Correlation of liver stiffness with restricted diffusion, fractional extracellular space, uptake of Gd-EOB-DTPA, perfusion of liver and MR spectroscopy for diagnosis of liver fibrosis. Peripheral increased stiffness may be a characteristic feature of primary sclerosing cholangitis.

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Frank H. Miller, MD - 2012 Honored Educator
Frank H. Miller, MD - 2014 Honored Educator
Dissecting the Stringy: Multimodality Imaging of Fibrous Tumors and Tumor-like Conditions in the Abdomen and Pelvis

All Day Location: GI Community, Learning Center

Participants
Bernard J. Flore, Zingem, Belgium (Presenter) Nothing to Disclose
Christophe Balliuw, MD, Hasselt, Belgium (Abstract Co-Author) Nothing to Disclose
Koenraad J. Mortele, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
To review multimodality imaging features of fibrous tumors and tumorlike conditions in the abdomen and pelvis using the latest pathologic classification and diagnostic criteria. To demonstrate specific features of benign tumors and to elaborate on means of differentiation with malignant or invasive lesions and tumor-like conditions.

TABLE OF CONTENTS/OUTLINE
IntroductionBenign Tumors Angiomyofibroblastoma Agressive Angiomyxoma Cellular Angiofibroma Calcifying fibrous tumor Solitary fibrous tumor Inflammatory Myofibroblastoma Fibro(theca)maTumor-like Conditions Reactive myofibroblastic proliferation Inflammatory myofibroblastic tumor Sclerosing mesenteritis Fibromatoses Desmoid Fibromatosis Low Grade Myofibroblastic SarcomaMalignant Tumors Fibroblastic Sarcoma Fibrohistiocytic TumorsConclusion:1. Fibrous tumors and tumorlike conditions of the abdomen and pelvis represent a vast array of specific pathological entities.2. Although fibrous tumors and tumorlike conditions of the abdomen and pelvis are sometimes difficult to diagnose by imaging alone, several of them have specific imaging features that allow for an accurate diagnosis.3. Moreover, specific imaging features allow radiologists to differentiate benign lesions and tumor-like conditions from malignant or invasive processes.
CT-guided Percutaneous Jejunostomy Catheter Placement: Technique, Tools of the Trade, and Tips for Successful Placement

All Day Location: GI Community, Learning Center

Participants
Stephen R. Lee, MD, Boston, MA (Presenter) Nothing to Disclose
Colin J. McCarthy, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Aoife Kilcoyne, MBCh, Boston, MA (Abstract Co-Author) Nothing to Disclose
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Peter R. Mueller, MD, Boston, MA (Abstract Co-Author) Consultant, Cook Group Incorporated
Ashraf Thabet, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

Although percutaneous gastrostomy and gastrojejunostomy tube placement are common procedures in most interventional radiology practices, direct jejunostomy tube requests are often deferred to surgery. In our experience, percutaneous jejunostomy tube placement can be safely and successfully performed via a percutaneous CT-guided approach, obviating the need for open surgery and, in many cases, general anesthesia. The purpose of this educational exhibit is to 1) review the indications for direct jejunostomy tube placement to ensure appropriate patient selection, 2) discuss the technique and post-procedural management of percutaneous CT-guided jejunostomy tube placement, 3) to share our tips and tools of the trade to improve the rate of successful placement.

TABLE OF CONTENTS/OUTLINE

1) Indications and patient selection
2) Technique
3) Periprocedural management and follow-up
4) Potential complications
5) Tools of the trade and tips for success

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Peter R. Mueller, MD - 2012 Honored Educator
Peter R. Mueller, MD - 2013 Honored Educator
Inferior But Not Lesser: Diagnostic and Interventional Radiologic, Anatomic, Pathologic and Surgical Review of the Inferior Mesenteric Vein

All Day Location: GI Community, Learning Center

Participants
Mateen Syed, MBBS, Leicester, United Kingdom (Presenter) Nothing to Disclose
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Vikas Shah, MRCP, FRCR, Leicester, United Kingdom (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The inferior mesenteric vein (IMV) has variable drainage paths; it is important to be aware of, and accurately report these to assist optimal pancreatic and left colonic surgical outcomes. Thrombophlebitis of the IMV is an uncommon but important complication of abdominopelvic sepsis and malignancy, not to be confused with mesenteric inflammatory veno-occlusive disease. It is the principal route of haematogenous dissemination of rectal carcinoma, and may have a role to play in upgrading the risk profile of such tumours. Changes in flow and hence imaging patterns are seen in portal hypertension and portosystemic shunts. It is an embolization target in rectal varices and arteriovenous fistulae, and used as a bypass vessel in the "nutcracker" syndrome.

TABLE OF CONTENTS/OUTLINE
Illustrated multimodality review of normal and variant anatomy of the IMV. Relevance of accurate anatomic reporting with regards to pancreatic and colonic surgery. Imaging signs of IMV thrombophlebitis, its causes and consequences. The role it plays in haematogenous dissemination of rectal carcinoma, and potential as marker of high risk tumours. Illustrated description of altered flow in portal hypertension and portosystemic shunts. Overview of interventional radiologic and surgical management of IMV, particularly embolization and bypass of upstream occlusions.
Since most gastroenterologists nowadays use endoscopy as a primary diagnostic tool for gastric diseases, opportunity to view barium study of early/advanced gastric carcinoma is decreasing for radiologists. Nevertheless, understanding of typical barium study appearances of various types of gastric carcinoma should remain a basic skill for radiologists. In addition, this knowledge will serve as an important basis for advanced future imaging techniques such as 3D CT gastrography. The purpose of this exhibit is: To understand the classification of early and advanced gastric carcinoma. To understand typical appearances of each subtype on barium study in correlation with endoscopic appearances and macroscopic appearances of resected specimens.

TABLE OF CONTENTS/OUTLINE

Morphological classification of gastric carcinoma
Appearances of each subtype on barium GI study
Early gastric cancer
Type I: protruded type
Type II: superficial type
IIa: slightly elevated
IIb: flat
IIc: slightly depressed
Type III: ulcerated
Advanced gastric cancer
Type 1: elevated lesion
Type 2: ulcerated lesion with well-demarcated margin
Type 3: ulcerated lesion with ill-demarcated margin
Type 4: scirrhous carcinoma (linitis plastica)
Incorporation of CEUS Into LI-RADS for Diagnosis of Hepatocellular Carcinoma (HCC): A Work in Progress

All Day Location: GI Community, Learning Center

FDA

Discussions may include off-label uses.

Awards
Certificate of Merit

Participants
Hyun-Jung Jang, MD, Toronto, ON (Presenter) Nothing to Disclose
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Fabio Piscaglia, Bologna, Italy (Abstract Co-Author) Research support, Bracco Group; Speaker, Bayer AG; Advisory Board, Bayer AG; Speaker, Siemens AG
David O. Cosgrove, MBBCh, FRCR, London, United Kingdom (Abstract Co-Author) Research Consultant, SuperSonic Imagine; Research Consultant, Bracco Group; Speakers Bureau, Toshiba Corporation
Stephanie R. Wilson, MD, Calgary, AB (Abstract Co-Author) Research Grant, Lantheus Medical Imaging, Inc; Equipment support, Siemens AG; Equipment support, Koninklijke Philips NV

TEACHING POINTS

1. Contrast-enhanced ultrasound (CEUS) is a real-time dynamic imaging method for characterizing focal liver masses using intravascular microbubble contrast agents.
2. CEUS provides sensitive detection of arterial phase enhancement, often superior to CT and MRI. CEUS can provide near-100% specificity for small HCC, with performance comparable to and sometimes exceeding that of CT/MRI.
3. Timing and degree of washout differentiate HCC from non-hepatocellular malignancy.
4. The American College of Radiology (ACR) convened a working group of international experts to develop CEUS Liver Imaging Reporting and Data System (CEUS LI-RADS) to complement previously developed LI-RADS for CT and MR scan.
5. CEUS LI-RADS will standardize technique, data collection, interpretation, and reporting of CEUS exams of the liver in patients at risk for HCC.

TABLE OF CONTENTS/OUTLINE

Background LI-RADS CEUS The need for integration of CEUS into LI-RADS Key Concepts Proposed terminology Proposed diagnostic algorithm Schematic diagram and clinical illustrations CEUS advantages and pitfalls Quiz cases Participants will
1. be familiar with proposed diagnostic algorithm and terminology
2. understand application of CEUS for diagnosis of HCC, including its indications, advantages and pitfalls
Role of Multidetector Computed Tomography in the Anatomy and Pathology of Inguinal Area: An Imaging Review

All Day Location: GI Community, Learning Center

Participants
Maria-Luz Parra Gordo, MD, Madrid, Spain (Presenter) Nothing to Disclose
Daniel Tejedor, Madrid, Spain (Abstract Co-Author) Nothing to Disclose
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Maria Dolores Terriza Rueda, MD, Madrid, Spain (Abstract Co-Author) Nothing to Disclose
Alfonsa Friera Reyes, MADRID, Spain (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

Remember normal anatomy of the inguinal region, with a special interest in the inguinal canal, its walls and contents. The knowledge of benign and malignant pathology of the inguinal region

TABLE OF CONTENTS/OUTLINE

The anatomic detail of the inguinal region can be better delineated with the higher-resolution of multidetector computed tomography (MDCT). We review the anatomic structures, that allow the differentiation of direct and indirect inguinal hernias, femoral and obturator hernias, and demonstrate their anatomic differences on axial images, as well as sagittal and coronal reconstructions. We also present other examples of pathology in inguinal region such as iliopectineal bursitis, Amyand’s hernias, hematomas, abscesses, seromas, endometriosis, cryptorchidism and benign conditions of the spermatic cord, pseudoaneurysms, solitary fibrous tumor, lymph nodes and metastasis. The combination of clinical history and radiologic features will aid the radiologist in the diagnosis from benign to malignant processes in the inguinal region.
Tropical Chronic Pancreatitis - A Unique Clinico-radiological Entity. Why Is It Important to Know This?

Awards
Certificate of Merit

Participants
Chinmay B. Kulkami, MBBS, MD, Cochin, India (Presenter) Nothing to Disclose
Srikanth Moorthy, MD, Kochi, India (Abstract Co-Author) Nothing to Disclose
Sreekumar K P, MBBS, MD, Kochi, India (Abstract Co-Author) Nothing to Disclose
Rajesh R. Kannan, MD, Kochi, India (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To understand aetio-pathogenesis, unique imaging features and complications associated with Tropical Chronic Pancreatitis (TCP).
2. To understand the role of radiologist in management of Tropical Chronic Pancreatitis (TCP).
3. To highlight the changing trend in the disease pattern and its relevance to non-tropical countries.

TABLE OF CONTENTS/OUTLINE
Liver Infections Mimicking Neoplasms; Diagnostic Patterns on Cross Sectional Imaging and Clues for Correct Diagnosis

All Day Location: GI Community, Learning Center

Participants
Firoozeh K. Arjmandi, MD, San Antonio, TX (Abstract Co-Author) Nothing to Disclose
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Karthik Ganesan, MBBS, MD, Mumbai, India (Abstract Co-Author) Nothing to Disclose
Ajaykumar C. Morani, MD, Houston, TX (Abstract Co-Author) Nothing to Disclose
Khaled M. Elsayes, MD, Ann Arbor, MI (Presenter) Nothing to Disclose

TEACHING POINTS
- Describe spectrum of common and uncommon infections that can involve the liver.
- Illustrate various imaging patterns that can lead to erroneous diagnoses.
- Describe relevant background and pathophysiology of these infections.
- Discuss pertinent clinical, laboratory and imaging clues which help in making correct diagnosis.

TABLE OF CONTENTS/OUTLINE
- Classification of liver infections; bacterial, mycobacterial (such as TB), fungal (such as candidiasis), viral, parasitic (such as schistosomiasis, fasiola hepatica, echinococcosis, toxoplasmosis).
- Pathogenesis.
- Typical and atypical imaging features.
- Clues to correct diagnosis; including clinical, laboratory and imaging clues.

Summary
Several bacterial, mycobacterial, fungal and parasitic organisms were described to involve the liver. These can lead to mass-like appearance which can be misinterpreted as neoplastic process. In this exhibit, we will review spectrum of these infections. Special emphasis will be placed on imaging, laboratory and clinical clues to correct diagnosis.

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Khaled M. Elsayes, MD - 2014 Honored Educator
Christine O. Menias, MD - 2013 Honored Educator
Christine O. Menias, MD - 2014 Honored Educator
Christine O. Menias, MD - 2015 Honored Educator
Small Bowel Wall Thickening on MDCT: An Algorithmic Approach

All Day Location: GI Community, Learning Center

Participants
Ali A. Al-Saraf, MD, Chicago, IL (Presenter) Nothing to Disclose
Aytekin Oto, MD, Chicago, IL (Abstract Co-Author) Research Grant, Koninklijke Philips NV

TEACHING POINTS
Wall thickening of the small bowel can be seen in several entities, which can make it a difficult topic to approach. MDCT has become a valuable tool in detecting intestinal wall pathology. An advantage of MDCT is the ability to evaluate the surrounding tissues that can assist in developing a succinct differential diagnosis. The purpose of this exhibit is multifold: 1. Define small bowel wall thickening on CT and recognize the entities that can result in a thickened bowel wall. 2. Develop an organized framework to approaching wall thickening of the small bowel. 3. Review MDCT findings of several etiologies presenting as small bowel thickening along with tips and pitfalls in their differentiation.

TABLE OF CONTENTS/OUTLINE
Small bowel wall thickening will be classified based on length, symmetry, degree, attenuation pattern, and associated mesenteric findings. Through these criteria, important CT findings that will allow the diagnosis of specific pathology will be discussed. Multiple entities will be illustrated: Ischemia (arterial, venous, global bowel ischemia, vasculitis), Inflammatory bowel disease, infections (C. diff., CMV, Typhilitis), Graft-versus-host disease, Neoplasms (primary [adenocarcinoma, carcinoid, GIST], metastasis, lymphoma), hemorrhage and miscellaneous (Angioneurotic edema, endometriosis, radiation enteritis, portal hypertension).

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Aytekin Oto, MD - 2013 Honored Educator
Sclerosing Encapsulating Peritonitis: 'The Cocoon Syndrome' - Radiologic-Pathologic Correlation

All Day Location: GI Community, Learning Center

Participants
Lindsay Duy, MD, Burlington, MA (Presenter) Nothing to Disclose
Francis J. Scholz, MD, Burlington, MA (Abstract Co-Author) Owner, FSpoon Company
Jennifer C. Broder, MD, Burlington, MA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The "cocoon syndrome" is an unusual cause of Small Bowel (SB) Obstruction. A thin membrane of tissue encases a cluster of SB loops, which can be seen on CT. Loops of bowel within this cocoon cannot fully distend, causing intermittent obstruction. A distinct transition point may not be seen. Varying amounts of ascitic fluid may be trapped within the cocoon.

TABLE OF CONTENTS/OUTLINE
General overview, including pertinent literature review Etiologies of cocoon syndrome, including secondary causes, including but not limited to: Liver transplantation Prior surgery Malignancy Inflammatory processes Current theories about pathogenesis of idiopathic causes Mainly effects young girls from tropical regions Retrograde menstruation is theorized to be the cause Common clinical presentations Abdominal pain Weight loss May develop small bowel obstruction and present with nausea and vomiting CT findings of cocoon syndrome with pathologic correlations Thin rim of enhancing soft tissue around bunched loops of bowel Sometimes associated with obstruction, ascites Cocoons may have peritoneal calcification Management options and outcomes Surgical options Conservative management
Elongation of the styloid process (SP) can be both an incidental finding and a pathologic entity causing dysphagia. Clinical context is key in suggesting the diagnosis of Eagle syndrome. SP elongation and calcification of its ligaments can cause a variety of clinical symptoms, including tinnitus, otalgia, neck pain, throat pain, dysphagia, and globus sensation. SP elongation can be diagnosed on a barium swallow. Attention to SP should be given on lateral view of the pharynx in all patients being evaluated for dysphagia.

TEACHING POINTS

Illustration of anatomy and anatomic variations of SP Discussion of development of the SP, specifically how this pertains to the theories about the etiology of Eagle syndrome Review of the function of the SP, specifically relating to swallowing Discuss current theories of the etiology of Eagle syndrome Review relevant physical examination findings associated with Eagle syndrome Discussion and illustration of cases diagnostic of Eagle syndrome across multiple modalities, including radiography, CT, and fluoroscopy. Special focus will be given to imaging findings on barium swallow, including dynamic images during swallowing. Discussion of management and surgical approaches of the treatment of Eagle syndrome, including intraoperative images from styloidectomy surgery.
TEACHING POINTS

Rising obesity rates have led to increasing treatment with gastric bypass surgery. This approach can be curative in severe to morbid obesity and result in significant reduction in co-morbidity and all-cause mortality. Gastric bypass is now a common surgery with over 100,000 cases performed annually in the United States. Early or late post surgical complications can be difficult to clinically diagnose. Serious impending complications such as an incarcerated internal hernia can be clinically silent, highlighting the radiologist's contribution in post bypass management. Unfortunately, the radiographic appearance of the normal post bypass abdomen and complications resulting from surgery can be challenging. The goal of this exhibit is to review normal anatomy and surgical complications following different types of gastric bypass surgery. Target audience includes general and subspecialized radiologists and residents who see this patient population.

TABLE OF CONTENTS/OUTLINE

Cases will be presented in quiz format. Differential diagnoses will be highlighted in each case. The list of cases includes:
- Normal vs abnormal placement gastric band placement
- Normal Roux-en-Y vs Roux-en-O anatomy
- Internal Hernia vs Volvulus
- Stricture vs Obstruction vs Afferent Loop Syndrome
- Entero-enteric fistulas vs Enteric leaks
- Types of internal hernias
Equivocal Appendicitis Patterns and Pitfalls on CT: What We Learn from Revisiting Cases following Surgico-Pathological Correlation, A Case-Based Review

All Day Location: GI Community, Learning Center

Participants
Alexander Martynov, MD, East Meadow, NY (Presenter) Nothing to Disclose
Subah Gupta, MD, East Meadow, NY (Abstract Co-Author) Nothing to Disclose
Hyukjun Yoon, MD, East Meadow, NY (Abstract Co-Author) Nothing to Disclose
Andrew J. Cantos, MD, East Meadow, NY (Abstract Co-Author) Nothing to Disclose
Dahua Zhou, MD, Old Westbury, NY (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The goal of the workshop is to demonstrate some appendicitis-related cases with subtle nuances that may falsely lead to the wrong diagnosis. In so doing, we will instruct the learner on how to approach a case systematically, which features to value over others, and how to avoid being thrown down the wrong track by mimics. We hope this will help guide the radiologist to the appropriate differential diagnoses for each clinical setting.

TABLE OF CONTENTS/OUTLINE
Inclusion criteria is of cases with incongruent radiological and surgico-pathological reports or which appeared equivocal at the time of diagnosis but later confirmed by pathology. Only those cases with operative and/or surgico-pathological confirmation were used. The cases will be presented in a quiz format and followed by a short discussion highlighting key misleading features. A systemic approach to the appendix will also be discussed. Case examples include:

- Incomplete visualization of the distal appendix - Avoiding satisfaction of search from normal proximal appendix.
- Intraluminal coating of enteric contrast as mimic for wall enhancement.
- Regional pathology mimicking appendicitis and vice versa: Looking at bigger picture.
- Differentiating features of resolved appendicitis, chronic appendicitis, mucocele, and others. Most valuable feature is patient history and symptoms.
Various Gastrointestinal Tumors Showing Typical and Atypical Uptake of 18F-FDG: Comparison with CT/MRI and Pathological Findings

All Day Location: GI Community, Learning Center

Participants
Takaharu Tsuda, MD, PhD, Toon, Japan (Presenter) Nothing to Disclose
Yuki Tanabe, Toon, Japan (Abstract Co-Author) Nothing to Disclose
Hiroaki Tanaka, MD, Onsen-Gun, Japan (Abstract Co-Author) Nothing to Disclose
Masao Miyagawa, MD, PhD, Toon, Japan (Abstract Co-Author) Nothing to Disclose
Yoshifumi Sugawara, MD, Matsuyama, Japan (Abstract Co-Author) Nothing to Disclose
Teruhito Mochizuki, MD, Toon, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
18F-fluorodeoxyglucose (18F-FDG) uptake of gastrointestinal tumors on positron emission tomography/computed tomography (PET/CT) is useful for detection and characterization of the tumor. Degree of uptake of the lesions usually depends on the malignant nature, such as high cellularity, mitotic rate and MIB1 index. However, some tumors show atypical findings. Teaching point of this exhibit is:1: To show various gastrointestinal tumors showing typical and atypical uptake of 18F-FDG.2: To compare images of 18F-FDG PET/CT with images of CT/MRI, endoscopy and pathological findings.3: Although degree of 18F-FDG uptake is usually parallel to the histological grade of malignancy, some tumors may show atypical findings, which knowledge may help the differential diagnosis.

TABLE OF CONTENTS/OUTLINE
Positive and negative uptake of scirrhoues gastric carcinoma. Is it possible to differentiate between malignant and benign GIST by the degree of 18F-FDG uptake? Does uptake of 18F-FDG of gastrointestinal neuroendocrine tumor (NET) depend on the histological grade? How much degree of 18F-FDG uptake is seen in indolent malignant lymphoma, such as follicular lymphoma and MALT lymphoma? Pitfalls.
Limitation of MDCT in Cysto-biliary Communication in Hepatic Hydatid Disease. (Retrospective Study of 50 Cases)

All Day Location: GI Community, Learning Center

Participants
Hiral D. Vasavada, MBBS, MD, Jamnagar, India (Presenter) Nothing to Disclose
Nandini U. Bahri, MD, Jamnagar, India (Abstract Co-Author) Nothing to Disclose
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Ketan Rathod, Jamnagar, India (Abstract Co-Author) Nothing to Disclose
Pankaj Watal, MBBS, Jamnagar, India (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
At the end of review of this presentation, the reviewer will be able to: Evaluate the precision of MDCT in the detection of the cysto-biliary communication of hepatic hydatid disease Evaluate factors leading to reduced diagnostic sensitivity of MDCT in diagnosis.

TABLE OF CONTENTS/OUTLINE
In last 5 years total 52 cases of surgically confirmed cysto-biliary communication of hepatic hydatid disease was studied retrospectively in two groups according to clinical symptoms at the time of first presentation. There were present in 34 cases and absent in 18 cases. In a group of 34 symptomatic cases; MDCT scan gave accurate diagnosis of cysto-biliary communication in 29 cases, in remaining 5 cases its fail to identify. In a group of 18 asymptomatic cases; MDCT scan gave accurate diagnosis of cysto-biliary communication in 11 cases, in remaining 7 cases its fail to identify. MDCT scan is very helpful in establish diagnosis of hepatic hydatid disease and its complications. But it's not precise in detection of cysto-biliary communication. Though diagnosis established clinically in first group; MDCT fails to identify cysto-biliary communication in 17% of cases. Failure rate is little higher around 39% in second group of asymptomatic cases. Failure of MDCT to detect this complication is because of cyst opens into small fissure.
CT Findings of Postoperative Bowel Obstruction and Ileus: Recent Advances in Knowledge

All Day Location: GI Community, Learning Center

Participants
Takahiro Tsuboyama, MD, Suita, Japan (Presenter) Nothing to Disclose
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Makoto Sakane, MD, Suita, Japan (Abstract Co-Author) Nothing to Disclose
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Aliou A. Dia, MD, Suita, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

Bowel obstruction (BO) or ileus is one of the most common complications after abdominal surgery. Treatment strategy is determined based on the cause of disturbed intestinal passage, the degree of obstruction (partial or complete), and the risk of bowel ischemia, all of which are quite different between early and late postoperative period. Learning objective of this presentation is to describe useful CT findings and pitfalls in evaluating postoperative BO and ileus.

TABLE OF CONTENTS/OUTLINE

1. Causes of disturbed intestinal passage and their CT findings- Paralytic ileus- Adhesions (including adhesive bands)- Inflammation- Internal hernia- Incisional or port-site hemia- Anastomosis-related stenosis or intussusception- Tumor recurrence- Bezoar 2. The degree of stenosis (partial vs. complete)- Causes of BO carrying a high risk of complete obstruction- CT findings for predicting partial or complete stenosis 3. The risk of bowel ischemia- Causes of BO carrying a high risk of ischemia- CT findings of bowel ischemia
The Tips and Tricks of MR Elastography of the Liver in Actual Clinical Practice: Experience at 3.0T Clinical Unit

All Day Location: GI Community, Learning Center

Participants
Kengo Yoshimitsu, MD, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose
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Koichi Takano, MD, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
To learn the basic principles of clinical MR elastography and understand the meanings of echo-planar magnitude images, phase images, wave images, and stiffness maps. To learn how to trouble-shoot when MR elastography images are not good enough in quality. To learn the mechanism and typical appearances of hot/dark spots on the stiffness map. To learn how and where to place region-of-interest on the stiffness map, avoiding pathologies, large vessels, cross-hatching marks, and hot/dark spots. To learn other pitfalls in measuring stiffness of the liver.

TABLE OF CONTENTS/OUTLINE
Basic principles of clinical MR elastography Magnetizing encoding gradient issue Stiffness map with cross-hatching marks Effect of ascites, fat, and iron on the MR elastography Region-of-interest placement methods Pitfalls: hot spots, dark spots, and others Case presentation and pathological correlation Summary
Early Hepatocellular Carcinoma: Clinical Features, Impact, and Radiologic-pathologic Correlation

All Day Location: GI Community, Learning Center

Participants
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Tomoaki Ichikawa, MD, PhD, Yamanashi, Japan (Abstract Co-Author) Nothing to Disclose
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Hiroyuki Morisaka, MD, Kofu, Japan (Abstract Co-Author) Nothing to Disclose
Shintaro Ichikawa, MD, Chuo-Shi, Japan (Abstract Co-Author) Nothing to Disclose
Masanori Matsuda, MD, Yamanashi, Japan (Abstract Co-Author) Nothing to Disclose
Hirosi Onishi, MD, Yamanashi, Japan (Abstract Co-Author) Nothing to Disclose
Hideki Fujii, MD, Tamaho, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
a. Early hepatocellular carcinoma (early HCC) has malignant potential and progresses to conventional hypervascular HCC. b. In pathological diagnosis, tumor cell invasion into the periportal space, known as stromal invasion, is the most important finding that can differentiate early HCC from benign dysplastic nodules. c. For the detection of early HCC, gadoxetic acid-enhanced magnetic resonance imaging (EOB-MRI) findings are most important. The majority of early HCC cases demonstrate hypointensity on the hepatocyte phase of EOB-MRI. d. Presence of early HCC is a risk factor for occurrence of hypervascular HCC at any sites of the liver, and recurrence after liver resection and radiofrequency ablation.

TABLE OF CONTENTS/OUTLINE
a. Criteria for pathological diagnosis of early HCC
b. Characteristic imaging findings: contrast-enhanced ultrasound; multiphasic contrast-enhanced CT; CT during angiography (CT during hepatic arteriography and CT during arterioprtography); and MRI, including EOB-MRI
C. Nodule-based malignant potential of early HCC: cumulative risk and risk factors of progression to hypervascular HCC
d. Patient-based malignant potential of early HCC: overview of prognostic risk factors, recurrence-free and overall survival rates after liver resection and RFA for hypervascular HCC
Vascular Disease of the Liver: Is It Feasible to Describe a Common Pattern of Disease?

All Day Location: GI Community, Learning Center

Participants
Gonzalo Tardaguila de la Fuente, MD, Vigo, Spain (Presenter) Nothing to Disclose
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Concepcion M. Martinez, MD, Vigo, Spain (Abstract Co-Author) Nothing to Disclose
Francisco Tardaguila Montero, MD, Vigo, Spain (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
To describe normal anatomy and physiology of liver circulation
To explain hemodynamic changes when arterial, portal or venous drainage obstruction is present
To briefly summarize the main vascular diseases of the liver
To describe a common radiological pattern that may alert radiologists to search a vascular disease as a cause

TABLE OF CONTENTS/OUTLINE
Liver hemodynamic and anatomy
Third inflow: Cholecistic veins, parabiliar and epigastric-paraumbilical venous systems
Imaging repercussion of the third inflow (pseudolesions: location and classification)
Zonal perfusion
Physiopathology of vascular liver disease:
Inflow obstruction (arterial and portal obstruction)
Outflow obstruction
Sinusoidal obstruction
Liver vascular disease description including arterio portal shunts, portal thrombosis, idiopathic portal hypertension, Budd-Chiari, sinusoidal obstruction syndrome, liver sinusoidal dilatation and hepatic peliosis
Nodular hepatic lesions associated to vascular disease
Imaging pattern of vascular liver disease and what the radiologist should look for if recognized
Intestinal and Multivisceral Transplantation: How and Why We Do It?

All Day Location: GI Community, Learning Center

Participants
Maansi R. Parekh, MBBS, New York, NY (Presenter) Nothing to Disclose
Shifali Dumeer, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
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Dhaval Shah, Mount Holly, AR (Abstract Co-Author) Nothing to Disclose
Anuradha S. Shenoy-Bhangle, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
This exhibit describes the surgical techniques, indications, contraindications, pre and postoperative imaging and complications related to intestinal and multivisceral transplantation.

TABLE OF CONTENTS/OUTLINE
- Background
  Technical difficulties associated with multivisceral transplantation, lack of donors and postoperative complications are the leading reasons for this being the least frequent intraabdominal transplantation. Mesentric encasement no longer continues to be a contraindication for surgery. Intestinal autotransplantation, a novel technique eliminates some of these difficulties. Given the rarity of these surgeries we would like to provide a succinct yet concise of- Review of key surgical anatomy and pathology-
  Indications Included cases of short bowel syndrome, tumors of the small bowel and mesentry- contraindications- Pre and postoperative diagnostic imaging doppler,CT,MR- outcomes including complications
MRI of the Stomach: The Way to a Radiologist’s Heart

All Day Location: GI Community, Learning Center

Participants
Christophe Balliauw, MD, Hasselt, Belgium (Presenter) Nothing to Disclose
Francesco Alessandrino, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Bernard J. Flore, Zingem, Belgium (Abstract Co-Author) Nothing to Disclose
Koenraad J. Mortele, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To review the normal MRI anatomy of the stomach.
2. To describe optimized MRI techniques to evaluate the stomach.
3. To discuss and illustrate the MRI features of common gastric abnormalities and unusual disorders.

TABLE OF CONTENTS/OUTLINE
Molecular Targeted Therapies in Gastrointestinal Malignancies: Imaging Features of Treatment Response and Toxicities

All Day Location: GI Community, Learning Center

Awards
Certificate of Merit

Participants
Hari Nandu, MD, Boston, MA (Presenter) Nothing to Disclose
Sreeharsa Tirumani, MBBS, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Atul B. Shinagare, MD, Brookline, MA (Abstract Co-Author) Nothing to Disclose
Katherine M. Krajewski, MD, Boston, MA (Abstract Co-Author) Research Grant, General Electric Company; Spouse, Employee, Ironwood Pharmaceuticals, Inc
Charles Fuchs, MD, MPH, Boston, MA (Abstract Co-Author) Nothing to Disclose
Michael H. Rosenthal, MD, PhD, Boston, MA (Abstract Co-Author) Equipment support, Toshiba Corporation

TEACHING POINTS
1. Molecular targeted therapies (MTT) are widely used in gastrointestinal (GI) malignancies including colon, esophageal, gastrointestinal stromal tumor (GIST), and neuroendocrine tumors.  
2. Radiologists should be aware of the distinct patterns of treatment response to MTT.  
3. There are drug- and class-specific toxicities of MTT, many of which were uncommon with traditional chemotherapy.

TABLE OF CONTENTS/OUTLINE
1. Review of current molecular targets and associated therapies in GI malignancies, including trastuzumab for esophageal and gastric adenocarcinoma, imatinib for GIST, epidermal growth factor receptor (EGFR) inhibitors including cetuximab and panitumumab and vascular endothelial growth factor (VEGF) inhibitors including bevacizumab for colon adenocarcinoma, and octreotide/lanreotide and mammalian target of rapamycin (m-TOR) inhibitors for neuroendocrine tumors.  
2. Current MTT use in the National Comprehensive Cancer Network (NCCN) guidelines will also be discussed.  
3. Discussion of mechanisms of action of the therapies for these molecular targets.  
4. Multimodality case-based review of treatment response for these therapies.  
5. Teaching points on common side effects and complications of MTT with imaging correlates.
Volumetric Quantification of Visceral Fat as a Marker for the Metabolic Syndrome

All Day Location: GI Community, Learning Center

Participants
Stephen R. Lee, MD, Boston, MA (Presenter) Nothing to Disclose
Mukesh G. Harisinghani, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Dushyant V. Sahani, MD, Boston, MA (Abstract Co-Author) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc
Peter R. Mueller, MD, Boston, MA (Abstract Co-Author) Consultant, Cook Group Incorporated
Ronald S. Arellano, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Raul N. Uppot, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is: 1. To review the pathophysiology of the metabolic syndrome. 2. To discuss the potential role of visceral fat quantification in the diagnosis of the metabolic syndrome. 3. To discuss the technique and technical requirements for volumetric quantification of intra-abdominal fat. 4. To discuss future directions and value in applying this novel technique to diagnosing the metabolic syndrome.

TABLE OF CONTENTS/OUTLINE


Honored Educators

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Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator
Peter R. Mueller, MD - 2012 Honored Educator
Peter R. Mueller, MD - 2013 Honored Educator
Guilt or Guilty by Association? Percutaneous Ablation Complications and Their Mimics

All Day Location: GI Community, Learning Center

Participants
Matthew H. Lee, MD, Madison, WI (Presenter) Nothing to Disclose
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Fred T. Lee JR, MD, Madison, WI (Abstract Co-Author) Stockholder, NeuWave Medical, Inc; Patent holder, NeuWave Medical, Inc; Board of Directors, NeuWave Medical, Inc; Patent holder, Medtronic, Inc; Inventor, Medtronic, Inc; Royalties, Medtronic, Inc

TEACHING POINTS
- History of intervention can introduce bias to study interpretation, creating diagnostic 'tunnel vision.'
- Review normal imaging appearance following percutaneous ablation (microwave, radiofrequency, and cryoablation) in the liver, kidney, and lung.
- Review clinical and imaging features of percutaneous ablation complications and ablation complication mimics.
- Demonstrate how familiarity with ablation complications and mimics aids in establishing appropriate diagnosis and limiting differential diagnosis.

TABLE OF CONTENTS/OUTLINE
- Introduction to percutaneous ablation modalities/technique and normal imaging appearance following ablation.
- Illustrated review of complications and mimics associated with percutaneous ablation including clinical presentation, biochemical profiles, and typical US, CT, and MRI findings.
  Examples: True Complications (i.e. "Our fault"): Hemorrhage, infarction, portal vein thrombosis, pleural effusion, pneumothorax, renal collecting system injury. Mimics (i.e. "Not our fault"): Pancreatitis, cholecodolithiasis, urolithiasis, pyelonephritis, vertebral compression fracture, herpes zoster, aspiration.
- Family with expected post-ablation imaging appearance as well as true ablation complications and their mimics aids in establishing appropriate diagnosis and prevents diagnostic 'tunnel vision.'

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Meghan G. Lubner, MD - 2014 Honored Educator
Meghan G. Lubner, MD - 2015 Honored Educator
TEACHING POINTS

Review of normal and variant venous and arterial anatomy in the abdomen and pelvis There are large numbers of potential venous and arterial collateral pathways that can develop when there is chronic vessel occlusion. The location of the occlusion plays a role in determining which pathways develop. The purpose of this presentation is to recognize these pathways on different imaging modalities and identify the site of occlusion.

TABLE OF CONTENTS/OUTLINE

Normal and variant venous anatomy. Localization of venous collaterals depends on the level of occlusion. We will review the collateral pathways associated with the following scenarios: Inferior vena cava occlusion Renal vein occlusion Portal vein occlusion Splenic vein occlusion Superior mesenteric vein occlusion Hepatic vein occlusion Adrenal vein occlusion Gonadal vein occlusion Portal to systemic collaterals in the setting of portal hypertension Normal and variant arterial anatomy. Localization of arterial collaterals depends on the level of occlusion. We will review the collateral pathways associated with the following scenarios: Aortoiliac arterial occlusion Dominant pathway dependent on length/location of occlusion. Celiac artery occlusion Superior mesenteric artery occlusion Splenic artery occlusion Uterine artery occlusion
Participants
Kinan Alhalabi, Scottsdale, AZ (Presenter) Nothing to Disclose
Christine O. Menias, MD, Scottsdale, AZ (Abstract Co-Author) Nothing to Disclose
Alvaro Huete Garin, MD, Santiago, Chile (Abstract Co-Author) Nothing to Disclose
Vincent M. Mellnick, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Sanjeev Bhalla, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Khaled M. Elsayes, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Purpose/Aim: 1. Discuss the epidemiology, presentation, and management of gallstone ileus. 2. Describe the imaging features of gallstone ileus on plain X-rays CT and MR imaging. 3. Discuss the imaging features in atypical cases that may implicate management

TABLE OF CONTENTS/OUTLINE
Content Organization: 1. Discuss the epidemiology and etiology of gallstone ileus and the myriad of complications. 2. Describe the imaging features of Bouveret syndrome, gallstone ileus on plain X-rays, CT, and MRI. 3. Review the surgical treatment options for gallstone ileus. Summary: Gallstone ileus (GS) is a rare cause of small bowel obstruction (1-4% of all cases). GS is a result of impaction of a relatively large gallstone on the small bowel that will cause mechanical obstruction. The gallstone passes from the gallbladder through a fistula into the stomach, duodenum, small bowel and Colon resulting in luminal obstruction. Imaging plays an important role in the diagnosis and management of these patients as many present with non-specific symptoms. This exhibit will review the spectrum of imaging features of the various types of cholecystoenteric fistulae that result in luminal obstruction concentrating on Bouveret and Gallstone Ileus.

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Christine O. Menias, MD - 2013 Honored Educator
Christine O. Menias, MD - 2014 Honored Educator
Christine O. Menias, MD - 2015 Honored Educator
Sanjeev Bhalla, MD - 2014 Honored Educator
Khaled M. Elsayes, MD - 2014 Honored Educator
Don't Pass This Gas: Abdominal Gas Patterns That Shouldn't Slip By
All Day Location: GI Community, Learning Center

Awards
Certificate of Merit

Participants
Santiago Cornejo, MD, Phoenix, AZ (Abstract Co-Author) Nothing to Disclose
Patricia Cornejo, MD, Phoenix, AZ (Abstract Co-Author) Nothing to Disclose
Christine O. Menias, MD, Scottsdale, AZ (Abstract Co-Author) Nothing to Disclose
George Chesteen, MD, Phoenix, AZ (Presenter) Nothing to Disclose

TEACHING POINTS
Review a general approach to the interpretation of abdominal radiographs. Illustrate abdominal gas patterns that should prompt further evaluation in both pediatric and adult patients. Familiarize the reviewer with management strategies for the cases presented.

TABLE OF CONTENTS/OUTLINE
Contents: General approach to the abdominal radiograph
Pediatrics
Obstructive Small Bowel
Large Bowel
Non-Obstructive Necrotizing enterocolitis
Intussusception
Adults
Obstructive Small Bowel
Large Bowel
Non-Obstructive Pneumoperitoneum
Pneumatosis Intestinalis
Gallstone ileus
Emphysematous cholecystitis
Emphysematous pyelonephritis
Summary: An organized approach to the interpretation of abdominal radiographs is critical for a comprehensive evaluation. While the entities affecting pediatric patients differ from that in adults, a few generalities can be made. Broadly, gas patterns may be obstructive or non-obstructive. The obstructive patterns can be further divided into small or large bowel obstructions. The remaining gas patterns are non-obstructive and rely on the detection of gas in abnormal locations. Identification of these gas patterns enables the interpreting physician to recommend further imaging and timely expert consultation when necessary.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Christine O. Menias, MD - 2013 Honored Educator
Christine O. Menias, MD - 2014 Honored Educator
Christine O. Menias, MD - 2015 Honored Educator
The Good, Bad and Ugly: Common and Uncommon Fat Containing Hepatic Lesions

All Day Location: GI Community, Learning Center

Participants
Amol S. Katkar, MD, San Antonio, CO (Presenter) Nothing to Disclose
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Mukesh G. Harisinghani, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Cross sectional imaging is useful for detection of fat within the hepatic lesions. Presence of fat within the lesion by itself does not indicate benign or malignant nature of the hepatic lesions. However, it can be used to generate and narrow down the differentials. Purpose of this exhibit is to educate the learners about methods of fat detection within the hepatic lesions using cross sectional imaging modalities and how to use additional imaging signs to further characterize the hepatic lesions by way of clinical examples.

TABLE OF CONTENTS/OUTLINE
Methods of fat detection within the hepatic lesions. How to use additional imaging signs to further characterize the hepatic lesions by way of clinical examples. Demonstrate clinical examples of fat containing hepatic lesions - focal steatosis or diffuse steatosis, nodular hepatic steatosis, adenoma, hepatocellular carcinoma, fatty regenerating nodules, angiomyolipoma, lipoma, dermoid, extramedullary hematopoiesis, post-radiation change, liposarcoma and liposarcoma metastases, hepatic adrenal rests and Langerhans cell histiocytosis.
Participants
Pankaj Kaushal, MD, Washington, DC (Presenter) Nothing to Disclose
Ryan D. Navarro, MD, Washington, DC (Abstract Co-Author) Nothing to Disclose
Alexander Somwaru, MD, Philadelphia, PA (Abstract Co-Author) Nothing to Disclose
Aline Charabaty, Washington, DC (Abstract Co-Author) Nothing to Disclose
Angela D. Levy, MD, Washington, DC (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
List the strengths and limitations of magnetic resonance enterography (MRE) and endoscopy in characterizing inflammatory bowel disease (IBD). Describe endoscopic correlates for MRE findings in IBD. Discuss MRE and endoscopy findings based on stages of Crohn disease and ulcerative colitis.

TABLE OF CONTENTS/OUTLINE
1. Introduction Inflammatory bowel disease (IBD) overview: demographics and natural history of Crohn disease and ulcerative colitis will be covered. Imaging techniques in IBD: oral preparation and sample protocols for MRE will be provided. Endoscopy and complementary use of capsule endoscopy will be discussed. 2. MRE and endoscopy correlation Strengths and limitations of MRE and endoscopy in characterizing IBD will be discussed. Crohn disease: classical imaging features of active, fibrostenotic, perforating and reparative phases will be reviewed. Endoscopic correlation for findings such as ileocolonic ulceration, wall thickening, cobblestoning, and strictures will be provided. Ulcerative Colitis: typical imaging features of active phase, characterized by mucosal inflammation and ulceration, as well as subacute and chronic phases, characterized by mural involvement and luminal narrowing will be reviewed. Endoscopic correlation for findings such as superficial ulceration, pseudopolyps, luminal narrowing and loss of haustra will be provided.
Read It before You See It! Virtual Dissection with CT Colonography

All Day Location: GI Community, Learning Center

Participants
Tsuyoshi Morimoto, MD, Kawasaki, Japan (Presenter) Nothing to Disclose
Kunihisa Miyakawa, Kawasaki, Japan (Abstract Co-Author) Nothing to Disclose
Brandon D. Lohman, Kawasaki, Japan (Abstract Co-Author) Nothing to Disclose
Atsushi Hiroishi, MD, Kawasaki, Japan (Abstract Co-Author) Nothing to Disclose
Takayuki Yamada, MD, PhD, Yokohama, Japan (Abstract Co-Author) Nothing to Disclose
Yasuo Nakajima, MD, Kawasaki, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To review morphologic distortions of normal anatomic structure on virtual dissection images. 2. To demonstrate imaging characteristic of various colonic lesions on virtual dissection images. 3. To share common pitfalls on virtual dissection images.
Current and Emerging MRE Biomarkers of Crohn’s Disease Activity and Response to Therapy

All Day Location: GI Community, Learning Center

Participants
Matthew P. Moy, MD, Boston, MA (Presenter) Nothing to Disclose
Jenny Sauk, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Mukesh G. Harisinghani, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Michael S. Gee, MD, PhD, Jamaica Plain, MA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: To discuss the current role of magnetic resonance enterography (MRE) in the management of patients with Crohn's disease (CD) To review MRE technical considerations To review imaging features of active inflammation and intestinal fibrosis To summarize current MRE indices of CD activity To explore new and emerging biomarkers of disease activity including diffusion-weighted imaging (DWI), ultrasmall superparamagnetic iron oxide nanoparticles (USPIO), magnetization transfer MRI, and simultaneously acquired positron emission tomography (PET)/MRE

TABLE OF CONTENTS/OUTLINE
Role of MRE in the management of CD Distribution of disease Extraintestinal manifestations Extraluminal complications Disease activity Inflammatory vs. fibrotic strictures MRE technique Pulse sequences Oral contrast agents Comparison of 1.5T vs. 3T field strength MRE features of active disease Wall thickening Mural T2 hyperintensity Perimural T2 hyperintensity Enhancement pattern Mucosal ulceration Comb sign Mesenteric lymphadenopathy MRE features of fibrosis T2 signal intensity Enhancement pattern Proximal bowel obstruction MRE indices of CD activity New and emerging MRE biomarkers DWI USPIO-enhanced MRI Magnetization transfer MRI Simultaneous FDG PET/MRE
Climbing the Biliary Tree: A Tour of Anatomy and Pathology

All Day Location: GI Community, Learning Center

Participants
Melinda J. Yeh, MD, San Francisco, CA (Presenter) Nothing to Disclose
Benjamin M. Yeh, MD, San Francisco, CA (Abstract Co-Author) Research Grant, General Electric Company; Author with royalties, Oxford University Press; Shareholder, Nextrast, Inc;
David M. Valenzuela, MD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
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Zhen J. Wang, MD, Hillsborough, CA (Abstract Co-Author) Nothing to Disclose
Spencer C. Behr, MD, Burlingame, CA (Abstract Co-Author) Research Grant, General Electric Company; Consultant, General Electric Company

TEACHING POINTS

Review of conventional biliary anatomy and anatomic variants Discuss benign and malignant bile duct pathology Highlight some potential mimics of primary biliary malignancy

TABLE OF CONTENTS/OUTLINE

Anatomy Normal anatomy Anatomic variants Congenital abnormalities (choledochal cysts) Inflammation Cholangitis Primary sclerosing cholangitis Recurrent pyogenic cholangitis Mechanical Bile duct injuries and ischemia Choledocholithiasis Mirizzi syndrome Primary malignancies Intrahepatic cholangiocarcinoma Extrahepatic cholangiocarcinoma Mimickers of primary biliary malignancy Hepatic TB Biliary metastasis
Participants
Thomas F. Flood, MD, PhD, Aurora, CO (Presenter) Nothing to Disclose

TEACHING POINTS
Metastatic disease to the pancreas accounts for 2-5% of all pancreatic malignancies. Understanding the general imaging characteristics of metastatic disease to the pancreas is important for differentiating metastatic disease from other types of pathology. This exhibit will expose the radiologists to a case review of metastatic RCC to the pancreas. General imaging principles of metastatic disease to the pancreas, with an emphasis on RCC, will be reviewed in quiz format.

TABLE OF CONTENTS/OUTLINE
Review case of metastatic disease to the pancreas. Learn the most common type of malignancy with the pancreas (primary vs metastatic disease). Learn the general imaging characteristics of metastatic disease to the pancreas (e.g. enhancement patterns, average number of lesions, and location of lesions). Learn the most common primary malignancies that metastasize to the pancreas. Learn general principle of metastatic renal cell carcinoma to the pancreas.
Fat or Foe? Differentiating Benign Fatty Hepatic Lesions from their Malignant Look-alikes

All Day Location: GI Community, Learning Center

Participants
Kristina Nowitzki, MD, PhD, Worcester, MA (Presenter) Nothing to Disclose
Adib R. Karam, MD, Worcester, MA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is to: Review typical and atypical patterns of hepatic steatosis. Present 5 imaging clues to differentiate atypical patterns of hepatic steatosis from malignant lesions. Discuss potential pitfalls for each of the 5 imaging clues. Survey imaging features of other benign fatty hepatic lesions including lipoma, pseudolipoma, hepatic adenoma and focal nodular hyperplasia.

TABLE OF CONTENTS/OUTLINE
Hepatic steatosis: typical and atypical patterns
Differentiating focal fat from other hepatic lesions: clues and pitfalls
CT density Distribution/location Relative enhancement Absence of mass effect Signal drop on out-of-phase MR images Imaging features of other benign fatty hepatic lesions
Teaching Points

- Paraduodenal pancreatitis (PDP), or 'groove pancreatitis', is a specific focal pancreatitis, also known as pancreatitis groove, which surrounds the second portion of the duodenum and the head of the pancreas and are more prevalent in young men and alcoholics. The main signs observed at CT and MRI suggesting the diagnosis of paraduodenal pancreatitis and assist in the differential diagnosis with pancreatic head adenocarcinoma are: • Thickening of the medial wall of the second portion of the duodenum; • Fat densification in the groove, with fibrotic tissue that present prolonged enhancement after contrast-media injection; • A homogeneous increase of the head of the pancreas;

Table of Contents/Outline

- Pancreatic Anatomy Review- Groove pancreatitis Pathophysiology- Protocols, techniques and imaging findings: CT and MRI. - Characterization of benign and malignant lesions in CT and MRI - Differential diagnosis, emphasizing the approach to inflammatory and neoplastic lesions:- Pancreatic head adenocarcinoma •Duodenal ulcer perforated •GIST •Lymphoma •Anatomical variants (annular pancreas and divisium) •Mesenteric masses and adrenal gland right •Pancreatic pseudolesions •Duodenal divertica - Choledochal cyst - Post surgical distortion. - Treatment and prognosis.
Participants
Christopher Sereni, MD, Philadelphia, PA (Presenter) Nothing to Disclose
Shuchi K. Rodgers, MD, Philadelphia, PA (Abstract Co-Author) Nothing to Disclose
Christopher E. Kim, MD, Philadelphia, PA (Abstract Co-Author) Nothing to Disclose
Igor Goykhman, DO, Philadelphia, PA (Abstract Co-Author) Nothing to Disclose
Cheryl L. Kirby, MD, Cherry Hill, NJ (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Portal vein thrombus can be bland or malignant, and the incidence of both is increased in cirrhosis. Portal vein thrombus can be elusive when it involves the peripheral portal veins or the entire portal vein. In heterogeneous livers, portal vein tumor thrombus may be the first clue to infiltrative hepatocellular carcinoma (HCC), as tumor thrombus is present in 68-100% of cases. Infiltrative HCC is a subtype of HCC that can be difficult to diagnose on screening ultrasound, multiphasic CT and MRI, particularly in cases with peripheral or entire portal vein involvement that results in altered liver perfusion. This exhibit will enable one to accurately diagnose portal vein thrombus on ultrasound, CT, MRI, and angiography, provide clues to differentiate bland from malignant portal vein thrombus, discusses the role of portal vein involvement in infiltrative HCC, and reviews the mimickers of infiltrative HCC.

TABLE OF CONTENTS/OUTLINE
Portal vein thrombus Bland versus malignant on US, CT, MRI, and angiography Association with infiltrative HCC PitfallsInfiltrative HCC on Ultrasound, CT, and MRI Ultrasound protocol including cine clips Review multimodality imaging findings and pitfalls Role of DWIMimickers of infiltrative HCC Fibrosis Arterial portal shunting Steatosis Metastatic disease Intrahepatic cholangiocarcinoma
Secretin-enhanced MRCP: Imaging Techniques, Pancreatic Duct Normal Variants and Abnormalities

All Day Location: GI Community, Learning Center

Participants
Qiushi Wang, MD, Indianapolis, IN (Presenter) Nothing to Disclose
Fatih Akisik, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Temel Tirkes, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Mark Tann, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Kumaresan Sandrasegaran, MD, Carmel, IN (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. Learn how to protocol a secretin enhanced MRCP.
2. Learn what to look for, and how to interpret and report secretin-enhanced MRCP examinations.
3. Learn normal variants and abnormal findings of the pancreatic duct.

TABLE OF CONTENTS/OUTLINE
1. Describe secretin-enhanced MRCP protocol on 1.5 and 3.0 Tesla.
2. Review common pancreatic duct variants: a) annular pancreas, b) anomalous pancreaticobiliary junction, c) pancreas divisum, d) wirsungocele and santorinicele.
3. Discuss and illustrate the different pathologies of the pancreatic duct: acute and chronic pancreatitis, IPMN, sphincter of Oddi dysfunction, post-operative pancreas e.g. Whipple patients.
4. Discuss the common pitfalls and limitations.
5. Proper reporting method will be explained.

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Temel Tirkes, MD - 2013 Honored Educator
Kumaresan Sandrasegaran, MD - 2013 Honored Educator
Kumaresan Sandrasegaran, MD - 2014 Honored Educator
Tumors and Tumor-like Lesions of Peritoneum: A Spectrum from Benign to Malignant Lesions - A Pictorial Review

All Day Location: GI Community, Learning Center

Participants
Qiushi Wang, MD, Indianapolis, IN (Presenter) Nothing to Disclose
Fatih Akisik, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Temel Tirkes, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Mark Tann, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Kumaresan Sandrasegaran, MD, Carmel, IN (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. Learning about the imaging findings of various tumors and tumor-like lesions of peritoneum with focus on diagnostic clues for arriving at the diagnosis. 2. Understand a rational and simplified diagnostic algorithm for differentiation benign from malignant.

TABLE OF CONTENTS/OUTLINE
1. Tumors and tumor-like lesions of peritoneum are common and may be difficult to diagnose. Knowledge of imaging appearances of them is important for accurate diagnosis, differentiation and treatment. 2. This will be a case based review of different peritoneal pathological conditions, considering the lesion's location, extension, size, number, shape, margin, contrast enhancement, density or signal intensity, mass effect, invasion of adjacent structures, presence or absence of calcification, ascites, enlarged lymph node and metastasis. 3. We will present primary and secondary tumors, as well as tumor-like lesions of the peritoneum. 4. We will also review clinical and pathological features. 5. Present a diagnostic algorithm for differentiation benign and malignant tumors and tumor-like lesions of peritoneum.

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Kumaresan Sandrasegaran, MD - 2013 Honored Educator
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Imaging of Pancreatic Abnormalities and Associated Syndromes or Congenital Systemic Diseases

All Day Location: GI Community, Learning Center

Participants
Qiushi Wang, MD, Indianapolis, IN (Presenter) Nothing to Disclose
Fatih Akisik, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Temel Tirkes, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Mark Tann, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Kumaresan Sandrasegaran, MD, Carmel, IN (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

1. Many syndromes or congenital systemic diseases can be associated with abnormalities involving pancreas.
2. Knowledge of typical imaging features of pancreatic manifestations of the syndromes or congenital systemic diseases is important for suggesting further diagnostic work-up.

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How Many "celes" Do You Know in the Abdomen and Pelvis?
All Day Location: GI Community, Learning Center

Participants
Qiushi Wang, MD, Indianapolis, IN (Presenter) Nothing to Disclose
Fatih Akisik, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Temel Tirkes, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Mark Tann, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Kumaresan Sandrasegaran, MD, Carmel, IN (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. "cele" suffix means a hernia, cavity or swelling. 2. To understand embryology, and imaging findings of the abdominal and pelvic "celes". 3. To demonstrate clinical significance of the "celes".

TABLE OF CONTENTS/OUTLINE
1. To review the anatomy and development of the "celes" in the abdomen and pelvis. 2. To demonstrate imaging features of the "celes" with typical and atypical examples. The imaging and pathologic findings of the "celes" are quite varied and may be encountered in nearly any abdominal organ. a. Choledocholeccele: unrelated to other choledochal cysts, with duodenal mucosal lining and no associated increased risk of cancer. b. Santorinicle and Wirsungocele: dilated distal end of ducts of Santorini and Wirsung, respectively, is suggestive of increased pancreatic ductal pressure. c. Ureterocele: associated with duplicated collecting systems. d. Functional pelvic floor disorders: colpocele, enterocele, sigmoidocele, rectocele, peritoneocele, hysterocele. e. Scrotal pyocele, spermatocele, hydrocele (of canal of Nuck, spermatic cord), scrotal cystocele, varicocele. f. Appendical mucocele and clinical importance. g. Rarities: omphalocele, periappendicocele.

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Fatih Akisik, MD - 2014 Honored Educator
Temel Tirkes, MD - 2013 Honored Educator
Temel Tirkes, MD - 2014 Honored Educator
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Append This: A Guide to Common and Uncommon Tumors of the Appendix

All Day Location: GI Community, Learning Center

Participants
Laura M. Leonards, MD, Los Angeles, CA (Presenter) Nothing to Disclose
Anokh Pahwa, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Maitraya K. Patel, MD, Sylmar, CA (Abstract Co-Author) Nothing to Disclose
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Cecilia M. Jude, MD, Los Angeles, CA (Abstract Co-Author) Author, UpToDate, Inc
Michael J. Nguyen, MD, Santa Barbara, CA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
This educational exhibit will (1) review common and uncommon appendiceal neoplasms, (2) illustrate the spectrum of imaging features of appendiceal neoplasms and (3) explore the role of imaging in diagnosing appendiceal neoplasms.

TABLE OF CONTENTS/OUTLINE
Introduction: The appendix is more complex than an outpouching of bowel, and its unique pathology reflects this distinction. Appendiceal neoplasms often cause clinical symptoms that necessitate imaging. The radiologist must accurately detect and describe appendiceal neoplasms to guide treatment and optimize the surgical approach.
Classification: This exhibit will review the histologic classification of tumors of the appendix, including epithelial tumors (adenoma and adenocarcinoma), carcinoid tumors (classic, tubular, and goblet cell), lymphoma, and gastrointestinal stromal tumors. In addition, we will review the TNM classification of malignant appendiceal tumors.
Imaging Correlation: This educational exhibit will present clinical courses and imaging findings of patients with mucinous and nonmucinous epithelial neoplasms, carcinoid tumors, and other less common appendiceal neoplasms. We will compare and contrast benign and malignant mucinous lesions. We will define and clarify the terms mucocele, mucinous tumors of uncertain malignant potential, and pseudomyxoma peritonei.
Fat-Containing Lesions of the Liver: Keep Hydatid Cyst in Differential Diagnosis, Especially in the Endemic Areas

All Day Location: GI Community, Learning Center

Participants
Ajay Gulati, MD, Chandigarh, India (Presenter) Nothing to Disclose
Santhosh Kumar Pavunesan, MD, Chandigarh, India (Abstract Co-Author) Nothing to Disclose
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Anindita Sinha, MD, New Delhi, India (Abstract Co-Author) Nothing to Disclose
Niranjan Khandelwal, MD, Chandigarh, India (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To describe the imaging findings of fat-containing liver hydatid cysts.
2. To emphasize on salient features in making an appropriate diagnosis of hydatid disease.

TABLE OF CONTENTS/OUTLINE
Focal liver lesions are commonly encountered in daily radiology practice. Multiphasic CECT is the preferred modality in characterizing liver lesions and presence of calcification and/or fat component can narrow down the differential diagnosis. Various fat-containing benign and malignant liver lesions have been described in literature. Hydatid cyst containing intracapsular macroscopic fat has however only been reported in a few isolated case reports. We reviewed our CT data for the last 3 months and found 30 cases of liver hydatid cysts with various imaging features as shown in graph with 12 cases having intracapsular fat. On imaging, presence of daughter cysts and lamellated membranes in a hypodense lesion on CECT usually confirms diagnosis of hydatid cyst and further unnecessary investigations can be avoided. Also, in our opinion, presence of fat and/or calcification in a cystic liver lesion even without daughter cysts or lamellated membranes is not an uncommon presentation of hydatid disease. Recognizing this entity of fat globules in focal hepatic lesions is important and a differential of hydatid cyst should always be considered especially in endemic regions.
Crohn's disease is an idiopathic chronic inflammatory disorder of the intestinal wall, which electively affects small bowel and terminal ileum. Clinical course is usually unpredictable and characterized by periods of remission alternating with acute relapses. In patients affected by Crohn's disease, MR Enterography plays an increasingly important role as non-invasive and effective method to evaluate small-bowel involvement and disease inflammatory activity. The purpose of this exhibit is: To briefly review pathophysiology and epidemiology of Crohn's disease; To discuss the best MR Enterography protocol/study technique in the assessment of small-bowel involvement; To understand the most relevant imaging findings, allowing the detection of small bowel involvement and the assessment of disease activity; To provide some case examples illustrating the correlation between the enterographic findings and the spectrum of disease appearance (acute, subacute, and chronic); To illustrate the imaging features of complications related to Crohn's disease.

TEACHING POINTS

TABLE OF CONTENTS/OUTLINE

Introduction Indications to MR Enterography Study technique Spectrum of imaging findings: disease extension; colonic and extracolonic findings MR assessment of disease activity Potential complications Case examples Conclusions References
Pancreatic Trauma - AAST Criteria and CT Findings

All Day Location: GI Community, Learning Center

Participants
Jaclyn Taylor, MD, Salt Lake City, UT (Presenter) Nothing to Disclose
Nicole S. Winkler, MD, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose
Nickolas Byrge, MD, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose
Daniel N. Sommers, MD, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose
Raminder Nirula, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose
Marta E. Heilbrun, MD, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. Understand the clinical importance of detecting pancreatic injuries in trauma patients.
2. Learn the CT imaging features of pancreatic trauma.
3. Learn the American Association for the Surgery of Trauma (AAST) pancreatic injury grading system and associated with CT findings.

TABLE OF CONTENTS/OUTLINE
- Pancreas anatomy
- Mechanisms of pancreatic injury
- Associated morbidity and mortality
- Clinical and imaging findings
- AAST classification illustrated by representative CT cases
- Commonly associated Injuries
- Patient management and surgical intervention
CT Findings of Complications Associated with Colonoscopic Examination: How Well do you Know about Postpolypectomy Coagulation Syndrome?

All Day Location: GI Community, Learning Center

Participants
Yoon Joo Shin, MD, Seongnam, Korea, Republic Of (Presenter) Nothing to Disclose
Young Hoon Kim, MD, PhD, Seongnam-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
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Ji Hoon Park, MD, Seongnam-Si, Korea, Republic Of (Abstract Co-Author) Research Grant, Bracco Group
Ji Ye Sim, MD, MS, Seongnam-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Kyoung Ho Lee, MD, Seongnam-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Because a colonoscopic examination for the detection of adenomatous polyp can reduce the incidence and mortality of colorectal cancer, this procedure has been widely performed for the screening protocol of the whole colon. Knowing the various complications after colonoscopic examination is crucial for patient's management since the treatment can be dependent on image findings. Until now, the typical image finding of complications associated with colonoscopic examination including perforation or bleeding is well studied. Meanwhile the image finding about more rare complication including postpolypectomy coagulation syndrome (PPCS) that can be managed by conservative management has not been described. The knowledge about imaging findings of complications followed by colonoscopic examination could help to decide an adequate management.

TABLE OF CONTENTS/OUTLINE
Overview of complications after colonoscopic examination Illustrated findings of various complications after colonoscopic examination colonic perforation: simple radiograph, CT postpolypectomy bleeding: CT, angiography PPCS: CT Other rare complications such as splenic rupture after colonoscopic examination. Specific case review emphasis on PPCS Conclusion References
Computed Tomography of Spigelian Hernia: Anatomy, Appearances and Pitfalls, an 8 Year Experience

All Day Location: GI Community, Learning Center

Participants
Shadi F. Azar, MBBS, Ann Arbor, MI (Presenter) Nothing to Disclose
Julie A. Ruma, MD, Northville, MI (Abstract Co-Author) Nothing to Disclose
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Gandikota Girish, MBBS, FRCR, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Qian Dong, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Elaine M. Caoili, MD, MS, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

1. Spigelian hernias were seen anywhere along the linea semilunaris, with only 32% of hernias found within the hernia belt (figure 1), at variance with the surgical literature. 2. The Surgical literature describes Spigelian hernias as small with a 14–21% incarceration rate, and 21–33% requiring surgery at presentation. We found the average hernia neck size was not small (3.4 cm). 65% of patients were asymptomatic, and none underwent emergent surgical repair. 3. 26 cases of incisional hernia were misdiagnosed by radiologists as Spigelian hernias. Mimics include incisional hernia, parastomal hernia, hematoma, lipoma, scar tissue. 84% demonstrated interplane dissection, making them not easily palpable on physical exam.

TABLE OF CONTENTS/OUTLINE

Search of the radiology information system for Spigelian hernia found 106 positive reports from 38,066 consecutive abdomen CT scans in 8 years. Retrospective review of these 106 studies by two fellowship trained radiologists found 43 Spigelian hernias, the largest series to date. Most were incidental findings on CT scans. We describe the CT appearance, and anatomical location and pitfalls, and compare our findings with the surgical literature, specifically location at the hernia belt.
Meckel Diverticulum: Clinical Presentation and Imaging Findings

All Day Location: GI Community, Learning Center

FDA Discussions may include off-label uses.

Participants
Ana Maria Afonso, BDS, Vigo, Spain (Presenter) Nothing to Disclose
Sabela Barreiro Villalustre, Vigo, Spain (Abstract Co-Author) Nothing to Disclose
Milagros Otero, MD, PhD, Santiago de Compostela, Spain (Abstract Co-Author) Nothing to Disclose
Juan M. Vieito, MD, Vigo, Spain (Abstract Co-Author) Nothing to Disclose
Marta Rodríguez Alvarez, Vigo, Spain (Abstract Co-Author) Nothing to Disclose
Milagros Otero, MD, PhD, Santiago de Compostela, Spain (Abstract Co-Author) Nothing to Disclose
Raquel Seijo Rodríguez, Vigo, Spain (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1.-Symptomatic patients with Meckel's diverticulum, showed a nonspecific clinical onset, mimicking many other entities that manifestate with acute abdominal pain or gastrointestinal bleeding.
2.-The radiological diagnosis of Meckel's diverticulum is pathognomonic when a fluid or air-filled blind-ending pouch, shorter and wider than the appendix, in the antimesenteric border of the ileum is correctly identified.

TABLE OF CONTENTS/OUTLINE
52 patients histological diagnoses of Meckel's diverticula (25% female, 75% male), (mean age 30.4 years, range: 5 days-85 years), most (n = 34, 65.4%) were diagnosed with non complicated or incidental Meckel's diverticulum and surgery was performed by other causes (appendicitis, tumours ...).18 patients (34.6%) with symptomatic and complicated Meckel's diverticulum had abdominal pain 12 (66.7%), rectal bleeding 7 (38.9%), and intestinal obstruction (intussusception) 1 (5.5%) .Only in 9 symptomatic patients (50%) radiological imaging studies were performed: US in 1 patient showed a segment of distal ileum with double Wall, in 4 patients CT was performed (2 had intestinal perforation and 2 other bleeding diverticulum) and the other 4 were diagnosed with Tc99 scintigraphy.
A Catalogue of Flat Lesions: How CT Colonography Can Help to Detect Superficial Colorectal Lesions

All Day Location: GI Community, Learning Center

Participants
Mototaka Miyake, MD, Chuo-Ku, Japan (Presenter) Nothing to Disclose
Gen Iinuma, MD, PhD, Tokyo, Japan (Abstract Co-Author) Nothing to Disclose
Yasuaki Arai, Tokyo, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To familiarize the audience with non-polypoid (shallow and flat) lesions.
2. To understand key imaging findings of the lesions and also how to differentiate them from low but shallow lesions whose clinical significance is minimal.
3. To understand the limitation of the detectability of flat lesions.
4. In a ‘forest’ of non-polypoid (shallow and flat) lesions, practitioners will be able to selectively identify which lesions should be detected effectively to reduce mortality.

TABLE OF CONTENTS/OUTLINE
1. Review the prevalence, classification (morphological variety of flat lesions) and clinically significant key imaging findings of flat lesions.
2. Use 2D- and 3D- images in a quiz, case-study format to give all participants real hands-on experience at clinically effective diagnosis.
3. Answer all questions.
Nodule-in-nodule appearance in the liver is a rare phenomenon, mostly described in cirrhotic liver. This term refers to the transition from a dysplastic nodule into a hepatocellular carcinoma (HCC) that occur only in a part of the lesion. However, this sign can also be encountered in non-cirrhotic liver. Thus, malignant transformation of hepatocellular adenomas (HCAs) into HCCs is a rare but serious complication which could also be shown as a "nodule-in-nodule" appearance. Moreover, metastases superimposed to hypervascular lesions such as focal nodular hyperplasias (FNHs) have already been described. This educational exhibit will feature original CT and MR images with pathological correlation of "nodule-in-nodule appearance" based upon our experience in a large tertiary referral center 10-year experience.
Low-Dose Abdominal CT for Evaluating Suspected Appendicitis in Adolescents and Young Adults: An Evidence-based Review

All Day Location: GI Community, Learning Center

Participants
Ji Ye Sim, MD, MS, Seongnam-Si, Korea, Republic Of (Presenter) Nothing to Disclose
Pen-ampai Tannaphai, MD, Bangkok, Thailand (Abstract Co-Author) Nothing to Disclose
Donghyun Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Kyoung Ho Lee, MD, Seongnam-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

1. To emphasize the need of using low-dose (LD) computed tomography (CT) in this population with normal life expectancies.
2. To review published evidences supporting that LD CT is comparable to standard-dose (SD) CT in the efficacy with respect to diagnostic performance and clinical outcome.
3. To propose LD imaging protocol and to suggest other necessary ingredients to overcome the low image quality.
4. To discuss future challenges and opportunities in incorporating LD CT into a multimodal diagnostic algorithm.

TABLE OF CONTENTS/OUTLINE

1. Epidemiology
2. Radiation dose level - Conventional doses from survey studies - LDs explored in research studies
3. Carcinogenic risk associated with CT examination
4. Efficacy comparison between LD CT and SD CT - Image quality - Diagnostic performance and confidence - Clinical outcome such as negative appendectomy rate and appendiceal perforation rate
5. Imaging technique - Scanning - Image reconstruction - Image visualization - Learning curve in interpretation - Reporting
6. Calibrating and monitoring radiation dose
7. Future challenges and opportunities
Participants
Ruju V. Doshi, MD, Hyderabad, India (Presenter) Nothing to Disclose

TEACHING POINTS
This exhibit will help reader
1) Understand the technique of performing 3D perianal scan using endoluminal (Transvaginal) probe.
2) Understand the simple post processing of the 3D data set to generate correct images according to anal clock.
3) Interpretation and classification of perianal fistula from data set.
4) Learn the scope of the technique, limitations and expected troubles along with troubleshooting.

TABLE OF CONTENTS/OUTLINE
Outline:
1) Indications
2) Understand the technique of performing 3D perianal scan using endoluminal (Transvaginal) probe.
   a) Male patients (probe at anal verge and no angulation)
   b) female patients (probe at introitus with posteroinferior angulation)
   c) if needed study is augmented by H2O2 administration.
3) Understand the simple post processing of the 3D data set to generate correct images according to anal clock.
4) Interpretation and classification of perianal fistula from data set. generate report with diagramatic presentation.
5) Learn the scope of the technique, limitations and expected troubles along with troubleshooting.
6) Comparison with MRI.
Imaging of Endoscopic Cystogastrostomy in Pancreatic Walled-off Necrosis: What the Radiologist Needs to Know

All Day Location: GI Community, Learning Center

Participants
Anthony Abou Karam, MD, El Paso, TX (Presenter) Nothing to Disclose
Jesus Edmundo Calleros-Macias, MD, El Paso, TX (Abstract Co-Author) Nothing to Disclose
Arya Bagherpour, DO, El Paso, TX (Abstract Co-Author) Nothing to Disclose
Shaked Laks, MD, El Paso, TX (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To review the imaging findings in acute necrotic collection and walled off necrosis.
2. To learn about the imaging features, changes and complications after placement of an endoscopic cystogastrostomy tube based on our case series.
3. To understand how the radiologist can help the clinician determine the appropriate timing for intervention and the preprocedural radiological features that may predict the outcome, based on our case series.

TABLE OF CONTENTS/OUTLINE
1. Physiopathology of acute necrotic collection and walled off necrosis with a brief review of the revised Atlanta classification.
2. Imaging features: - Acute necrotic collection (ANC) - Walled off pancreatic necrosis (WON)
3. Imaging features and changes after placement of an endoscopic cystogastrostomy tube based on our case series: - Complete resolution - Absence of improvement - Complications
4. How can the radiologist help the clinician? - Determine appropriate candidates for an endoscopic cystogastrostomy: Preprocedural radiological features that may predict successful outcome of an endoscopic cystogastrostomy in WON.
**Partial Pancreatectomy: MR Imaging of Normal Postoperative Appearance and Complications**

All Day Location: GI Community, Learning Center

**Awards**
*Cum Laude*

**Participants**
Michael Baad, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Kayleen M. Jahangir, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Annemarie Newark, Normal, IL (*Abstract Co-Author*) Nothing to Disclose
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Stephen Thomas, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

**TEACHING POINTS**
Review the surgical technique, normal post-surgical imaging appearance and indications for imaging in patients undergoing partial pancreatectomy, including pancreaticoduodenectomy and distal pancreatectomy. Review early and late post-surgical complications. Correlate MRCP and ERCP findings.

**TABLE OF CONTENTS/OUTLINE**
The Many Faces of Fat Necrosis and How it May Simulate Thoracic and Abdominal Emergencies

All Day Location: GI Community, Learning Center

TEACHING POINTS

1. The intra-abdominal fat is an active metabolic tissue that may undergo necrosis by several mechanisms, including torsion, trauma and microvascular bleeding. 2. The pain caused by this process is usually localized in the exact point of the necrosis and depending on its location and relation to other organs, may simulate abdominal or thoracic emergencies. 3. The image findings are an oval area with fat attenuation with a surrounding soft tissue ring and stranding of the adjacent fat planes. 4. CT is the chosen exam for this diagnosis, and the correct interpretation of the image findings is important to avoid unnecessary clinical/surgical interventions.

TABLE OF CONTENTS/OUTLINE

- Introduction: epidemiology and the mechanism of fat necrosis
- Imaging presentations of fat abdominal and thoracic necrosis and its main differential diagnosis.
- Review of imaging findings: cases in which fat necrosis led to a misdiagnosis of other thoracic or abdominal emergencies (sample cases and mimics).
- Conclusion
Imaging of the Duodenum with Endoscopic Correlation: A Case-based Approach

All Day Location: GI Community, Learning Center

Participants
Hanan Sherif, MD, Doha, Qatar (Presenter) Nothing to Disclose
Ahmed-Emad Mahfouz, MD, Doha, Qatar (Abstract Co-Author) Nothing to Disclose
Mohamed E. Abdelhady, MBBS, MBBCh, Doha, Qatar (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: To know the radiological anatomy of the duodenum To know the different pathological processes that may involve the duodenum and their appearance on imaging. To get familiar with the endoscopic appearance corresponding to the imaging findings and the relative strength and weakness of endoscopy and imaging in the different disease entities.

TABLE OF CONTENTS/OUTLINE
Anatomy of the duodenum
Pathological entities of the duodenum with endoscopic correlation: Course of the duodenum in gut malrotation Duodenal ulcer disease Duodenal perforation Duodenitis Duodenal diverticulum Intramural hematoma of the duodenum Duodenal intussusception Choledochocoele Choledochoduodenal fistula Aortomesenteric compression (nut-cracker syndrome) of the duodenum Aortoduodenal fistula Duodenal hamartoma Duodenal lipoma Brunner gland adenoma Ampullary carcinoma Duodenal adenocarcinoma Lymphoma of the duodenum
Surgical Implications of Imaging Evaluation of Tailgut Cysts

All Day Location: GI Community, Learning Center

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Certificate of Merit

Participants
Diego P. Araujo, MD, Sao Paulo, Brazil (Presenter) Nothing to Disclose
Luiz T. Siqueira, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
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Claudia D. Leite, MD, PhD, Sao Paulo, Brazil (Abstract Co-Author) Researcher, Guerbet SA

TEACHING POINTS

SURGICAL IMPLICATIONS OF IMAGING EVALUATION OF TAILGUT CYSTS

The purpose of this exhibit is: 1. To demonstrate the impact of imaging evaluation over the surgical planning and treatment approach based on imaging characteristics. 2. Review pelvic anatomy with emphasis in surgical relevance. 3. Review of postsurgical complications.

TABLE OF CONTENTS/OUTLINE

TAILGUT CYST- Introduction and clinical aspects- Review of MRI findings, differential diagnosis and pelvic anatomy that are relevant to surgical approach- Description of possible surgical approaches- Review of postoperative complications
Where is Your Mother?: The Key Concepts to Find the Primary Disease of a Solitary Metastasis in the Abdomen on CT/MR

All Day Location: GI Community, Learning Center

Participants
Manabu Minami, MD, PhD, Tsukuba, Japan (Presenter) Nothing to Disclose
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Hiroaki Takahashi, MD, Tokyo, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Multiplicity is the most reliable imaging finding of a metastatic disease. Therefore, a solitary metastasis is often difficult to be differentiated from lesions primarily arising from an abdominal organ. The purpose of this quiz-format exhibit is to know 1) how to differentiate a solitary metastasis in the abdomen from the primary disease of the adjacent organ on CT/MR, and 2) how to find the primary lesion for the metastasis in the abdomen.

TABLE OF CONTENTS/OUTLINE
Key differential points between the solitary metastasis and the primary disease of the organ will be discussed. How to find the primary lesion of the metastasis in the abdomen on CT/MR will be also shown with several clinical pearls. The main reasons why a solitary lesion can mimic the primary abdominal disease are that: 1. the primary site can be too small and/or exist in an unexpected site. 2. the metastatic lesion can be located in the juxta-organ area, mimicking arising from the organ. 3. the metastatic lesion can mimic a specific entity of the organ. To know the pattern to metastasize to the organ is important. # via blood supply # via lymphatics # via dissemination in the abdominal cavity. Clinical history of malignancy, imaging clues of postoperative changes, and the knowledge of predilection metastatic sites of the common primary lesion are also useful.
Calcified Pancreatic and Peripancreatic Masses: Common to Uncommon Pathologies

All Day Location: GI Community, Learning Center

Participants
Franco Verde, MD, Baltimore, MD (Presenter) Nothing to Disclose
Elliot K. Fishman, MD, Owings Mills, MD (Abstract Co-Author) Research support, Siemens AG Advisory Board, Siemens AG Research support, General Electric Company Advisory Board, General Electric Company Co-founder, HipGraphics, Inc

TEACHING POINTS
1. Calcification can be seen with many pancreatic tumors
2. Calcified masses can mimic pancreatitis associated calcification
3. Endoscopic ultrasound and fine needle aspiration is usually necessary

TABLE OF CONTENTS/OUTLINE
I. Calcification in pancreatic masses
   A. Common
      1. Adenocarcinoma
   B. Uncommon
      1. Neuroendocrine
      2. Serous cystadenoma
      3. Solid pseudopapillary epithelial neoplasm
      4. Colloid carcinoma
      5. Intrapapillary mucinous tumor
      6. Mucinous tumor
      7. Lymphoepithelial cyst
II. Calcification in peripancreatic masses
   1. Peripancreatic desmoid tumor
   2. Duodenal mucinous tumor
   3. Pseudocyst

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Elliot K. Fishman, MD - 2012 Honored Educator
Elliot K. Fishman, MD - 2014 Honored Educator
TEACHING POINTS

In addition to the "classic" types of primary hepatic hypervascular lesions (such as hemangioma, focal nodular hyperplasia, hepatocellular adenoma and carcinoma), there are additional benign and malignant primary vascular mesenchymal tumors of the liver that should be considered in the differential diagnosis. The purpose of this exhibit is to expand the differential diagnosis of vascular hepatic lesions, characterize the differentiating imaging features of these "other" vascular tumors and present radiology-pathology correlation.

TABLE OF CONTENTS/OUTLINE

Introduction
Benign vascular tumors (for example, cavernous hemangioma, perivascular epithelioid cell tumor, hepatic peliosis)
Introduction
Clinical features
Imaging features
Pathology correlation
Malignant vascular tumors (for example, angiosarcoma, epithelioid hemangioepithelioma, Kaposi sarcoma)
Introduction
Clinical features
Imaging features
Pathology correlation
Differential diagnoses (for example, solitary fibrous tumor, hereditary hemorrhagic telangiectasia)
Differentiating imaging features
Summary
Cholangiocarcinoma: Typical, Unusual and Mimics

All Day Location: GI Community, Learning Center

Participants
Vanessa Lewis, MD, Chicago, IL (Presenter) Nothing to Disclose
Faeezeh Sodagari, MD, Chicago, IL (Abstract Co-Author) Grant, Siemens AG
Atilla Arslanoglu, MD, Chicago, IL (Abstract Co-Author) Grant, Siemens AG
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Frank H. Miller, MD, Chicago, IL (Abstract Co-Author) Nothing to Disclose
Vahid Yaghmai, MD, Chicago, IL (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

Cholangiocarcinoma is a relatively rare epithelial cancer of the bile duct that may manifest in classic or atypical fashion but typically presents in an advanced stage. This exhibit will review the common and uncommon cross-sectional imaging manifestations of intra- and extrahepatic cholangiocarcinomas. Mimics of cholangiocarcinoma will also be discussed.

TABLE OF CONTENTS/OUTLINE

- Epidemiology, staging and treatment of cholangiocarcinoma
- Appropriate imaging of cholangiocarcinomas
- Common and uncommon imaging manifestations
- Lesions that mimic cholangiocarcinomas
- Imaging algorithm for improving diagnosis of cholangiocarcinoma

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- Vahid Yaghmai, MD - 2012 Honored Educator
- Vahid Yaghmai, MD - 2015 Honored Educator
- Frank H. Miller, MD - 2012 Honored Educator
- Frank H. Miller, MD - 2014 Honored Educator
Comprehensive Approach to Hepatic Vascular Disease

All Day Location: GI Community, Learning Center

Participants
Beatrice L. Madrazo, MD, Miami, FL (Presenter) Nothing to Disclose
Khaled M. Elsayes, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
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Victor J. Casillas, MD, Miami, FL (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1) To detail hepatic embryology and its association to congenital vascular anomalies of the liver; 2) To offer clues to the correct identification of congenital, acquired or iatrogenic hepatic vascular lesions; 3) To recognize vascular lesions due to hereditary syndromes, veno-occlusive disease, cirrhosis, siphon effects by tumours, THAD/THID, RGVD, ALGVD and primary hepatic vascular tumours.

TABLE OF CONTENTS/OUTLINE

The hepatic arterial phase of CT/MRI may demonstrate vascular shunts that can result in misdiagnosis if their appropriate recognition is not achieved. Our interest is in detailing our experience with the following conditions: arterio-venous malformations; arterioporal fistulas; hepatic artery pseudoaneurysm (iatrogenic and polyarteritis nodosum); Osler-Webber-Rendu; Abernathy malformation; Budd-Chiari Syndrome and intra-hepatic shunts; cirrhosis associated shunts; thad/thid; extrahepatic venous occlusion with hepatic shunts; cavernoma; intra-hepatic caval anomalies; peri-cholecystic varices; epitheliod hemangioendothelioma and portal vein aneurysms. The clues to the correct identification of these lesions will be offered emphasizing their enhancement patterns, enhancement/intensity relative to the blood pool and associated findings.

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Khaled M. Elsayes, MD - 2014 Honored Educator
Christine O. Menias, MD - 2013 Honored Educator
Christine O. Menias, MD - 2014 Honored Educator
Christine O. Menias, MD - 2015 Honored Educator
Akram M. Shaaban, MBBCh - 2015 Honored Educator
TEACHING POINTS

To know the technique of non contrast MR lymphography which uses very heavily T2-weighted fast spin echo sequences with 3D acquisition and very thin sections source images. To understand that source images, thin and thick MIP reconstructions and volume reformatted images should be analyzed. To understand the principles of hepatic lymph formation in both normal and pathological conditions. To know the basic anatomy of hepatic lymphatic channels including deep vessels around portal and hepatic veins and superficial vessels at liver surface and around falciform ligament. To recognize lymphatic vessels that can be seen in normal conditions and that are easily recognized in various pathological entities. To know the main abnormal lymphatic conditions in which dilated lymphatic vessels are commonly demonstrated: lymphedema, portal hypertension, cirrhosis, chronic biliary obstruction and various post operative conditions including liver transplantation.

TABLE OF CONTENTS/OUTLINE

Technique of non contrast MR lymphography
Technique of analysis of MR lymphography sequences
Principle of hepatic lymph formation in both normal and abnormal conditions
Anatomy of hepatic lymphatic system including deep and superficial lymphatic channels
Various abnormal conditions in which dilated lymphatic vessels are commonly demonstrated.
Liver Nodules in Hereditary Haemorrhagic Telangiectasia: How to Characterize and How to Manage Them?

Awards
Certificate of Merit

Participants
Paul Bazeries, ANGERS, France (Presenter) Nothing to Disclose
Maxime Ronot, MD, Clichy, France (Abstract Co-Author) Nothing to Disclose
Jerome Lebigot, MD, Angers, France (Abstract Co-Author) Nothing to Disclose
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Valerie Vilgrain, MD, Clichy, France (Abstract Co-Author) Nothing to Disclose
Christophe Aube, MD, PhD, Angers, France (Abstract Co-Author) Speaker, Bayer AG Support, General Electric Company

TEACHING POINTS
- To illustrate typical and less typical imaging findings of nodules involving the liver in Hereditary Haemorrhagic Telangiectasia (HHT)
- To demonstrate the most common pitfalls
- To choose appropriate management for each type of lesion

TABLE OF CONTENTS/OUTLINE
- Background: reminder on HHT disease
- Liver involvement in HHT
- Liver nodules: Regenerative lesions: Focal Nodular Hyperplasia (FNH) Nodular Regenerative Hyperplasia (NRH)
- Peliosis Hepatis
- Pitfalls
- Conclusion
- References
Electronic Cleansing in Fecal-tagging CT Colonography: Past, Present and Future

Awards
*Cum Laude*

Participants
Wenli Cai, PhD, Boston, MA (*Presenter*) Nothing to Disclose
Michael E. Zalis, MD, Boston, MA (*Abstract Co-Author*) Co-founder, QPID Health Inc; Chief Medical Officer, QPID Health Inc; Stockholder, QPID Health Inc

**TEACHING POINTS**

Electronic cleansing (EC) is an image post-processing technique for removal of tagged fecal materials in fecal tagging CTC (ftCTC) for virtual fly-through of the colon. In this exhibit, we present an overview about the past, present, and the future developments of EC technology. The teaching points of this exhibits are:

1. Image characteristics of ftCTC may vary between cathartic- vs. non-cathartic bowel preparations, normal-dose vs. low-dose and single-energy vs. dual-energy imaging protocols.
2. Early EC technologies tends to generate severe EC artifacts when applying to non-cathartic ftCTC.
3. Current EC research aims at reducing EC artifacts in non-cathartic ftCTC using advanced image-processing technologies.
4. Dual-energy EC (DE-EC) is a promising solution to non-cathartic ftCTC, and has the potential to become the next-generation EC tool for low-dose non-cathartic colorectal screening.

**TABLE OF CONTENTS/OUTLINE**

1. Introduction of the image characteristics of cathartic and non-cathartic ftCTC.
2. Review of early and current EC solutions to ftCTC, the major EC artifacts and pitfalls, and the technique challenges.
3. Discussion of the novel DE-EC techniques in the reduction of EC artifacts by comparison with current EC methods.
4. Future work and summary of DE-EC in low-dose non-cathartic ftCTC.
Multimodality Approach to Liver Transplant Complications. What to Focus on When the Graft Does Not Work Properly

All Day Location: GI Community, Learning Center

Participants
Maria Arriaza, MD, Pamplona, Spain (Presenter) Nothing to Disclose
David Cano, MD, Pamplona, Spain (Abstract Co-Author) Nothing to Disclose
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Alberto Benito, MD, Pamplona, Spain (Abstract Co-Author) Nothing to Disclose
Ignacio Gonzalez Crespo, MD, Pamplona, Spain (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To review common anastomotic techniques and expected postoperative imaging findings.
2. To describe a wide range of complications of liver transplantation using a multimodality approach, emphasizing the advantages and limitations of each imaging modality and the algorithm for imaging evaluation of these complications.
3. To analyze which complication requires follow up imaging or immediate surgery intervention for achieving good clinical long term outcome.

TABLE OF CONTENTS/OUTLINE
Coating the Colon: Review of the Enema

All Day Location: GI Community, Learning Center

Participants
Vivek Patel, MD, New Haven, CT (Presenter) Nothing to Disclose
Aditi Vyas, MD, Norwalk, CT (Abstract Co-Author) Nothing to Disclose
Saad Hussain, MD, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Mahan Mathur, MD, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Mike Spektor, MD, New Haven, CT (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Review proper indications and relative/absolute contraindications for various types of enemas. Understand limitations and benefits of corresponding alternative imaging modalities. Summarize proper techniques for performing safe, diagnostic quality enemas with the minimum radiation dose necessary. Discuss potential complications. Provide imaging examples of numerous disease entities seen on enema exams with multimodality, clinical, and pathologic correlation. Discuss relevant pathophysiology, treatments and outcomes. Offer imaging overview for the use and role of enema as treatment.

TABLE OF CONTENTS/OUTLINE
Background Indications Contraindications Anatomy Technique Single contrast Double contrast Negative contrast Positive contrast Pathology Colitis/Pseudomembranous colitis Constipation Diverticulosis/Diverticulitis Fistula Inflammatory bowel disease Intussusception Neoplasms Obstruction Perforation Polyp/Polyposis syndromes Post-surgical Stricture Volvulus Enema as treatment Constipation/impaction Intussusception Complications
The ABCD of Focal Hepatic Lesions in the Non-Cirrhotic Liver: A 4-Step Algorithmic Approach

All Day Location: GI Community, Learning Center

Participants
Kelly A. Tornow, BS, MD, Dallas, TX (Presenter) Nothing to Disclose
Gaurav Khatri, MD, Dallas, TX (Abstract Co-Author) Nothing to Disclose
Ivan Pedrosa, MD, Dallas, TX (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

MRI is an accurate tool for characterization of liver lesions, even in the setting of hepatic steatosis or siderosis. Lesions can be categorized as primary hepatocellular origin or non-hepatocellular origin based on signal intensity (SI) comparison on T1-weighted (T1-w) noncontrast images to background liver in absence of hepatic steatosis or siderosis, or to normal spleen in the setting of hepatic steatosis or siderosis. T2-weighted (T2-w) images may help differentiate between various non-hepatocellular lesions.

TABLE OF CONTENTS/OUTLINE

Background - role of MRI
4-step ABCD algorithm for characterization of liver lesions
Overview of algorithm
Step 1 - Assess background liver parenchyma for presence of steatosis or siderosis
Step 2 - compare to Background liver or spleen on T1-w images
Step 3 - Categorize as hepatocellular or non-hepatocellular origin lesion
Step 4 - Differentiate between non-hepatocellular origin lesions based on T2-w images
Illustration of algorithm with cases and demonstration of impact on clinical management
Summary
Underlying hepatic steatosis or siderosis must be considered when evaluating SI of liver lesions. Comparison of MR SI to background liver parenchyma and spleen can help characterize liver lesions in the non-cirrhotic patient.
Hepatic Adenomas in MRI: Differences between Them and Other Hepatic Lesions

All Day Location: GI Community, Learning Center

Participants
Marcio Rodrigues, MD, Braga, Portugal (Presenter) Nothing to Disclose
Ricardo G. Correia, MD, Porto, Portugal (Abstract Co-Author) Nothing to Disclose
Andre Carvalho, MD, Porto, Portugal (Abstract Co-Author) Nothing to Disclose
Catia Esteves, MD, Porto, Portugal (Abstract Co-Author) Nothing to Disclose
Barbara S. Viamonte, MD, Vila Real, Portugal (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To review the pathophysiology of hepatic adenomas 2. To discuss the clinical and imaging features associated with hepatic adenomas subtypes and its practical relevance 3. To systematize the differences between adenomas and other hepatic lesions (benign and malignant) in MRI

TABLE OF CONTENTS/OUTLINE
Hepatocellular adenomas subtypes (Inflammatory, HNF-1α-mutated, β-Catenin-mutated and unclassified adenoma):- Pathophysiology;- Clinical features;- MRI findings;- Management implications;- Complications.Differences between adenomas and other hepatic lesions.
Beyond the Usual: Breast Cancer Metastasis to the Gastrointestinal Tract

Awards
Certificate of Merit

Participants
Kirsteen R. Burton, MD, MBA, Toronto, ON (Presenter) Nothing to Disclose
Seng Thipphavong, MD, Toronto, ON (Abstract Co-Author) Nothing to Disclose
Richard Kirsch, MD, PhD, Toronto, ON (Abstract Co-Author) Nothing to Disclose
Nasir M. Jaffer, MD, Toronto, ON (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Breast cancer, although commonly known to metastasize to the brain, bone, lung and liver, also has the propensity to metastasize to the gastrointestinal (GI) tract. Breast cancer metastases can mimic other clinical and imaging GI tract entities.

TABLE OF CONTENTS/OUTLINE
Learning objectives
Secretory Tumors of the Gastrointestinal Tract; Cross Sectional Imaging with Pathologic and Laboratory Correlation

All Day Location: GI Community, Learning Center

Awards
Certificate of Merit

Participants
Yehia M. Elguindy, MD, Toledo, OH (Abstract Co-Author) Nothing to Disclose
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Mahmoud Ali, MD, Houston, TX (Abstract Co-Author) Nothing to Disclose
Khaled M. Elsayes, MD, Ann Arbor, MI (Presenter) Nothing to Disclose

TEACHING POINTS
- Review classification of secretory tumor of the GI tract.
- Identify the cells of origin, hormones produced and clinical presentations of these tumors.
- Review the syndromes associated with secretory tumors of the GI tract.
- Imaging findings of the tumors and associated syndromes

TABLE OF CONTENTS/OUTLINE
- Introduction- List of secretory tumors of the GI tract, their relevant cells of origin, hormones produced and malignant potential.
- Syndromes associated with secretory tumors of the GI tract (MEN I and VHL).
- Neuroendocrine tumors (Insulinoma, glucagonoma, gastrinoma, and somatostatinoma, ZE syndrome, VIPomas).
- Clinical Picture- Imaging findings with pathologic correlation.

SUMMARY: Secretory tumors are tumors with hormone producing capability. In this exhibit we will review the secretory tumors of the GI tract, the clinical manifestations that results from their hormone production as well as imaging findings and pathological correlation. We will also discuss the malignant potential and the clinical syndromes associated with these tumors.

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Khaled M. Elsayes, MD - 2014 Honored Educator
Christine O. Menias, MD - 2013 Honored Educator
Christine O. Menias, MD - 2014 Honored Educator
Christine O. Menias, MD - 2015 Honored Educator
Hepatic Complication of Estrogen and Oral Contraceptive Pills

All Day Location: GI Community, Learning Center

Participants
Neeraj Lalwani, MD, Seattle, WA (Presenter) Nothing to Disclose
Kiran Gangadhar, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
Ryan O’Malley, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
Manjiri K. Dighe, MD, Seattle, WA (Abstract Co-Author) Research Grant, General Electric Company
Carolyn L. Wang, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
Dhakshina M. Ganeshan, MBBS, FRCR, Houston, TX (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Oral contraceptive pills (OCPs) and estrogen has been recognized for its hepatic complications. Estrogen induced hepatotoxicity may cause inhibition of bilirubin excretion and lead to jaundice and altered liver functions. Hepatic adenomas are known to be linked with OCPs. However, malignant transformation of adenoma and hepatocellular carcinoma may also occur in such patients. Estrogens may also stimulate the growth of other benign hepatic neoplasm, such as focal nodular hyperplasia, hemangiomas, and hamartomas. Hepatic venous thrombosis or Budd Chiari syndrome have also been linked with intake of OCPs and estrogen. Moreover, OCPs are associated with occurrence of peliosis hepatis.

TABLE OF CONTENTS/OUTLINE
Background Mechanism of hepatotoxicity Cholestasis due to OCPs, manifestation in patients with Dubin Johnson syndrome. Hepatic adenoma: Etiopathogenesis and genetics, classification, adenomatosis, complications including malignant transformation and rupture, imaging features, MR with gadoxetate disodium, Differentiation of inflammatory adenoma vs. FNH on hepatospecific phase, management guidelines. FNH, Hemangioma and hamartoma under the influence of OCPs. Budd Chian syndrome and venous thrombosis. Dilated sinusoids and peliosis hepatis and their complications associated with OCPs.
Pharyngoesophagram: Traditional GI Imaging Which Survived in 21st Century!

All Day Location: GI Community, Learning Center

Participants
Neeraj Lalwani, MD, Seattle, WA (Presenter) Nothing to Disclose
Sachin S. Kumbar, MBBS, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
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Kiran Gangadhar, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The face of conventional gastrointestinal (GI) radiology is swiftly changing; despite the ever increasing popularity of new age cross sectional imaging in GI radiology, pharyngoesopahagrams has survived and has become the one of the most common and useful imaging tool to evaluate esophageal and pharyngeal functions. Evaluation of esophageal motility, pre- and post-operative anatomy for GERD and bariartic surgery, and assessment of post-operative concerns are gaining popularity in modern radiology departments. The evaluation of dysphagia remains one of the commonest indications of performing esophagram. Wide variety of pathologies including functional or structural abnormalities of the oral cavity, pharynx, esophagus, or gastric cardia exist which may cause dysphagia. None of the other investigation can provide such a precise and elaborate assessment of such pathologies.

TABLE OF CONTENTS/OUTLINE
Indications in modern scenario Practical approach to perform an ideal pharyngoesophagram Ideal vs. tailored examinations Dysphagia: Commonly met but frequent misinterpreted! GERD Dysmotility Achalasia: Modification of Technique, Differentiating the primary and secondary achalasia. Future of fluoroscopic procedures

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Krishna Prasad Shanbhogue, MD - 2012 Honored Educator
Krishna Prasad Shanbhogue, MD - 2013 Honored Educator
Canary in the Coal Mine: The Spleen as an Indicator of Systemic Infectious Disease

All Day Location: GI Community, Learning Center

Participants
Leslie K. Lee, MD, Boston, MA (Presenter) Nothing to Disclose
Peter F. Hahn, MD, PhD, Belmont, MA (Abstract Co-Author) Stockholder, Abbott Laboratories Stockholder, Medtronic, Inc Stockholder, CVS Caremark Corporation Stockholder, Kimberly-Clark Corporation Stockholder, Landauer, Inc

TEACHING POINTS

Splenic lesions may represent local manifestation of systemic infectious disease; differential considerations include infectious, inflammatory, and neoplastic conditions; in certain cases, the spleen may represent the sole site of systemic disease involvement; management options include: follow-up imaging, diagnostic sampling, and splenectomy; abdominal MR and PET imaging may aid diagnostic evaluation.

TABLE OF CONTENTS/OUTLINE

1. Splenic Lesions: appearance on ultrasound, CT, MRI, and PET. 2. Imaging recommendations to narrow the differential considerations. 3. Case review of infectious conditions resulting in focal splenic lesions.
Isolated Arteries Originated from the Intrahepatic Arteries: Functions and Importance in Intervention

All Day Location: GI Community, Learning Center

Awards
Certificate of Merit

Participants
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Norihide Yoneda, Kanazawa, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this presentation is 1. To review the microanatomy and microcirculation of the isolated arteries in the liver. 2. To review the function of isolated arteries in subcapsular hemorrhage of the liver. 3. To review the function of isolated arteries in arterial collateral formation following the obstruction of hepatic arteries. 4. To discuss the importance of isolated arteries in intervention for subcapsular hemorrhage and TACE for liver cancers.

TABLE OF CONTENTS/OUTLINE
1. Microanatomy/microcirculation of isolated arteries of the liver - Review the microanatomy with special references to communications with capsular arterial plexus and extrahepatic and other hepatic arteries. 2. Function of the isolated arteries in subcapsular hemorrhage - Pathophysiology of subcapsular hemorrhage and isolated arteries - How to perform TAE for subcapsular hemorrhage. 3. Function of the isolated arteries in arterial collateral formation following the obstructions of hepatic arteries - Case presentations with arterial collateral formation through isolated arteries From extrahepatic arteries From other intrahepatic arteries - How to prevent the microcollaterals through isolated arteries. 4. Summary
Cholangiocarcinoma in Primary Sclerosing Cholangitis: A Pictorial Review

Awards
Certificate of Merit

Participants
Tae Kyung Kim, MD, PhD, Toronto, ON (Presenter) Nothing to Disclose
John Jonghun Lee, Toronto, ON (Abstract Co-Author) Nothing to Disclose
Hyun-Jung Jang, MD, Toronto, ON (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Various morphologic patterns of cholangiocarcinoma (CC) associated with primary sclerosing cholangitis (PSC) on cross-sectional imaging. Challenges in detecting small CC in PSC due to underlying bile duct abnormalities and heterogeneous liver parenchyma. Importance of early diagnosis of perihilar CC in PSC which can be indicated for curative therapies including liver transplantation (LT). Usefulness of a multi-modality approach and careful comparison with prior images to diagnose CC in PSC. Recognition of frequent mimickers of CC.

TABLE OF CONTENTS/OUTLINE
Multi-modality approach - US, CT, MRI, and biopsy - for the accurate diagnosis and staging of CC in PSC. Case presentations of CC in PSC that was detected by serial surveillance imaging by MRI/MRCP and ultrasound. Variable imaging patterns of CC in PSC - mass-forming intrahepatic, perihilar periductal infiltrating, and distal extrahepatic CC. Review of imaging methods for perihilar CC in LT candidates. Imaging findings of mimickers of CC in PSC - hepatocellular carcinoma, inflammatory mass, and confluent fibrosis.
Tumor-Vessels Relationships in Pancreatic Adenocarcinoma: Different Classification Systems and their Influence on Treatment Planning: A Guide for the Radiologist

All Day Location: GI Community, Learning Center

Participants
Ahmed Zaki, MBBCh, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Matthew Weiss, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Christopher L. Wolfgang, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Elliot K. Fishman, MD, Owings Mills, MD (Abstract Co-Author) Research support, Siemens AG Advisory Board, Siemens AG Research support, General Electric Company Advisory Board, General Electric Company Co-founder, HipGraphics, Inc
Atif Zaheer, MD, Baltimore, MD (Presenter) Nothing to Disclose

TEACHING POINTS
1- Classification systems that describe the resectability of pancreatic adenocarcinoma such as the MDACC criteria, AHPBA/SSA/SSAT criteria, which was endorsed by the National Comprehensive Cancer Network (NCCN) and Ishikawa classification system for venous involvement. 2- Description of different anatomic variants such as replaced hepatic artery, high insertion of jejunal branches of the superior mesenteric vein (SMV) close to the confluence, etc., are important for preoperative planning of vascular reconstruction. 3- Descriptors such as length of tumor vascular interface, smooth shift versus narrowing of the veins, presence of portal vein and splenic collaterals, etc., are important for the decision making for the surgical approach.

TABLE OF CONTENTS/OUTLINE
a) Different classification systems that describe the tumor-vessel relationships will be illustrated.
b) Preoperative imaging of different degrees of involvement of peri-pancreatic major blood vessels will be shown.
c) Postoperative imaging for cases with vascular reconstruction will be shown.
d) Examples of down staging and progression following neoadjuvant treatment will be shown.
e) The importance of establishment of standardized radiology reporting template will be addressed.

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Atif Zaheer, MD - 2012 Honored Educator
Elliot K. Fishman, MD - 2012 Honored Educator
Elliot K. Fishman, MD - 2014 Honored Educator
Autoimmune pancreatitis (AIP) is the most common etiology for false-positive imaging diagnosis of pancreatic carcinoma, frequently causing an unnecessary pancreatic resection. Recognition of suggestive imaging findings on cross-sectional imaging can lead to a proper laboratory test (serum IgG4) and an accurate diagnosis of AIP. Multi-modality imaging approach (US, CT, MRI, and MRCP) is helpful to differentiate between AIP and pancreatic carcinoma.

TABLE OF CONTENTS/OUTLINE

- Review of international consensus diagnostic criteria for type 1 AIP (lymphoplasmocytic sclerosing pancreatitis) based on parenchymal imaging, ductal imaging (ERCP), serology, other organ involvement, histology, and response to steroids
- Typical and atypical imaging patterns of AIP: Diffuse, focal, and multifocal
- Differentiating imaging features of AIP from pancreatic carcinoma: Halo sign, Multifocal pancreatic lesions, Strong delayed-phase enhancement, Extrapancreatic involvement of IgG4-related disease: bile ducts, kidneys, retroperitoneum, gallbladder, and lymph nodes
- Multiple irregular pancreatic ductal strictures with mild upstream dilatation < 5 mm
- Long-segment (> 30 mm) narrowing of the pancreatic duct
- Response to short-term (2 weeks) steroid treatment
Participants
Kevin R. Kalisz, MD, Cleveland, OH (Presenter) Nothing to Disclose
Raj M. Paspulati, MD, Cleveland, OH (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To understand the advantages and disadvantages of various imaging modalities and utilize the proper imaging technique in the imaging of gastric masses 2. To discuss the imaging characteristics and differentiating features among various benign and malignant gastric mass lesions 3. To recognize common gastric imaging pitfalls and differentiate true gastric mass lesions from non-gastric mimics

TABLE OF CONTENTS/OUTLINE
Acute Abdomen in the Oncologic Patient

All Day Location: GI Community, Learning Center

Participants
Maria Eugenia Arias L., MD, Sant Joan D'Alacant, Spain (Presenter) Nothing to Disclose
Angeles Franco Lopez, Madrid, Spain (Abstract Co-Author) Nothing to Disclose
Fatima Garcia Navarro, MD, Sant Joan d'Alacant, Spain (Abstract Co-Author) Nothing to Disclose
Isabel Gonzalez-Alvarez, San Juan de Alicante, Spain (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
As oncologic patients’ life expectancy improves, so do the possible complications derived from oncologic treatments. Throughout this educational exhibit our purpose is to: Explore the association and frequency of acute abdominal episodes throughout our oncologic patients. Consider different approaches for the oncologic patient with acute abdominal pain. Significant facts radiologist should take in account when imaging oncologic patients.

TABLE OF CONTENTS/OUTLINE
We revised the total amount of emergency abdominal CTs performed in our hospital in a 6-month period, of which a little under 25% corresponded to oncologic patients and classified them in accordance to their main clinical complaint. We divided the pathologies in 3 groups: Related to the tumoral process: association between acute abdominal syndromes in oncologic patients secondary to the tumor: structural alterations, progression, extension of the primary tumor or the metastasis, etc. Hemorrhage Obstruction Perforation Intussusception Ischemic colitis Related to treatment: Surgery: abscess, obstruction, etc. Chemotherapy: angiogenic secondary effects Radiotherapy Hematopoietic stem cell transplantation Immunosuppression: tiflitis, pancolitis, ischemia and GVHD. Independent (of both tumor and treatment).
Contribution of Imaging in the Differential Diagnosis of Splenomegalies

All Day Location: GI Community, Learning Center

FDA

Discussions may include off-label uses.

Participants
Thais C. Lima, Sao Paulo, Brazil (Presenter) Nothing to Disclose
Camila T. Amancio, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
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Publio C. Viana, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Marcos R. Menezes, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Giovanni G. Cerri, MD, PhD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is: Set esplenomegalias and its associated radiological findings Recognize splenomegaly as a change found in several diseases To review the pathophysiology of splenomegaly. Identify the associated radiological findings that can guide the differential diagnosis of splenomegaly

TABLE OF CONTENTS/OUTLINE

Anatomical aspects and definition of splenomegaly Differential diagnosis of splenomegaly: infection, congestive, hematological, tumor and infiltration Imaging findings in congestive splenomegaly: portal hypertension, liver disease signs, expansion of the splenic vein. Imaging findings hematological diseases: splenic infarcts and hematopoise extramedullary
Sectional Imaging Diagnosis of Sigmoid Mesocolon

All Day Location: GI Community, Learning Center

Awards
Certificate of Merit

Participants
Akitoshi Inoue, MD, Shiga, Japan (Presenter) Nothing to Disclose
Shinichi Ohta, MD, PhD, Otsu, Japan (Abstract Co-Author) Nothing to Disclose
Akira Furukawa, MD, PhD, Tokyo, Japan (Abstract Co-Author) Nothing to Disclose
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Michio Yamasaki, MD, Ritto, Japan (Abstract Co-Author) Nothing to Disclose
Norihisa Nitta, MD, Kyoto, Japan (Abstract Co-Author) Nothing to Disclose
Kiyoshi Murata, MD, Otsu, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The sigmoid mesocolon is covered by two peritoneums and contains fat tissue, arteries, veins, nerves, lymph ducts and nodes. The anatomical and radiological knowledge of the sigmoid mesocolon are necessary to diagnose the origin and spread of disease in the pelvis correctly. The aims of this exhibition are: 1. To review anatomy and clinical significance of the sigmoid mesocolon 2. To know how to detect the sigmoid mesocolon on CT or MRI 3. To demonstrate various diseases in the sigmoid mesocolon 4. To show various pattern of sigmoid colon perforation

TABLE OF CONTENTS/OUTLINE
1. Gross anatomy of the sigmoid mesocolon The sigmoid mesocolon attaches to third sacral segment and extending in the cephalad direction toward the left external iliac vessels. 2. Sectional imaging anatomy of the sigmoid mesocolon The normal mesothelium of the sigmoid mesocolon is invisible on CT and MRI. It is important to find the sigmoid artery and vein in order to identify the sigmoid mesocolon. 3. Case presentation The various diseases in the sigmoid mesocolon will be classified into two categories by the origin in this exhibition. - Originated from the sigmoid mesocolon - Originated from the sigmoid colon 4. Perforation pattern - peritoneal cavity - retroperitoneal space - sigmoid mesocolon - adjacent organ 5. Summary
Contrast-Enhanced Ultrasound: Its Use as a Problem-Solving Tool in the Multimodality Evaluation of Hepatocellular Carcinoma

All Day Location: GI Community, Learning Center

FDA Discussions may include off-label uses.

Participants
Eugenia Khorochkov, MD, London, ON (Abstract Co-Author) Nothing to Disclose
Joel Z. Mercer, MD,MENG, London, ON (Presenter) Nothing to Disclose
Stefanie Y. Lee, MD,FRCPC, Hamilton, ON (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is to review the indications and technique for contrast-enhanced ultrasound (CEUS) in the evaluation of liver lesions in patients at risk for HCC. Cases shown will demonstrate the application of CEUS as a problem-solving modality in the imaging diagnosis of HCC.

TABLE OF CONTENTS/OUTLINE
Why contrast-enhanced ultrasound?· Strengths and limitations of CEUS compared to other imaging modalities· Background and technical factorsPerforming CEUS· Patient selection; indications and contraindications· Review of the procedure· Optimizing image acquisitionCEUS in the liver· Phases of enhancement of background liver parenchyma· Spectrum of HCC enhancement on CEUSCase examples of CEUS as a problem-solving tool when other modalities are inconclusive in the diagnosis of HCC· CEUS when other types of contrast are contraindicated· CEUS when arterial enhancement and/or delayed washout are not clearly demonstrated on other modalities· CEUS in characterizing diffuse infiltrative HCC· CEUS in diagnosing tumor thrombusSummary and future applications
Beyond Large Bowel Obstruction and Mural Thickness: Uncommon Complications of Colorectal Cancer at MDCT

All Day Location: GI Community, Learning Center

Participants
Nicolas A. Zugbe, MD, Santiago, Chile (Presenter) Nothing to Disclose
Sebastian Bravo-Grau, MD, MSc, Santiago, Chile (Abstract Co-Author) Nothing to Disclose
Jose Gutierrez Chacoff, MD, Santiago, Chile (Abstract Co-Author) Nothing to Disclose
Ignacio Maldonado, MD, Santiago, Chile (Abstract Co-Author) Nothing to Disclose
Juan C. Prieto Rayo SR, MD, Santiago, Chile (Abstract Co-Author) Nothing to Disclose
Cristian Varela, MD, Santiago, Chile (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

? Abnormal mural thickness is the earliest and most common presentation of colorectal cancer in imaging studies.? Uncommon imaging manifestations at diagnosis in MDCT include: Intestinal perforation, acute appendicitis, intussusception, fistulae and local organ invasion.? Colon cancer can be clinically and/or radiologically obscured by these complications, and this may result in a delayed diagnosis and treatment.

TABLE OF CONTENTS/OUTLINE

Hypodense Lesions of the Spleen: Case-based Pictorial Review

All Day Location: GI Community, Learning Center

Participants
Pouya Ziai, MD, Derby, PA (Abstract Co-Author) Nothing to Disclose
Najmeh Rohani, MD, Derby, PA (Presenter) Nothing to Disclose
Mohamadreza Hayeri, MD, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Stanley U. Chan, MD, Philadelphia, PA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Become familiar with etiological categories of hypodense splenic lesions and their pathophysiology Provide a rational approach to reach the correct differential diagnosis

TABLE OF CONTENTS/OUTLINE
This exhibit aims to: Enhance familiarity with hypodense splenic lesions through a case-based pictorial review featuring multimodality imaging Introduction Focal hypodense splenic lesions are frequently encountered on CT. It is important to differentiate the more common benign etiologies not requiring further evaluation from etiologies that warrant closer attention Multimodality case based review of hypodense splenic lesions Benign cystic Benign non-cystic Inflammatory Infectious Malignant Miscellaneous
MR Evaluation of Abdominal Transplant Vasculature with an Ultrasmall Iron Oxide Particle

All Day Location: GI Community, Learning Center

Participants
Andrew Bowman, MD, PhD, Jacksonville, FL (Presenter) Nothing to Disclose
Candice W. Bolan, MD, Jacksonville, FL (Abstract Co-Author) Nothing to Disclose
Christine O. Menias, MD, Scottsdale, AZ (Abstract Co-Author) Nothing to Disclose
Mellena D. Bridges, MD, Jacksonville, FL (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Describe MR imaging techniques using ferumoxytol, an ultrasmall iron oxide particle, as a contrast agent. Illustrate the utility of ferumoxytol as a contrast agent in vascular imaging of abdominal transplants.

TABLE OF CONTENTS/OUTLINE
Describe the mechanism by which ferumoxytol acts as MR blood pool contrast agent. Illustrate the appearance of normal and abnormal vascular findings using ferumoxytol in the imaging of: Liver transplants Renal transplants Pancreas transplants Briefly review pitfalls of MR imaging with ferumoxytol and tips to avoid them. Vascular complications in abdominal organ transplants are common, requiring prompt and accurate diagnosis. Vascular imaging of transplant patients with traditional gadolinium-based contrast agents can be challenging, especially in ill patients that may have difficulty remaining still, or in those who suffer from decreased renal function. Ferumoxytol has a plasma half-life of approximately 14 hours and unique properties that make it an ideal agent for the evaluation of abdominal vasculature. The use of ferumoxytol can be advantageous in the imaging of transplant patients because its long intravascular half-life allows for optimal clarity in vascular imaging and its iron oxide composition is safe for renal failure patients in whom gadolinium-based contrast agents are contraindicated.

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Christine O. Menias, MD - 2013 Honored Educator
Christine O. Menias, MD - 2014 Honored Educator
Christine O. Menias, MD - 2015 Honored Educator
Liver Arterioportal Shunts Revisited: From Microstructure Schematics to Cross-sectional Imaging Approach

All Day Location: GI Community, Learning Center

Participants
Natalia Sabaneeff, MD, Rio de Janeiro, Brazil (Presenter) Nothing to Disclose
Romulo Varella, MD, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Erick S. Hollanda, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Dafne D. Melquiades, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Leonardo K. Bittencourt, MD, PhD, Rio De Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Arterial and portal systems communicate in the normal liver through transvasal, transplexal and transinusoidal pathways. Vascular shunts can be structural (neo-routes) or functional (normally found routes). Whenever there is a compromise in portal venous flow, there is a compensatory increase in arterial flow (functional shunt). Neo-routes of arterioportal shunts can be created by a several number of mechanisms (structural shunts). Transient enhancement of the parenchyma, may reflect unbalance in the usual arterial/portal flow, with redistribution of arterial flow. Knowledge of hepatic perfusion disorders avoids misinterpretation of imaging findings.

TABLE OF CONTENTS/OUTLINE
- Liver blood supply
- Arterioportal physiological communications: transplexal, transvasal, transinusoidal
- Vascular shunt: concepts
- Functional x Structural arterioportal shunts
- Functional shunts: How does it happen? Compensatory increase in normal arterioportal routes
- Why does it happen? Cirrhosis, portal vein obstruction/thrombosis, inflammatory changes, biliary obstruction
- How do we see it?
- Cross sectional imaging findings
- Transient hepatic parenchymal enhancement
- Structural shunts: Neoroutes: transtumoral, tumoral thrombus, macroscopic fistula
- Cross sectional imaging findings
Vascular Lesions at Multi-phase CT Enterography for Obscure GI Bleeding (OGIB): Theme and Variations

All Day Location: GI Community, Learning Center

Awards
Magna Cum Laude
Identified for RadioGraphics

Participants
Krishna Pundi, BS, Rochester, MN (Presenter) Nothing to Disclose
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Shannon P. Sheedy, MD, Rochester, MN (Abstract Co-Author) Nothing to Disclose
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Jeff L. Fidler, MD, Rochester, MN (Abstract Co-Author) Research Grant, Beekley Corporation
John M. Barlow, MD, Rochester, MN (Abstract Co-Author) Nothing to Disclose
Joel G. Fletcher, MD, Rochester, MN (Abstract Co-Author) Grant, Siemens AG;
Parakkal Deepak, MBBS, Rochester, MN (Abstract Co-Author) Nothing to Disclose
David Bruining, MD, Rochester, MN (Abstract Co-Author) Research Grant, Given Imaging Ltd Consultant, Bracco Group
Stephanie Hansel, MD, Rochester, MN (Abstract Co-Author) Research support, Given Imaging Ltd; Advisory Board, Medtronic, Inc

TEACHING POINTS
Vascular Lesions are the most common cause of small bowel bleeding identified in OGIB patients at multi-phase CT enterography (mpCTE), and colorectal vascular lesions are the most common cause of OGIB outside the small bowel. Common vascular causes of OGIB vary by age, occur in typical locations, and have characteristic 3D morphology and temporal evolution of enhancement at mpCTE. mpCTE can guide the selection of most appropriate treatment (surgery, angiography, balloon-assisted endoscopy, iron supplementation and observation).

TABLE OF CONTENTS/OUTLINE
1. Classification and Common Causes Yano (endoscopic) and Huprich (CTE) classifications Most common small bowel lesions by age Non-small bowel enteric vascular lesions - cecal AVM/angioectasia, rectal AVM/varices, others 2. Imaging Findings Indicating Specific Vascular Lesions Temporal Evolution of vascular blush and active bleeding Angioectasias - usually most prominent in enteric phase Arterial lesions - AVM, Dieulafoy Venous lesions - Varices (cirrhosis, Crohn’s, anastomotic, congenital), venous angiomas 3D morphology - particularly helpful for distinguishing angioectasias from prominent mesenteric veins associated with aging Common Locations - anastomoses, jejunum (for angioectasias), cecum, rectum, anus Mimics 3. Time-efficient review
CT Pitfalls in Gastrointestinal Imaging
All Day Location: GI Community, Learning Center

Participants
Bahar Mansoori, MD, Cleveland, OH (Presenter) Nothing to Disclose
Majid Chalian, MD, Cleveland Heights, OH (Abstract Co-Author) Nothing to Disclose
Raj M. Paspulati, MD, Cleveland, OH (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
To get familiar with the common sources of pitfalls in GI imagingTo understand the appropriate CT techniques to avoid pitfallsTo acquire interpretive skills to avoid misdiagnosis/over diagnosis of the CT findings

TABLE OF CONTENTS/OUTLINE
Common sources of pitfalls: A) Stomach a) Inappropriate imaging techniques b) Importance of multiplanar imaging c) Disease mimickers B) Small Bowel a) Inappropriate imaging techniques b) Importance of multiplanar imaging c) Disease mimickers C) Large Bowel a) Inappropriate imaging techniques b) Importance of multiplanar imaging c) Disease mimickers D) Rectosigmoid Colon a) Inappropriate imaging techniques b) Importance of multiplanar imaging c) Disease mimickers
Mibs and Mabs: Intra-abdominal Complications of Targeted Cancer Therapies

All Day Location: GI Community, Learning Center

Awards
Magna Cum Laude

Participants
Stephanie T. Chang, MD, Palo Alto, CA (Presenter) Nothing to Disclose
Christine O. Menias, MD, Scottsdale, AZ (Abstract Co-Author) Nothing to Disclose
Vincent M. Mellnick, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Meghan G. Lubner, MD, Madison, WI (Abstract Co-Author) Grant, General Electric Company; Grant, NeuWave Medical, Inc; Grant, Koninklijke Philips NV
Amy K. Hara, MD, Scottsdale, AZ (Abstract Co-Author) Royalties, General Electric Company;
Terry S. Desser, MD, Stanford, CA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Increasingly widespread usage of targeted cancer therapies has revealed emerging drug toxicity profiles. Side effects of targeted cancer therapies should not be mistaken for tumor progression. Early recognition of known drug toxicities can facilitate appropriate clinical management and cessation of drug administration.

TABLE OF CONTENTS/OUTLINE
Hepatitis and hepatosteatosis: ipilimumab
Cholecystitis: sorafenib, everolimus
Pancreatitis: sorafenib, everolimus
Colitis: ipilimumab, bevacizumab, sunitinib
Tumor-bowel fistula: bevacizumab, ipilimumab
Bowel perforation: bevacizumab, sunitinib, sorafenib
Intratumoral hemorrhage: imatinib
Fluid retention: imatinib
Thromboembolic disease: bevacizumab

Targeted cancer therapy includes monoclonal antibodies and small molecules designed to interfere with specific molecular ‘targets’ involved in cancer growth. It is one of the basic components of precision medicine, which uses knowledge of a patient’s genes and proteins to prevent, diagnose, and treat disease. After President Obama’s unveiling of the Precision Medicine Initiative in 2015, more research will be directed to this burgeoning field. Radiologists must understand and recognize potential complications of these novel therapies and implications for management so that appropriate treatment can be offered.

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Christine O. Menias, MD - 2013 Honored Educator
Christine O. Menias, MD - 2014 Honored Educator
Christine O. Menias, MD - 2015 Honored Educator
Meghan G. Lubner, MD - 2014 Honored Educator
Meghan G. Lubner, MD - 2015 Honored Educator
Amy K. Hara, MD - 2015 Honored Educator
Median Arcuate Ligament Crossing Over the Celiac Artery: Median Arcuate Ligament Syndrome is Not the Only Problem

All Day Location: GI Community, Learning Center

Participants
Shinichi Ohta, MD, PhD, Otsu, Japan (Presenter) Nothing to Disclose
Akitoshi Inoue, MD, Shiga, Japan (Abstract Co-Author) Nothing to Disclose
Shobu Watanabe, MD, Otsu, Japan (Abstract Co-Author) Nothing to Disclose
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Norihisa Nitta, MD, Kyoto, Japan (Abstract Co-Author) Nothing to Disclose
Ryuta Itoh, MD, Otsu, Japan (Abstract Co-Author) Nothing to Disclose
Kiyoshi Murata, MD, Otsu, Japan (Abstract Co-Author) Nothing to Disclose
Akira Furukawa, MD, PhD, Tokyo, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: To differentiate between the median arcuate ligament crossing over the celiac artery (MALc/oCA) and median arcuate ligament syndrome (MALS). The understanding that not only MALS but also MALc/oCA leads to some diseases including the celiac stenosis, the celiac dissection, the celiac aneurysm, and the pancreaticoduodenal aneurysm. To examine the relationship between MALc/oCA and acute pancreatitis.

TABLE OF CONTENTS/OUTLINE
The contents of this exhibit are: Anatomy of MAL Definition of MALc/oCA CT findings of MALc/oCA CT findings of MALc/oCA during expiration Diseases caused by MALc/oCA including the celiac stenosis, the celiac dissection, the celiac aneurysm, and the pancreaticoduodenal aneurysm Relationship between MALc/oCA and acute pancreatitis Tricks of angiography in cases of MALc/oCA Therapeutic strategy for MALc/oCA and MALS Summary
TEACHING POINTS

In 2012, an international working group has modified the Atlanta classification for acute pancreatitis to update the terminology and provide new morphologic classifications. The purpose of this exhibit is: - To understand 2012 revision of the Atlanta classification and new terminology- To define advantages of the revised Atlanta classification- To discuss limitations of the revised Atlanta Classification

TABLE OF CONTENTS/OUTLINE

1) Definitions of interstitial oedematous pancreatitis and necrotising pancreatitis.2) Early (first week) and late phase (after the first week) of the disease.3) Severity of disease : mild, moderate severe and severe4) Imaging features of local complications (US, CT and MRI)- Fluid alone collections: acute peripancreatic fluid collections (APFC; in the first 4 weeks) and pseudocysts (after 4 weeks).- Collections with solid component: acute necrotic collections (ANC; first 4 weeks) and walled-off necrosis (after 4 weeks).5) Remaining limitations - No assessment of pancreatic ducts. Place for MRCP?- Difficulty to differentiate an APFC from an ANC in the first week.
Small Bowel Tumors: An Algorithmic Approach To Differential Diagnosis and Management, with Emphasis on Optimal Cross-Sectional Imaging Technique

All Day Location: GI Community, Learning Center

Participants
Francisco Rego Costa, MD, Porto, Portugal (Presenter) Nothing to Disclose
Catia Esteves, MD, Porto, Portugal (Abstract Co-Author) Nothing to Disclose
Luis S. Guimarães, MD, Toronto, ON (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
To review the epidemiology, clinical presentation, imaging findings and management of small bowel tumors (SBTs). To describe the computed tomography (CT) and magnetic resonance (MR) technical protocols that allow high sensitivity for SBTs, as well as lesion characterization. To illustrate the imaging findings of most kinds of SBTs (pictorial essay) and to propose an algorithmic approach to differential diagnosis. To discuss the complementary roles of cross-sectional and endoscopic imaging. A management protocol is suggested.

TABLE OF CONTENTS/OUTLINE
Incidence, clinical presentation and management of the different types of SBTs. Optimal cross-sectional imaging technique: Triphasic CT enterography/enteroclysis. Comprehensive MR protocol. Enterography vs enteroclysis. CT vs MR. Review of the imaging findings and differential diagnosis of the different types of SBTs. Pictorial essay of SBTs and mimics, including adenocarcinoma, lymphoma, metastases, gastrointestinal stromal tumors, carcinoids, adenomas, angiodysplasias, Peutz-Jeghers syndrome, etc. Proposal of an algorithmic approach. Key findings to include in the report. Complementarity with endoscopy. Future trends and summary.
Drug-induced Disorders in the Abdomen: Clinico-radiological Features and Differential Diagnosis

All Day Location: GI Community, Learning Center

Awards
Certificate of Merit

Participants
Hiroshi Okada, Kashihara, Japan (Presenter) Nothing to Disclose
Nagaaki Marugami, Kashihara, Japan (Abstract Co-Author) Nothing to Disclose
Junko Takahama, MD, Kashihara, Japan (Abstract Co-Author) Nothing to Disclose
Takahiro Itoh, MD, Kashihara, Japan (Abstract Co-Author) Nothing to Disclose
Aki Takahashi, MD, Kashihara, Japan (Abstract Co-Author) Nothing to Disclose
Kimihiko Kichikawa, MD, Kashihara, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1) To understand the etiology of drug-induced disorders in the abdomen
2) To clarify the imaging approach to drug-induced disorders comparing with the clinical features

TABLE OF CONTENTS/OUTLINE
Imaging of Biliary Reconstructions and Complications after-Living Donor Liver Transplantation

Awards
Certificate of Merit

Participants
So Hyun Park, MD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Kyoung Won Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Bohyun Kim, MD, Rochester, MN (Abstract Co-Author) Nothing to Disclose
So Jung Lee, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jong Seok Lee, MD, Goyang, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Hyoung Jung Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Gi-Won Song, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Woo Kyoung Jeong, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Sung Gyu Lee, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1. To discuss the complexity of biliary preparation and various reconstructions in living donor liver transplantation (LDLT). 2. To emphasize the importance of reviewing radiologic features of biliary complications in recipients of LDLT compared with recipients of cadaveric whole liver transplantation. 3. Benefits and pitfalls of various imaging modalities to assess biliary complications in LDLT.

TABLE OF CONTENTS/OUTLINE
1. Bile duct preparation and various reconstructions in LDLT. 2. Radiologic and clinical features of biliary complications (1) Leaks (2) Strictures (3) Necrosis (4) Accidental ligation of intrahepatic bile duct (5) ABO incompatibility-related biliary lesions (6) Biliary cast syndrome. 3. Benefits and pitfalls in doppler US, CT and cholangiography imaging interpretations in recipient of biliary complications. Summary: Patients with biliary complications after LDLT may have similar clinical presentations to those with other causes of graft dysfunction. Therefore, radiological evaluation plays a key role for differential diagnosis of complications. A clear understanding of biliary reconstructions and anatomy is able to evaluate accurate biliary complications of LDLT. We discuss the various methods of biliary reconstruction and imaging findings of biliary complications in recipients of LDLT.

All Day Location: GI Community, Learning Center

Participants
Luis S. Guimaraes, MD, Toronto, ON (Presenter) Nothing to Disclose
Gary Levy, Toronto, ON (Abstract Co-Author) Nothing to Disclose
David Grant, MD, Toronto, On (Abstract Co-Author) Nothing to Disclose
Ian McGlervay, Toronto, ON (Abstract Co-Author) Nothing to Disclose
Kartik S. Jhaveri, MD, Toronto, ON (Abstract Co-Author) Speaker, Bayer AG

TEACHING POINTS
To describe a comprehensive protocol that allows Magnetic Resonance (MR) to be a "one-stop-shop" for triage of potential live liver donors. To extensively illustrate normal and variant vascular and biliary anatomy, along with implications for patient selection and surgical planning. To review and exemplify state-of-the-art MR-based liver fat quantification methods.

TABLE OF CONTENTS/OUTLINE
Introduction Significance of liver transplantation from live donors and of pre-operative imaging. Potential of MR to become a "one-stop-shop", saving costs and radiation dose to these usually young and healthy subjects. MR technique at 1.5T and 3T, including: Dynamic acquisition and hepatobiliary phase: T1-weighted sequence with fat saturation and VIBE images, associated or not with controlled aliasing in parallel imaging results in higher acceleration (CAIPIRINHA) technique. MR cholangiopancreatography: Thick-slab and high resolution 3D T2-weighted images. Calculation of HFF: T2*-corrected 6-echo water-fat separation imaging, 2-point Dixon reconstruction and hydrogen 1MR Spectroscopy. Illustration Vascular and biliary anatomical variations. Suboptimal MR cases and discussion of causes/solutions. Examples of liver fat quantification with different techniques and liver biopsy correlation.
Diffuse Peritoneal Disease Beyond Peritoneal Carcinomatosis

All Day Location: GI Community, Learning Center

Participants
Diamanto Rigas, MD, Boston, MA (Presenter) Nothing to Disclose
Koenraad J. Mortele, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Bettina Siewert, MD, Brookline, MA (Abstract Co-Author) Nothing to Disclose
Martin P. Smith, MD, Newton, MA (Abstract Co-Author) Research Grant, Bracco Group; Research Grant, Bayer AG; Consultant, Bayer AG; Research Consultant, General Electric Company

TEACHING POINTS
To review anatomy and physiology of the peritoneum
To recognize the wide differential for multiple peritoneal masses, including many more entities than peritoneal carcinomatosis
To recognize key imaging findings that may narrow the differential diagnosis and guide management

TABLE OF CONTENTS/OUTLINE
Introduction
Background of normal anatomy and physiology of the peritoneum
Brief review of peritoneal carcinomatosis, the most common diffuse peritoneal disease imaged in the USDiscuss imaging features with imaging examples of multiple peritoneal masses and mass-like conditions, including:
Primary peritoneal neoplasms
Mesothelial tumors
Epithelial tumors
Peritoneal Leiomyomatosis
Tumors of uncertain origin including solitary fibrous tumor
Metastatic Neoplasms other than peritoneal carcinomatosis
Pseudomyxomatous peritonei
Lymphomatosis
Gastrointestinal stromal tumor
Sarcomatosis
Infectious and Inflammatory conditions
Tuberculous peritonitis
Disseminated Histoplasmosis
Inflammatory Pseudotumor
Tumor Mimics
Endometriosis
Gliomatosis peritonei
Splenosis
Discuss imaging features helpful in the differential diagnosis, including internal mass characteristics, distribution, presence of lymphadenopathy and ascites, and involvement of the liver and spleen and other organs in the peritoneal cavity
Conclusions
Participants
Hanae A. Okuda, MD, Kita-Gun, Japan (Presenter) Nothing to Disclose
Yoshihiro Nishiyama, MD, Kagawa, Japan (Abstract Co-Author) Nothing to Disclose
Yuka Yamamoto, MD, PhD, Kagawa, Japan (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To review the abdominal CT findings in patients with lupus enteritis 2. To review the follow-up CT for monitoring therapeutic assessment

TABLE OF CONTENTS/OUTLINE
Abdominal CT imaging in patients with lupus enteritis 1. Bowel wall changes Bowel wall thickening Involving sites Target sign 2. Mesenteric changes Engorged mesenteric vessels Increased attenuation of mesenteric fat 3. Other findings Ascites Retroperitoneal lymphadenopathy Cystitis 4. Follow-up abdominal CT imaging after therapy
Clinical Utility of "Translucency Rendering" (Polyp Lens) in 3D Evaluation of CT Virtual Colonography in Differentiating Polyps from Lipoma, Untagged Stool and Tagged Stool

Participants
Sharad Maheshwari, MD, Mumbai, India (Presenter) Nothing to Disclose
Abhijit A. Raut, MD, Mumbai, India (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The exhibit aims to discuss: 1. The role of primary 3D evaluation of a CT Virtual Colonoscopy dataset in suspected lesion detected on 2D data set. 2. Introduction to the concept of Translucency rendering (polyp lens) using the density and homogeneity of the lesion. 3. Technical challenges in patient preparation prior to CT Virtual colonoscopy for best use of translucency rendering. 4. Use of color coding in translucency rendering based on attenuation of lesion and its internal structure. 5. Equally challenging is interpretation of translucency rendering and differentiating true polyp from pseudo lesions. A step-by-step guide has been provided making it easy for a radiologist.

TABLE OF CONTENTS/OUTLINE
1. Patient preparation.
2. Scanning technique and image acquisition.
3. Software analysis for translucency rendering.
4. Color coding used in translucency rendering.
5. Various examples, including polyp, residual non tagged stool, residual tagged stool and lipoma.
6. Reporting format.
Multiple Faces of Gastric Cancer at MDCT: Common and Uncommon Morphological Presentations in Early and Advanced Disease

All Day Location: GI Community, Learning Center

Participants
Freddy A. Jalil, MD, Santiago, Chile (Presenter) Nothing to Disclose
Sebastian Bravo-Grau, MD, MSc, Santiago, Chile (Abstract Co-Author) Nothing to Disclose
Cristopher Henderson, Santiago, Chile (Abstract Co-Author) Nothing to Disclose
Jose Gutierrez Chacoff, MD, Santiago, Chile (Abstract Co-Author) Nothing to Disclose
Jorge Ortiz Vega, MD, Santiago, Chile (Abstract Co-Author) Nothing to Disclose
Cristian Varela, MD, Santiago, Chile (Abstract Co-Author) Nothing to Disclose
Ignacio Maldonado, MD, Santiago, Chile (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The importance of MDCT technique and study protocol: role of adequate gastric distention. Accustom with the initial-subtle manifestations of locally invasive gastric carcinoma and typical and atypical sites of lymph node metastasis and secondary organ involvement. Importance of MDCT at the moment of diagnosis, etapification of gastric carcinoma and its impact in prognosis and treatment.

TABLE OF CONTENTS/OUTLINE
Inflammatory Bowel Disease: The Current Role of Imaging Modalities in the Diagnosis and Investigation of Complications

All Day Location: GI Community, Learning Center

Awards
Certificate of Merit
Identified for RadioGraphics

Participants
Pedro Panizza, Sao Paulo, Brazil (Presenter) Nothing to Disclose
Tassia R. Yamanari, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Camila T. Amancio, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Thais C. Lima, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Tassia S. Paixao, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Natally d. Horvat, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Marcos A. Costacurta, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Publio C. Viana, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Claudia D. Leite, MD, PhD, Sao Paulo, Brazil (Abstract Co-Author) Researcher, Guerbet SA
Giovanni G. Cerri, MD, PhD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
To review the distinct and overlapping clinical, radiological and pathologic characteristics of the two major conditions: ulcerative colitis (UC) and Crohn disease (CD). To demonstrate which are currently the best imaging modalities to perform the diagnosis and management of patients with suspected inflammatory bowel disease. Order to illustrate most common abdominal imaging features related to complications, including fistulae, abscesses, stenosis and related neoplasia. THE MAJOR TEACHING POINT OF THIS EXHIBIT Promote the knowledge regarding in the different image patterns in these conditions, for early diagnosis and active research of possible complications.

TABLE OF CONTENTS/OUTLINE
Clinical and epidemiologic data of the inflammatory bowel disease. Review of imaging findings according to location and imaging pattern, including atypical cases and tips and tricks to avoid pitfalls. Correlation of radiological findings (small-bowel barium examination, barium enema, CT and MRI), and endoscopic (colonoscopy) examinations. To discuss recent advances in each cross-sectional imaging modality, their advantages and disadvantages, and their performances in the evaluation of enteric and colonic lesions.
Diffusion-weighted MR Imaging of the Abdomen and Pelvis: A Teaching File in Quiz Format

All Day Location: GI Community, Learning Center

Participants
Ahmed-Emad Mahfouz, MD, Doha, Qatar (Presenter) Nothing to Disclose
Hanan Sherif, MD, Doha, Qatar (Abstract Co-Author) Nothing to Disclose
Mustafa A. Mafraji, MBBS, Doha, Qatar (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The purpose of this educational exhibit is: To know the principles and techniques of diffusion-weighted images To know the diagnostic value of diffusion-weighted images in different disease processes of the abdomen and pelvis

TABLE OF CONTENTS/OUTLINE
Principles and techniques of diffusion-weighted images Application of diffusion-weighted images in the abdomen and pelvis: Solid mass lesions Cystic mass lesions
The purpose of this presentation is
1. To review the current status of imaging biomarkers correlated with molecular and/or genetic expression (radioproteomics and radiogenomics) in hepatocellular carcinoma (HCC) using various imaging modalities
2. To demonstrate the hepatobiliary phase of gadoxetic acid enhanced MR imaging is a molecular imaging reflecting molecular and genetic characteristics of HCC.
3. To discuss the usefulness of these imaging biomarkers for future personalized medicine in HCC.

TABLE OF CONTENTS/OUTLINE
1. Concept of imaging biomarker
   - Molecular and genetic expression in HCC as biomarkers
   - Usefulness in personalized medicine (diagnosis, prediction of prognosis and treatment response)
2. Imaging biomarkers based on molecular and genetic expression in HCC applying various methods
   - Contrast enhanced US
   - Dynamic CT
   - FDG-PET
3. Gadoxetic acid enhanced MR imaging for radioproteomics and radiogenomics in HCC
   - Enhancement mechanism of gadoxetic acid enhanced MR imaging as a molecular imaging
   - Clinical and pathological findings
   - Molecular and genetic findings
4. Prospects of imaging biomarker in HCC
Choledochal Cysts: Imaging Features, Classification and Complications on MRI/MRCP

All Day Location: GI Community, Learning Center

Participants
Maryam Rezvani, MD, Salt Lake City, UT (Presenter) Nothing to Disclose
Akram M. Shaaban, MBBCh, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The aim of this exhibit is to:
1. Review the embryology, classification and imaging of choledochal cysts
2. Describe and demonstrate the complications of choledochal cysts

TABLE OF CONTENTS/OUTLINE
1. Clinical features, embryology and classification of choledochal cysts
2. MRI/MRCP imaging
3. Complications: stones, strictures, cholangitis, hepatic fibrosis, cholangiocarcinoma

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Maryam Rezvani, MD - 2015 Honored Educator
Akram M. Shaaban, MBBCh - 2015 Honored Educator
Three Dimensional Volumetric Image Segmentation of the Liver; Tips for Clinical Practice and Future Perspectives

All Day Location: GI Community, Learning Center

Participants
Kareem Ahmed, MBBCh, Houston, TX (Abstract Co-Author) Nothing to Disclose
David Fuentes, Houston, TX (Abstract Co-Author) Nothing to Disclose
Aliya Qayyum, MBBS, Houston, TX (Abstract Co-Author) Nothing to Disclose
John D. Hazle, PhD, Houston, TX (Abstract Co-Author) Nothing to Disclose
Veronica L. Cox, MD, Palo Alto, CA (Abstract Co-Author) Nothing to Disclose
Khaled M. Elsayes, MD, Ann Arbor, MI (Presenter) Nothing to Disclose

TEACHING POINTS

- Provide a practical overview of medical image 3D volumetric segmentation
- Highlight the utility of segmentation in image analysis of liver volumes and tumors
- Describe various segmentation methods currently used in the clinical practice as well as technical advances and future perspectives
- Exhibit challenges in the techniques of segmentation and tips to overcome these challenges.

TABLE OF CONTENTS/OUTLINE

- Definition and overview of 3D volumetric image segmentation
- Advantages and disadvantages of manual compared to automatic image segmentation
- Challenges facing automatic segmentation and tips for solution
- Classification of automated segmentation (supervised/unsupervised)
- Successive generations of automated segmentation techniques
  - First generation: Thresholds - Region Growing - Edge tracing
  - Second generation: Statistical Pattern Recognition - C-means clustering - Deformable Models - Graph search - Neural Networks
  - Third generation: Shape Models - Appearance Models - Atlas-based Segmentation
- Applications in liver imaging
  - Measure tissue volumes
  - Surgical planning
  - Radiation therapy planning
  - Delineate anatomical structures
  - Detection of tumors and other pathology
- Evaluation of treatment response

Summary and Conclusion

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Khaled M. Elsayes, MD - 2014 Honored Educator
"Current Role of MR Enterography: What General Radiologists Need to Know"

All Day Location: GI Community, Learning Center

**Participants**
Ana M. Olarte, MD, Barcelona, Spain (*Presenter*) Nothing to Disclose
Silvia Llaverias Borrell, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose
Vicens Querol, MD, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose
Angel A. Marin Suarez, MBBS, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose
Cristina Simon, MD, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose
Jaime Isern, MD, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose

**TEACHING POINTS**
1. To describe the technique and indications for MR Enterography.
2. To describe the main imaging findings in the diagnosis and activity assessment in Crohn's disease.
3. Review the role of MR in other entities beyond Crohn's disease.

**TABLE OF CONTENTS/OUTLINE**
MR Enterography is an imaging technique useful for the study of the small bowel that allows multiplanar imaging without ionizing radiation and the assessment and monitoring of Crohn's disease, especially in young patients. Less well known is its role in other intestinal diseases, as benign and malignant neoplasms and other inflammatory conditions.

1. We first review the indications and optimal MRI protocol.
2. Imaging findings in acute and chronic Crohn's disease.
3. Assessment of inflammatory activity and extraenteric findings.
4. Evaluation of other small bowel diseases: lymphoma, GIST, celiac disease and other inflammatory and infectious enteritis. All cases presented have been diagnosed in our department. At the end of the presentation you may recognize current state of Enterography MRI and the typical findings of Crohn's disease as other pathologies mainly neoplasms.
Long Common Channel: How Common is it and Why Do We Need to Report It?

All Day Location: GI Community, Learning Center

FDA Discussions may include off-label uses.

Awards
Cum Laude

Participants
Sreejita Bhowmik, MBBS, Sturbridge, MA (Presenter) Nothing to Disclose
Dushyant V. Sahani, MD, Boston, MA (Abstract Co-Author) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc

TEACHING POINTS

Teaching points:
1. To review the different types of long common channels (LCC) and learn their imaging appearances in MRCP and ERCP.
2. To gain an awareness of the different malignancies associated with long common channels and the types of LCCs associated with them.
3. To learn the optimal methods to detect long common channels by following an algorithm.
4. To identify and report particular characteristics that influence the management of the associated carcinoma.

TABLE OF CONTENTS/OUTLINE

Table of contents: Types of Long common channels Imaging criteria and diagnostic Algorithm, Imaging finding on MRCP and ERCP Association of LCC with Biliary and pancreatic cancers, Pathophysiology of cancers in LCC, Review of case reports of Biliary and pancreatic cancers Imaging findings of the LCC in the associated cancers and their subsequent management accordingly Future directions and Summary

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator
Review of Current Portal Venous Reconstruction Techniques Performed with Pancreatectoduodenectomy and Correlation with Post-Operative CT Imaging Appearances

All Day Location: GI Community, Learning Center

Awards
Certificate of Merit

Participants
Karen B. Bleich, MD, Baltimore, MD (Presenter) Nothing to Disclose
Ammar Javed, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Fabio Bagante, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Christopher L. Wolfgang, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Elliot K. Fishman, MD, Owings Mills, MD (Abstract Co-Author) Research support, Siemens AG Advisory Board, Siemens AG Research support, General Electric Company Advisory Board, General Electric Company Co-founder, HipGraphics, Inc

TEACHING POINTS
1. To review up to date vascular reconstruction techniques performed in conjunction with pancreaticoduodenectomy for pancreatic cancer.
2. To describe the post-operative CT imaging appearances following portal venous reconstruction, with an emphasis on distinguishing post-surgical changes from recurrent/residual disease, both of which can manifest as vascular narrowing and perivascular soft tissue induration.

TABLE OF CONTENTS/OUTLINE
1. PV-SMV reconstruction techniques used in conjunction with pancreatectoduodenectomy for pancreatic cancer have evolved to allow for potentially curative resection of tumors with increasing degrees of vascular involvement.
2. Review of up to date PV-SMV reconstruction techniques: primary end to end anastomosis, venorrhaphy, patch venoplasty, venous interposition grafts, PTFE grafts.
3. Range of post-operative CT appearances with correlation to type of surgical reconstruction performed:
   a. vascular narrowing, defects, thrombosis,
   b. perivascular fluid collections and soft tissue density induration
4. Conclusion: Postsurgical CT findings after PV reconstruction include venous attenuation and perivenous soft tissue density induration, both of which can mimic recurrent tumor. Familiarity with current surgical techniques can allow for more accurate interpretation of followup CTs.

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Elliot K. Fishman, MD - 2012 Honored Educator
Elliot K. Fishman, MD - 2014 Honored Educator
SPSP01

Diagnóstico Precoz por Imagen en la Población el CIR: Sesión del Colegio Interamericano de Radiología (CIR) en Español/Population based Preventive Imaging from CIR: Session of the Interamerican College of Radiology (CIR) in Spanish

Saturday, Nov. 28 1:00PM - 5:00PM Location: E451A

AMA PRA Category 1 Credits ™: 3.75
ARRT Category A+ Credits: 4.00

Participants
Pablo R. Ros, MD, PhD, Cleveland, OH (Moderator) Medical Advisory Board, Koninklijke Philips NV; Medical Advisory Board, KLAS Enterprises LLC; Medical Advisory Committee, Oakstone Publishing; Departmental Research Grant, Siemens AG; Departmental Research Grant, Koninklijke Philips NV; Departmental Research Grant, Sectra AB; Departmental Research Grant, Toshiba Corporation
Miguel E. Stoopen, MD, Mexico City, Mexico (Moderator) Nothing to Disclose

LEARNING OBJECTIVES
1) To review the state-of-the-art of population based preventive imaging
2) To discuss preventive imaging approaches in all major organ systems and key pathologies, ranging from dementia, cardiovascular disease, colon, liver, lung and breast cancer
3) To illustrate the use of different imaging technologies in preventive imaging such as CT, MRI and ultrasound

Sub-Events

SPSP01A Introducción/Introduction

Participants
Dante R. Casale Menier, MD, Ciudad Juarez, Mexico (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.

SPSP01B Parte 1/Part 1

Participants

LEARNING OBJECTIVES
View learning objectives under main course title.

SPSP01C Presentación de Ponentes/Panel Introduction

Participants
Pablo R. Ros, MD, PhD, Cleveland, OH (Presenter) Medical Advisory Board, Koninklijke Philips NV; Medical Advisory Board, KLAS Enterprises LLC; Medical Advisory Committee, Oakstone Publishing; Departmental Research Grant, Siemens AG; Departmental Research Grant, Koninklijke Philips NV; Departmental Research Grant, Sectra AB; Departmental Research Grant, Toshiba Corporation

LEARNING OBJECTIVES
View learning objectives under main course title.

SPSP01D Colon: La Colonografía Virtual: ¿Un Método de Escrutinio en la Población?/Colon: Virtual Colonography: A Population Screening Tool?

Participants
Jorge A. Soto, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Jorge A. Soto, MD - 2013 Honored Educator
Jorge A. Soto, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2015 Honored Educator

SPSP01E Cardiovascular: Cribaje de Enfermedad Cardiovascular por Imagen Medica/Cardiovascular: Diagnostic Imaging in Cardiovascular Screening

Participants
LEARNING OBJECTIVES

View learning objectives under main course title.

Honored Educators

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Carlos S. Restrepo, MD - 2012 Honored Educator
Carlos S. Restrepo, MD - 2014 Honored Educator

Participants

Carlos Zamora, MD, PhD, Chapel Hill, NC (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

Objetivos: 1) Comprender conceptos clínicos básicos para el diagnóstico de los síndromes principales de demencia. 2) Reconocer características anatómicas y metabólicas fundamentales de neuroimagen en los síndromes principales de demencia, con especial atención a enfermedad de Alzheimer. 3) Explorar direcciones futuras y desafíos para el diagnóstico temprano. Learning objectives: 1) Understand basic clinical concepts for the diagnosis of major dementia syndromes. 2) Recognize fundamental anatomic and metabolic neuroimaging features of major dementia syndromes, with special focus on Alzheimer's disease. 3) Explore future directions and challenges for early diagnosis.

Participants

LEARNING OBJECTIVES

View learning objectives under main course title.

Participants

Miguel E. Stoopen, MD, Mexico City, Mexico (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

Participants

Linei A. Urban, Curitiba, Brazil (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

Participants

Claudio S. Silva Fuente-Alba, MD, MSc, Santiago, Chile, (csilvafa@alemana.cl) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

Participants

Carmen Ayuso, MD, PhD, Barcelona, Spain, (cayuso@clinic.ub.es) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Definir la población en riesgo de desarrollar un carcinoma hepatocelular que debe ser incluida en un programa de cribado. 2) Analizar la mejor estrategia para llevar a cabo el cribado del hepatocarcinoma en la población en riesgo de padecerlo. 3) Discutir la conducta a seguir una vez que se detecta un nódulo hepático en pacientes incluidos en un programa de cribado. 1) To define the population at risk of hepatocellular carcinoma to be included in a surveillance program. 2) To analyze the best strategy for
surveillance in patients at risk of hepatocellular carcinoma. 3) To discuss how to proceed when a liver nodule is detected in patients on surveillance.

**SPSP01L Comentarios Finales y Clausura/Closing Remarks**

Participants
Dante R. Casale Menier, MD, Ciudad Juarez, Mexico *(Presenter)* Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.
Participants
Vincent M. Mellnick, MD, Saint Louis, MO (Presenter) Nothing to Disclose
Gayatri Joshi, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Matthew C. McDermott, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
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TEACHING POINTS
1) Each GI case of the day will be taken from disorders of the luminal GI tract as well as the liver, spleen, pancreas, and biliary system. The findings may be uncommon manifestations of common diseases or common manifestations of uncommon diseases.

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Meghan G. Lubner, MD - 2014 Honored Educator
Meghan G. Lubner, MD - 2015 Honored Educator
Perry J. Pickhardt, MD - 2014 Honored Educator
Douglas S. Katz, MD - 2013 Honored Educator
Douglas S. Katz, MD - 2015 Honored Educator
Gastrointestinal (Pancreas Solid Masses)

Sunday, Nov. 29 10:45AM - 12:15PM Location: E353A

SSA06-01 Diagnostic Performance of 18F-FDG PET/MRI for the Preoperative Assessment of Resectability and Staging of Pancreatic Cancer: Comparison with 18F-FDG PET/CT Plus Contrast-enhanced MDCT - A Prospective Preliminary Study

Sunday, Nov. 29 10:45AM - 10:55AM Location: E353A

Participants
Michael A. Blake, MBBCb, Boston, MA (Moderator) Editor with royalties, Springer Science+Business Media Deutschland GmbH
Desiree E. Morgan, MD, Birmingham, AL (Moderator) Research support, General Electric Company

Purposes
To evaluate the diagnostic performance of 18F-FDG PET/MRI in the assessment of local resectability, N staging, and M staging in patients with pancreatic cancer compared with 18F-FDG PET/CT plus contrast-enhanced MDCT.

Method and Materials
In this prospective study, a total of 37 patients with 39 pancreatic cancers were enrolled and underwent 18F-FDG PET/MRI, 18F-FDG PET/CT, and contrast-enhanced MDCT within 2 weeks of each other. Mean and maximum standardized uptake values (SUVs) in PET/MRI and PET/CT of pancreatic cancers were measured. Two independent radiologists retrospectively reviewed two imaging sets (set 1: PET/MRI, set 2: PET/CT plus MDCT) to evaluate tumor conspicuity and local resectability using a 5-point scale, and to determine preoperative N staging (N- or N+) and M staging (M0 or M1). Diagnostic performances two imaging sets were compared using paired t-test, ROC analysis, and McNemar test.

Results
Both mean and maximum SUVs of the pancreatic cancer showed strong correlations between PET/MRI and PET/CT (r=0.89 and 0.90, Ps<0.0001). Tumor conspicuity was slightly higher in PET/MRI set than PET/CT plus MDCT set (3.64 vs. 3.36, and 3.49 vs. 3.23 in reviewers 1 and 2, respectively; Ps>0.05). Diagnostic performance of PET/MRI in assessing local resectability was equivalent to PET/CT plus MDCT (Az values of 0.857 vs. 0.725, and 0.875 vs. 0.754 in reviewers 1 and 2, respectively; Ps>0.05). There were no statistically significant difference in the diagnostic accuracies for N- and M-staging between two imaging sets (N-staging: 52.6% vs. 42.1%, and 57.9% vs. 42.1%; M-staging: 75.0% vs. 79.2%, and 79.2% vs. 83.3%, in reviewers 1 and 2, respectively; Ps>0.05).

Conclusion
In this preliminary study in patients with pancreatic cancer, diagnostic performance of 18F-FDG PET/MRI is comparable to that of 18F-FDG PET/CT plus contrast-enhanced MDCT in the preoperative assessment of local resectability, N-staging, and M-staging.

SSA06-02 Prospective Histopathological Correlation of IVIM Derived Quantitative MR Parameters in Pancreatic Adenocarcinoma

Sunday, Nov. 29 10:55AM - 11:05AM Location: E353A

Participants
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Martin R. Prince, MD, PhD, New York, NY (Abstract Co-Author) Patent agreement, General Electric Company; Patent agreement, Hitachi, Ltd; Patent agreement, Siemens AG; Patent agreement, Toshiba Corporation; Patent agreement, Koninklijke Philips NV; Patent agreement, Nemoto Kyorindo Co, Ltd; Patent agreement, Bayer AG; Patent agreement, Lantheus Medical Imaging, Inc; Patent agreement, Bracco Group; Patent agreement, Medtronic, Inc; Patent agreement, Topspins, Inc; Stockholder, Topspins, Inc
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Michael D. Kluger, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
PURPOSE
To assess agreement between IVIM derived parameters and histopathology in participants with suspected pancreatic ductal adenocarcinoma (PDA) undergoing surgical resection.

METHOD AND MATERIALS
18 patients (9M:9F, mean 68y) were prospectively enrolled in this IRB approved, HIPAA compliant study with informed consent. All underwent respiratory-triggered axial EPI DWI with b values from 0 to 800 within 1 month of surgery (mean, 6d). Two experienced radiologists (>10y each) independently drew 2 ROIs over tumor and surrounding non-tumoral tissue when present and individual results were averaged. Mono (ADC0-800, ADCtotal) and bi-exponential (true diffusion (D), "pseudo"- diffusion (D*) and perfusion fraction (f) fitting were derived using open source MITK software (MITK.org). DWI metrics were compared with quantitative histopathology including % fibrosis, tumor cell density, and mean vascular density (MVD). Statistical analysis included intra-class correlation, Pearson correction and student t-test.

RESULTS
16 patients had PDA (Grade 2 (n=7), 2-3 (n=4), 3 (n=5),1 cholangiocarcinoma and 1 metastatic renal cell carcinoma (mRCC). Non-tumoral pancreas tissue was available in 14/18 patients specimens. Mean reader ROI size for tumor and non-tumoral tissue was not significantly different (p>0.05). Reader agreement was moderate-high (0.68-0.98) for ADC, f and D. Histopathology revealed that MVD was significantly lower in tumor as compared to non tumor (p=0.002) and % fibrosis was significantly higher in tumor (p=0.004). D, f and ADC0-800 were not significantly different between tumor and non-tumor tissue for either reader. There was moderate but significant correlation between D and % fibrosis in tumor tissue (excluding mRCC) for each reader (Reader 1, r=-0.48, p=0.04; Reader 2, r=-0.59, p=0.01. Including non-tumor and tumor tissues significance was maintained (Reader 1, r=-0.43, p=0.02; Reader 2, r=-0.47, p=0.007). D was lower for grades 3-4 vs. grades 1-2 fibrosis (1.11 μm²/ms vs. 1.45 μm²/ms, p=0.05). MVD did not significantly correlate with f or D*. Cell density/tumor grade did not correlate with IVIM metrics.

CONCLUSION
D negatively correlates with % fibrosis in tumor and non-tumoral pancreatic tissue and may serve as a biomarker of treatment response.

CLINICAL RELEVANCE/APPLICATION
Development of imaging biomarkers that can monitor desmoplasia in pancreatic adenocarcinoma would be clinically useful.
SSA06-04  Enhancement Pattern of Pancreatic Neuroendocrine Tumors on Dynamic Enhanced CT: A Comparison between Tumors with Different Degree of Fibrosis Component

Participants
Cherry Kim, MD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
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Moon-Gyu Lee, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

PURPOSE
To compare the enhancement pattern and other CT findings between pancreatic neuroendocrine tumor (NET) with different degree of fibrosis component.

METHOD AND MATERIALS
We retrospectively reviewed the CT images of 45 patients (17 males and 28 females) with surgically confirmed NET containing fibrotic component > 30% of the whole tumor (Group A). They were matched for age, gender, and tumor grade at a ratio of 1:1 to 45 NET patients with fibrotic component < 30% (Group B). Hounsfield unit (HU) of tumors in the precontrast (PC), arterial (AP), and portal (PP) phases, HU ratio (tumor to normal parenchyma) in each phase, HU enhancement pattern (progressive enhancement or wash-out pattern), and visible enhancement pattern change from AP to PP (peripheral to full, peripheral to peripheral, full to peripheral, or full to full) were compared between Group A and B. Other CT findings, including heterogeneity of enhancement, calcification, margin, perilesional infiltration, pancreatic duct dilation, direct invasion, lymph node and distant metastasis, were also compared between the two groups.

RESULTS
Group A showed progressive enhancement pattern and Group B showed wash-out pattern (P<0.05). HU of tumors and HU ratio in PC were higher in group A than in group B (42.5±4.7 vs. 38.6±4.8; 1.02±0.48 vs. 0.88±0.23; P≤.024), whereas those in AP were lower in group A than in group B (146.2±8.2 vs. 183.1±49.7; 1.4±0.52 vs. 1.61±0.38; P≤.003). Perceptible to full or peripheral enhancement change was more frequent in group A, while full to full enhancement change was more frequent in Group B (P<0.05). Other CT findings were not significantly different between the two groups (P>.05).

CONCLUSION
On dynamic enhanced CT, NET with rich fibrotic component tended to show progressive enhancement pattern and peripheral to full or full enhancement change, while NET with poor fibrotic component tended to show wash-out pattern and full to full enhancement change.

CLINICAL RELEVANCE/APPLICATION
CT enhancement pattern has been suggested as a prognostic indicator of pancreatic NET. However, its degree of fibrotic component could be one of causes for its various enhancement patterns.

SSA06-05  Using Iodine Quantification from DECT Images to Differentiate Pancreatic Neuroendocrine Tumors from Splenules

Participants
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Dushyant V. Sahani, MD, Boston, MA (Abstract Co-Author) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc

PURPOSE
Differentiating intrapancreatic splenule from other solid pancreatic masses and pancreatic neuroendocrine tumors (pNET) can be challenging on a single phase CT exam. We investigated the role of iodine quantification from DECT for characterizing splenules (SPL).

METHOD AND MATERIALS
In this retrospective study, 45 patients (16 with pNET and 29 with SPL) underwent portal phase DECT (750HD GE) and material decomposed iodine images (MD-I) were used to quantify mean iodine concentrations (MIC) for pNET, SPL, spleen and aorta. Normalized iodine concentration (NIC) were calculated for pNET, SPL and spleen. MIC of pNET and of SPL were compared with spleen MIC. On the SECT images, mean HU (MHU) values were calculated for pNET, SPL and spleen. MHU and NIC values of lesions and spleen and their ratio were compared using a t-test. Lesion appearance was evaluated on MD-I with a scale from 1 to 3 (1 homogenous, 2 mild heterogeneity, 3 heterogeneous).

RESULTS
NIC values were: pNET 0.73±0.2, SPL 0.66±0.1 and spleen 0.66±0.1. The MIC ratio between pNET and spleen was 1.14±0.3, and for SPL/spleen 1.01±0.1 (p=0.47). The MHU ratios between pNET and spleen was 0.92±0.2 and for SPL/spleen 0.86±0.1 (p=0.174). SPL also demonstrated a homogenous appearance (29) vs the heterogeneous appearance of pNET (16, 4=mild heterogeneity, 12=obvious heterogeneous).
**CONCLUSION**

On the MD-I images from DECT, SPL's are homogenous and follow the iodine concentration of spleen whereas pNET are often heterogenous and show higher NIC values than spleen.

**CLINICAL RELEVANCE/APPLICATION**

Inaccurate diagnosis of intrapancreatic SPL and pNET on portal phase CT often leads to unnecessary interventions and surgeries and occasionally delay in much needed surgery in the cases of pNET. Reliable diagnosis of splenule on portal-venous phase DECT is feasible by subjective assessment and iodine quantification.

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Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator

**PURPOSE**

Previous studies suggest that enhancement patterns of pancreatic ductal adenocarcinoma (PDAC) reflect tumor angiogenesis and fibrosis, both of which are implicated in PDAC prognosis. The purpose of this study is to determine whether the degree of enhancement of resectable PDAC at pancreatic phase CT can predict subsequent early development of metastases.

**METHOD AND MATERIALS**

We retrospectively identified 38 patients with resectable PDAC who underwent multiphasic pancreatic protocol CT prior to surgery (no neoadjuvant therapy), and who had >= 12 month follow up at our institution. Tumor enhancement was determined by measuring CT attenuation change (Δ Hounsfield unit (HU)) between the pancreatic phase and unenhanced images. Tumor grade, size, and AJCC stage at pathology were recorded. Follow up imaging studies were reviewed to determine any subsequent development of metastatic disease and its timing in these patients. Uni- and multi-variate analyses were used to determine predictors of the development of metastases within 12 month of surgery.

**RESULTS**

Fourteen of the 38 patients had developed metastases (liver, lung, peritoneum) by 12 months. The mean tumor enhancement in patients who had developed metastases by 12 months was significantly lower than that of patients who did not (32.1±13.7HU vs. 55.9±18.9HU, p=0.0002). A threshold of 40HU identified patients with metastases by 12 months with 79% sensitivity and 92% specificity. Both tumor grades and size at pathology were significantly higher in patients with metastases by 12 months than those without (both p values < 0.05). There was a trend of higher tumor stages in patients with metastases by 12 months (p=0.06). 32/38 patients underwent gemcitabine based adjuvant therapy post resection. The proportion of patients receiving adjuvant therapy was not significantly different between the two groups. Multivariate analysis showed that tumor enhancement < 40HU and tumor grade were independent predictors of development of metastases by 12 months (both p values <0.05).

**CONCLUSION**

Low contrast enhancement (<40HU) of primary PDAC is associated with development of metastases by 12 months following resection.

**CLINICAL RELEVANCE/APPLICATION**

Enhancement pattern of primary PDAC at CT may be a useful prognostic marker.

**SSA06-07 Low Contrast Enhancement of Primary Pancreatic Ductal Adenocarcinoma is Associated with Early Development of Metastases Following Resection**

**Participants**

Aisha True-Yasaki, San Francisco, CA (Presenter) Nothing to Disclose
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**PURPOSE**

To evaluate quantitative change of iodine uptake by pancreatic cancer using dual source dual energy CT before and after...
chemotherapy

METHOD AND MATERIALS

Twenty patients (13 males, 7 females, average age 67.8±11.8 years) with newly diagnosed pancreatic adenocarcinoma were scanned with dual source dual energy CT before and after (average interval: 71.9±42.8 days) chemotherapy. Dual phase CT protocol included arterial phase timed by bolus tracking, followed by a 60 second venous phase scanned with dual energy CT at 100 kV and 140 kV with tin filtration with reference dose of 250 and 193 mAs, respectively. Tumor segmentation was performed on a workstation using automated segmentation followed by manual editing. Iodine uptake by the tumor was obtained as an iodine concentration (mg/ml) and normalized by iodine uptake within the abdominal aorta ('normalized tumor iodine uptake'). Tumor iodine uptake was compared to change in tumor volume and tumor markers.

RESULTS

At baseline, average iodine uptake by tumor was 1.26±0.37mg/ml in arterial phase and 1.79±0.50mg/ml in venous phase, and average normalized tumor iodine uptake was 0.10±0.05 in arterial phase and 0.38±0.09 in venous phase. After chemotherapy, average normalized tumor iodine uptake was significantly decreased compared to the baseline in both arterial phase (0.08±0.04 [p=0.016]) and venous phase (0.31±0.09 [p=0.0007]). The tumor was decreased in volume in 17 patients (average volume change: 71±15%), and increased in 3 patients (average volume change: 15±22%). Average normalized iodine uptake in tumors that reduced volume greater than 20% after chemotherapy (n=9) was 72% and 77% of the baseline in arterial and venous phase respectively, lower than that of the other tumors (n=11) (88% of the baseline in both phase), but there was no statistically significantly difference. Average normalized tumor iodine uptake in patients with decreased tumor markers (n=8) were 74% and 80% of the baseline in arterial and venous phase, and in patients with increased tumor markers (n=3) were 116% and 96% of the baseline in arterial and venous phase, but the number of subjects were too small for statistical analysis.

CONCLUSION

Iodine uptake by pancreatic adenocarcinoma evaluated using dual energy CT may decrease after chemotherapy.

CLINICAL RELEVANCE/APPLICATION

Iodine uptake by pancreatic adenocarcinoma evaluated by dual energy CT may be potentially useful for assessment of treatment response.

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Elliot K. Fishman, MD - 2012 Honored Educator
Elliot K. Fishman, MD - 2014 Honored Educator

SSA06-08 Agreement of Results of CT-perfusion Measurements in Pancreatic Carcinoma: Comparison of Three Different Kinetic Calculation Models

Sunday, Nov. 29 11:55AM - 12:05PM Location: E353A

Participants

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Sven Schneeweis, Tubingen, Germany (Abstract Co-Author) Nothing to Disclose
Konstantin Nikolaou, MD, Tuebingen, Germany (Abstract Co-Author) Speakers Bureau, Siemens AG Speakers Bureau, Bracco Group Speakers Bureau, Bayer AG
Marius Horger, MD, Tuebingen, Germany (Abstract Co-Author) Nothing to Disclose

PURPOSE

To evaluate the interchangeability of perfusion parameters between three calculation methods for the post-processing of perfusion-CT images in pancreatic carcinoma.

METHOD AND MATERIALS

Perfusion-CT images was performed in 48 (32 male; mean age: 69±9 years) patients with adenocarcinoma of the pancreas. Images were post-processed using a software package based on the maximum-slope approach (blood flow-BF and blood volume-BV) and Patlak analysis (BV and k-trans), as well as a software package with deconvolution-based analysis (BF, BV and k-trans). Volume-of-interest (VOI) analysis of the tumor average perfusion was performed. Perfusion parameters were compared using the Wilcoxon matched-pairs test and Bland-Altman plots. Following CT-examinational protocol: 80kV, 100/120mAs, 64x0.6mm collimation, 26 consecutive scans, IV injection of 50 mL contrast at a flow rate of 5 mL/s, was used.

RESULTS

48 VOIs of tumors were analyzed. Moderate to good correlations were demonstrated between the various perfusion values (r = 0.42-0.90, P < .001). The Wilcoxon test revealed a significant difference between the methods (P < .001), with the BF and BV values obtained using the maximum-slope approach and Patlak analysis being lower than those obtained using deconvolution-based analysis. For analysis of k-trans deconvolution revealed significantly lower values (P<0.001). The Bland-Altman plots for BF and BV values revealed a proportionality trend with outliers, which were strongly associated with the magnitudes of the parameters. Analysis of the k-trans values did not show any systematic bias. Comparison of the three different BV-calculations revealed an equal distribution.

CONCLUSION

There were significant differences in the perfusion parameters obtained using the three software packages, and therefore these parameters are not directly interchangeable. However, the magnitude of pairs of parametric values is in constant relation to each other enabling the use of any of these methods.
**Role of Sarcopenia and Visceral Obesity, Assessed Using Preoperative CT-scan, as Predictors of Short-term Outcome Following Pancreaticoduodenectomy in Pancreatic Cancer Patients**

Sunday, Nov. 29 12:05PM - 12:15PM Location: E353A

**Participants**
Anna Damascelli, MD, Milan, Italy (Presenter) Nothing to Disclose
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Francesco A. De Cobelli, MD, Milan, Italy (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
Recent reports showed that body composition parameters, assessed using computed tomography (CT) images, may improve preoperative risk stratification in oncologic Patients. The aim of this study is to evaluate how sarcopenia (depleted muscle mass) and visceral obesity impact on postoperative outcome in pancreatic cancer patients treated with pancreaticoduodenectomy (PD) in a high volume Institution, focusing on mortality and pancreatic fistula (PF) occurrence.

**METHOD AND MATERIALS**
Between 2010 and 2014, 284 consecutive patients underwent PD for pancreatic cancer; among them 202 patients underwent preoperative staging CT-scan imaging at our Institution within 30-days before PD, and were included in this study. Total abdominal muscle area (TAMA), visceral fat area (VFA) and subcutaneous fat area (SFA) were assessed using Slice-O-Matic 5.0 software (Tomovision, Montreal, Canada); TAMA and VFA were evaluated on two contiguous slices at the third lumbar vertebra, and then averaged, using Hounsfield unit threshold of -29 to +150 for skeletal muscle, -150 to -50 for visceral adipose tissue and -190 to -30 for subcutaneous and intermuscular fat. Perioperative variables and postoperative outcomes were prospectively collected. Multivariate analysis was performed to identify independent predictors of 60-day mortality, and PF graded according to International Study Group of Pancreatic Fistula criteria. Sarcopenia was defined using predetermined sex-specific cut-off values (52.4 cm²/m² for men and 38.5 cm²/m² for women).

**RESULTS**
132 (65.4%) patients were classified as sarcopenic. Postoperative mortality occurred in 12 patients (5.9%), major complications in 40 (19.8%) and pancreatic fistula in 48 patients (23.8%). At multivariate analysis, VFA/TAMA and ASA score = 3 were the strongest predictors of mortality (p<0.001). Among patients who developed major complications, survivors had significantly lower VFA/TAMA ratio than non-survivors (p=0.017). VFA was an independent predictor of PF (p<0.001).

**CONCLUSION**
Preoperative analytic morphometric assessment, using CT images, is a useful tool for the prediction of mortality and pancreatic fistula occurrence, following PD for cancer.

**CLINICAL RELEVANCE/APPLICATION**
Preoperative CT assessment of sarcopenia and visceral adiposity improve risk stratification in patients undergoing pancreaticoduodenectomy for cancer, predicting mortality and pancreatic fistula occurrence.
Correlations of Extramural Vascular Invasion on Preoperative MRI with Local Lymph Node Metastasis in Rectal Cancer

Participants
Marc J. Gollub, MD, New York, NY (Moderator) Nothing to Disclose
Kedar Jambhekar, MD, Little Rock, AR (Moderator) Nothing to Disclose

Sub-Events
SSA07-01 Correlations of Extramural Vascular Invasion on Preoperative MRI with Local Lymph Node Metastasis in Rectal Cancer

PURPOSE
To evaluate the possibility of predicting local lymph node metastasis by extramural vascular invasion (EMVI) on preoperative MRI in patients with rectal cancer.

METHOD AND MATERIALS
MR images and clinical pathologic data of 183 consecutive patients with rectal cancer (between Dec. 2011 and Dec. 2014) were reviewed. MRI-detected extramural vascular invasion (mr-EMVI), with clinical pathologic factors (including age, gender, T stage, differentiation, size and pathological EMVI), were analyzed by chi-square crosstabs test (or t test) and multivariate logistic regression to determine risk factors for lymph node metastasis.

RESULTS
A total of 183 rectal cancer patients who underwent radical surgery were included in our study. Of them, 78 (42.6%) patients had lymph node metastasis according to pathology at the time of surgery. Among those clinical pathologic factors, T stage (odds ratio, 1.848), pathological EMVI (odds ratio, 4.878) and MRI-detected EMVI (odds ratio, 3.884) were independent risk factors for LNM. The incidence of LNM in the patients with pathological EMVI and MRI-detected EMVI was 78.7% and 75.4% respectively. By using pathological EMVI as a gold standard, sensitivity, specificity and agreement rate of MRI-detected EMVI were 61.7%, 82.3% and 77.0%.

CONCLUSION
MRI-detected EMVI could be used as a predictor for lymph node metastasis in patients with rectal cancer.

Reproducibility of Evaluation of Invasion Depth of Rectal Cancer into the Mesorectal Fat: Can We Reliably Discern T3ab from T3cd Tumours?

Participants
Monique Maas, MD, Maastricht, Netherlands (Presenter) Nothing to Disclose
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Regina G. Beets-Tan, MD, PhD, Maastricht, Netherlands (Abstract Co-Author) Nothing to Disclose

PURPOSE
One of the important aspects of rectal cancer staging is the measurement of the invasion depth of a tumour into the mesorectal fat in millimetres. This determines whether there is a T3ab (<5mm) or T3cd (>5mm), which changes treatment for patients (CRT yes/no). Measurement of this factor is arbitrary. Aim was to evaluate reproducibility of the measurement of invasion depth into the mesorectal fat by different readers.

METHOD AND MATERIALS
Sixty-one patients with a pathologically proven T3 tumour were selected. Two readers with different experience in reading rectal...
Sixty-one patients with a pathologically proven T3 tumour were selected. Two readers with different experience in reading rectal cancer MRI (2 years and 5 years) measured the maximal depth of invasion of tumour into mesorectal fat in the axial plane perpendicular to the tumour axis. Clock position of the measurement was registered. ICC and Bland-Altman plots were used for analyses.

**RESULTS**
Intraclass correlation coefficient was 0.61. The Bland-Altman plot showed a mean difference between measurements of 2.45 (SD 3.53) mm with limits of agreement of -4.45 to 9.39. Differences between measurements ranged from -9 to 15 mm. In 36% of patients the clock position of the measurements of both readers were not in the same quadrant.

**CONCLUSION**
Reproducibility of measurement of invasion depth of tumour into the mesorectal fat is low, both with regard to the depth and to the location of the deepest invasion. Therefore, the distinction between T3ab and T3cd tumours is unreliable and should not be used for treatment decisions.

**CLINICAL RELEVANCE/APPLICATION**
The distinction between T3ab and T3cd tumours is deemed relevant to identify patients with a high risk tumor and administer neoadjuvant chemoradiation. Since measurement of invasion depth is only moderately reproducible, the use of this factor for risk and treatment stratification is questionable.
RESULTS

Among 291 patients, 69 patients (23.7%) were confirmed to have distant metastasis. In univariate analysis, MRI-T stage (P<0.005), MRI-N stage (P<0.001), CEA value (P=0.007), pT stage (P<0.001), pN stage (P<0.001), pMLNNs (P<0.001), pLNR (P<0.001), tumor deposits (P=0.014), pLV (P=0.005), pNL (P=0.003) correlated significantly with metachronous distant metastasis. In multivariate analysis, only preoperative CEA values (P=0.038, Exp(B)=2.102), pLNR(P<0.001, Exp(B)=23.780) and pT stage (P=0.005, Exp(B)=3.677) were independent risk factors for distant metastasis. The mean DFS period for both groups was significantly different (57.2±40.62 vs 18.8±21.98 months, P<0.001). The 3-year OS rate for patients with distant metastasis was 35.0% compared with 97.1% for those without distant metastasis (P<0.001).

CONCLUSION

Preoperative MRI provided limited value in prediction of metachronous distant metastasis in patients with rectal cancer as independent risk factor. Compared with MRI features, preoperative CEA values, pLNR and pT stage were independent risk factors. Patients with the risk factors should be closely followed up for monitoring the metachronous metastasis status in order to take measures for the hope of a good survival outcome.

CLINICAL RELEVANCE/APPLICATION

Compared with MRI features, CEA values, pLNR and pT stage were independent risk factors to predict metachronous distant metastasis in patients with rectal cancer.

MRI Detected Tumor Response for Intermediate Stage Rectal Cancer (RC) Treated with Chemotherapy Predicts Disease Free Survival and Recurrence: A Collaborative Group Experience

Sunday, Nov. 29 11:25AM - 11:35AM Location: E450A

Participants

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Gina Brown, MD, MBBS, Sutton, United Kingdom (Abstract Co-Author) Nothing to Disclose

METHOD AND MATERIALS

The trial evaluated safety and efficacy of neoadjuvant Capecitabine, Oxiplatin and Bevacizumb (CAPOX-B). Forty-six patients were enrolled between 2009-11. Eligibility included baseline magnetic resonance imaging (MRI) showing a T3 tumour with mesorectal fascia (MRF) potentially clear. Baseline Nodal and Extra-mural venous invasion (EMVI) status was also recorded. Response was assessed by post-treatment MR and pathological T, N and EMVI status as well as Tumor regression grade (TRG). Additionally, MR tumor length change, MRI EMVI reversion and pathological T downstaging were recorded. Three-year disease free survival and recurrence were calculated using Kaplan-Meier. Cox proportional regression determined relationships between outcomes and all recorded imaging and pathology variables divided into good and poor responders. Three separate Cox-regression analyses were also performed for: baseline imaging, post-treatment imaging and pathology variables.
Median follow-up was 36 months, fourteen patients experienced relapse. 3-year DFS was 69%. On Cox multivariate analysis including all factors mrEMVI(p=0.028) and T-downstaging(p=0.032) were independent prognostic factors for DFS. mrEMVI(p=0.040), T-downstaging(p=0.013) and ypN(p=0.041) were significant independent factors for recurrence. Significant univariate factors for DFS were: Baseline mrEMVI status(p=0.0001), mrEMVI reversion(p=0.003), post-treatment MR Tstaging(ymrT)(p=0.007), mrTRG(p=0.011), pathological nodal status(p=0.02) and T-downstaging(p=0.0009). Significant univariate factors for recurrence were: mrEMVI(p=0.007), ymrT(p=0.008), mrTRG(p=0.019), T-downstaging(p=<0.0001), ypN(p=0.002) and ypT(p=0.022).

CONCLUSION
Baseline MRI-EMVI is an independent prognostic factor for survival and recurrence in intermediate risk rectal cancer treated with neoadjuvant chemotherapy.

CLINICAL RELEVANCE/APPLICATION
Future randomised trials should evaluate primary chemotherapy verses standard treatment in patients with T3, MRF clear and mrEMVI positive disease. Moreover mrEMVI positive may be recommended as a stratification factor.

SSA07-06  Follow-up with MRI of Rectal Cancer Treated by TEM: Recurrence Detection and Inter-observer Reproducibility

Sunday, Nov. 29 11:35AM - 11:45AM Location: E450A

Participants
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PURPOSE
Small rectal cancers can be treated with transanal endoscopic microsurgery (TEM). Postoperative changes make follow-up with MRI challenging. Aim was to evaluate post-TEM-MRI at different time points for recurrence detection and assess interobserver-reproducibility.

METHOD AND MATERIALS
38 patients underwent TEM (8 after CRT). 122 MRIs were performed with a mean of 3 MRIs per patient. Seven patients had a recurrence. MRI was performed every 3-4 months during follow-up and consisted of T2W-MRI±DWI. MRIs were evaluated by readers with different experience by confidence level (CL) scoring for recurrence, reproducibility was evaluated with weighted kappa statistics.

RESULTS
For all MRIs AUC for recurrence detection was 0.79 and 0.73 for T2W-MRI and 0.69 and 0.76 for DWI. During follow-up AUC increased from 0.55-0.57 at the first MRI to 0.67-0.73 at subsequent MRIs for T2W-MRI. Interobserver-reproducibility was increased during FU for T2W-MRI from kappa 0.09 to 0.77. For DWI reproducibility was fair-good (kappa 0.49-0.61) which increased slightly during FU. Reproducibility also increased during FU from kappa 0.36 to 0.84. At the first MRI after TEM higher CL scores were given at DWI than at T2W-MRI, this difference disappeared as of the second MRI during FU. Number of equivocal scores decreased during FU. Iso-intensity in bowel wall and/or mesorectal fat were predictive for recurrence.

CONCLUSION
The first post-TEM MRI is difficult to assess. After the first MRI accuracy for recurrence detection increases dramatically, due to comparison with earlier studies. There is a learning curve during FU per patient leading to more certainty in readers. Reproducibility is fair-moderate, but increases during FU. Iso-intensity in bowel wall and/or mesorectal fat were predictive for recurrence.

CLINICAL RELEVANCE/APPLICATION
After TEM follow-up is crucial to detect recurrences. MRI is a feasible and reliable modality to perform follow-up after TEM to both detect luminal and nodal recurrences.

SSA07-07  Imaging Genomics of Colorectal Cancer: Patterns of Metastatic Disease at Time of Presentation Based on Mutational Status

Sunday, Nov. 29 11:45AM - 11:55AM Location: E450A

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PURPOSE
To identify the most frequent genetic traits associated with metastatic colorectal tumors at time of presentation and whether there is a correlation between the genotypes and the metastatic disease patterns.

METHOD AND MATERIALS
Retrospective review of 713 subjects with cross-sectional imaging at time of diagnosis with no previous treatment. All tumor samples were tested for Single Nucleotide Polymorphisms (SNP). Mutations can be present individually or coexisting. Z tests were
RESULTS

Three-hundred-ninety-seven males and 316 females. Metastatic disease in 547/713 (76), 385/487(79) mutants (M) and 162/226(72) wild types (WT) (p=0.02). Incidence of metastatic disease per genotype as follows: NRAS 31/35(89%), KRAS 213/244 (87%), APC 47/55(85%), TP53 142/170(84%), PIK3C 95/114 (83%), BRAF 56/79(71%) and WT (72%)162/226. Metastasis to the liver, lymphnodes (LN), peritoneum and lung were observed with all genotypes. Liver:LN proportion of involvement was seen as follows: KRAS 62:28 (p<0.001), BRAF 55:62, NRAS 71:58, TP53 63:59, PIK3C 69:49, APC 64:47 and WT 51:49. Metastatic site involvement exclusive to certain genotypes was observed: duodenum/kidneys/uterus/cervix/vagina: KRAS+TP53, Brain:TP53, Appendix: KRAS, Retroperitoneum:PIK3C/WT and Bladder/Pancreas/Prostate/Mediastinum: WT. All genotypes except for BRAF demonstrated bone metastasis.

CONCLUSION

Our study suggests there is an association between mutational status and patterns of metastatic disease in Colorectal Cancer. Metastatic disease to the bladder, pancreas, prostate and mediastinum in CRC suggests wild type tumors. A lower involvement of LN suggests the presence of KRAS mutation.

CLINICAL RELEVANCE/APPLICATION

Genetic profiling should guide the search for specific metastatic patterns allowing special consideration for unusual sites of involvement of metastatic disease to suggest the presence of a specific mutation.

HONORED EDUCATORS

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Debra A. Gervais, MD - 2012 Honored Educator

SSA07-08  The Application of 3.0T MR Intravoxel Incoherent Motion Imaging and Diffusion Weighed Imaging in Preoperative Diagnosis of Lymph Node Metastatic of Rectal Carcinoma

Sunday, Nov. 29 11:55AM - 12:05PM Location: E450A

Participants
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PURPOSE

To evaluate the clinical value of Intravoxel Incoherent Motion imaging (IVIM) sequence in the diagnosis of lymph node metastatic of rectal carcinoma.

METHOD AND MATERIALS

87 lymph nodes from sixty-two rectal carcinoma patients with IVIM sequence (b=0,25,50,75,100,150,200,400,600,800,1000,1500 and 2000 s/mm²) at 3.0T MR scanner and pathology data were collected. The parameter of IVIM (standard ADC, D, D*, and f values) and the DWI signal strength value with b=1000 s/mm² were measured and calculated. Pathology findings and MR sequence were compared. The difference of metastatic lymph nodes and non-metastatic lymph nodes were compared by paired-samples t test.

RESULTS

There were 25 metastatic lymph nodes was found in 62 patients. The standard-ADC=(0.795 ±0.23)×10-3 s/mm²,D= (0.649 ±0.11)×10-3 s/mm²,D*= (4.79±2.38)×10-3 s/mm², f=(0.27±0.09) % and =348.25±26.74 in the metastatic lymph nodes ;the standard-ADC= (0.995 ±0.34)×10-3 s/mm²,D= (0.787 ±0.19)×10-3 s/mm²,D*= (4.86±5.40)×10-3 s/mm², f=(0.33±0.33) % and S1000 =211.75±35.66 in non-metastatic lymph nodes. The difference of standard-ADC value (t=31.92, p<0.01), D value (t=17.63, p=0.02) and S1000 (t=18.92, p<0.01) were statistically significant in the metastatic lymph nodes and non-metastatic lymph nodes; the standard-ADC value, D value and S1000 value of metastatic lymph nodes were higher than non-metastatic lymph nodes.

CONCLUSION

IVIM sequence can reveal standard ADC, D, D*, f and signal strength values ,they are helpful for diagnose metastatic lymph node.

CLINICAL RELEVANCE/APPLICATION

IVIM sequence is helpful for diagnose metastatic lymph node.

SSA07-09  CT Texture Analysis in Patients with Locally Advanced Rectal Cancer Treated with Neoadjuvant Chemoradiotherapy: A Potential Imaging Biomarker for Treatment Response and Prognosis

Sunday, Nov. 29 12:05PM - 12:15PM Location: E450A

Participants
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PURPOSE
To evaluate the association of texture of locally advanced rectal cancer in computed tomography (CT) with neoadjuvant concurrent chemoradiotherapy treatment (CRT) response and 3-year disease-free survival (DFS).

METHOD AND MATERIALS
Institutional review board approved this retrospective study and waived the requirement of informed patient consent. 95 consecutive patients who had neoadjuvant CRT followed by surgery for locally advanced rectal cancer have been included. Texture features were assessed with pretreatment CT scans by using independently developed software. Entropy, uniformity, kurtosis, skewness, and standard deviation were obtained from the largest axial image of the tumor (its boundary being manually drawn), without filtration and with Laplacian of Gaussian spatial filter of various filter values for fine (1.0), medium (1.5 and 2.0), and coarse (2.5) textures. Dworak pathologic grading was used for treatment response. Mean value of each texture parameter was compared between treatment responder (grade 3 and 4) and non-responder (grades 1 and 2) groups via independent t-test. Kaplan-Meier analysis was used to find the relationship between CT texture and 3-year DFS. Receiver operating characteristic curve was performed to determine the optimal threshold values. Using Cox proportional hazards model, independence of texture parameters from patient's stage and age was assessed.

RESULTS
Treatment responder group (n = 32) showed fine-texture features (lower entropy, higher uniformity, and lower standard deviation) with statistical significance in no filtration, and fine (1.0) and medium (1.5) filter values. Without filtration, Kaplan-Meier survival plots for entropy, uniformity, and standard deviation were significantly different (P = .03, P = .016, and P = .033) and fine-texture features (≤ 6.7 for entropy, > 0.0100 for uniformity, and ≤ 28.06 for standard deviation) were associated with higher 3-year DFS. Entropy, uniformity, and standard deviation were independent factors from the cancer stage and age in 3-year DFS (P = .033, P =.011, and P = .04).

CONCLUSION
Fine-texture features are associated with better neoadjuvant CRT response and higher 3-year DFS in patients with locally advanced rectal cancer.

CLINICAL RELEVANCE/APPLICATION
Our study implies the possibility of texture analysis as an imaging biomarker for the treatment response of neoadjuvant CRT and 3-year DFS in locally advanced rectal cancer.
PURPOSE
To evaluate, in a large population of patients with chronic liver disease, the performances of the different imaging techniques (contrast enhanced ultrasound (CEUS), CT scanner and MRI) alone and in combinations for the characterisation of hepatic nodules smaller than 3cm.

This study was supported by a national institutional grant (PHRC 2008)

METHOD AND MATERIALS
From April 2010 to April 2013, 442 patients with a chronic liver disease have been prospectively included in 16 centres. They had 1 to 3 nodules 10 to 30 mm explored by CEUS, CT scanner and a MRI within a month. The examination was regarded as positive if the nodule displayed the typical landmark of HCC as defined by the European and American Association for the Study of the Liver (EASL and AASLD) recommendations. A composite gold standard was constructed with histology, imaging and follow up. We determined sensitivity and specificity for a given exam alone and for various combinations of exams as single tests. Results were given regarding the size of the nodules: 10-20mm and 20-30 mm.

RESULTS
382/442 patients with 551 nodules have been finally kept for the statistical analysis. They were 315 (82.46%) males; the mean age was 62.06 +/- 9.73 years. The causes of the chronic liver disease were mainly alcohol (58.12%), C virus (31.41%) and metabolic syndrome (19.11%). The mean size of the nodules was 18.15 +/- 5.74mm. For the 10 - 20mm nodules (n=347) sensibility for the diagnosis of HCC was 70.2% for MR, 67.6% for CT scanner and 39.9% for the CEUS; and the specificity was respectively 83.1%, 76.6% and 93.5%. For the 20 - 30mm nodules (n=204) sensibility for the diagnosis of HCC was 70.5% for MR, 67.5% for CT scanner and 52.4% for the CEUS; and the specificity was respectively 97.3%, 97.3% and 100%. For the 10 - 20mm nodules the sensibility and specificity were respectively 54.8% and 100% for the association of CT + MR; 27.7% and 100% for CT + CEUS; and 28.7% and 99.4% for MR and CEUS.

CONCLUSION
This study validates the use of sequential application of CT and MRI as recommended in the recent update of EASL and AASLD guidelines, in case of small HCC and in a large population. It shows the potential interest of CEUS for its high specificity. This study is part of the CHIC group.

CLINICAL RELEVANCE/APPLICATION
Recent updates of EASL and AASLD recommendations for the non invasive diagnosis of HCC are validated for the small HCC in a large population.
**SSA08-03** Non-invasive Diagnostic Criteria of Hepatocellular Carcinoma: Comparison of Diagnostic Accuracy of Updated LI-RADS with Clinical Practice Guidelines of OPTN-UNOS, AASLD, NCCN, EASL-EORTC, and KLCSG-NCC

Participants
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**PURPOSE**
To retrospectively compare the diagnostic accuracy of different noninvasive diagnostic criteria of hepatocellular carcinoma (HCC) by LI-RADS, OPTN-UNOS, AASLD, NCCN, EASL-EORTC, and KLCSG-NCC.

**METHOD AND MATERIALS**
We reviewed the medical records of 2,210 patients who had undergone biopsy, resection, or explantation of liver from January 2011 to November 2013 in our institution. Ninety three patients (M:F=69:24; mean age: 54.8, range 30-77) with chronic hepatitis B and/or cirrhosis for any etiology who had focal hepatic lesions ≥ 5 mm reported on dynamic contrast enhanced CT or MR were included. The focal hepatic lesions treated prior to imaging were excluded. A total of 144 lesions were finally included in our study with 73 lesions ≥ 2 cm, 55 lesions between 1-2 cm, and 16 lesions < 1 cm. The focal hepatic lesions were retrospectively evaluated on CT or MR by use of different noninvasive diagnostic criteria of HCC including LI-RADS (2014), OPTN-UNOS, AASLD, NCCN, EASL-EORTC, and KLCSG-NCC. Using the pathology reports as a gold standard, sensitivity, specificity, and accuracy of the diagnostic criteria were analyzed.

**RESULTS**
The sensitivity was highest and equal with AASLD, NCCN, EASL-EORTC and KLCSG-NCC criteria (84.4%), followed by LI-RADS (77.9%) and OPTN-UNOS criteria (75.3%). The specificity was highest with OPTN-UNOS criteria (92.5%), followed by LI-RADS (90.0%), AASLD, NCCN, EASL-EORTC and KLCSG-NCC (82.1%). The accuracies were 83.3%, equal for all noninvasive diagnostic criteria.

**CONCLUSION**
AASLD, NCCN, EASL-EORTC and KLCSG-NCC had the highest sensitivity whereas OPTN-UNOS had the highest specificity among all six guidelines. LI-RADS could not provide higher specificity than OPTN-UNOS criteria or high sensitivity than AASLD or EASL criteria.

**CLINICAL RELEVANCE/APPLICATION**
Though LI-RADS 2014 is widely used by radiologists, it provides lower specificity than OPTN-UNOS criteria as well as lower sensitivity than AASLD or EASL criteria for noninvasive diagnosis of HCC.

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**SSA08-04** Prognostic Stratification of Patients with Hepatocellular Carcinoma Undergoing Curative Resection: Comparison of Preoperative MRI Staging and Postoperative American Joint Committee on Cancer Staging Systems

Participants
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**PURPOSE**
To devise a preoperative staging system for hepatocellular carcinoma (HCC) undergoing resection using magnetic resonance imaging (MRI) findings, and to compare its prognostic ability with that of the American Joint Committee on Cancer (AJCC) staging.

**METHOD AND MATERIALS**
A total of 175 consecutive patients with HCC who underwent curative hepatic resection after preoperative MRI between January 2000 and December 2007 were analyzed. We devised an MRI staging system based on the number of nodules, a size criterion of 2 cm, gross vascular invasion, and two MRI features (rim enhancement and peritumoral parenchymal enhancement in the arterial phase) which were reported to be associated with worse prognosis after curative resection of HCC. In the devised MRI staging, instead of microvascular invasion which is used by the AJCC staging system, a size criterion of 2 cm was used to differentiate tumor stages 1 and 2. Each tumor stage was further divided into two substages; if both of the MRI features were absent, a patient was staged as T1a, 2a, or 3a, but staged as T1b, 2b, or 3b if any of these were present. Disease-free survival of both staging systems was analyzed using the Kaplan-Meier method with log-rank testing.

**RESULTS**
Both MRI and AJCC staging systems were excellent for predicting disease-free survival across different tumor stages 1, 2 and 3. Of 175 patients, 29 (16.6%), 6 (3.4%), 77 (44%), 51(29%), 6 (3.5%), and 6 (3.5%) were staged as T1a, T1b, T2a, T2b, T3a, and T3b by the preoperative MRI staging system, respectively. Disease-free survival was significantly different between T1 and T2a (median, 1925 days vs. 1668 days; P=0.048), between T2a and T2b (median, 1668 days vs. 799 days; P=0.0021), and between T2b and T3 (median survival, 799 days vs. 141 days; P=0.0015). However, no significant difference was found in disease-free survival between T1a and T1b, and between T3a and T3b.

**CONCLUSION**
Preoperative MRI staging system may be comparable to the postoperative AJCC staging system in predicting prognosis following...
curative resection of HCC. Furthermore, tumor stage 2 of the MRI staging system may be further divided into T2a and T2b.

CLINICAL RELEVANCE/APPLICATION
These advantages (preoperative staging and further stratification of T2 into T2a/b) can make the devised MRI staging useful in deciding on treatment plans of patients with HCC.

SSA08-05  Utilising the Full Potential of MRI in the Diagnosis of HCC - Time for a Game Changer?

Participants
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Angelo Luca, MD, Palermo, Italy (Abstract Co-Author) Nothing to Disclose

PURPOSE
The current cornerstone of HCC diagnosis is the wash-in/wash-out enhancement pattern. It is known that HCC might exhibit other MRI findings. Our aim was to retrospectively review the MRIs of histologically proven HCCs on liver explants, and to identify the best combination of sequences useful in HCC diagnosis.

METHOD AND MATERIALS
97 consecutive patients who underwent liver transplantation between 2004 and 2012 and Gd-BOPTA-MRI within 3 months of surgery were enrolled. A hepatobiliary histopathologist and two radiologists blinded to the radiological/histopathological findings performed a nodule by nodule analysis. The signal intensity of all nodules was assessed on the following axial sequences: T1 in/opposed phase, 3D fat suppressed (FS) T1 (pre-contrast, arterial, portal, equilibrium, and hepatobiliary phases), T2, T2 FS, and diffusion (B=800). Arterial enhancement was graded as none, mild, moderate, or intense. A multiple logistic regression analysis was performed following pathological/radiological correlation, and the Odds Ratio (OR) was calculated for every parameter analysed and adjusted for nodule size.

RESULTS
Imaging was performed 41.7±25.4 days pre-transplantation. 291 lesions were identified on histopathology, of which 193 were HCCs, 68 regenerative nodules, 8 low-grade dysplastic nodules (DN), 19 high-grade DN, 2 cholangiocarcinomas, and 1 necrotic nodule. 48 HCCs (24.9%) were not detectable on imaging (24.9%), leaving a total of 145 HCCs (≤ 10 mm n=25; 11-19 mm n=58; ≥ 20 mm n=62). As expected, intense (OR 10.9, p<0.000) or moderate (OR 2.2, p=0.003) arterial enhancement and hypointensity on the portal venous (OR 14.3, p<0.000) or equilibrium (OR 15.9, p<0.000) phases were found to predict HCC. In addition, nodules showing hypointensity on the hepatobiliary phase and T2 hyperintensity were also highly likely to represent HCC. In the former, an OR of 10.2 was observed (p<0.000). The OR was 14.3 in non-FS T2 weighted sequences, and 10.2 in FS T2 weighted sequences (p<0.000).

CONCLUSION
In patients with a high risk of HCC, nodules lacking the typical hemodynamic findings are most likely HCC if they exhibit T2 hyperintensity and/or hypointensity on the hepatobiliary phase with an OR of 14.3 and 10.2, respectively (p<0.000).

CLINICAL RELEVANCE/APPLICATION
MRIs targeted at diagnosing HCC should include T2 weighted sequences with and without FS and Gd-BOPTA/Gd-EOB-enhanced hepatobiliary phases alongside standard sequences.

SSA08-06 A Tumor Suppression Factor HNF4a (Hepatocyte Nuclear Factor) Expression Correlates with Gadoxetic Acid Enhanced MRI Findings in Hepatocellular Carcinoma

Participants
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PURPOSE
Hepatocyte nuclear factor (HNF) 4A is one of transcription factors with tumor suppression effect, and besides, regulates expression of many molecules including organic anion transporting polypeptide (OATP) 1B3 (uptake transporter of gadoxetic acid) in hepatocellular carcinoma (HCC) (Yamashita T, Hepatology 2014). The purpose of this study is to clarify the correlation between HNF4A expression, pathological findings and imaging findings on gadoxetic acid enhanced MRI.

METHOD AND MATERIALS
The subjects are 138 surgically resected HCCs. We semiquantitatively evaluated the immunohistochemical HNF4A and OATP1B3 expression of HCC into four grades: grade 0: no expression, grade 1: weak expression, grade 2: moderate expression and grade 3:
The presence of hypovascular hypointense nodules on hepatocyte phase of preoperative gadoxetic acid-enhanced MR imaging (hypo-nodule) showed a significant positive correlation with OATP1B3 expression (P=0.003, r=0.46). There was also a significant positive correlation between HNF4A grade and enhancement ratio on the hepatobiliary phase of gadoxetic acid enhanced MRI (P<0.0001, r=0.49). Intensive HNF4A expression was observed in atypical HCC showing high enhancement ratio and increased OATP1B3 expression. HNF4A grade was decreased according to the decline of differentiation grade of HCC (P=0.0007, r=0.29).

CONCLUSION

The presence of HNF4A in HCC correlated with both of OATP1B3 expression and enhancement ratio on the hepatobiliary phase of gadoxetic acid enhanced MRI. In addition, HNF4A expression was decreased during multistep hepatocarcinogenesis. Gadoxetic acid enhanced MRI is useful to evaluate the expression of HNF4A in HCC.

CLINICAL RELEVANCE/APPLICATION

Gadoxetic acid enhanced MRI has a potential to reflect the expression of many genes and molecules regulated by HNF4A as imaging biomarkers (radiogenomics), which will be important for future personalized medicine.

SSA08-07 Presence of Hypovascular and Hypointense Nodules on Preoperative Gadoxetic Acid-enhanced MR Imaging: An Important Risk Factor for Recurrence after Liver Resection for Hypervascular Hepatocellular Carcinoma

Sunday, Nov. 29 11:45AM - 11:55AM Location: E450B

Participants
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PURPOSE

The hepatocyte phase (HP) of gadoxetic acid-enhanced magnetic resonance imaging (EOB-MRI) can reveal numerous hypovascular and hypointense nodules with malignant potential, which may progress to conventional hypervascular hepatocellular carcinoma (HCC). We retrospectively evaluated the prognostic factors for patients with hypervascular HCC after liver resection, including the presence of hypovascular hypointense nodules on HP of EOB-MRI (hypo-nodule).

METHOD AND MATERIALS

In total, 114 consecutive patients who had undergone surgical resection and were pathologically diagnosed with moderately differentiated HCC were included. For the analysis of risk factors for recurrence and a poor survival rate after liver resection, univariate and multivariate Cox regression analyses were performed for the following factors: age, tumor size, tumor number, vascular invasion, TNM stage, albumin level, prothrombin ratio, Child-Pugh class, alpha-fetoprotein level, protein induced by vitamin K absence/antagonist-II (PIVKA-II), liver cirrhosis, past history of HCC, and presence of hypo-nodules on HP of preoperative EOB-MRI. We compared the 5-year recurrence-free and overall survival rates between patients with and without hypo-nodules on HP of EOB-MRI.

RESULTS

Univariate and multivariate analyses revealed the presence of hypo-nodules as the only significant risk factor for recurrence after liver resection (risk ratio, 2.1 and 2.1; p-value, 0.014 and 0.020) and albumin level as the only significant risk factor for a poor survival rate (risk ratio, 10.3 and 6.1; p-value, <0.001 and 0.019). The 5-year recurrence-free rate was significantly lower for patients with hypo-nodules (13.1%) than for those without (48.8%; p = 0.008); similar results were observed for the 5-year survival rate (66.1% vs. 83.4%), although the difference was not significant (p = 0.222).

CONCLUSION

The presence of hypo-nodules on HP of preoperative EOB-MRI is an important risk factor for recurrence after liver resection for hypervascular HCC.

CLINICAL RELEVANCE/APPLICATION

The presence of hypovascular and hypointense nodules on hepatocyte phase of preoperative gadoxetic acid-enhanced MR imaging is an important risk factor for recurrence after liver resection for hypervascular hepatocellular carcinoma.

SSA08-08 Hepatocellular Carcinoma without Gadoxetic Acid Uptake on Preoperative MR Imaging: An Important Prognostic Risk Factor after Liver Resection

Sunday, Nov. 29 11:55AM - 12:05PM Location: E450B

Participants
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PURPOSE

The hepatocyte phase (HP) of gadoxetic acid-enhanced magnetic resonance imaging (EOB-MRI) can reveal numerous hypovascular and hypointense nodules with malignant potential, which may progress to conventional hypervascular hepatocellular carcinoma (HCC). We retrospectively evaluated the expression of HNF4Α in hepatocellular carcinoma (HCC). The expression of HNF4Α correlated with both of OATP1B3 expression and enhancement ratio on the hepatobiliary phase of gadoxetic acid enhanced MRI. In addition, HNF4Α expression was decreased during multistep hepatocarcinogenesis. Gadoxetic acid enhanced MRI is useful to evaluate the expression of HNF4Α in HCC.

METHOD AND MATERIALS

In total, 114 consecutive patients who had undergone surgical resection and were pathologically diagnosed with moderately differentiated HCC were included. For the analysis of risk factors for recurrence and a poor survival rate after liver resection, univariate and multivariate Cox regression analyses were performed for the following factors: age, tumor size, tumor number, vascular invasion, TNM stage, albumin level, prothrombin ratio, Child-Pugh class, alpha-fetoprotein level, protein induced by vitamin K absence/antagonist-II (PIVKA-II), liver cirrhosis, past history of HCC, and presence of hypo-nodules on HP of preoperative EOB-MRI. We compared the 5-year recurrence-free and overall survival rates between patients with and without hypo-nodules on HP of EOB-MRI.

RESULTS

Univariate and multivariate analyses revealed the presence of hypo-nodules as the only significant risk factor for recurrence after liver resection (risk ratio, 2.1 and 2.1; p-value, 0.014 and 0.020) and albumin level as the only significant risk factor for a poor survival rate (risk ratio, 10.3 and 6.1; p-value, <0.001 and 0.019). The 5-year recurrence-free rate was significantly lower for patients with hypo-nodules (13.1%) than for those without (48.8%; p = 0.008); similar results were observed for the 5-year survival rate (66.1% vs. 83.4%), although the difference was not significant (p = 0.222).

CONCLUSION

The presence of hypo-nodules on HP of preoperative EOB-MRI is an important risk factor for recurrence after liver resection for hypervascular HCC.

CLINICAL RELEVANCE/APPLICATION

The presence of hypovascular and hypointense nodules on hepatocyte phase of preoperative gadoxetic acid-enhanced MR imaging is an important risk factor for recurrence after liver resection for hypervascular hepatocellular carcinoma.
Hepatocellular carcinomas (HCCs) commonly demonstrate hypointensity compared with the surrounding liver parenchyma on the hepatocyte phase (HP) of gadoxetic acid-enhanced MR imaging (EOB-MRI). However, some hypervascular HCCs with gadoxetic acid (EOB) uptake demonstrate iso- or hyperintensity on HP. Such lesions are known to be biologically less aggressive. A previous study showed a lower recurrence rate for hyperintense HCC than for hypointense HCC. In this study, we retrospectively evaluated the overall survival rate for patients with hyperintense and hypointense HCC on EOB-MRI.

METHOD AND MATERIALS

In total, 114 consecutive patients with moderately differentiated HCC that was surgically resected from January 2008 to December 2013 were included in this study. According to their signal intensity on HP of EOB-MRI, the 114 patients were classified as EOB uptake (+) HCC (n = 23) and EOB uptake (-) HCC (n = 91). Risk factors for recurrence and a poor survival rate after liver resection were analyzed by univariate and multivariate Cox regression analyses of the following factors: age, tumor size, tumor number, vascular invasion, TNM stage, albumin level, prothrombin ratio, Child-Pugh class, alpha-fetoprotein level, protein induced by vitamin K absence/antagonist-Ⅱ (PIVKA-Ⅱ), liver cirrhosis, past history of HCC, and EOB uptake on HP of preoperative EOB-MRI. Then, we calculated the overall survival and recurrence-free rates for both groups using Kaplan-Meier survival curves. The log-rank and Wilcoxon tests were used to analyze significant differences.

RESULTS

The absence of EOB uptake was found to be a significant risk factor for a poor survival rate after liver resection (risk ratio, 5.4; p < 0.05). The EOB uptake (+) group showed a higher overall survival rate compared with the EOB uptake (-) group (5-year survival rate, 100% and 73.3%; p < 0.05). However, the recurrence-free rate was not significantly different (p = 0.70).

CONCLUSION

The absence of EOB uptake was a significant risk factor for a poor survival rate after liver resection. The overall survival rate was higher for patients with EOB uptake than for those without.

CLINICAL RELEVANCE/APPLICATION

In patients with moderately-differentiated hepatocellular carcinoma, the absence of gadoxetic acid uptake is a significant risk factor for a poor survival rate after liver resection. The overall survival rate is higher for patients with gadoxetic acid uptake than for those without.

SSA08-09 Dual Energy Spectral CT Imaging for the Evaluation of Small Hepatocellular Carcinoma Microvascular Invasion

Participants

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PURPOSE

To evaluate small hepatocellular carcinoma microvascular invasion using dual energy spectral CT imaging.

METHOD AND MATERIALS

This study was approved by our ethics committee. We retrospectively analyzed the images of 50 patients with 56 small hepatocellular carcinoma who underwent preoperative contrast enhanced dual-phase spectral CT scans before surgical resection. Tumors were divided into two groups based on the pathological findings for analysis: with (n=37) and without (n=19) microvascular invasion. Iodine concentration (IC) for tumors was measured in arterial phase (AP) and venous phase (VP) on the iodine-based material decomposition images to calculate IC reduction rate (ICrr) between AP and VP. IC values were further normalized to that without microvascular invasion (Fig 1A-1C) (2.40±0.80 mg/ml vs. 1.68±0.47 mg/ml for IC; 0.22±0.06 vs. 0.16±0.05 for NIC; 0.27±0.16 vs. 0.01±0.25 for ICrr; and 3.28±1.08 vs. 2.27±0.63 for slope, all p<0.05)(Table 1). Using the normalized iodine concentration value of 0.18 in AP as a threshold, one could obtain an area-under-curve of 0.82 for ROC study with sensitivity of 82.4% and specificity of 70.0% for differentiating small hepatocellular carcinoma with and without microvascular invasion. These values were significantly higher than the sensitivity of 64.7% and specificity of 69.2% with conventional CT numbers at 70keV(Table 2).

CONCLUSION

Using quantitative parameters obtained in spectral CT in the arterial phase provides new method with high accuracy to evaluate small hepatocellular carcinoma microvascular invasion.

CLINICAL RELEVANCE/APPLICATION

Quantitative iodine concentration measurement in spectral CT may be used to provide a new method to evaluate small
hepatocellular carcinoma microvascular invasion.
**Purpose**

The purpose of our study was to evaluate the flow rates and patterns of simulated bile through drainage catheters in an in vitro biliary system model.

**Method and Materials**

The in vitro model consisted of a manometer-monitored constant pressure chamber containing simulated bile connected to a biliary tree made from airline and heat shrink cable tubing. Three types of 12-French drainage catheters (Cook Medical, Bloomington, IN) were inserted through a "T"-shaped sidearm in the biliary tree section of the model: biliary (32 sideholes along the shaft and locking pigtail), pigtail (6 sideholes within the pigtail), and a prototype pigtail catheter with a single sidehole in the catheter mid-shaft. Simulated bile at 4 different viscosities (guar gum solutions in water determined by a rotational viscometer to be in the range of human bile viscosity) flowed through the system under a constant pressure of 12 cm of water. A circumferential occlusion device was used to occlude distal flow. Flow volumes through each catheter were recorded over 1-minute intervals with the "common bile duct" unobstructed or obstructed. Ten trials were performed for each catheter and flow rates compared using Student's t-test.

**Results**

Without obstruction, there was no significant difference in the flow rates between all catheters tested. With obstruction, there was no significant difference in the flow rates between the prototype and standard biliary catheters while no flow was observed with the pigtail catheter. Fluid was seen flowing along the external shaft of all unobstructed catheters. In the obstructed prototype and biliary catheters, fluid was seen to exit from the sidehole(s) proximal to the obstruction and out of the distal sideholes.

**Conclusion**

Our data suggest that biliary drainage may be achieved with fewer sideholes proximal to the obstruction. Similar flow rates were obtained with multiple sideholes as compared to one proximal sidehole.

**Clinical Relevance/Application**

Biliary catheters with multiple sideholes do not improve flow rates and may facilitate encrustation with debris that could lead to catheter obstruction and sepsis. Catheters with one or fewer sideholes may achieve the same flow rate while reducing the likelihood of catheter obstruction.
PURPOSE

to assess the mid-term outcome of biodegradable biliary stents (BBS) to treat benign biliary strictures.

METHOD AND MATERIALS

Institutional Review Board approval was obtained and patients' consent was waived. Between 2007 and 2014, ninety-nine patients (mean age 57±16 years [mean±standard deviation]), 57 males (61±15 years), 42 females (54±17 years), were treated. Technical feasibility, technical success, and immediate complications were recorded. In 89 patients (51 males, 38 females, aged 57±17 years) with at least 6 months follow-up (mean follow-up 20.2±4.9 months), late complications, episodes of cholangitis, episodes of altered hepatic functional tests without symptoms of cholangitis, episodes of biliary stones, and development of imaging demonstrated biliary stricture recurrence were recorded. Fisher's exact test, Mann-Whitney U test, and Cox regression model were used.

RESULTS

Stent implantation was feasible in 99/99 cases (100%). In 2/99 cases (2%), migration of the stent occurred immediately after deployment (technical success 98%). In 4/99 cases (4%), immediate mild haemobilia occurred. No major or late complications occurred. In 24/89 patients (26.9%) subsequent cholangitis occurred. 15/89 (16.8%) patients had episodes of altered hepatic functional tests without symptoms of cholangitis. Six out of 89 patients (6.7%) developed biliary stones. In 19/89 patients (21.3%), stricture recurrence occurred. The estimated mean time to stricture recurrence was 32.9 months (95% C.I 29.6-36.2 months).

CONCLUSION

Percutaneous placement of BBS is a feasible, safe and effective strategy to treat benign biliary strictures and may represent a further option for treating patients in whom standard percutaneous therapy failed.

CLINICAL RELEVANCE/APPLICATION

Percutaneous placement of BBS is a feasible, safe and effective strategy to treat benign biliary strictures, potentially representing a further option for treating patients in whom standard percutaneous therapy failed.

Interventional MRI-Guided Local Delivery of Agents into Swine Bile Duct Walls Using MR Compatible Needle-Integrated Balloon Catheter System

Sunday, Nov. 29 11:05AM - 11:15AM Location: E352

Participants
Feng Zhang, MD, Seattle, WA (Presenter) Nothing to Disclose
Zhibin Bai, Seattle, WA (Abstract Co-Author) Nothing to Disclose
Yaoping Shi, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
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Yonggang Li, MD, Suzhou, China (Abstract Co-Author) Nothing to Disclose
Xiaoming Yang, MD, PhD, Seattle, WA (Abstract Co-Author) Nothing to Disclose

PURPOSE

To investigate the feasibility of interventional magnetic resonance imaging (MRI)-guided local agent delivery into pig common bile duct (CBD) walls using a newly-designed MR-compatible, needle-integrated balloon catheter system.

METHOD AND MATERIALS

We first designed a needle-integrated balloon catheter system that is comprised of a 22-G MR-compatible Chiba biopsy needle and a conventional 12mmx2cm balloon catheter. Under fluoroscopy guidance, a custom needle/balloon system was positioned into the target CBD via a transcholecystic access. T1-weighted MR imaging was used to localize and reposition the needle/balloon system in the target. A 0.5-mL mixture of motexafin gadolinium (MGd) and trypan blue dye as well as 5-fluorouracil (5-Fu) was delivered into the CBD wall through the needle/balloon system. Post-infusion T1-weighted MR imaging was obtained and contrast-to-noise ratios (CNR) of CBD walls of pre- and post-MGd/blue infusions were compared by a paired t-test. In addition, post-infusion x-ray cholangiography was achieved to evaluate the potential injuries of CBDs by the needle/balloon system. High-pressure liquid chromatography was used to quantify 5-FU in the bile duct tissue. Subsequent histologic analysis was performed to correlate and confirm the imaging findings.

RESULTS

Post-infusion cholangiogram didn't show any extravasation of contrast agent, indicating no procedure-related damage to the CBDs. MR imaging demonstrated the clear enhancement of the target bile duct walls infused with MGd/trypan blue dye with average penetration depth of 4.7±1.2mm. The average CNR of the post-infusion bile ducts was significantly higher than that of the pre-infusion bile ducts (110.6±22 vs 5.7±2.8, p<0.0001). Out of the total 5mg 5-Fu injected into the bile duct tissue, 4.1±0.12 mg 5-FU were retrieved, proving an approximately 80% drug delivery efficiency. Histology depicted the blue dye staining and red fluorescence of MGd through the target CBD walls, which was well correlated with the imaging findings.

CONCLUSION

It is feasible to use the new MR compatible, needle-integrated balloon catheter system for intrabiliary local agent delivery into CBD walls under MR imaging guidance.

CLINICAL RELEVANCE/APPLICATION

This study may open new avenues for efficient management of pancreatobiliary malignancies using MR-guided interventional oncology.

Portal Vein Embolization via an Ipsilateral Approach is Safe and Effective

Sunday, Nov. 29 11:15AM - 11:25AM Location: E352

Participants
Feng Zhang, MD, Seattle, WA (Presenter) Nothing to Disclose
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Jianfeng Wang, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
Yonggang Li, MD, Suzhou, China (Abstract Co-Author) Nothing to Disclose
Xiaoming Yang, MD, PhD, Seattle, WA (Abstract Co-Author) Nothing to Disclose

PURPOSE

To investigate the feasibility of interventional magnetic resonance imaging (MRI)-guided local agent delivery into pig common bile duct (CBD) walls using a newly-designed MR-compatible, needle-integrated balloon catheter system.

METHOD AND MATERIALS

We first designed a needle-integrated balloon catheter system that is comprised of a 22-G MR-compatible Chiba biopsy needle and a conventional 12mmx2cm balloon catheter. Under fluoroscopy guidance, a custom needle/balloon system was positioned into the target CBD via a transcholecystic access. T1-weighted MR imaging was used to localize and reposition the needle/balloon system in the target. A 0.5-mL mixture of motexafin gadolinium (MGd) and trypan blue dye as well as 5-fluorouracil (5-Fu) was delivered into the CBD wall through the needle/balloon system. Post-infusion T1-weighted MR imaging was obtained and contrast-to-noise ratios (CNR) of CBD walls of pre- and post-MGd/blue infusions were compared by a paired t-test. In addition, post-infusion x-ray cholangiography was achieved to evaluate the potential injuries of CBDs by the needle/balloon system. High-pressure liquid chromatography was used to quantify 5-FU in the bile duct tissue. Subsequent histologic analysis was performed to correlate and confirm the imaging findings.

RESULTS

Post-infusion cholangiogram didn't show any extravasation of contrast agent, indicating no procedure-related damage to the CBDs. MR imaging demonstrated the clear enhancement of the target bile duct walls infused with MGd/trypan blue dye with average penetration depth of 4.7±1.2mm. The average CNR of the post-infusion bile ducts was significantly higher than that of the pre-infusion bile ducts (110.6±22 vs 5.7±2.8, p<0.0001). Out of the total 5mg 5-Fu injected into the bile duct tissue, 4.1±0.12 mg 5-FU were retrieved, proving an approximately 80% drug delivery efficiency. Histology depicted the blue dye staining and red fluorescence of MGd through the target CBD walls, which was well correlated with the imaging findings.

CONCLUSION

It is feasible to use the new MR compatible, needle-integrated balloon catheter system for intrabiliary local agent delivery into CBD walls under MR imaging guidance.

CLINICAL RELEVANCE/APPLICATION

This study may open new avenues for efficient management of pancreatobiliary malignancies using MR-guided interventional oncology.
Liver failure represents the most severe post-operative complication of major hepatic resection. Our aim was to prospectively compare percutaneous portal vein embolization (PVE), portal vein ligation (PVL), and associating liver partition and portal vein ligation for staged hepatectomy (ALPPS) in terms of FLR hypertrophy, complications and clinical outcome.

METHOD AND MATERIALS

From January 2004 to January 2015, 118 patients with an inadequate FLR underwent procedures to induce preoperative hypertrophy before major liver resection. 73 patients underwent PVE, 27 underwent PVL and 18 ALPPS. PVE was percutaneously performed under US and fluoroscopy, with a 4-F catheter, using PVA particles, coils and glue. Total liver volume (TLV), tumor volume and FLR were calculated before both the procedure and surgery. The following outcome measures were considered: operating time, intraoperative blood losses, hospital stay, morbidity and mortality rate. Plasma samples were collected preoperatively and in 1st, 2nd and 5th postoperative day to assess liver function. Moreover, serum levels of white blood cells, C-reactive protein (CRP), Interleukin-6 (IL-6) and Endothelin-1 (ET-1) were determined as markers of inflammatory surgical stress.

RESULTS

The three groups were homogeneous in terms of pre-procedural volumes, comorbidities and histopathological findings. In ALPPS group, FLR mean hypertrophy was higher than PVE and PVL groups (PVE=5.45 ± 3.17 cc/day, PVL=5.59 ± 2.19 cc/day, ALPPS =21.03 ± 11.09 cc/day, p<0.05). A higher grade of severe complications was recorded in ALPPS group compared to PVE and PVL groups. Postoperative plasma levels of AST, ALT, WBC, CRP, IL-6 and ET-1 showed a higher increase after the first surgical stage in the ALPPS series compared with the same stage of patients subjected to PVE/PVL.

CONCLUSION

PVE and PVL are comparable in inducing FLR hypertrophy. ALPPS assures the possibility to obtain a higher rate of hypertrophy in a shorter time even if with an higher rate of complications. PVE is preferable to PVL in all cases of unrequired two stage hepatectomy. ALPPS should not be considered a substitute for PVE or PVL but rather a technique to expand the pool of resectable
To identify fundamental causes underlying recurrent variceal hemorrhage (VH) following transjugular intrahepatic portosystemic shunt (TIPS) creation in order to ascertain opportunities for improvement of TIPS-based management of VH and rebleeding prevention.

METHOD AND MATERIALS
In this single-center retrospective study, 166 patients (M:F=101:65, median age 52 years, median MELD score 14) who underwent TIPS creation for VH between 1999-2014 were studied. Medical record review was used to detect patients who had recurrent VH events, and root cause analysis (RCA) allowed identification of most probable causal factors. A 5-person Interventional Radiology physician group then generated quality improvement (QI) recommendations for process changes to address causal factors, with consensus achieved using a modified Delphi method.

RESULTS
Twenty-five (15%) patients suffered variceal rebleeding post-TIPS. The 1-, 3-, and 5-year variceal rebleeding incidence was 17%, 21%, and 21%. Variceal rebleeding was associated with high 90-day all-cause mortality incidence (10/25, 40%). Male gender (P=0.018) and MELD score (P=0.009) were statistically associated with variceal rebleeding. The most common primary and secondary causes of recurrent VH were lack of or insufficient variceal embolization (48%, 12/25) and coagulopathy (44%, 11/25). Other causal factors included TIPS stenosis or occlusion (n=8) with recurrent portosystemic pressure gradient (PSG) elevation (n=5), inadequate PSG reduction (n=3), and TIPS under dilation (n=1). Fourteen preventative QI recommendations, spanning items related to TIPS portal venous puncture, venographic assessment, stent type and deployment technique, PSG reduction, embolotherapy methodology, and coagulopathy correction, were developed to potentially address variceal rebleeding.

CONCLUSION
While recurrent VH rates following TIPS are non-trivial, rebleeding may be related to addressable underlying causal factors. Further investigation may assess the efficacy of QI-based procedure methodological enhancements in reducing post-TIPS rebleeding incidence.

CLINICAL RELEVANCE/APPLICATION
Root cause analysis based identification of fundamental reasons underlying recurrent variceal hemorrhage after TIPS creation may help reduce the significant morbidity and mortality associated with this condition by targeting causal factors for correction through quality improvement measures.
because of severe thrombocytopenia, pancytopenia or recurrent bleeding from other sites than varices (n=5) and thrombocytopenia associated with hepatic encephalopathy (n=3). TIPS was carried out for the secondary prevention of variceal bleeding (n=6), refractory ascites (n=6) and portal venous thrombosis (n=1). The PPG decreased from 15.2 ± 3.7 mmHg before PSE to 11.8 ± 4.0 mm Hg after PSE. This allowed limiting the TIPS size to 6 mm in 7 patients. The PPG was 6.3 ± 2.1 mm Hg after the TIPS placement. The platelet count increased from 52 ± 27 G/L before PSE to 209 ± 109 G/L two months after the combined therapy. After the procedure, there was one splenic abscess leading to death, one splenic hematoma and one hepatic abscess and three cases of transient hepatic encephalopathy.

CONCLUSION
Our study evaluated the hemodynamic effects of this combined therapy. It showed that PSE decreases the PPG and can allow the creation of a smaller caliber TIPS.

CLINICAL RELEVANCE/APPLICATION
Randomized controlled studies are needed to evaluate the possible benefits of this combined therapy over encephalopathy and complications of splanchnic hemodynamic stress in patients with PHT and hypersplenism undergoing TIPS placement.

PURPOSE
To investigate the utility of bridging locoregional therapies (LRT) and transjugular intrahepatic portosystemic shunts (TIPS) in HCC patients undergoing orthotopic liver transplant (OLT) and its effect on survival outcomes in a national population study.

METHOD AND MATERIALS
The United Network for Organ Sharing (UNOS) database was used to identify patients who were listed for OLT from 2002 to 2013 and followed through 2014. Patients within the Milan Criteria with approved HCC Model for End-Stage Liver Disease (MELD) exception and available pre-OLT TIPS placement data were included. Overall survival (OS) from OLT was stratified by TIPS status and bridging LRT (including transcatheter chemoembolization (TACE), radiofrequency ablation (RFA) and cryoablation). Chi-squared tests were used to compare categorical variables and t-tests to compare continuous variables. Kaplan-Meier estimation and log-rank test were used for survival analysis.

RESULTS
Of 17,291 HCC patients who were listed for OLT during the study period, 14,511 patients received OLT, of whom 13,299 patients had adequate pre-OLT TIPS placement data, mean age 57.5 years, 77.1% male; 616 (4.6%) patients received pre-OLT TIPS, and 6,358 patients received at least one LRT. Comparison groups were similar for age at OLT, waitlist duration, gender, ethnicity, BMI, Child and MELD scores (p>0.05 for all). No significant differences in survival from OLT were observed between patients who received pre-OLT TIPS (mean 108.6 months) vs. those who did not (118.9 months), p=0.84. TIPS Patients who received at least one bridging LRT had significantly higher mean survival vs. those who received no bridging LRT (106.1 vs. 102.5 months, p=0.03).

CONCLUSION
In a national population study, OS from transplant in HCC patients was not significantly affected by pre-OLT TIPS placement status. TIPS Patients who received at least one bridging locoregional therapy had significantly improved post-OLT survival compared to those who did not.

CLINICAL RELEVANCE/APPLICATION
Pre-OLT TIPS for HCC patients may be safely performed without significant impact on post-OLT survival. Bridging LRT may improve post-OLT survival in HCC patients who require TIPS placement.
pre-OLT TIPS placement data, mean age 48.9 years, 67.4% male; 5,304 (7.6%) patients received pre-OLT TIPS. Comparison groups were similar for age at OLT, waitlist duration, gender, ethnicity, BMI, Child and MELD scores (p>0.05 for all). No significant differences in survival from OLT were observed between patients who received pre-OLT TIPS (mean 112.9 months) vs. those who did not (123.6 months), p=0.07. There were significant regional and geographic differences in TIPS placement rates (range 1.9-12.24%, p<0.001) and mean OS from OLT (range 36.3-101.9 months, p<0.001). Increasing longitudinal 12-month OS rates were observed in both TIPS and non-TIPS patients from 2002-2012.

CONCLUSION

In a national population study, OS from transplant was not significantly affected by pre-OLT TIPS placement status. Increasing longitudinal trends in 12-month post-OLT survival and significant geographic disparities in TIPS placement rates and survival from OLT were observed.

CLINICAL RELEVANCE/APPLICATION

Pre-OLT TIPS may be safely performed without significant impact on post-OLT survival.
**GI328-SD-SUA1**  
**Low-tube-voltage Liver CT during Hepatic Arterial Phase - Effect of Liver Volume on Image Quality**

**PURPOSE**
Object size and object densities are well-known important determinants of x-ray absorption. In liver CT, liver volume may have influence on the gross object density and size at the liver level being imaged. Therefore, we evaluated whether individual liver volume may have impact on image quality of low kVp liver CT during the hepatic arterial phase.

**METHOD AND MATERIALS**
Seventy-seven patients (72 men, 5 women; age range, 40-79 years) who underwent clinically indicated liver dynamic CT examination were enrolled in the study. 80 kVp CT and intermediate tube current was performed in the late hepatic arterial phase using a 320-detector row scanner with AIDR 3D reconstruction. Based on the CT volumetric measurement and estimated liver volume calculation, CT liver volume-to-estimated volume ratio (CTLVratio) was calculated. On an axial scan of hepatic arterial phase at the level of right portal vein, the ratio of the liver-to-abdominal area (LAratio) was calculated. Then, on the same selected image, the mean image noise and contrast-to-noise ratios (CNRA) for the aorta were assessed. Decreased liver volume was determined when CTLVratio was less than 0.9 or LAratio was less than 0.22. Correlations between CTLVratio, LAratio and image quality parameters were evaluated. Mean image quality parameters were compared between decreased liver volume group and normal liver volume group.

**RESULTS**
In all patients, 46 patients had decreased liver volume and 31 patients had normal liver volume. CTLVratio was significantly correlated with LAratio (r =708; p =0.001). CTLVratio and LAratio showed inverse correlation with image noise (r =-0.322 and -0.420; all, p <0.05) and positive correlation with CNRA (r =0.239 and 0.281; all, p <0.05). Patients with decreased liver volume showed significantly higher mean image noise (13.61 vs 10.83; p =0.001) and lower mean CNRA (39.34 vs 49.10; p =0.001) than those with normal liver volume.

**CONCLUSION**
Liver volume has influence on image noise and CNRA in low-tube-voltage liver CT during hepatic arterial phase.

**CLINICAL RELEVANCE/APPLICATION**
In patients with liver cirrhosis, decreased liver volume can be considered as one of determinants in CT parameter adjustment to perform low-tube-voltage liver CT during hepatic arterial phase. Therefore, acceptable image quality with can be achieved with diagnostic improvement for hypervascular hepatic tumor and radiation dose reduction.
(HCC); however the response rate is relatively low, and the predictor of response to HAIC is still unknown. Organic anion transporter 8 responsible for intracellular uptake of Gd-EOB is known to transport certain anticancer drugs; therefore we speculated that uptake of Gd-EOB by HCC can be a predictor for the good response to HAIC. The purpose of the study is to investigate the potential role of Gd-EOB enhanced MRI to predict the response to HAIC.

METHOD AND MATERIALS

35 patients with advanced HCC who underwent Gd-EOB enhanced MRI using 3T or 1.5T MR scanner prior to HAIC were enrolled and retrospectively analysed. The largest lesion per patient was selected for evaluation, and the relative enhancement ratio (RER) was calculated using the following formula: \( \frac{SI_{nodule}}{SI_{liver}} \) hepatobiliary phase / \( \frac{SI_{nodule}}{SI_{liver}} \) unenhanced, where SI nodule and SI liver respectively represent the signal intensity of the nodule and liver parenchyma. Apparent diffusion coefficient (ADC) was also measured. Cisplatin with a dose of 65 mg/m² dissolved in saline was administered into the hepatic artery by one-shot method for 20-40 min. HAIC was repeated, until confirmation of progression of disease (PD) or complete response (CR). According to modified RECIST the patients were classified as responders (CR, PR) or non-responders (SD, PD). RER, tumour size, ADC, Child-Pugh score, tumour stage, tumour marker of two groups were correlated with the response to HAIC using multivariate logistic regression analysis. For the significant variable, receiver operating characteristic (ROC) analysis was performed to determine the best cut-off values.

RESULTS

There are 6 responders (CR2, PR4) and 29 non-responders (SD12, PD17), and the response rate to HAIC was 17.1% (6/35). Multivariate logistic regression analysis demonstrated that RER was the only significant predictor of response (risk ratio, 2.75×11; \( P<0.01 \)). Using ROC analysis, RER of 1.02 is the best cutoff value for predicting a response to HAIC, offering a sensitivity of 83.3% and a specificity of 96.6%.

CONCLUSION

RER in Gd-EOB enhanced MRI was the only independent predictor for response to HAIC for the treatment of advanced HCC.

CLINICAL RELEVANCE/APPLICATION

Intratumoral uptake of Gd-EOB in HCC would be a predictor of response to HAIC.

Purpose

The main objective of the study is to evaluate the usefulness of the information provided by contrast-enhanced ultrasound (CEUS) or magnetic resonance enterography (MRE) in therapeutic decision of patients with Crohn’s disease and to analyze the differences between the two techniques influencing this decision.

Method and Materials

100 episodes were prospectively evaluated in 71 patients (mean age: 37±10 years) with established diagnosis of Crohn’s disease by ultrasound and entero-contrast MRI, performed the same day and requested for clinical assessment. In both techniques, the presence or absence of signs of inflammatory activity, fistulas, abscesses, or stenosis were studied. Treatment effectiveness was also assessed, or if there was or not improvement in the image. The gastroenterologist based on the information provided by imaging techniques take therapeutic decisions (maintenance or changes in treatment).

Results

Based on information provided by imaging techniques, treatment was remained at 31 episodes and changed in 69 episodes: intensification (n = 52) or decreased (n = 4) of treatment, surgery (n = 10) or drainage (n = 3). The information from both techniques was similar in 85% of episodes. In 7 cases ultrasound determined the treatment by detection of stenosis (n = 2), fistula (n = 2) or persistence of activity (n = 3). In 8 cases MRI determined the treatment by detection of stenosis (n = 3), fistula (n = 1), abscess (n = 1) or persistent activity (n = 3).

Conclusion

There are no differences in clinical decision about regarding treatment based on the information provided by ultrasound and contrast entero-MRI in patients with Crohn’s disease.

Clinical Relevance/Application

Cross-sectional imaging techniques add information to clinical management in patients with Crohn’s disease and alter the treatment plans in more than half of patients. There are no differences between the information provided by CEUS and MR enterography in the decision to perform therapeutic changes.
**Assessment of Liver and Pancreas PDFF with a 3.0 T MRI Multi-Echo Chemical Shift Gradient Echo Single Breath-hold Sequence, in Diffuse Liver Disorders: Correlation with Anthropometric Data and Liver Biopsy**

**PURPOSE**
Liver steatosis is the hallmark of NAFLD, but is also present in several diffuse liver diseases. Pancreas lipomatosis may be related with liver steatosis in patients with obesity and insulin resistance. Our purpose was to assess PDFF of the liver and pancreas, with a Multi-Echo Chemical Shift Gradient Echo (MECSh) single breath-hold MR sequence in patients with diffuse liver diseases, to compare the PDFF values with liver biopsy and anthropometric data, and also to evaluate the relationship between both organs.

**METHOD AND MATERIALS**
In this prospective study, consecutive patients with diverse diffuse liver disorders and clinically indicated liver biopsy were recruited. To estimate PDFF, a 3T MR single breath-hold MECSh GRE sequence with 12 echoes was used. Quantification was performed with magnitude and phase reconstruction, T1 and T2* bias correction. ROIs were placed in the biopsied liver segment and in 3 pancreatic regions (head, body, tail). Liver biopsy was used to grade liver steatosis (0-3).

**CONCLUSION**
In patients with diffuse liver disorders, there is an excellent correlation between liver PDFF and liver biopsy quantifications. A significant relationship was also found between pancreas PDFF and both liver PDFF and histologic steatosis grade.

**CLINICAL RELEVANCE/APPLICATION**
MECSh GRE MR imaging allows to evaluate liver and pancreas fatty deposits, which may be relevant in patients with diffuse liver disorders.

**The Application of 3.0T MR Intravoxel Incoherent Motion Imaging and Diffusion Weighed Imaging in Preoperative Diagnosis of Lymph Node Metastatic of Rectal Carcinoma**

**PURPOSE**
To evaluate the clinical value of Intravoxel Incoherent Motion imaging (IVIM) sequence in the diagnosis of lymph node metastatic of rectal carcinoma.

**METHOD AND MATERIALS**
87 lymph nodes from sixty-two rectal carcinoma patients with IVIM sequence (b=0,25,50,75,100,150,200,400,600,800,1000,1200,1500 and 2000 s/mm²) at 3.0T MR scanner and pathology data were collected. The parameter of IVIM(standard ADC, D, D* and f values) and the DWI signal strength value with b=1000 s/mm² (S1000) in non-metastatic lymph nodes and metastatic lymph nodes were measured and calculated. Pathology findings and MR sequence were compared.

**RESULTS**
There were 25 metastatic lymph nodes was found in 62 patients. The standard-ADC=(0.795 ±0.23)×10-3 s/mm²,D=(0.649 ±0.11)×10-3 s/mm²,D*=(4.79±2.38)×10-3 s/mm²,f=(0.27±0.09) % and S1000=211.75±35.66 in metastatic lymph nodes;the standard-ADC=(0.995 ±0.34)×10-3 s/mm²,D=(0.787 ±0.19)×10-3 s/mm²,D*=(4.86±5.40)×10-3 s/mm²,f=(0.33±0.33) % and S1000=211.75±35.66 in non-metastatic lymph nodes. The difference of standard-ADC value and S1000 value of metastatic lymph nodes were measured and calculated. Pathology findings and MR sequence were compared. The difference of metastatic lymph nodes and non-metastatic lymph nodes were compared by paired-samples t test.

**CONCLUSION**
IVIM sequence can reveal standard ADC, D, D*, f and signal strength values ,they are helpful for diagnose metastatic lymph node.

**CLINICAL RELEVANCE/APPLICATION**
IVIM sequence is helpful for diagnose metastatic lymph node.
PURPOSE
To evaluate the prognostic role of MR elastography (MRE) in patients with HCC treated by hepatic resection

METHOD AND MATERIALS
From January 2012 to June 2013, 83 patients with HCCs initially treated by hepatic resection who had Child class A liver cirrhosis underwent liver MRE before surgery. Hepatic stiffness (HS) values were measured by one experienced abdominal radiologist using MRE. After surgery, follow-up laboratories as well as imaging tests were carefully reviewed for the detection of developing postoperative liver decompensation defined as follows: increased bilirubin level more than 3mg/dL; development of ascites or encephalopathy. HS values were compared between two groups (i.e., patient with/without postoperative decompensation) by Mann-Whitney U test. The receiver operating characteristic (ROC) analysis was used for evaluating diagnostic performance of HS value for predicting postoperative decompensation. After a mean follow-up of 24.2 ± 8.7 months, we also analyzed the overall survival after hepatic resection by evaluating the prognostic factors using the Kaplan-Meier method and Cox proportional hazard regression model.

RESULTS
After hepatic resection, 15 of 83 patients (18.1%) experienced postoperative decompensation. The HS value in patients with decompensation was significantly higher than those in patients without decompensation (3.82Kpa vs. 2.96Kpa, P=0.002). In ROC analysis, area under the curve of HS value was 0.756 (P=0.002) for predicting postoperative decompensation. Thirteen patients had the HS value more than 4Kpa, and the estimated 1,3-year survival in these patients were 84.6%, and 65.8%, respectively. In contrast, the estimated 1,3-year survival in 70 patients with HS value < 4Kpa were 97.0% and 95.4%, respectively: this difference was significant (P=0.003). In multivariate Cox hazard regression model, HS value > 4Kpa was the only significant affecting factor for overall survival.

CONCLUSION
HS values could predict the development of postoperative decompensation after hepatic resection for HCC. Furthermore, HS value > 4Kpa was significant affecting factor for overall survival after hepatic resection.

CLINICAL RELEVANCE/APPLICATION
HS value measured by using MRE can provide important prognostic information for patients with hepatocellular carcinoma treated by hepatic resection.
TABLE OF CONTENTS/OUTLINE

1. Description of postoperative changes of two surgical variants of CPD: 1.1 Classic Whipple procedure. 1.2 Pylorus-preserving Whipple procedure. 2. Remembrance of normal postoperative inflammatory findings in CT that radiologist should not misinterpret as tumor recurrence or as an abnormal inflammatory process. 3. Review of most common postoperative complications: 3.1 Pancreatic fistula. 3.2 Leaks from the anastomosis. 3.2.1 Leaks from the gastrojejunostomy. 3.2.2 Leaks from the biliary-enteric anastomosis. 3.3 Delayed gastric emptying. 3.4 Abscesses. 3.5 Peritonitis. 3.6 Pancreatitis. 3.7 Hemorrhage. 3.8 Venous thrombosis. 3.9 Hepatic infarction. 3.10 Anastomotic stricture. 3.10.1 Pancreaticojejunostomy stricture. 3.10.2 Choledochojejunosotmy stricture. 3.10.3 Gastrojejunostomy stricture. 3.11 Tumor recurrence.

Awards
Certificate of Merit

Participants
Qiushi Wang, MD, Indianapolis, IN (Presenter) Nothing to Disclose
Fatih Akisik, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Temel Tirkes, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Mark Tann, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Kumaresan Sandrasegaran, MD, Carmel, IN (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

1. To become familiar with the surgical procedure and postoperative anatomy of pancreas transplantation with enteric drainage.
2. To recognize post-operative complications.
3. To understand the indications and limitations of multi-modality imaging for evaluation pancreas transplantation.

TABLE OF CONTENTS/OUTLINE

1. To review the surgical techniques and postoperative anatomy of pancreas transplantation with enteric drainage.
2. To illustrate the normal imaging appearance of pancreas transplants with enteric drainage.
3. To demonstrate the spectrum of postoperative pathologic findings: including pancreatic abnormalities, vascular abnormalities, enteric abnormalities, rejection and miscellaneous.
4. To discuss the strengths and limitations of US, CT, and MR imaging in evaluation of pancreas transplantation.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Fatih Akisik, MD - 2014 Honored Educator
Temel Tirkes, MD - 2013 Honored Educator
Temel Tirkes, MD - 2014 Honored Educator
Kumaresan Sandrasegaran, MD - 2013 Honored Educator
Kumaresan Sandrasegaran, MD - 2014 Honored Educator

G0251-ED-SUA09 Postoperative Anatomy and Pathologic Findings of Pancreas Transplantation with Enteric Drainage: A Radiological Review

Hardcopy Backboard

Participants
Michael J. Carter, MD, Ann Arbor, MI (Presenter) Nothing to Disclose
Ashish P. Wasnik, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Matthew S. Davenport, MD, Cincinnati, OH (Abstract Co-Author) Book contract, Wolters Kluwer nv; Book contract, Reed Elsevier;
Mahmoud M. Al-Hawary, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Aaron M. Udager, MD, PhD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

1. Small bowel masses identified on imaging are often indeterminate, necessitating definitive characterization with tissue sampling.
2. The aim of this presentation is to briefly review small bowel anatomy and commonly encountered benign and malignant pathologies with imaging and histopathologic examples.
3. Emphasis will be given on description of key imaging features that may affect clinical approach in managing these cases (like endoscopic evaluation versus surgical section).
4. The learner will be able to identify small bowel pathologies and communicate the key imaging features to clinicians for optimal management.

TABLE OF CONTENTS/OUTLINE

1. Brief review of small bowel anatomy and commonly encountered small bowel pathologies.
2. Presentation of small bowel mass imaging features with histopathologic correlation.
3. Entities that will be discussed include but are not limited to small bowel adenocarcinoma, lymphoma, gastrointestinal stromal tumor, carcinoid, melanoma, lipoma, lymphangiomata, heterotopic pancreas, metastases, vascular malformation and mass-like artifact.
4. The role of imaging in dictating clinical management and predicting the best approach to tissue diagnosis, including precise anatomic location, length of bowel involved, location within the bowel layer, and associated complications (obstruction, intussusception, bleeding).
**GI334-SD-SUB1**

**Prediction of Postoperative Bleeding Due to Abnormality of Gastroduodenal Artery Stump after the Whipple Procedure**

**Station #1**

Participants
Elena K. Korngold, MD, Portland, OR (Moderator) Nothing to Disclose

Sub-Events

**PURPOSE**
To evaluate CT manifestations in patients with hemorrhage due to abnormality of gastroduodenal artery (GDA) stump after the Whipple surgery and to assess the risk factors predictive of these hemorrhage.

**METHOD AND MATERIALS**
This study included 152 retrospectively identified patients undergone Whipple surgery. The hemorrhage due to abnormality of GDA stump was diagnosed by CT or angiographic findings including sentinel clot sign, contrast extravasation or pseudoaneurysm. Two radiologists reviewed CT images within 7 days after surgery, including fluid or abscess in abdominal and pelvic cavity and their density, fluid along hepaticojejunostomy (HJ) and pancreaticojejunostomy (PJ), inhomogeneous arterial enhancement of liver, and diameter of common hepatic artery and visible GDA stump. Variation of celiac trunk and the ratio of common hepatic artery and GDA on preoperative CT were also assessed. Laboratory data including amylase, lipase, CRP and total cholesterol and tumor size reported on pathologic report were reviewed and recorded. Simple and multivariate logistic regression analyses were performed to identify independent clinical and imaging variables associated with postoperative bleeding by abnormality of GDA stump.

**RESULTS**
Seventeen of the 152 patients (11%) showed hemorrhage due to abnormality of GDA stump (either pseudoaneurysm or active extravasation). Of the 17 patients with bleeding, 12 exhibited sentinel clot sign and 13 exhibited contrast extravasation on CT. Intraluminal and extraluminal hematoma were noted in six (35.3%) and nine (52.9 %) patients, respectively. Although the results of the univariate analysis showed that fluid collection in abdominal and pelvic cavity, fluid near the HJ or PJ, abscess and larger size of GDA stump were associated with bleeding, multivariate analysis revealed that only size of the stump correlated with the GDA stump bleeding (p<0.001).

**CONCLUSION**
Postoperative hemorrhage after the Whipple procedure is a well-known complication. The GDA stump size seen on postoperative CT may represent an independent marker for bleeding from GDA stump, requiring intensive postoperative follow up.

**CLINICAL RELEVANCE/APPLICATION**
CT after Whipple surgery could play an important role in predicting and assessing complications.

**GI335-SD-SUB2**

**Clinical Impact of MR Defecography**

**Station #2**

Participants
Neeraj Lalwani, MD, Seattle, WA (Presenter) Nothing to Disclose
Peyvand Pordeli, MD, New Westminster, BC (Abstract Co-Author) Nothing to Disclose
Malak Itani, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
To evaluate the role of MR Defecography in the management of patients presenting with constipation and difficulty in defecation with particular attention to the subgroup presenting with suspected dyssynergia and functional constipation on clinical grounds. How MR Defecography affected the patient’s management and differentiated surgical vs. non-surgical cases.

**METHOD AND MATERIALS**
Approximately 46 patients with history of constipation or obstructed defecation presenting to gastroenterology or urogynecology clinics in our institution from September of 2012 to May 2014 were retrospectively evaluated. Clinical data recorded from the charts include clinical notes and assessment and plan documented by the clinician before and after MRI. MRIs were evaluated for imaging findings suggestive of dyssynergia or functional constipation including ability to evacuate, presence of paradoxical contraction of puborectalis or non-relaxing external sphincter, inadequate defecatory propulsion. Presence of additional pelvic floor abnormalities like cystocele, urethral hypermobility, uterine or cervical descent, enterocele/peritoneocele, rectocele and rectal intussusception
were also documented. Imaging findings were correlated with other clinical investigations including manometry, EMG or balloon expulsion test if available. Sensitivity, specificity, positive and negative predictive values and accuracy for the diagnosis of dyssynergic defecation were calculated. Clinical plan before and after MR defecography was compared without consideration of the MRI results by two different blinded observers. Data how MR Defecography impacted the patient management was obtained if patient underwent surgical treatment based on MR investigation.

RESULTS
MR defecography has impacted the management of 32 patients (69%) out of 46. This impact has been mostly in the form of including or excluding structural abnormality seen at the time of defecation which precludes or requires surgical treatment.

CONCLUSION
MR defecography not only provides anatomical overview of the lower GI tract it provides important information regarding the functional status of the defecation and hence has a major role in the management of these patients.

CLINICAL RELEVANCE/APPLICATION
MR Defecography can segregate surgical vs. non-surgical candidate. Diagnosis of dyssynergia on MR Defecography has high overall accuracy.

GI337-SD-SUB4 Role of MRI in Predicting Pathological Response to Neoadjuvant Chemoradiation Therapy in Locally Advanced Rectal Cancer

Participants
Anna Palmisano, MD, Milan, Italy (Presenter) Nothing to Disclose
Francesco A. De Cobelli, MD, Milan, Italy (Abstract Co-Author) Nothing to Disclose
Antonio Esposito, MD, Milan, Italy (Abstract Co-Author) Nothing to Disclose
Gabriele Ioni, Milan, Italy (Abstract Co-Author) Nothing to Disclose
Paolo Passoni, Milan, Italy (Abstract Co-Author) Nothing to Disclose
Alessandro Del Maschio, MD, Milan, Italy (Abstract Co-Author) Nothing to Disclose

PURPOSE
Magnetic resonance imaging is commonly used in post-neoadjuvant evaluation of local advanced rectal cancer (LARC). There is a growing interest in the identification of early markers of response to therapy in order to plan a tailored therapy to improve therapeutical success. Aim was to evaluate the performance of multiparametric-MRI in the early assessment of LARC response to neoadjuvant CT-RT.

METHOD AND MATERIALS
42 pts with LARC underwent 1.5T MRI before the beginning of CT-RT (preMRI), after 6 week of treatment (midMRI), and at the end of CT-RT (postMRI). High-resolution axial-T2w sequences were acquired, cancer volume manually segmented and the percentage of volume modification evaluated (ΔV). In a subset of 20 patients also DWI sequences and DCE-MRI studies were acquired. ADC and Ktrans, and the percentage of their modification over time was assessed. All patients underwent surgical intervention and histopathological Tumor Regression Grade (TRG) evaluated. Patients with TRG=0-2 were considered Non-Responder (NR), with TRG=3-4 Responder (R).

RESULTS
Based on TRG, 31 Patients were R and 11 NR. ΔV at postMRI was significantly higher in responders (R: 67±17% vs NR: 28±19%, p<0.01). In subset of responders, 11/31 had TRG=4 and 20/31 TRG=3; At midMRI ΔV was higher in TRG=4 than TRG=3 (83±14% vs 58±14%, p=0.002), while ΔV at the end of treatment was not different in relation to TRG 3 or 4. ΔV <30% at mid-MRI predicted the absence of response to treatment (TRG 0-2) with a sensitivity of 97%. Moreover, ΔADC at midMRI showed a significant inverse correlation with TRG (R -0.516 p <0.05). No correlations with TRG were found for ΔKtrans both at mid and postMRI.

CONCLUSION
Volume and ADC modifications obtained during neoadjuvant chemoradiation, at midMRI, may represent a feasible and reliable tool to assess tumor response for local advanced rectal cancer.

CLINICAL RELEVANCE/APPLICATION
MRI at 6 weeks after CT-RT may discriminate degree of response to therapy, and, therefore, may help to early identify NR patients in order to candidate them to more intensive or alternative treatment.

GI338-SD-SUB5 Liver Imaging Reporting and Data System (LI-RADS) v2014 with Gadoxetic Acid-enhanced MR Imaging: Outcome Analysis in LI-RADS Category 4 and 5 Criteria

Participants
Sang Hyun Choi, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Jae Ho Byun, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
So Jung Lee, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
So Yeon Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Hyung Jin Won, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Yong Moon Shin, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Pyo Nyun Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

PURPOSE
To evaluate the outcome of the Liver Imaging Reporting and Data System (LI-RADS) v2014 category 4 and 5 criteria on gadoxetic acid-enhanced magnetic resonance imaging (MRI) in patients with chronic liver disease
METHOD AND MATERIALS
From January 2012 to December 2012, 412 patients with chronic liver disease who had newly detected hepatic nodules 3.0 cm or smaller in diameter on initial gadoxetic acid-enhanced MRI were included. A LI-RADS category was retrospectively assigned to each nodule detected on MRI. Final diagnosis was assessed using pathologic diagnosis only (operation or core-needle biopsy) and pathologic and clinical diagnosis (marginal recurrence after treatments or interval change of the lesion on follow-up imaging). For the outcome analysis of LI-RADS category 4 and 5 criteria, positive-predictive value (PPV) and false-positive rate (FPR) for diagnosing hepatocellular carcinoma (HCC) were compared. Local recurrence rate (LRR) between the two category nodules was also compared.

RESULTS
297 nodules and 295 nodules were classified into the LI-RADS category 4 and category 5, respectively. Using pathologic diagnosis only, the PPV for category 5 criteria was significantly higher than that for category 4 criteria (92.5% versus 81.0%, P=.008), with showing a significantly lower FPR (7.5% versus 19.0%, P=.008). Using pathologic and clinical diagnosis, the PPV for category 5 criteria was significantly higher than that for category 4 criteria (92.5% versus 77.0%, P<.001). The overall LRR for category 5 nodules was not significantly different from that for category 4 (17.8% versus 23.4%, P=.108).

CONCLUSION
In patients with chronic liver disease, LI-RADS category 5 criteria on gadoxetic acid-enhanced MRI had a high PPV for the diagnosis of HCC and its nodule showed a similar LRR to category 4 nodule after treatments.

CLINICAL RELEVANCE/APPLICATION
On gadoxetic acid-enhanced MRI, LI-RADS v2014 category 5 criteria are useful for diagnosing HCC in patients with chronic liver disease, whereas LI-RADS category 4 criteria are not.
Awards
Certificate of Merit

Participants
Matthew Peckham, MD, Worcester, MA (Presenter) Nothing to Disclose
Young Hwan Kim, MD, Worcester, MA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Differentiating between interstitial edematous pancreatitis and acute necrotizing pancreatitis. Characterizing pseudocyst vs walled off necrosis. Illustration of different treatment options.

TABLE OF CONTENTS/OUTLINE
A Case-based discussion of the imaging features that separate interstitial edematous pancreatitis and acute necrotizing pancreatitis. Discussion of CT, MRI and US imaging finding of acute peripancreatic collections, pseudocysts, acute necrotic collections, and walled off necrosis (WON). Once established diagnosis will be used to select intervention whether: CT guided percutaneous drainage, endoscopic pancreatic stent placement, or endoscopic cystogastrostomy/necroctomy.

Current Anticoagulant Management for Percutaneous Liver Biopsy

Participants
Richard H. Marshall JR, MD, New Orleans, LA (Presenter) Nothing to Disclose

TEACHING POINTS
This review of recent literature and guidelines describes mechanisms of action of both old, well known anticoagulants and newer agents that have gained popularity and are more frequently encountered. This manuscript provides a synopsis of available guidelines and data and provides recommendations for management of anticoagulants. Where data is sparse, the authors make recommendations based on opinion to provide the reader with a guideline in these situations. A chart provides a succinct reference for the reader understand these medications and management related to percutaneous liver biopsy.

TABLE OF CONTENTS/OUTLINE
1. Introduction
2. Description of Classes of Anticoagulants
   A. Vitamin K Inhibitors
      a. Mechanism of action
      b. Available data
      c. Recommendations
   B. Factor IIa and Xa Inhibitors (Heparins)
      a. Mechanism of action
      b. Available data
      c. Recommendations
   C. Indirect Factor Xa Inhibitors
      a. Mechanism of action
      b. Available data
      c. Recommendations
   D. Direct Thrombin Inhibitors
      a. Mechanism of action
      b. Available data
      c. Recommendations
3. Antiplatelet Agents
   A. Mechanism of action
   B. Available data
   C. Recommendations
4. Non-Steroidal Anti-Inflammatory Agents
5. Conclusion
MR Techniques in GI Cancers
Sunday, Nov. 29 2:00PM - 3:30PM Location: E352

Liver Specific Contrast Agents

Participants
Giuseppe Brancatelli, MD, Palermo, Italy, (gbranca@yahoo.com) (Presenter) Speaker, Bayer AG

LEARNING OBJECTIVES
1) Describe the mechanism of action of liver specific contrast agents. 2) Understand the added value of liver-specific contrast agents in the characterization of focal liver lesions. 3) Identify the most common pitfalls and limitations of liver specific contrast agents.

ABSTRACT

Diffusion-weighted Imaging

Participants
Ihab R. Kamel, MD, PhD, Baltimore, MD (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Discuss the basic concepts for DWI in body applications. 2) Describe the emerging role of DWI in assessing response in cancer. 3) Discuss the application of DWI in whole body imaging.

MR Perfusion

Participants
Hersh Chandarana, MD, New York, NY (Presenter) Equipment support, Siemens AG; Software support, Siemens AG; Consultant, Bayer, AG;

LEARNING OBJECTIVES
1) Understand basic principles of Perfusion Weighted Imaging (PWI) 2) Understand steps involved in performing PWI 3) Clinical applications and limitations will be highlighted.

ABSTRACT

PET MR

Participants
Alexander R. Guimaraes, MD, PhD, Portland, OR (Presenter) Speakers Bureau, Siemens AG; Expert Witness, Rice, Dolan, Kershaw

LEARNING OBJECTIVES
1) Understand the unique challenges in the physics underlying PET/MRI. 2) Understand the unique role of PET/MRI in diagnosing and staging GI Malignancies. 3) Understand the potential future role of PET/MRI in both diagnosing GI malignancies and in assessing novel therapeutic response.

ABSTRACT
Pediatric MR: Normal or Not?

Sunday, Nov. 29 2:00PM - 3:30PM Location: N228

Participants
Geetika Khanna, MD, MS, Iowa City, IA (Moderator) Nothing to Disclose

LEARNING OBJECTIVES
1) Differentiate normal and abnormal signal intensity patterns of abdominal structures in children. 2) Recognize normal developmental variants that can simulate abdominal pathology.

ABSTRACT

In pediatric neuroradiology, magnetic resonance imaging is used to assess central nervous system (CNS) disease in the infant, child, and teenager. This requires 1) an understanding of normal brain development and maturation from gestation through adolescence; 2) a technical mastery of the neuroimaging techniques that are used in evaluating brain diseases of childhood; and 3) an overall grasp of the imaging features of numerous brain pathologies, both acquired and congenital. This lecture will focus on the common MR imaging features of the normal pediatric brain and spine and will compare and contrast with MR imaging features in specific brain diseases and disorders of development.

Participants
Nancy A. Chauvin, MD, Philadelphia, PA, (chauvinn@email.chop.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Describe the MR appearance of normal marrow conversion in the developing skeleton. 2) Identify common pediatric marrow pitfalls that might be mistaken for pathology. 3) Describe the MR appearance of common bone marrow abnormalities in children.

Participants
Tina Y. Poussaint, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Assess MR features associated with normal brain and spine development and maturation. 2) Identify abnormal MR imaging features associated with specific brain diseases and disorders of development in childhood.

Participants
Geetika Khanna, MD, MS, Iowa City, IA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Differentiate normal and abnormal signal intensity patterns of abdominal structures in children. 2) Recognize normal developmental variants that can simulate abdominal pathology.
Modern Non-invasive Imaging of Cholestatic Liver Diseases

Sunday, Nov. 29 2:00PM - 3:30PM Location: S404AB

LEARNING OBJECTIVES

1) Describe MRI; MRCP techniques for evaluating biliary disease. 2) List applications in malignant biliary disease. 3) List applications in benign conditions of the biliary tract.

ABSTRACT

This workshop is designed to review the broad spectrum of morphologic and functional features encountered in patients with cholestatic liver diseases involving the intrahepatic and extrahepatic bile ducts and adjacent liver parenchyma, in correlation with the histopathologic hallmark of this group of diseases the so-called “vanishing duct sign. We will start by explaining the role of various different imaging modalities including invasive endoscopic retrograde cholangiopancreatography (ERCP) and non-invasive conventional T2 weighted magnetic resonance cholangiography (MRCP) as well as gadoxetic acid-enhanced T1 MRCP and diffusion weighted images to expedite the evaluation of patients with known or suspected cholestatic liver diseases. Next, we will discuss the broad spectrum of biliary disorders that define cholestatic liver diseases including: primary sclerosing cholangitis (PSC), primary biliary cirrhosis (PBC), ischemic cholangiopathy, chronic rejection following liver transplant, drug-induced liver injury (DILI), infectious secondary cholangitis, cystic fibrosis (CF), etc.
**Participants**
Ronald L. Arenson, MD, San Francisco, CA *(Presenter)* Nothing to Disclose

**Sub-Events**

**PS12A**  
**Report of the RSNA Research and Education Foundation**

**Participants**
Burton P. Drayer, MD, New York, NY *(Presenter)* Advisor, Hologic, Inc

**Abstract**
The RandE Foundation - Our Future is Now  
This year marks the 100th anniversary of the RSNA's founding. As radiology looks toward the future, one wonders what the next 100 years will look like for our specialty and whether the central role of radiologists in healthcare will be sustained. Analogous to our clinical radiology mantra, if we are not at the radiology research table we will be on the menu. As a leading global force in radiology, the RSNA is poised to lead the specialty into the next century and exceed the incredible success of the past 100 years. The RandE Foundation will play a key role in radiology's future by continuing its support of inspiring investigators and those pursuing innovative approaches to education. To meet these research and education needs head-on, the Foundation launched Inspire-Innovate-Invest, The Campaign for Funding Radiology's Future® at last year's annual meeting. This bold campaign seeks to raise $17.5 million to fund grants in radiologic research and education, bridging the gaps in funding for promising investigators and educators. To date our campaign has been a success with individuals, private practice and corporate donors generously pushing us to the mid-way point in our goal. There is still a long way to go. The future of our specialty depends on the commitment and generosity of each of us, the members of the imaging community. This year, the Foundation will fund 92 grants totaling $3.6 million. The RandE is funding 25% of our ever increasing number of excellent grant applications. While pleased with these achievements, imagine what the RandE Foundation could fund with additional support from all of us as radiology colleagues? During the meeting week, please take time to visit the RandE Foundation Booth, located on Level 3 of Lakeside Center to learn more about how you can be a part of the campaign and support the RandE Foundation and the future robustness of our specialty.

**PS12B**  
**Image Interpretation Session**

**Participants**
Jonathan B. Kruskal, MD, PhD, Boston, MA *(Presenter)* Author, UpToDate, Inc
Donald P. Frush, MD, Durham, NC *(Presenter)* Nothing to Disclose
Bruce B. Forster, MD, Vancouver, BC *(Presenter)* Travel support, Siemens AG; Travel support, Toshiba Corporation;
Christine M. Glastonbury, MBBS, San Francisco, CA *(Presenter)* Author with royalties, Reed Elsevier
Michelle M. McNicholas, MD, Dublin, Ireland *(Presenter)* Nothing to Disclose
Melissa L. Rosado De Christenson, MD, Kansas City, MO *(Presenter)* Author, Thieme Medical Publishers, Inc; Author, Reed Elsevier; Author, American Registry of Pathology; Author, Oxford University Press; ; ; 
Jorge A. Soto, MD, Boston, MA *(Presenter)* Nothing to Disclose

**Honored Educators**
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Melissa L. Rosado De Christenson, MD - 2012 Honored Educator
Jorge A. Soto, MD - 2013 Honored Educator
Jorge A. Soto, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2015 Honored Educator
Jonathan B. Kruskal, MD, PhD - 2012 Honored Educator
Participants
Vincent M. Mellnick, MD, Saint Louis, MO (Presenter) Nothing to Disclose
Matthew C. McDermott, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Ryan W. Buss, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Aarti Sekhar, MD, Brookline, MA (Abstract Co-Author) Nothing to Disclose
Tarek N. Hanna, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Gayatri Joshi, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Meghan G. Lubner, MD, Madison, WI (Abstract Co-Author) Grant, General Electric Company; Grant, NeuWave Medical, Inc; Grant, Koninklijke Philips NV
Perry J. Pickhardt, MD, Madison, WI (Abstract Co-Author) Co-founder, VirtuoCTC, LLC; Stockholder, Cellestica Biosciences, Inc; Research Consultant, Bracco Group; Research Consultant, KIT; Research Grant, Koninklijke Philips NV
Lauren Saling, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
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Natalie Chen, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Rex A. Parker III, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
John J. Hines Jr, MD, New Hyde Park, NY (Abstract Co-Author) Nothing to Disclose
Melanie Wegener, Garden City, NY (Abstract Co-Author) Nothing to Disclose
Douglas S. Katz, MD, Mineola, NY (Abstract Co-Author) Nothing to Disclose
Lori M. Gettle, MD, MBA, Hummelstown, PA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1) Each GI case of the day will be taken from disorders of the luminal GI tract as well as the liver, spleen, pancreas, and biliary system. The findings may be uncommon manifestations of common diseases or common manifestations of uncommon diseases.

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Meghan G. Lubner, MD - 2014 Honored Educator
Meghan G. Lubner, MD - 2015 Honored Educator
Perry J. Pickhardt, MD - 2014 Honored Educator
Douglas S. Katz, MD - 2013 Honored Educator
Douglas S. Katz, MD - 2015 Honored Educator
RSNA Diagnosis Live™: 'Bo you don't know Didley' - Test Your Diagnostic Skills at the Crack of Dawn

Monday, Nov. 30 7:15AM - 8:15AM Location: E451B

CA  GI  HN  MK  NR

AMA PRA Category 1 Credit ™: 1.00  ARRT Category A+ Credit: 1.00

Participants
Adam E. Flanders, MD, Penn Valley, PA (Presenter) Nothing to Disclose
Christopher G. Roth, MD, Philadelphia, PA (Presenter) Nothing to Disclose
Sandeep P. Deshmukh, MD, Philadelphia, PA, (sandeep.deshmukh@jefferson.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) The participant will be introduced to a series of radiology case studies via an interactive team game approach designed to encourage "active" consumption of educational content. 2) The participant will be able to use their mobile wireless device (tablet, phone, laptop) to electronically respond to various imaging case challenges; participants will be able to monitor their individual and team performance in real time. 3) The attendee will receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.
Controversy Session: Enteral Contrast for CT...High or Dry?

Monday, Nov. 30 7:15AM - 8:15AM Location: E451A

Participants
Kumaresan Sandrasegaran, MD, Carmel, IN (Moderator) Nothing to Disclose

Sub-Events

SPSC20A  Pro Enteral Contrast

Participants
Perry J. Pickhardt, MD, Madison, WI (Presenter) Co-founder, VirtuoCTC, LLC; Stockholder, Cellectar Biosciences, Inc; Research Consultant, Bracco Group; Research Consultant, KIT ; Research Grant, Koninklijke Philips NV

LEARNING OBJECTIVES
1) Identify the advantages and disadvantages for the use of enteral contrast at CT. 2) Compare and contrast the various types of enteral contrast (positive, neutral, and negative). 3) Assess the appropriateness of the use of enteral contrast according to specific study indication.

ABSTRACT

N/A

URL

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Perry J. Pickhardt, MD - 2014 Honored Educator

SPSC20B  Against Enteral Contrast for Most CT Indications

Participants
Benjamin M. Yeh, MD, San Francisco, CA, (ben.yeh@ucsf.edu) (Presenter) Research Grant, General Electric Company; Author with royalties, Oxford University Press; Shareholder, Nextrast, Inc;

LEARNING OBJECTIVES
1) Review the evidence for the use and non-use of positive oral contrast material for CT will be reviewed. 2) Discuss artifacts and interpretive pitfalls arising from positive oral contrast use at CT. 3) Understand issues of patient tolerance and compliance with positive oral contrast use. 4) Explore specific scenarios where non-use of positive oral contrast outweighs the use of oral contrast will be explored, including in the emergency room setting, and when bowel pathology such as ischemia and inflammation is of concern.

ABSTRACT

As our multidetector CT technology improves and our understanding of imaging technique progresses, the use or non-use of positive oral contrast for CT imaging is evolving. Although positive oral contrast is used by the great majority of radiologists for routine CT imaging and has undisputed value, specific scenarios are emerging where positive oral contrast usage is harmful to accurate imaging diagnosis and patient care. This discussion will explore the economic, logistical, interpretive, and side effect issues of positive oral contrast usage in the modern CT practice. A re-examination of when it is appropriate not to use positive oral contrast will be discussed, and include rapid patient triage in the emergency setting, certain subsets of abdominopelvic imaging, and patient tolerance. The economic and radiation dose cost of positive oral contrast use will also be explored.

URL

Active Handout: Benjamin M. Yeh

Case-based Review of Magnetic Resonance (An Interactive Session)

Monday, Nov. 30 8:30AM - 10:00AM Location: S100AB

Participants
John R. Leyendecker, MD, Dallas, TX (Director) Nothing to Disclose

LEARNING OBJECTIVES
1) Be familiar with the MRI appearance of common musculoskeletal derangements of the hip. 2) Develop a differential diagnosis for musculoskeletal soft tissue tumors based on MRI appearance. 3) Distinguish between common benign and malignant liver neoplasms. 4) Be familiar with the typical MRI appearance of select female pelvic disorders.

ABSTRACT
This session will help attendees recognize and manage select, commonly encountered musculoskeletal and abdominopelvic abnormalities based on their MRI appearances using a case-based, interactive format.

Sub-Events

MSCM21A  Musculoskeletal MRI of the Hip and Pelvis

Participants
Mini N. Pathria, MD, San Diego, CA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.

Active Handout:

MSCM21B  MRI of Soft Tissue Masses of the Extremities

Participants
Kirkland W. Davis, MD, Madison, WI, (kdavis@uwhealth.org) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Distinguish characteristic extremity soft tissue masses on the basis of signal characteristics, such as high signal on T1-weighted images or low signal on all sequences.

ABSTRACT

MSCM21C  MRI of the Liver

Participants
Nicole M. Hindman, MD, New York, NY, (Nicole.Hindman@nyumc.org) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Recognize and analyze benign but unusual liver lesions. 2) Analyze uncommon presentations of liver lesions. 3) Recognize neoplastic mimics of benign lesions in the liver (eg, a colon metastasis mimicking a hemangioma).

ABSTRACT
This session will cover common and uncommon presentations of liver lesions on several modalities (ultrasound, CT and MRI). A brief interactive review of common, but atypical presentations of both benign and malignant liver lesions will be presented. Malignant mimics of benign liver lesions will also be shown, with features that should be analyzed in order to better characterize the lesion, and appropriately raise concern (eg, for a metastasis or intrahepatic cholangiocarcinoma instead of a benign hemangioma). Recent advances in liver lesion characterization will be covered.

MSCM21D  MRI of the Female Pelvic Organs

Participants
Christine O. Menias, MD, Scottsdale, AZ, (menias.christine@mayo.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.

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Christine O. Menias, MD - 2013 Honored Educator
Christine O. Menias, MD - 2014 Honored Educator
Christine O. Menias, MD - 2015 Honored Educator
RC209

Gastrointestinal Series: Imaging Pancreatic Diseases

Monday, Nov. 30 8:30AM - 12:00PM Location: E351

Participants
Eric P. Tamm, MD, Houston, TX (Moderator) Nothing to Disclose
Onofrio A. Catalano, MD, Napoli, Italy (Moderator) Nothing to Disclose
Mahmoud M. Al-Hawary, MD, Ann Arbor, MI (Moderator) Nothing to Disclose

Sub-Events
RC209-01 Cutting-Edge Imaging on the Pancreas

Monday, Nov. 30 8:30AM - 8:55AM Location: E351

Participants
Riccardo Manfredi, MD, Verona, Italy (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To illustrate the role of contrast enhanced sonography and then Ultrasound elastography in pancreatic imaging
   The role and utility of dual energy CT examination in pancreatic CT and the clinical utility of low voltage CT examination in detecting pancreatic focal lesions.
2) To illustrate the role of diffusion weighted imaging in detecting small pancreatic neuroendocrine neoplasms, especially in functioning neuroendocrine neoplasms.
3) To show the pancreatic response to secretin stimulation; the pancreatic duct changes following secretin stimulation.
4) To illustrate how to diagnose pancreatic outflow obstruction due to Sphincter of Oddi dysfunction.

ABSTRACT

New pancreatic diagnostic imaging technique are represented by contrast enhanced ultrasound (US), US Elastography, dual energy computed tomography (CT), perfusion CT, diffusion weighted Magnetic Resonance (MR) imaging, and secretin enhanced magnetic resonance cholangiopancreatography (S-MRCP). The role of contrast enhanced ultrasound (CEUS) in pancreatic sonography will be illustrated and its role in staging pancreatic adenocarcinoma. Ultrasound elastography is an emerging technique that is able to assess the stiffness of pancreatic parenchyma and might be helpful in diagnosis and staging chronic pancreatitis and in the differential diagnosis of focal pancreatic lesions. Dual energy CT might be useful in increasing the contrast resolution of pancreatic adenocarcinoma, and namely in diagnosing isovascular and/or small pancreatic adenocarcinomas, eventually responsible of main pancreatic duct stenosis. Diffusion weighted MR imaging is helpful in diagnosing focal pancreatic neoplasms and autoimmune pancreatitis. Its role in the abovementioned clinical settings will be discussed. MRCP is able to non-invasively assess pancreatic duct system. However in the assessment of pancreatic duct system MRCP has limitation due to the small size of the ducts. Secretin is able to improve the pancreatic duct system visualization at MRCP and at the same time is able to give functional information, since is able to physiologically stimulate the exocrine pancreas. The indication to S-MRCP and the S-MRCP signs in different pancreatic diseases will be illustrated.

Handout: Riccardo Manfredi

RC209-02 Pancreatic Mass Evaluation with Portal Venous Phase Single Energy (SE) and Dual-Energy CT (DECT)

Monday, Nov. 30 8:55AM - 9:05AM Location: E351

Participants
Andrea Prochowski Iamurri, MD, Boston, MA (Presenter) Nothing to Disclose
Manuel Patino, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Diana Murcia, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Yasir Andrabi, MD, MPH, Boston, MA (Abstract Co-Author) Nothing to Disclose
Rodrigo Canellas, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Farhad Mehrkani, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Avinash R. Kambadakone, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Dushyant V. Sahani, MD, Boston, MA (Abstract Co-Author) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc

PURPOSE

Pancreatic mass evaluation with CT often dictates multi-phase acquisition and focused CM injection protocols for optimal detection and staging. Our objective was to investigate if the gain in the CNR from material density iodine images from ssDECT in portal venous phase is sufficient for pancreatic mass evaluation.

METHOD AND MATERIALS

In the IRB approved analysis, 143 patients with pancreatic masses and 10 controls (CC) were included; 100 with pancreatic ductal adenocarcinoma (PDAC), 16 with neuroendocrine tumors (pNET), 7 malignant cystic lesions (mCL), 5 metastasis (MTx), 5 focal pancreatitis (AP) and 10 splenules (SPL). Portal-phase ssDECT (GE) of the abdomen was performed. 140 kV single energy (SE) and material decomposition iodine images (MD-I) images were reviewed by two blinded readers for lesion detection, size, diagnosis, stage using a 5-point confidence scale. ROIs were placed in the aorta and lesions for estimating mean iodine concentration (MIC)
and normalized iodine concentrations (NIC). Surgical findings in 128 cases and EUS/FNA and or FU in 15 cases served as a reference standard.

RESULTS

All 153 portal-phase DECT exams were rated of diagnostic quality and sufficient for rendering interpretation in 151/153 (98.7%) with high overall confidence (R1 4.4 and R2 4.5). The SECT images were considered adequate in 138/153 (90.1%) exams with low overall diagnostic score and confidence (R1 3.8 and R2 3.5) (p<0.001, p<0.001). 4 pNET, 6 PDAC and 2 solid masses in mCL were not reliably recognized on SECT but detected on DECT (p<0.05). 14/143 (9.8%) lesions measured < 2cm in diameter and 11/14 (78.6%) were confidently detected on the MD-I in comparison to 6/14 (42.9%) detected on SECT (p>0.005). In PDAC group, 6 patients were incorrectly down staged on SECT. Agreement between readers resulted almost perfect (κ = 0.81-1). The mean NIC were for PDAC 0.35±0.1, pNET 0.71±0.1, mCL 0.32±0.01, MTx 0.37±0.2, AP 0.55±0.3, SPL 0.66±0.1 and CC 0.50±0.1.

CONCLUSION

ssDECT enables more confident evaluation of pancreatic masses including small lesions and staging over SECT in a single portal phase acquisition. Quantitative analysis showed differences of iodine distribution in each type of lesion.

CLINICAL RELEVANCE/APPLICATION

These results lend opportunity to simplify pancreas CT protocol for easier workflow and lower radiation dose without negatively impacting the diagnostic performance.

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Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator

RC209-03 Detection of Small Neuroendocrine Tumors by Pancreatic 3T MRI in Patients with Endogenous Hyperinsulinemic Hypoglycemia: A Prospective Study in Comparison to Glucagon-like Peptide-1 Receptor Imaging

Monday, Nov. 30 9:05AM - 9:15AM Location: E351

Participants

Kwadwo Antwi, Basel, Switzerland (Presenter) Nothing to Disclose
Daniel Boll, Basel, Switzerland (Abstract Co-Author) Nothing to Disclose
Christoph J. Zech, MD, Basel, Switzerland (Abstract Co-Author) Research Grant, Bayer AG Speaker, Bayer AG Travel support, Bayer AG Advisory Board, Bayer AG Speaker, Bracco Group Travel support, Bracco Group
Elmar M. Merkle, MD, Basel, Switzerland (Abstract Co-Author) Nothing to Disclose
Damian Wild, MD, Basel, Switzerland (Abstract Co-Author) Nothing to Disclose
Tobias Heeke, MD, Basel, Switzerland (Abstract Co-Author) Nothing to Disclose
Emanuel Christ, Bem, Switzerland (Abstract Co-Author) Nothing to Disclose
Melpomeni Fani, PhD, Basel, Switzerland (Abstract Co-Author) Nothing to Disclose
Guillaume Nicolas, Basel, Switzerland (Abstract Co-Author) Nothing to Disclose

PURPOSE

To evaluate pancreatic 3T MRI in the detection of small neuroendocrine tumors in comparison to Glucagon-like Peptide-1 receptor (GLP1-R) imaging by 68Ga-DOTA Exendin-4 Positron emission computed tomography (PET/CT) and/or surgery.

METHOD AND MATERIALS

This is an IRB approved, HIPAA compliant prospective study. In this interim analysis (32 patients planned) 18 consecutive patients with endogenous hyperinsulinemic hypoglycemia highly suspicious for an insulinoma and 2 healthy controls (13 female; 7 male; mean 56 yrs; range 18-80 yrs.) were included. Patients first underwent pancreatic MR imaging using a 3T MRI scanner (Magnetom Prisma, Siemens Healthcare) including T1w, T2w, diffusion weighted imaging (DWI) and dynamic contrast enhanced (DCE) sequences. PET/CT (Discovery STE, GE Healthcare) 2.5h after intravenous administration of 68Ga-DOTA Exendin-4 (all patients) and surgery in 14 patients served as reference standard. Three expert readers with >10 years of experience in abdominal radiology analyzed MRI in a blinded fashion. Presence and size of lesions were determined by 2 different readers in consensus using MRI and PET/CT results.

RESULTS

A total of 23 lesions were identified (mean size 12mm; range 3-25mm) by PET/CT. The overall MRI sensitivity and specificity was 82.1% and 44.4%, respectively (reader A: 69.6%; 60.0%; reader B: 81.8%, 33.3%; reader C: 95.5%; 42.9%). Signal characteristics of detected lesions were as follows: GRE 3D T1wo FS 100% hypointense; TSE T2w 85.7% hyperintense; 14.3% hypointense; high b-value DWI hyperintense 90.9%; 9.1% hypointense; DCE: 67.4% early hyperenhancing, 30.4% late hyperenhancing, 2.2% hypoenhancing. Consensus reading in correlation with PET/CT data showed all 23 lesions are discernible on MRI.

CONCLUSION

Focused pancreatic MRI is able to visualize small lesions in patients with suspected insulinomas with a sufficient detection rate. Although most lesions revealed typical reported signal characteristics few showed a different pattern which may explain failed detection. While MRI is not specific in lesion characterization it offers precise lesion localization when combined with a specific method such as Glucagon-like Peptide-1 receptor imaging.

CLINICAL RELEVANCE/APPLICATION

The combination of 3T MRI and GLP1-R PET/CT changed clinical management in 14 of 18 patients in which previous diagnostic procedures were not able to localize any lesion.
RC209-04 Pancreas Cancer

Monday, Nov. 30 9:15AM - 9:40AM Location: E351

Participants
Eric P. Tamm, MD, Houston, TX (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Understand the current status of staging pancreatic cancer, the impact of cross-sectional imaging on staging, and understand the category of ‘borderline resectable pancreatic cancer.’ 2) Appreciate the impact of advances in vascular reconstruction surgery on staging and surgical planning. 3) Have a basic understanding of neoadjuvant therapy, and its impact on staging.

ABSTRACT
Because of recent advances in surgical technique and preoperative therapy, it has become useful for clinicians to group pancreatic cancer into categories useful for clinical trials and treatment management. Besides the clearly resectable, and clearly unresectable tumors, there has emerged the category of ‘borderline’ resectable pancreatic cancer. Classifying patients into these three categories is dependent on precise descriptions of the extent of tumor, particularly vascular involvement, as seen on cross-sectional imaging. These descriptions also depend on the use of commonly understood terminology. Understanding and appreciating new surgical techniques, advances in preoperative therapy and how this has impacted margin positivity, and therefore why it is important to describe accurately and clearly tumor involvement and how best to do that will be the focus of this lecture.

RC209-05 Diffusion-weighted MRI of the Pancreas: Optimizing b-Value for Visualization of Pancreatic Adenocarcinoma

Monday, Nov. 30 9:40AM - 9:50AM Location: E351

Participants
Yoshiihiko Fukukura, MD, PhD, Kagoshima, Japan (Presenter) Nothing to Disclose
Toshikazu Shindo, Kagoshima, Japan (Abstract Co-Author) Nothing to Disclose
Hiroyuki Hakamada, Kagoshima, Japan (Abstract Co-Author) Nothing to Disclose
Koji Takumi, Kagoshima, Japan (Abstract Co-Author) Nothing to Disclose
Yuichi Kumagae, Kagoshima, Japan (Abstract Co-Author) Nothing to Disclose
Aya Umanodan, Kagoshima, Japan (Abstract Co-Author) Nothing to Disclose
Junichi Ideue, Kagoshima, Japan (Abstract Co-Author) Nothing to Disclose
Masanori Nakajo, MD, Kagoshima, Japan (Abstract Co-Author) Nothing to Disclose
Kiyohisa Kaminura, MD, PhD, Kagoshima, Japan (Abstract Co-Author) Nothing to Disclose
Takashi Yoshiura, MD, PhD, Kagoshima, Japan (Abstract Co-Author) Nothing to Disclose

PURPOSE
To determine the optimal b-value of DWI for visualizing pancreatic adenocarcinomas.

METHOD AND MATERIALS
Fifty-five patients with histologically confirmed pancreatic adenocarcinoma underwent DWI with different b-values (b=500, 1000, 1500, and 2000 s/mm²). We evaluated DWI findings of tumors using 3-point visual scoring (type 1, clearly demarcated hyperintensity; type 2, hyperintensity with an unclear distal border; and type 3, isointensity), and measured signal intensity (SI) of the tumor and proximal or distal pancreatic parenchyma. Visual scores and SI ratios of the tumor to pancreatic parenchyma were compared between b-values of 500, 1000, 1500, and 2000 s/mm². We evaluated DWI findings of tumors using 3-point visual scoring (type 1, clearly demarcated hyperintensity; type 2, hyperintensity with an unclear distal border; and type 3, isointensity), and measured signal intensity (SI) of the tumor and proximal or distal pancreatic parenchyma. Visual scores and SI ratios of the tumor to pancreatic parenchyma were compared between b-values of 500, 1000, 1500, and 2000 s/mm². In types 2 and 3 tumors on DWI with b-value of 1000 s/mm², serum amylase levels were compared between type 1 and types 2-3 tumors on DWI with b-value of 1500 s/mm².

RESULTS
Type 1 tumors were seen in 17 (30.9%), 28 (50.9%), 42 (76.4%), and 44 patients (80.0%) on DWI with b-values of 500, 1000, 1500, and 2000 s/mm², respectively. There was a higher incidence of type 1 tumors on DWI with b-value of 1500 s/mm² than on that with b-value of 1000 s/mm² (P<.001), and on DWI with b-value of 1000 s/mm² than on that with b-value of 500 s/mm² (P<.001). There was no significant difference in the tumor to proximal pancreas SI ratio among the four b-values (P=.467). The tumor to distal pancreas SI ratio was higher with b-value of 1500 s/mm² than with b-value of 1000 s/mm² (P=.077), and with b-value of 1000 s/mm² than with b-value of 500 s/mm² (P=.001). Between b-values of 1500 and 2000 s/mm², there was no significant difference in the incidence of type 1 tumors (P=.083) or the tumor to distal pancreas SI ratio (P=.870). In types 2-3 tumors on DWI with b-value of 1000 s/mm², a lower frequency of abnormal serum amylase elevation was observed in patients whose SI types were changed to type 1 at b-value of 1500 s/mm² than in those whose SI types were not changed (P=.018).

CLINICAL RELEVANCE/APPLICATION
The use of b-values>=1500 s/mm² can improve the delineation of pancreatic adenocarcinomas without tumor-associated acute pancreatitis on DWI.

RC209-06 CT after Neoadjuvant FOLFIRINOX Chemotherapy for Borderline and Locally Advanced Pancreatic Adenocarcinoma

Monday, Nov. 30 9:50AM - 10:00AM Location: E351

Participants
Mathilde Wagner, MD, PhD, Paris, France (Presenter) Nothing to Disclose
Celia Margarida S. Antunes, Coimbra, Portugal (Abstract Co-Author) Nothing to Disclose
Daniel Pietresz, Creteil, France (Abstract Co-Author) Nothing to Disclose
Christophe Cassinotto, MD, Pessac, France (Abstract Co-Author) Nothing to Disclose
Magaly Zappa, MD, Clichy, France (Abstract Co-Author) Nothing to Disclose
Antonio Sa Cunha, Villejuif, France (Abstract Co-Author) Nothing to Disclose
Jean-Baptiste Bachet, Paris, France (Abstract Co-Author) Consultant, Amgen Inc Consultant, F. Hoffmann-La Roche Ltd Consultant, sanofi-aventis Group Consultant, Celgene Corporation
Olivier Luciarde, MD, Paris, France (Abstract Co-Author) Consultant, Bracco Group Consultant, F. Hoffmann-La Roche Ltd
PURPOSE
FOLFIROX is a chemotherapy regimen, which demonstrated positive impact in pancreatic adenocarcinoma. The aim of this study was to assess Computed Tomography (CT) modifications after neoadjuvant FOLFIROX chemotherapy for borderline (BR) and locally advanced (LA) pancreatic adenocarcinoma.

METHOD AND MATERIALS
Thirty-six patients (M/F = 26/10, mean age 60 ± 10) with BR and LA pancreatic adenocarcinoma who had received neoadjuvant FOLFIROX chemotherapy and had undergone surgery were retrospectively included. Baseline CT and pre-surgical CT were reviewed by two radiologists in consensus. All lesions were classified according to NCCN classification by the radiologists and a pancreatic surgeon. Largest diameter, product of the 3 diameters (P3D), arterial (superior mesenteric/coeliac/hepatic arteries) and venous (superior mesenteric/portal veins) involvement (score = 0-5) were studied on both CT and compared to pathological data (TNM/type of resection R0-R1).

RESULTS
There were significant decreases of the largest diameter and of P3D (p < 0.0001) and a partial response (PR) according to RECIST was found in 17/36 patients (47%). A significantly smaller pre-surgical largest diameter and P3D were found in patients with complete R0 resection (p = 0.019/p = 0.021). The largest diameter and P3D variations were significantly higher in patients with pathological response (T0-1N0) (p = 0.004/p = 0.033). A decrease of the arterial or venous involvement was respectively found in 9 (25%) and 8 patients (22%). In the opposite progression of the vascular involvement was seen in 2 (5%) patients associated with a shorter Disease Free Survival after the surgery (p < 0.05). 31 patients had R0 resection and among them only 4 (13%) exhibited a downstaging according to NCCN classification, while 27 (87%) did not.

CONCLUSION
In BR and LA pancreatic adenocarcinoma, effects of FOLFIROX regimen are identified on CT. However, downstaging identification is rare even in case of resectable lesion.

CLINICAL RELEVANCE/APPLICATION
Despite a lack of NCCN downstaging during chemotherapy, most of BR and LA patients were R0 at surgery, suggesting that additional imaging patterns must be found to predict resectability post-chemotherapy.

PURPOSE
To compare the diagnostic performance and image features for prediction of malignant potential in intraductal papillary mucinous neoplasm of the pancreas between EUS, contrast-enhanced CT and MRI.

METHOD AND MATERIALS
76 patients with pancreatic IPMN (benign = 37, malignant = 39) underwent EUS, contrast-enhanced CT, and MRI. EUS finding was analyzed based on the formal reports and CT and MR imaging were retrospectively analyzed by two radiologists, according to the high-risk stigmata and worrisome feature proposed by the international consensus guideline 2012. Diagnostic performance of each image modalities and image features in the evaluation of the malignant potential of IPMNs were analyzed by using receiver operating curve analysis and univariate and multivariate analyses.

RESULTS
The diagnostic performance for prediction of malignant potential was comparable among contrast-enhanced CT (A(z)=0.7918 in R1, A(z)=0.8302 in R2), MRI (A(z)=0.7422 in R1, A(z)=0.7755 in R2), and EUS (A(z)=0.7328) without significant difference (p>0.05). In multivariable analysis, enhanced solid component in CT and MRI and mural nodule (OR= 1.8 in CT, OR= 1.36 in MRI, and OR= 1.47 in EUS, p < 0.05), MPD diameter >= 10mm (OR= 1.3 in CT, OR= 1.4 in MRI, and OR= 1.66 in EUS, p < 0.05), MPD diameter of 5-9mm (OR= 1.23 in CT, OR= 1.31 in MRI, p < 0.05) and thickened septae or wall (OR= 1.3 in CT and MRI, p < 0.05) were significant variables. With CT and MRI, interobserver agreement of thickened cyst wall or septum (k=0.6893-0.7884) and abrupt caliber change of MPD (k=0.5790-0.6174) was lower than that of other variables (k>0.80).

CONCLUSION
The diagnostic performance for prediction of malignant potential of pancreatic IPMN was comparable among contrast-enhanced CT, MRI, and EUS without significant difference (p>0.05). Enhanced solid component in CT and MRI and mural nodule in EUS, MPD diameter 5mm, and thickened septae or wall were significant variables.

**CLINICAL RELEVANCE/APPLICATION**

Contrast-enhanced CT, MRI, and EUS are useful for prediction of malignant potential in pancreatic IPMN using specific image features.

**RC209-09 Tumor Cellularity is a Negative Predictor of Survival in Pancreatic Cancer**

Monday, Nov. 30 10:45AM - 10:55AM Location: E351

Participants
Rickmer Braren, MD, Munich, Germany (Presenter) Nothing to Disclose
Irina Heid, Munich, Germany (Abstract Co-Author) Nothing to Disclose
Katja Steiger, Munich, Germany (Abstract Co-Author) Nothing to Disclose
Marija Trajkovic-Arsic, Munich, Germany (Abstract Co-Author) Nothing to Disclose
Markus Settles, Munich, Germany (Abstract Co-Author) Nothing to Disclose
Andreas Steingotter, Munich, Germany (Abstract Co-Author) Nothing to Disclose
Markus Schweiger, MD, Munich, Germany (Abstract Co-Author) Nothing to Disclose
Jorg Kleef, Munich, Germany (Abstract Co-Author) Nothing to Disclose
Irene Esposito, MD, Neuherberg, Germany (Abstract Co-Author) Nothing to Disclose
Jens Siveke, Munich, Germany (Abstract Co-Author) Nothing to Disclose
Ernst J. Rummensy, MD, Munich, Germany (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

Molecular and morphological heterogeneity are key factors for prognosis, therapy response and resistance in pancreatic ductal adenocarcinoma (PDAC). By defining subtypes of PDAC based on tumor cellularity, we applied multiparametric MRI in complex mouse models of endogenous PDAC for non-invasive detection of subtypes.

**METHOD AND MATERIALS**

Murine (mPDAC; N=141) and human (hPDAC; N=94) PDAC were histologically analyzed and subtyped based on tumor cellularity. Diffusion weighted- and dynamic contrast enhanced-MRI (DW-MRI, DCE-MRI) was evaluated for non-invasive characterization of mPDAC subtypes.

**RESULTS**

Tumor cellularity showed excellent correlation with the DW-MRI derived ADC parameter in murine PDAC (r=-0.86, CI=-0.92 - -0.78). Applied in patients with corresponding PDAC subtypes (hPDAClow, N=55; hPDACmed, N=27) revealed a significantly better prognosis of patients exhibiting low tumor cellularity (19.8 versus 13.0 months, Log rank, p<0.002). In analogy to the murine model, the ADC parameter identified hPDAC subtypes pre-operatively.

**CONCLUSION**

This study identifies tumor cellularity as a negative predictor in PDAC and the ADC parameter as a promising biomarker for non-invasive classification that may be used for evaluation of subtype-directed approaches.

**CLINICAL RELEVANCE/APPLICATION**

The presented work supports the clinical relevance of subtyping of PDAC based on tumor cellularity and identifies high sensitivity and specificity of the ADC parameter for non-invasive detection of the different PDAC subtypes. Reliable, non-invasive assessment of tumor cellularity of a particular tumor by means of ADC calculation may facilitate stratification of PDAC subtypes for outcome analysis and personalized therapeutic intervention trials.
PURPOSE

This study was conducted to assess Extrapancreatic inflammation on CT (EPIC) in predicting early organ dysfunction of patients with acute pancreatitis based on the revised Atlanta classification.

METHOD AND MATERIALS

109 patients diagnosed as acute pancreatitis from December 2013 to February 2014 were analyzed retrospectively. Outcome parameters included the length of hospital stay and the occurrences of organ dysfunction during the first week. The Balthazar score, the EPIC score, the Beside Index of Severity in Acute Pancreatitis (BISAP) and the Systemic Inflammatory Response Syndrome (SIRS) were evaluated by calculating receiver operator characteristic (ROC) curves and the area under the ROC curve.

RESULTS

In our study population of 109 patients (68 men, 41 women; median age, 44 years; age range, 16-85 years), 44 patients developed organ dysfunction, 20 patients developed persistent organ failure, 3 patients developed infection, and nobody died. The area under the ROC curve of EPIC to predict early organ dysfunction was 0.770 (95% confidence interval, 0.679-0.845), which was higher than the Balthazar score (0.641, 95% confidence interval, 0.551-0.738), similar to BISAP (0.789, 95% confidence interval, 0.701-0.862) and SIRS (0.742, 95% confidence interval, 0.650-0.821). An EPIC score of 5 or more had a 68.18% sensitivity and 80.00% specificity for predicting early organ dysfunction. The EPIC score was significantly superior to the Balthazar score to predict outcome.

CONCLUSION

In patients with acute pancreatitis, EPIC allows accurate estimation of early organ dysfunction.

CLINICAL RELEVANCE/APPLICATION

EPIC can early predict severity of acute pancreatitis, help clinicians to determine treatments and improve patients’ outcomes.

LEARNING OBJECTIVES

1) To review the diagnostic criteria for autoimmune pancreatitis. 2) To discuss the differences between Type 1 and Type 2 autoimmune pancreatitis. 3) To understand the temporal changes and morphologic patterns of contrast enhancement in autoimmune pancreatitis. 4) To describe imaging features relating to the pancreatic and intrahepatic ducts, and periductal parenchyma, in autoimmune pancreatitis that may distinguish it from cancer, chronic pancreatitis, or PSC. 5) To describe non-diagnostic but other frequently seen imaging findings of autoimmune pancreatitis. 6) To illustrate imaging findings demonstrating response to treatment in autoimmune pancreatitis, as well as recurrence after initial remission.
Abdominal Doppler (An Interactive Session)
Monday, Nov. 30 8:30AM - 10:00AM Location: E353C

GI US
AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Sub-Events

RC210A Imaging and Doppler of Portal Hypertension

Participants
Myron A. Pozniak, MD, Madison, WI, (mpozniak@uwhealth.org) (Presenter) Stockholder, Cellectar Biosciences, Inc; Support, General Electric Company

LEARNING OBJECTIVES

1) Understand the normal anatomy, anatomic variants of the hepatic vasculature. 2) Identify the normal Doppler flow profiles of the hepatic vasculature. 3) Understand the hemodynamic principles of portal hypertension and how they impact the Doppler waveforms of the hepatic arteries, portal veins and hepatic veins. 4) Understand the role of ultrasound in the evaluation of variceal pathways.

RC210B Doppler Evaluation of Mesenteric Vessels

Participants
John S. Pellerito, MD, Manhasset, NY, (johnp@nshs.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify applications for Doppler evaluation of the mesenteric arteries and veins. 2) Develop techniques to detect and interpret mesenteric flow abnormalities. 3) Explain criteria for the interpretation of significant mesenteric arterial disease.

ABSTRACT

RC210C Renal Doppler: Vessels and Beyond

Participants
Deborah J. Rubens, MD, Rochester, NY (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the technical parameters and diagnostic criteria of color and spectral Doppler interrogation of the renal arteries, veins and parenchyma. 2) Learn and apply new information regarding Doppler ultrasound applications including vascular disease, stone disease, renal masses and renal parenchymal disease. 3) Appreciate the value of renal Doppler and its role vs other vascular imaging with CT or MRI.

ABSTRACT

Renal Doppler: Vessels and Beyond
This lecture will explore the use of Doppler ultrasound in the assessment of the kidney and its vascular supply. Doppler technique will be reviewed with particular attention to artifacts and pitfalls which may enhance or detract from diagnostic efficacy. The role of ultrasound imaging in assessment of acute as well as chronic renal dysfunction will be elucidated. The performance of Doppler ultrasound will be highlighted regarding vascular stenosis and occlusion, parenchymal perfusion, and diagnosis of renal masses and stones. Doppler techniques to avoid false negative and false positive studies will be emphasized. Controversial parameters will be stressed, in particular the use of absolute velocities versus ratios in the diagnosis of renal artery stenosis, especially in renal transplants. Surgical emergencies will be highlighted, and the role of correlative imaging with CT, MR and/or angiography will be addressed.

Active Handout: Deborah J. Rubens

Quantitative CT and MR Perfusion Imaging

ABSTRACT

With the emergence of novel targeted therapies for cancer, imaging techniques that assess tumor vascular support have gained credence for response assessment alongside standard response criteria. CT perfusion techniques that quantify regional tumor blood flow, blood volume, flow-extraction product, and permeability-surface area product through standard kinetic models, are attractive in this scenario by providing evidence of a vascular response or non-response. Additionally, these techniques may provide prognostic and predictive information to the clinician. Their increasing acceptance in oncological practice in recent years has been related to the combination of clinical need and technological improvements in CT, including faster tube rotation speeds, higher temporal sampling rates, the development of dynamic 3D acquisitions and development of commercial software programmes embedded within the clinical workflow. Recently published consensus guidelines provide a way forward to performing studies in a more standardized manner. To date single centre studies have provided evidence of clinical utility. Future studies that include good quality prospective validation correlating perfusion CT to outcome endpoints in the trial setting are now needed to take CT perfusion forward as a biomarker in oncology. These presentations will cover the principles of CT perfusion analysis for tumor assessment and its pathophysiological basis. Clinical applications will be discussed focusing on hepatic and extrahepatic applications and clinical trials. Areas for further development including assessment of tumor heterogeneity will also be discussed.

LEARNING OBJECTIVES

1) To understand the principles of CT perfusion analysis for tumor assessment. 2) To understand the pathophysiological basis of CT perfusion parameters for tumors. 3) To understand unique CT perfusion analysis of the liver due to its characteristic dual blood supply. 4) To discuss the potential clinical applications, with a focus on hepatic and extrahepatic applications and clinical trials. 5) To discuss several recent challenging issues regarding CT perfusion. 6) To discuss areas for further development including assessment of tumor heterogeneity.

CT Perfusion in Oncology: Hepatic Imaging

LEARNING OBJECTIVES

1) To understand basic principles, acquisition protocol, and pharmacokinetic models of CT perfusion. 2) To learn unique CT perfusion analysis of the liver due to its characteristic dual blood supply. 3) To describe the potential clinical applications, with a focus on hepatic applications. 4) To discuss several recent challenging issues regarding CT perfusion.

ABSTRACT

With the emergence of novel targeted therapies for cancer, imaging techniques that assess tumor vascular support have gained credence for response assessment alongside standard response criteria. CT perfusion techniques that quantify regional tumor blood flow, blood volume, flow-extraction product, and permeability-surface area product through standard kinetic models, are attractive in this scenario by providing evidence of a vascular response or non-response. Additionally, these techniques may provide prognostic and predictive information to the clinician. Their increasing acceptance in oncological practice in recent years has been related to the combination of clinical need and technological improvements in CT, including faster tube rotation speeds, higher temporal sampling rates, the development of dynamic 3D acquisitions and development of commercial software programmes embedded within the clinical workflow. Recently published consensus guidelines provide a way forward to performing studies in a more standardized manner. To date single centre studies have provided evidence of clinical utility. Future studies that include good quality prospective validation correlating perfusion CT to outcome endpoints in the trial setting are now needed to take CT perfusion forward as a biomarker in oncology. This presentation will cover the principles of CT perfusion analysis for tumor assessment and its pathophysiological basis. Clinical applications will be discussed focusing on extrahepatic applications and clinical trials. Areas for further development including assessment of tumor heterogeneity will also be discussed.

CT Perfusion in Oncology: Extrahepatic Imaging

LEARNING OBJECTIVES

1) To understand the principles of CT perfusion analysis for tumor assessment. 2) To understand the pathophysiological basis of CT perfusion parameters for tumors. 3) To describe the potential clinical applications, with a focus on extrahepatic applications and clinical trials. 4) To discuss areas for further development including assessment of tumor heterogeneity.

ABSTRACT

With the emergence of novel targeted therapies for cancer, imaging techniques that assess tumor vascular support have gained credence for response assessment alongside standard response criteria. CT perfusion techniques that quantify regional tumor blood flow, blood volume, flow-extraction product, and permeability-surface area product through standard kinetic models, are attractive in this scenario by providing evidence of a vascular response or non-response. Additionally, these techniques may provide prognostic and predictive information to the clinician. Their increasing acceptance in oncological practice in recent years has been related to the combination of clinical need and technological improvements in CT, including faster tube rotation speeds, higher temporal sampling rates, the development of dynamic 3D acquisitions and development of commercial software programmes embedded within the clinical workflow. Recently published consensus guidelines provide a way forward to performing studies in a more standardized manner. To date single centre studies have provided evidence of clinical utility. Future studies that include good quality prospective validation correlating perfusion CT to outcome endpoints in the trial setting are now needed to take CT perfusion forward as a biomarker in oncology. This presentation will cover the principles of CT perfusion analysis for tumor assessment and its pathophysiological basis. Clinical applications will be discussed focusing on extrahepatic applications and clinical trials. Areas for further development including assessment of tumor heterogeneity will also be discussed.

Quantitative MR Perfusion Imaging of the Brain
LEARNING OBJECTIVES

1) Understand the difference between quantitative and qualitative perfusion measurements. 2) Distinguish several approaches for obtaining quantitative perfusion maps in the brain. 3) Appreciate the strengths and weaknesses between the two major techniques, arterial spin labeling and bolus contrast dynamic susceptibility imaging.
RC220A

**Post-radiation Therapy Lung Imaging**

**Participants**
Gregory Videtic, MD, FRCP-C, Cleveland, OH, (videtig@ccf.org) (*Moderator* Nothing to Disclose

Michelle S. Ginsberg, MD, New York, NY (*Presenter* Nothing to Disclose

**LEARNING OBJECTIVES**
1) To review short term and long term changes following radiation therapy. Post SBRT changes will also be reviewed which can differ from more traditional conformal radiotherapy changes. 2) To distinguishing evolving post RT changes from recurrence which is critical in the follow up of these patients. Use of PET/CT in these cases will be discussed.

**ABSTRACT**

With the improvement of outcomes of treatment for pediatric cancers, the number of long-term survivors continues to rapidly grow. Although the use of radiation therapy has generally declined over recent decades, it continues to play an essential role in treatment of many children with Wilms tumor, Ewing sarcoma, rhabdomyosarcoma, or Hodgkin lymphoma and some patients undergoing bone marrow transplant for leukemia. Though cured of their disease, long-term survivors often experience late-effects from radiation therapy with accompanying findings on body imaging. The session will describe late effects on multiple organ systems including musculoskeletal, gastrointestinal, and pulmonary, and relate the imaging findings to radiation techniques including dose and radiation fields.

RC220B

**Post-radiation Therapy Pediatric Body Imaging**

**Participants**
Ralph P. Ermoian, MD, Seattle, WA, (ralphpe@uw.edu) (*Presenter* Nothing to Disclose

R. Paul Guillerman, MD, Houston, TX (*Presenter* Nothing to Disclose

**LEARNING OBJECTIVES**
1) Attendees will be able to list at least one common late body imaging finding associated with radiation treatment for Ewing sarcoma, Hodgkin lymphoma, Wilms tumor and transplant conditioning with total body irradiation. 2) Attendees will be able describe the relationship between dose and target volume in discussing late imaging findings on the musculoskeletal, hepatic and gastrointestinal systems.

**ABSTRACT**

With the improvement of outcomes of treatment for pediatric cancers, the number of long-term survivors continues to rapidly grow. Although the use of radiation therapy has generally declined over recent decades, it continues to play an essential role in treatment of many children with Wilms tumor, Ewing sarcoma, rhabdomyosarcoma, or Hodgkin lymphoma and some patients undergoing bone marrow transplant for leukemia. Though cured of their disease, long-term survivors often experience late-effects from radiation therapy with accompanying findings on body imaging. The session will describe late effects on multiple organ systems including musculoskeletal, gastrointestinal, and pulmonary, and relate the imaging findings to radiation techniques including dose and radiation fields.

RC220C

**Post-radiation Therapy Liver Imaging**

**Participants**
Michael I. Lock, MD, FRCP-C, London, ON, (michael.lock@lhsc.on.ca) (*Presenter* Research Consultant, Accuray Incorporated; Speaker, AbbVie Inc

Ashkan A. Malayeri, MD, Bethesda, MD, (ashkan.malayeri@nih.gov) (*Presenter* Nothing to Disclose

**LEARNING OBJECTIVES**
1) Discuss the current literature on radiological liver changes induced by radiation. 2) Describe the incidence and long-term morphology/natural history of these changes. 3) Apply practical concepts that distinguish recurrence from normal changes in a growing subject area where evidence is just emerging.

**ABSTRACT**

Primary and secondary liver cancer is becoming a larger proportion of the radiology case load due to increasing incidence and the introduction of new treatment techniques. In particular, new radiotherapy techniques like stereotactic body radiotherapy (SBRT) are being applied routinely for hepatic lesions. However, SBRT induces changes that are difficult to distinguish from local recurrence. Many changes manifest over time and knowledge of the natural history of radiation changes is important. Some changes are transient and others are predictive of critical clinical outcomes. Radiologists are being pressured to provide clinical input as their opinions often result in significant changes in management. These management changes include high risk and expensive treatments. Therefore, we review the literature and provide practical case examples to assist radiologists in a) identifying normal changes b) determining the appropriate investigations with multidisciplinary input c) selecting appropriate predictive parameters for clinically important endpoints such as recurrence.
Rectal Carcinoma: Pre and Post Treatment Evaluation with MRI (An Interactive Session)

Monday, Nov. 30 8:30AM - 10:00AM Location: E353B

GI | MR | OI

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Sub-Events

RC229A  Rectal Carcinoma: Setting the Stage, What the Clinician Needs to Know

Participants
Gina Brown, MD, MBBS, Sutton, United Kingdom, (gina.brown@rmh.nhs.uk) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the prognostic relevance of MRI in planning surgical treatment options. 2) MRI assessment for oncologic treatment decisions. 3) Future developments in treatment strategies based on MRI assessment and restaging after chemoradiotherapy.

Handout: Gina Brown

RC229B  Pre Treatment Staging Standardized Reporting: Have you Checked the 'DISTANCE'?

Participants
Caroline Reinhold, MD, MSc, Montreal, QC, (caroline.reinhold@mcgill.ca) (Presenter) Consultant, GlaxoSmithKline plc

LEARNING OBJECTIVES

1) To propose a MR imaging protocol for staging newly diagnosed rectal carcinoma. 2) To understand the anatomy of the rectum and mesorectum as pertains to MRI staging. 3) To propose a step-by-step approach for standardized MRI staging of pre-treatment rectal carcinoma using the mnemonic "DISTANCE".

ABSTRACT

In the Western Hemisphere, colorectal cancer is the third most common cancer in men after prostate and lung, and the second most common in women after breast cancer. One-third of colorectal cancers occur in the rectum. Survival rates for rectal cancer have improved in the past decade due to the combined effects of better staging, improved preoperative treatment strategies and total mesorectal excision (TME) surgery. Several studies have been published showing the ability of MRI to accurately stage rectal cancer and predict a negative circumferential resection margin. Moreover, advances in preoperative therapies require accurate preoperative MRI staging to select those patients who may benefit from chemoradiation prior to surgery. To accurately stratify patients according to the risk of local and distant failure, imaging takes on the same importance as tumor type and genetic susceptibility. However, rectal cancer evaluation by MRI continues to pose a challenge in non-experts' hands. This presentation will present a mnemonic: "DISTANCE" to enable a systematic and standardized approach to the interpretation of MR imaging in newly diagnosed rectal cancers, thereby enabling all the clinically relevant features to be adequately assessed: DIS: for Distance from the Inferior part of the tumor to the transitional Skin, T: for T staging, A: for Anal complex, N: for Nodal staging, C: for Circumferential Resection Margin, E: for Extramural vascular invasion.

Honored Educators

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Caroline Reinhold, MD, MSc - 2013 Honored Educator
Caroline Reinhold, MD, MSc - 2014 Honored Educator

RC229C  Post Treatment Evaluation: What Criteria and Imaging Protocol Should I Use?

Participants
Stephanie Nougaret, MD, New York, NY (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To highlight current management of rectal cancer including sphincter- and organ-sparing treatment options. 2) To describe how pretreatment multi-parametric rectal MRI may serve as a predictive biomarker of subsequent tumor response to chemoradiation (CRT). 3) To propose a step-by-step approach for accurate interpretation of rectal MRI following CRT and to illustrate how the information gleaned from post CRT multi-parametric rectal MRI may influence treatment decisions.

ABSTRACT

Recent changes in the management of patients with locally advanced rectal cancer highlight the need for accurate assessment of tumor response to chemoradiation (CRT). In the past, CRT was followed by surgical resection in nearly all patients, irrespective of response to CRT. However, new data suggest that surgery may not be necessary in patients with complete response. MR imaging
has become an essential tool to enable the oncology team to make appropriate treatment decisions. MRI has so far relied on changes in morphology as a measurement for response. However, this evaluation is hampered by the difficulties in differentiating residual tumor from radiation-induced fibrosis. Recent studies have suggested that adding diffusion-weighted imaging (DWI) to conventional MRI can aid this differentiation and thus improve the prediction of response after neoadjuvant therapy. Thus, the learning objectives for this lecture are as follows:

1) To learn about the value of multi-parametric rectal MRI prior to and following CRT for the prediction and subsequent assessment of response to CRT. To understand how rectal MR imaging finding are essential to making patient-centered treatment decisions.

2) To become familiar with "DISTANCE" mnemonic and diagnostic clues which provide a systematic approach to the interpretation of rectal MRI images in patients with rectal cancer prior to treatment and following CRT.

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Stephanie Nougaret, MD - 2013 Honored Educator
**SSC03**

**ISP: Gastrointestinal (Dual Energy CT)**

Monday, Nov. 30 10:30AM - 12:00PM Location: E353A

**AMI PRA Category 1 Credits™: 1.50**

**ARRT Category A+ Credits: 1.50**

**FDA** Discussions may include off-label uses.

**Participants**
Benjamin M. Yeh, MD, San Francisco, CA (Moderator) Research Grant, General Electric Company; Author with royalties, Oxford University Press; Shareholder, Nextraxt, Inc;
Laura R. Carucci, MD, Midlothian, VA (Moderator) Nothing to Disclose
Meghan G. Lubner, MD, Madison, WI (Moderator) Grant, General Electric Company; Grant, NeuWave Medical, Inc.; Grant, Koninklijke Philips NV

**Sub-Events**

**SSC03-01  Gastrointestinal Keynote Speaker: Dual Energy CT-Principles and Implementations**

Monday, Nov. 30 10:30AM - 10:40AM Location: E353A

Participants
Dushyant V. Sahani, MD, Boston, MA (Presenter) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc

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Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator

**SSC03-02  Comparison of Iodine Quantification between Single-source and Dual-source DECT**

Monday, Nov. 30 10:40AM - 10:50AM Location: E353A

**Awards**

**Trainee Research Prize - Fellow**

**Participants**
Diana Murcia, MD, Boston, MA (Presenter) Nothing to Disclose
Manuel Patino, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Andrea Paradowski Jamurri, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Farhad Mehrkani, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Rodrigo Canellas, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Yasir Andradi, MD, MPH, Boston, MA (Abstract Co-Author) Nothing to Disclose
Dushyant V. Sahani, MD, Boston, MA (Abstract Co-Author) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc

**PURPOSE**

Although Iodine quantification is possible on DECT scans, it remains unclear if the measurements are specific to scanners from different vendors. The purpose of our study is to compare the accuracy of Iodine quantification between single-source and dual-source DECT.

**METHOD AND MATERIALS**

An anthropomorphic CT colonography phantom with capacity for 500ml of fluid, and two iodinated solutions with known concentrations were used: 1) 9mg/ml, 2) 12mgI/ml. Each solution was diluted with water to obtain 75% (7 and 9mg/ml), 50% (4.5 and 6mg/ml), and 25% (2 and 3mg/ml) of the known concentration. The phantom was filled up serially with 400 ml of each dilution, from the lowest to the highest concentration, and scanned on DECT mode of ssDECT (Discovery CT750 HD, GE Healthcare) (140/80 kVp and tube current of 375 mA), and dsDECT (Somatom Definition Flash, Siemens Healthcare) (140/100 kVp and 180 Ref mA) scanners. MD-Iodine images were generated from the DECT scans in vendor specific workstations. A total of 16 datasets were obtained (4 for each solution on each scanner), 8 for ssDECT and 8 for dsDECT. Twenty regions of interest (ROIs) were placed at multiple levels of the gastrointestinal lumen. Iodine values (mg/ml) were measured and recorded for all the different dilutions. Iodine values were compared with the known concentration of iodine. Statistical analysis was conducted with t-test.

**RESULTS**

Spectrally calculated iodine concentration showed minimal discrepancy compared to the known iodine concentration on ssDECT and dsDECT scanners (± 0.4 and 0.6 mg/ml, respectively) (p>0.05). The variability was the same for high and low iodine concentrations.

**CONCLUSION**

Despite the differences in approach for material separation between dsDECT (Image based) and ssDECT (raw data based) techniques, Iodine quantification is accurate, robust and reproducible for both scanners. Presence of image artifacts negatively
impacts the iodine quantification.

**CLINICAL RELEVANCE/APPLICATION**

CT Attenuation values are used for clinical diagnosis and decision-making. The results of this study reassure the availability of an additional parameter (DECT-iodine quantification) for clinical use.

**Honored Educators**

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Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator

**RESULTS**

Spectral data revealed an excellent image quality (3.2 +/- 0.5). For quantitative evaluation, at 60keV in aorta, arterial phase difference between Io350, Io400 and Io250 were estimated to -17.97(CI=99.99%) and 36.5(CI=99.06%), venous phase difference between Io350, Io400 and Io250 were estimated to -3.13(CI=99.99%) and 11.87(CI=99.99%). At 60 KeV, at portal phase Io250 was superior to Io350 vs Io400 for hepatic parenchyma and portal vein, respectively. At 65 KeV, Io250 revealed no significant differences with others contrast agents for all sites. At 75 KeV, Io250 was inferior to others contrast agent for all sites. The radiation dose was increased at less than 10% ; DLP : 489 mGy.cm(spectral) vs 513 mGy.cm(conventional).

**CONCLUSION**

Spectral imaging allows iodine dose reduction up to 37.5% for arterial and portal phase, better information at 60 KeV, excellent image quality and no increased radiation dose.

**CLINICAL RELEVANCE/APPLICATION**

Iodine dose is reduced by using spectral CT imaging, with better results at 60keV in terms of UH, without degradation of image quality or increased radiation dose for abdominal applications.

**SSC03-04 Assessment of Radiation Dose, Image Quality and Accuracy of Virtual Non-Contrast Images in Thoracoabdominal CT Acquired with a Novel Single-source Dual-Energy Technique Using a Split Filter**

Monday, Nov. 30 11:00AM - 11:10AM Location: E353A

**Participants**

Andre Euler, MD, Basel, Switzerland (Presenter) Nothing to Disclose
Anushri Manneck, Basel, Switzerland (Abstract Co-Author) Nothing to Disclose
Sebastian Schindera, MD, Basel, Switzerland (Abstract Co-Author) Nothing to Disclose
Bernhard Krauss, PhD, Forchheim, Germany (Abstract Co-Author) Employee, Siemens AG ;
Zsolt Szucs-Farkas, MD, PhD, Berne, Switzerland (Abstract Co-Author) Nothing to Disclose
Sebastian T. Schindera, MD, Basel, Switzerland (Abstract Co-Author) Research Grant, Siemens AG; Research Grant, Ulrich GmbH & Co KG; Research Grant, Bayer AG

**PURPOSE**

To assess the radiation dose, image quality and accuracy of virtual non-contrast images with a novel single-source dual-energy technique using a split filter (TwinBeam Dual-Energy, Siemens) compared with a single-energy CT scan.
50 patients received a CT of the thorax and abdomen for oncologic staging on a single-source scanner (SOMATOM Edge, Siemens) either with (A) single-energy mode with automatic tube voltage modulation and 130 ref mAs or with (B) split filter dual-energy mode at AuSn120 kVp and 420 ref. mAs. Radiation dose was estimated by CTDIvol and DLP. Objective image quality was assessed by measuring image noise and calculating CNR. Subjective image quality was evaluated by three radiologists independently (one resident and one board-certified). The attenuation in the liver, spleen and muscle were measured on the true non-contrast premonitoring scan and at the same location on the virtual non-contrast image of protocol B. Descriptive statistics and Mann-Whitney-U-test were used.

RESULTS

The mean CTDIvol was 15% and the mean DLP was 20% lower with the dual-energy compared to the single-energy protocol (11.2 mGy (A) vs. 9.5 mGy (B) and 700 mGy*cm (A) vs. 558 mGy*cm (B)). No significant difference in objective image quality (image noise: 7.4HU (A) vs. 7.1HU (B); CNR: 29.2 (A) vs. 28.5 (B); p=0.43 and 0.88, respectively) and subjective image quality was found between the two protocols. The mean error of measurement for the virtual non-contrast images was 6.2%, 12.7% and 16.3% for the liver, spleen and muscle, respectively.

CONCLUSION

Dose-neutral dual-energy CT scans are possible with a single-source CT scanner using a novel split filter technique compared to a single-energy mode with similar objective and subjective image quality. The dual-energy CT protocol also offers accurate attenuation measurements on the virtual non-contrast images.

CLINICAL RELEVANCE/APPLICATION

Since the split filter dual-energy technique on a single-source CT scanner benefits from the added information like virtual non-contrast, iodine quantification or stone characterization and the dose-neutral aspect, it can replace single-energy protocols in clinical routine.

SSC03-05 Differentiation of Mass Type Colorectal Adenocarcinoma from Colorectal Adenoma on Spectral CT: Preliminary Research

Monday, Nov. 30 11:10AM - 11:20AM Location: E353A

Participants

Xiaodong Liu, Dalian, China (Presenter) Nothing to Disclose
Ailian Liu, MD, Dalian, China (Abstract Co-Author) Nothing to Disclose
Meiyu Sun, Dalian, China (Abstract Co-Author) Nothing to Disclose
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Li Ye, Dalian, China (Abstract Co-Author) Nothing to Disclose
Chen Anliang, Dalian, China (Abstract Co-Author) Nothing to Disclose
Shifeng Tian, Dalian, China (Abstract Co-Author) Nothing to Disclose

PURPOSE

To assess the value of spectral CT imaging in distinguishing mass type colorectal adenocarcinoma from colorectal adenoma.

METHOD AND MATERIALS

This retrospective study was approved by the institutional review board and informed consent was waived. Twenty-seven patients with colorectal masses were scanned with spectral CT scanner (GE Discovery HD 750) from January 2012 to April 2015, including 15 mass type colorectal adenocarcinomas and 12 colorectal adenomas proven by pathology. Bowel cleaning was performed until no excrement in 8-12h before examination including pre-contrast and three-phase dynamic enhancement. The mean CT value of 68 kVp images (minic conventional polychromatic images) and monochromatic images (40-140 keV, effective atomic number(eff-Z) and iodine(water),fat(water) and the slope of spectral curve from 4 phases were measured using the GSI General MD analysis software equipped at an Advantage Workstation (ver.4.5, GE, USA). These parameters from mass type colorectal adenocarcinomas and adenomas were compared using the nonparametric rank sum test.

RESULTS

In the arterial phase of 68 KVp, the mean CT value was 88.45±22.15 HU for adenocarcinoma group, and 61.03±27.54 HU for the adenoma group. The mean CT value for adenocarcinoma was significantly higher than that of adenoma on 68 KVp images in arterial phase (p<0.05). There were statistically significant differences of the CT value between two groups at low energy keV(40-90keV) in the arterial phase. The slope of spectral curve was -1.70±0.62 for adenocarcinoma group and -1.03±0.55 for the adenoma group (p<0.05). The mean CT value and slope of spectral curve in venous and delayed phases did not differ significantly between these two groups .The eff-Z and iodine(water),fat(water) were not significantly different between adenocarcinoma and adenoma groups.

CONCLUSION

The mean CT values and slope of spectral curve in arterial phase derived from spectral imaging is a potential quantitative parameters to distinguish mass type colorectal adenocarcinoma from adenoma. There was certain guiding significance in colorectal adenoma and mass type colorectal adenocarcinoma for spectral CT multi-parameter analysis.

CLINICAL RELEVANCE/APPLICATION

It's important to figure out the type of colorectal disease to provide more reference for clinical treatment.
Jingtao Wu, Yangzhou, China (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To assess the accuracy of dual-source dual-energy (DSDE) CT in liver iron content (LIC) quantification and grading at different clinically significant LIC thresholds.

**METHOD AND MATERIALS**

Fifty-one rabbits of iron-loaded model were established by intravenous injection of iron dextran. DSDE CT was performed at 80 kVp and 140 kVp with tin filter. Hepatic attenuation difference ($\Delta H$) between 80 kVp and 140 kVp was calculated. Postmortem assessments of LIC were conducted on inductively-coupled plasma (ICP) spectrometer. The correlation between $\Delta H$ and LIC was analyzed. Diagnostic performance of $\Delta H$ in discriminating different LIC thresholds was evaluated by receiver operating characteristic (ROC) analysis.

**RESULTS**

The LIC of our models was from 0.2 to 39.6 mg Fe/g measured by ICP. $\Delta H$ was highly correlated with LIC and the Spearman's coefficient was 0.975. For discriminating clinically significant LIC thresholds (1.8, 3.2, 7.0, 15.0 mg Fe/g dry tissue), ROC analysis revealed that the corresponding optimal cutoff value of $\Delta H$ was 13.1, 16.2, 23.1, 39.4 HU, respectively. For the lowest threshold of discriminating iron accumulation from normal storage, $\Delta H$ had a sensitivity of 86% and a specificity of 100%. With the cutoff value of $\Delta H$ = 39.3 HU, the highest sensitivity (100%) and specificity (100%) were obtained at LIC threshold of 15.0 mg Fe/g dry tissue.

**CONCLUSION**

$\Delta H$ has a strong linear association with titrated LIC in the iron- overloaded rabbits. DSDE CT has the potential for liver iron content quantification and grading.

**CLINICAL RELEVANCE/APPLICATION**

DSDE CT has the potential to guide iron chelation therapy and to monitor chelation effect.

SSC03-07  Benefit of Iodine Maps to Reduce Out-of-Field Image Artifacts at Rapid kVp Switching Dual Energy CT

**Monday, Nov. 30 11:30AM - 11:40AM Location: E353A**

Participants

Brandan Dotson, BS, San Francisco, CA (Presenter) Nothing to Disclose
Jack Lambert, PhD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Zhen J. Wang, MD, Hillsborough, CA (Abstract Co-Author) Nothing to Disclose
Michael A. Ohliger, MD, PhD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Sebastian Winkhofer, MD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Benjamin M. Yeh, MD, San Francisco, CA (Abstract Co-Author) Research Grant, General Electric Company; Author with royalties, Oxford University Press; Shareholder, Nextrast, Inc.

**PURPOSE**

To evaluate the reduction of artifacts caused by body parts outside the field of view (out-of-field image artifacts) at rapid kVp switching dual energy CT (rsDECT).

**METHOD AND MATERIALS**

This retrospective study was approved by our institutional review board and informed consent was not required. We retrospectively viewed 246 consecutive rsDECT thoracoabdominal scans to identify those with out-of-field image artifacts. The field of view, thickness and subjective severity of the out-of-field artifacts were recorded for the 40, 65 and 140 keV virtual monochromatic images and on the, iodine and water maps. Image artifact severity was rated on a 5 point scale from 0=not seen to 4=obscures all tissue detail. The thickness of artifacts and severity scores were compared between image reconstructions by t-test and Wilcoxon tests, respectively.

**RESULTS**

In 20 of 246 scans (8.1%), body parts extended past the CT's maximum field of view (FOV), 500 nm. The mean BMI of these 20 patients was 40 (range, 29 to 61), and out-of-field artifacts occurred for all 20. The mean maximal out-of-field artifact height was 167.4 cm. The mean artifact thickness was significantly less for iodine map (0.67 mm) than for the 65 keV and water map images (8.43 and 13.5 mm, respectively, p<0.001 each comparison). The mean artifact severity score was significantly lower for iodine map (0.23) than for the 65 keV and water map images (2.3 and 2.7, respectively, p<0.00X).

**CONCLUSION**

Iodine maps substantially reduce out-of-field image artifact at rsDECT and may assist in the evaluation of peripheral tissues that extend beyond the maximal CT field of view in obese patients.

**CLINICAL RELEVANCE/APPLICATION**

Obese patients with concern for peripheral tissue injury may benefit from rsDECT iodine maps to minimize out-of-field image artifact.

SSC03-08  Can Dual Energy CT Predict the Need for Surgery in Crohn's Disease?

**Monday, Nov. 30 11:40AM - 11:50AM Location: E353A**

Participants

Naama R. Bogot, MD, Jerusalem, Israel (Presenter) Nothing to Disclose
Ruth Cytter-Kuint, MD, Jerusalem, Israel (Abstract Co-Author) Nothing to Disclose
Tomer Adar, Jerusalem, Israel (Abstract Co-Author) Nothing to Disclose
Irith Hadas, MD, Jerusalem, Israel (Abstract Co-Author) Nothing to Disclose
Dov Wengrower, Jerusalem, Israel (Abstract Co-Author) Nothing to Disclose
PURPOSE
Dual energy CT (DECT) is sensitive for detection and quantification of iodine in tissue. We aimed to evaluate the correlation between iodine uptake in the inflamed bowel wall in Crohn’s disease (CD) and the need for surgery and create an inflammatory index.

METHOD AND MATERIALS
IRB approved prospective double-blind study. 36 patients (mean age 38.6 years, 20 males) with Crohn's disease (CD) underwent a DECT (Somaton Flash) for acute abdominal symptoms. Study protocol: abdominal-pelvic CT using DE mode (100 and 140kV), IV contrast and negative oral contrast contrast. The DECT was interpreted by a radiologist blinded to the clinical outcome. The referring physicians were blinded to DECT interpretation. Studies were interpreted by a radiologist on a dedicated software (syngo.CT dual energy, syngo.via). Enhancement (HU) was measured for each bowel lesion in both low and mixed images. Inflammatory enhancement index (IEI) was defined as the ratio between the inflamed segment and the stomach (HU on mixed images). Patients were followed for 3 months for an outcome of surgery.

RESULTS
A total of 63 intestinal lesions were demonstrated (1-3 per patient). Eleven patients underwent surgery, 7 within 3 months after the CT and 4 within 1 month after the CT. Higher attenuation on 100kV and mixed images correlated with increased risk of surgery within 3 month: 92.2 ± 66.6 for 100kV (p=0.01) 82.7 ± 59.5 for mixed images (p=0.05) as well as for surgery within 1 month 105.2 ± 67.04 (p=0.05) and 93.8 ± 59.7 for the mixed images (p<0.05). AUROC analysis for the IEI achieved negative predictive value of 98% for the need for surgery.

CONCLUSION
DECT is a reliable tool in assessment of inflammation in patients with CD and can predict the need for surgery. The IEI has a high negative predictive value.

CLINICAL RELEVANCE/APPLICATION
Our study demonstrates that DECT is possible novel decision making tool (surgery vs. conservative surgery) applicable also to acute settings.

SSC03-09 Comparison between Spectral Imaging Scan Mode on Fast kVp-Switching Single-Source Dual-Energy Scan and Conventional Helical Scan Mode for CT Scan DOSE in 259 Abdomen Cases: Body Mass Index Factor

PURPOSE
On fast kVp-switching single-source dual-energy (ssDE) CT scan (gemstone spectral imaging: GSI), automatic exposure control (AEC) remains unavailable. The purpose of this paper is to compare DOSE between GSI scans and conventional helical scans about the DOSE and image quality in different body mass index (BMI) group.

RESULTS
CTDItvol (mGy) values between MONO mode and POLY mode at each BMI group were: A: 13.4 ± 1.3 and 9.1 ± 2.5; B: 13.5 ± 1.0 and 11.2 ± 2.0; C: 14.3 ± 2.4 and 12.8 ± 2.9; D: 15.8 ± 2.6 and 15.6 ± 3.3; E: 18.3 ± 4.3 and 17.7 ± 4.3; F: 22.3 ± 5.6 and 21.3 ± 3.6; G: 29.1 ± 4.9 and 27.4 ± 2.1, respectively. The CTDIvol with MONO scan mode was significantly higher than conventional POLY scan mode at each BMI group (A: 55.6%, B: 22.9%, C: 14.2%, D: 2.5%, E: 4.9%, F: 6.3% and G: 8.8%), but the results were not statistical significantly (P > 0.05) in D, E, F and G BMI group. The image quality with MONO scan mode (66keV) was significantly higher than FBP, similar to ASIR30%, poorer than ASIR50% with POLY-120kVp scan mode at gall bladder, muscular and liver.

CONCLUSION
From this study, we can conclude that GSI scan mode without automatic exposure control has similar DOSE level with normal helical (120kVp) scan mode in large BMI group (BMI>26).

CLINICAL RELEVANCE/APPLICATION
In this study, we have demonstrated that GSI images reconstructed at MONO-66keV can achieve similar DOSE level as conventional helical (120kVp) scan.
**Purpose**

The purpose of this study is to evaluate whether an incidentally noted splenic lesion on abdominal computed tomography (CT) requires further imaging work-up.

**Method and Materials**

In this HIPAA compliant retrospective study, we performed a search of our CT database for patients with splenic lesions who underwent imaging from 2002 to 2008. Online medical records were reviewed for a history of malignancy and the indication for the CT examination. Patients were devided into 3 groups: 1. patients with a history of malignancy, 2. patients without a history of malignancy and no systems related to the left upper quadrant, 3. patients without a history of malignancy, but constitutional symptoms such as weight loss or fever or pain related to the left upper quadrant and epigastrium. Final diagnosis of the etiology of the lesion was confirmed by surgery, image guided biopsy or clinical and/or imaging follow-up. A lesion was considered benign on follow-up if it was stable by imaging for 2 years and by clinical follow-up for 5 years.

**Results**

Our search revealed 525 patients, 57 patients needed to be excluded due to insufficient follow-up data. 468 patients were included in this study (294 women, 174 men, mean age = 58 years, age range 21-97 years). 154 of 468 (32.9%) patients had a history of malignancy (group 1), 279 of 468 (59.6%) patients had no history of malignancy and no systems related to the left upper quadrant (group 2). 35 of 468 (7.4%) patients had no history of malignancy, but constitutional symptoms or symptoms related to the left upper quadrant (group 3). The number of malignant lesions was as follows: group 1: 43 of 154 (27.9%), group 2: 2 of 305 (0.7%), group 3: 6 of 35 (17.1%). Patients with malignant lesions in group 2 consisted of new diagnoses of lymphoma (n=1) with extensive lymphadenopathy as well as metastatic ovarian carcinoma (n=1). Patients with malignant lesions in group 3 were diagnosed with lymphoma (n=6).

**Conclusion**

In a patient with no history of malignancy, no fever, weight loss or pain in the left upper quadrant or epigastrium, the likelihood of malignancy is very rare (0.7%). Patients who are diagnosed with a malignancy in this group have other lesions that allow for this diagnosis to be made. Therefore in patients with no evidence of previous or newly diagnosed malignancy, follow-up of splenic lesions may not be indicated.

**Clinical Relevance/Application**

Follow-up of incidentally noted splenic lesions may not be indicated.
CLINICAL RELEVANCE/APPLICATION

Interpretation. Increased access to ancillary patient information can improve interpretation accuracy. CT clinical history quality does not correlate with CT diagnosis accuracy. However, a misleading history could alter CT case interpretation.

RESULTS

Patient age: 41 ± 12.6 (range 22-68) years, 85 females. 1 day (range 0-10) between CT and operation. Surgical results: 33 VIH (21 due to mesenteric defect and 12 to an adhesive band), 28 other diagnoses (intussusception, small bowel obstruction, adhesions) and 18 non-RYGB related diagnoses (acute cholecystitis, other hernias, cecal and sigmoid volvulus, perforated duodenal ulcer, ruptured ovarian cyst, appendicitis, omental infarct, PID). and 21 had no pathology. CT was 97% SEN, 78% SPEC for diagnosis of VIH with, NPV = 98%, PPV = 68 %. Presence of volvulus alone or IH alone on CT had numerically lower predictive value for surgical VIH than presence of either one: corresponding C-statistics 0.82, 0.75, 0.87. Of 9 predictors of VIH, only mesenteric swirl (odd ratio [95%CI] 7.46 (2.5-22.2) and vascular narrowing (12.0[2.3-62.5]) predicted VIH (p<.0001, C-statistic 0.843). Review of single FN showed subtle mesenteric swirl and 15 FPs showed 4 SBO and 1 adhesion all requiring surgery and 10 negative cases in which swirls were overcalled and other findings were minimal. CT correctly identified 83% of non-RYGB related operative diagnoses (missed 2 cholecystitis and 1 leaking ovarian cyst).

CONCLUSION

Mesenteric swirl and vascular narrowing on CT predict surgical VIH. FP cases occurred because SBO 2º adhesions may appear similar to VIH and simple adhesions can cause appearance of a mesenteric swirl.

CLINICAL RELEVANCE/APPLICATION

CT can predict volvulus/internal hernia after RYGB amongst a cohort of all cases taken to surgery for abdominal pain.

HONORED EDUCATORS

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Mindy M. Horrow, MD - 2013 Honored Educator

SSC04-03 An Assessment of Clinical History Quality and Its Effect on Acute Abdominal CT Diagnostic Accuracy

Monday, Nov. 30 10:50AM - 11:00AM Location: E451A

Participants
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Pawel Stefanski, MD, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
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Arash Jaber, MD, Toronto, ON (Abstract Co-Author) Nothing to Disclose
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Christian B. Van Der Pol, MD, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
Angel Y. Fu, BSc, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
Matthew D. McInnes, MD, FRCP, Ottawa, ON (Abstract Co-Author) Nothing to Disclose

PURPOSE

CT interpretation is integral in the management of emergency department (ER) patients. The clinical history provided on the ER CT requisition is variable in quality but often guides CT interpretation. The aim of this study is to evaluate the effect of CT requisition history quality on acute abdominal CT diagnostic accuracy and determine if more patient information would aid in study interpretation.

METHOD AND MATERIALS

335 abdominal CT scans at a tertiary care ER between September and October 2012 was retrospectively reviewed. The following data was collected: a) clinical history provided on CT requisition, b) lab work-up ordered prior to CT request, c) impression by ER CT radiologist, d) final disposition diagnosis by ER physician, and e) microbiology, surgical or pathology results. The quality of the clinical histories collected were evaluated by two blinded staff radiologists and two radiology residents. A 5-point Likert scale based on 4 categories of history criteria was used (presenting complaint, past medical history or symptom evolution, objective laboratory or prior examination results and differential diagnosis based on clinical evaluation). A composite CT diagnosis was created through: 1) Blinded double reading by two radiologists in consensus; 2) Patient laboratory data ordered by ER physician; 3) Surgical or pathology confirmation; 4) Follow-up imaging confirming CT diagnosis. This combined composite was compared to the original CT diagnosis from the CT report.

RESULTS

14.9% (50/335) of ER CT diagnoses did not correlate with the final composite CT diagnosis. The usage of patient information (e.g. lab work, reports) in addition to CT requisition clinical history changed the radiological diagnosis for 8.0% (27/335) of cases. 8.4% (28/335) of cases had misleading history that could have led to interpretation error. No statistically significant correlation (P=0.589) was found between graded quality of the clinical history provided and CT diagnosis accuracy.

CONCLUSION

CT clinical history quality does not correlate with CT diagnosis accuracy. However, a misleading history could alter CT case interpretation. Increased access to ancillary patient information can improve interpretation accuracy.

CLINICAL RELEVANCE/APPLICATION

CT interpretation is integral in the management of emergency department (ER) patients. The clinical history provided on the ER CT requisition is variable in quality but often guides CT interpretation.
The results of our study could lead to greater live-access in electronic medical systems of more patient information and of increased quality for ER radiologists to improve interpretation accuracy.

**SSC04-04  Body Packing: Which Modality to Choose in the Initial Evaluation? A Comparative Study of X-ray versus CT**

**Monday, Nov. 30 11:00AM - 11:10AM Location: E451A**

Participants
Robin F. Gohmann, MD, Aachen, Germany (Presenter) Nothing to Disclose
Christiane K. Kuhl, MD, Bonn, Germany (Abstract Co-Author) Nothing to Disclose
Sebastian Reinartz, MD, Aachen, Germany (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
The purpose of this study was to evaluate the diagnostic performance of plain film and CT in the detection of internally concealed drugs, frequently referred to as body packing.

**METHOD AND MATERIALS**
The study was approved by the local ethics committee and performed retrospectively. Between July 2009 and June 2013, 142 consecutive X-ray (n=98) and CT (n=44) examinations on medically asymptomatic suspects were included (107 men, 25 females, mean age 35±8).

**RESULTS**
In a total of 40 cases (40 %) authorities ascertained intracorporally concealed drugs with a prevalence of 35 % in the group examined with X-ray and 14 % in the group examined with CT. In 85 % of those cases heroin was found. The rate of radiologically detected cases of body packing in either modality (X-ray: 79 %, CT: 82 %) did not vary statistically significantly (p>0.05). Both the NPV of X-ray (83 %) and CT (94 %) as well as the PPV of X-ray (68 %) and CT (40 %) were statistically equivalent (p>0.05).

**CONCLUSION**
As body packing is not limited to a single substance or mode of packaging and therefore presents with differing imaging characteristics, diagnostic performance of X-ray and CT may vary. Because CT and X-ray were statistically equivalent in our cohort, and body packing sometimes can be invisible on plain film and other times is very easily picked up we emphasise a stepwise approach with a careful interpretation of the CT-scout view and to only secondarily proceed to CT.

**CLINICAL RELEVANCE/APPLICATION**
Hard ray CT-scout view in body packing should be viewed as a diagnostic image with the potential of rendering the planned CT of the abdomen not necessary in selected cases.

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**SSC04-05  Pelvic Artifacts in Material Decomposition Images from Dual Energy CT: A Phantom and Patient Study**

**Monday, Nov. 30 11:10AM - 11:20AM Location: E451A**

Participants
Sebastian Winkhofer, MD, San Francisco, CA (Presenter) Nothing to Disclose
Jack Lambert, PhD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Yuxin Sun, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Zhen J. Wang, MD, Hillsborough, CA (Abstract Co-Author) Nothing to Disclose
Benjamin M. Yeh, MD, San Francisco, CA (Abstract Co-Author) Research Grant, General Electric Company; Author with royalties, Oxford University Press; Shareholder, Nextrast, Inc;

**PURPOSE**
Aim of the study was to describe the frequency, appearance and severity of pelvic beam hardening artifacts on material decomposition images from rapid-kV switching Dual-Energy Computed Tomography (rsDECT).

**METHOD AND MATERIALS**
Monochromatic (70keV, 52keV, 120keV) and material decomposition images (iodine(-water), water(-iodine)) reconstructed from pelvic rsDECT scans of 41 patients (22 male, mean age 57±6 years, range 22-86 years) were retrospectively evaluated. We qualitatively analyzed the presence, type (hyperdense vs. hypodense) and severity of artifacts and the diagnostic capability of anatomic detail (5-point scales). Quantitative measurements included CT numbers, iodine and water concentrations, grayscale values (GY), and standard deviations (SD) of the artifact-affected regions, compared with corresponding unaffected reference tissue. A pelvic phantom was constructed and scanned to validate the presence of artifacts. Wilcoxon signed-rank and paired t-tests were used to compare results between the different image reconstructions.

**RESULTS**
Beam hardening artifacts were seen in all 41 patients in all datasets. The median artifact severity score was higher in water(-iodine) and iodine(-water) images (3, each) compared to 70keV (1), 52keV (2), and 120keV (1) (P<0.001, each). The diagnostic capability for pelvic organ depiction was lower (P<0.001) in water(-iodine) and iodine(-water) images compared to monochromatic images. Higher SD values of CT number, concentrations, and GY value were revealed for areas affected by artifacts compared to reference tissues in all data sets (each P<0.001). Similar results were seen in the phantom study.

**CONCLUSION**
Beam hardening artifacts are prevalent in pelvic material decomposition rsDECT images, show inverted high and low signal and should not be misinterpreted as disease in the pelvis.

**CLINICAL RELEVANCE/APPLICATION**
It is important for the radiologist to know that the accuracy of pelvic material decomposition images might be impaired by artifacts
and that the diagnosis of frequently seen pathologies such as urinary bladder cancer or wall thickening, intravesicular calculi, enlargement of the prostate gland or ovarian cancer might be impeded.

**SSC04-06  The Clinical Value of MR Gadolinium Colonic Transit Test in Patients with Constipation**

**METHOD AND MATERIALS**

According to Rome III clinical diagnostic criteria, eight patients, 1 male, 7 female, aged 15-48 with a mean of 34.3, with a history of functional constipation from 1 to 10 years, with a mean of 5.4 years were chosen to undergo both traditional barium X-ray and MR colonic transit test at the same time. 20 barium tablets and 5 gadolinium grains were taken orally at the same time by each patient, then rechecked after 24h, 48h, 72h to count the residual barium tablet and gadolinium markers in X-ray and MRI respectively. The results, advantages and disadvantages of the two methods were compared.

**RESULTS**

All of the eight patients successfully underwent both X-ray and MR colonic transit tests. X-ray transmission test showed 5 cases residual barium strip markers ≥20% (4 tablets) after 48h, 3 cases ≥20% (4 tablets) after 72h; MR transmission test showed 5 cases residual gadolinium markers ≥20% (1 grain) after 24h, 3 cases ≥20% (1 grain) after 48h. The residual barium tablet markers ≥20% (4 tablets) after 72h in X-ray test was set as a positive standard of slow colonic transit. All 3 positive patients in X-ray test showed residual gadolinium markers ≥20% (1 grain) after 48h in MR colonic transit tests; All 5 negative patients in X-ray test showed no residual gadolinium grain after 48h in MR tests.

**CONCLUSION**

MR transmission test can clearly demonstrate the location and quantify the remaining markers in the colon with fast scan sequences. The exact location of the residual markers can be observed by using 2D combined with 3D technology. MR has no ionizing radiation which is very important for multiple follow-ups. Our preliminary results indicate that it is feasible to consider the residual markers ≥20% (1 grain) in the colon after 48h as the diagnostic criteria of slow transit constipation time by MRI.

**CLINICAL RELEVANCE/APPLICATION**

It is expected that MR gadolinium transmission test to replace the X-ray colon transmission test due to its accurate positioning and without radiation.

**SSC04-07  Quantification of Inflammation with Ultrasound Molecular Imaging Following Automated Imaging Fusion with CT/MRI: A Pilot Study in a Porcine Model of Acute Ileitis**

**METHOD AND MATERIALS**

An acute terminal ileitis model was established in 3 female pigs by intraluminal exposure of a segment of terminal ileum with 2,4,6-trinitrobenzene sulfonic acid (TNBS in ethanol). All pigs were imaged at 48h after induction of acute ileitis. Pigs were either imaged with a clinical CT (Zeego, Siemens) or MR (Discovery MR750w; GE) enterography protocol and data sets were uploaded onto a clinical ultrasound machine (Acuson S3000; Siemens). Using an anatomical landmark-based approach, inflamed bowel segments were localized in real-time on subsequent ultrasound molecular imaging of the bowel using eSie Fusion auto registration software (Siemens). Inflammation of the bowel wall was quantified using dual P- and E-selectin-targeted ultrasound molecular imaging and compared with histology.

**RESULTS**

Real-time image fusion was successful in all 3 animals. Using anatomical CT and MR road mapping, the inflamed bowel segment could be identified quickly and inflammation of the bowel segment could be assessed within 10 minutes. Selectin-targeted ultrasound molecular imaging signal correlated well with the grade of inflammation on histology.
To compare splenic stiffness (SS) measured by shear wave elastography (SWE) in patients of extrahepatic portal vein obstruction

PURPOSE

Arun K. Gupta, MBBS, MD, New Delhi, India (Nihar R. Dash, MS, New Delhi, India (Sujoy Peush Ragini Madhusudhan Participants

SSC04-09 CT after Pancreaticoduodenectomy with Portal Vein and/or Superior Mesenteric Vein Reconstruction: Review of Current Surgical Techniques and Associated Post Surgical Imaging Findings

Monday, Nov. 30 11:40AM - 11:50AM Location: E451A

Participants
Karen B. Bleich, MD, Baltimore, MD (Presenter) Nothing to Disclose
Ammar Javed, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Fabio Bagante, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Christopher L. Wolfgang, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Elliot K. Fishman, MD, Owings Mills, MD (Abstract Co-Author) Research support, Siemens AG Advisory Board, Siemens AG Research support, General Electric Company Advisory Board, General Electric Company Co-founder, HipGraphics, Inc

PURPOSE

To review the current range of PV-SMV reconstruction procedures that may be performed in conjunction with pancreaticoduodenectomy, and to establish patterns of imaging findings associated with these vascular procedures in order to more accurately distinguish post-surgical findings from recurrent malignancy, both of which can demonstrate venous attenuation and perivenous induration.

METHOD AND MATERIALS

We reviewed our database of patients who underwent PV-SMV reconstruction from 2004-2014 and identified patients who met the following criteria: 1. CT available within 60 days following surgery, 2. pathologic R0 or R1 resection. We restricted our analysis to cases with recent post-operative CT and complete surgical resection because recurrent malignancy is highly unusual in the immediate post-operative period in patients for whom a complete surgical resection has been achieved; therefore the observed CT findings could be attributed to post-surgical changes rather than to recurrent or residual disease. 71 patients in the database met the inclusion criteria. Two radiologists and two surgeons reviewed the CTs and the operative notes. The configuration and caliber of the post-reconstruction portal vein and SMV (referred to as the PV-SMV complex) were analyzed, and the perivenous tissue was characterized. The findings were correlated with the details of the type of venous reconstruction.

RESULTS

There are four patterns of the PV-SMV complex following reconstruction: concentric smooth narrowing, eccentric/irregular narrowing or defect, thrombosis, and changes in venous configuration without significant caliber change. There are two patterns of the perivenous tissue: soft tissue density thickening, and a range of low attenuation induration/inflammation/ fluid. The post-operative imaging findings can be correlated with the type of venous reconstruction performed. Some of the post-operative imaging appearances overlap with findings considered suspicious for recurrent malignancy.

CONCLUSION

There are specific patterns of imaging findings after portal venous reconstruction. In some cases, the normal post-surgical findings mimic recurrent disease. Knowledge of the expected post-surgical appearances may allow for more accurate interpretation of follow-up CT.

CLINICAL RELEVANCE/APPLICATION

Recognition of the patterns of the PV-SMV complex after pancreaticoduodenectomy with venous reconstruction may prevent erroneous diagnosis of recurrent/residual disease.

Honored Educators

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Elliot K. Fishman, MD - 2012 Honored Educator
Elliot K. Fishman, MD - 2014 Honored Educator

SSC04-09 Evaluation of Splenic Stiffness in Patients of Extrahepatic Portal Vein Obstruction Using Shear Wave Elastography: Comparison with Intra-Operative Portal Pressure

Monday, Nov. 30 11:50AM - 12:00PM Location: E451A

Participants
Madhusudhan Kumble Seetharama, MD, FRCSR, New Delhi, India (Presenter) Nothing to Disclose
Raju Sharma, MD, New Delhi, India (Abstract Co-Author) Nothing to Disclose
Ragini Kilambi, MS, New Delhi, India (Abstract Co-Author) Nothing to Disclose
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Arun K. Gupta, MBBS, MD, New Delhi, India (Abstract Co-Author) Nothing to Disclose

PURPOSE

To compare splenic stiffness (SS) measured by shear wave elastography (SWE) in patients of extrahepatic portal vein obstruction...
To compare splenic stiffness (SS) measured by shear wave elastography (SWE) in patients of extrahepatic portal vein obstruction (EHPVO) with intra-operative portal system pressures (PP)

**METHOD AND MATERIALS**

21 patients (14 males; 7 females) of mean age 20.4 years (range: 13 - 34 years) with clinical and sonographic diagnosis of EHPVO were included in this prospective study after obtaining approval from institute ethics committee. Endoscopy for esophageal varices was done in all patients. Splenic stiffness was measured using shear wave elastography (SWE) on Aixplorer Supersonic Imagine ultrasonography scanner. Three values were taken three different region of interests drawn at different areas of spleen avoiding major vessels and mean was calculated. Intra-operative PP was measured from an omental vein in all these patients during proximal spleno-renal shunt surgery. The PP was compared and correlated with SS along with other parameters. A p-value of < 0.05 was considered significant.

**RESULTS**

The mean SS was 46.04 ± 8.0 kPa and the mean PP was 33.29 ± 4.1 mm of Hg. Although there was negative correlation between PP and SS (Pearson correlation coefficient: minus 0.119), this was not statistically significant (p=0.607). There was no significant correlation between grades of esophageal varices (EV) and SS (p=0.375) and between EV and PP (0.06). PP also did not show significant difference between patients with and without portal biliopathy (p=0.14).

**CONCLUSION**

There was no significant correlation between SS and PSP, EV grading and PSP, and EV grading and SS. Thus SS measured by SWE may not help in predicting gastrointestinal bleed in patients of EHPVO.

**CLINICAL RELEVANCE/APPLICATION**

Assessment of splenic stiffness by SWE is a simple technique giving absolute values of stiffness in kilopascals. Although, SS should indirectly reflect portal pressure, we did not find this in our study. The results of our study indicate that simple measurement of SS may not be sufficient to predict portal pressure and thus variceal bleeding.
PURPOSE

Time-spatial labeling inversion pulse (Time-SLIP) flow-in technique is a spin labeling method using fresh blood as an intrinsic endogenous contrast material to enter into the tagged region by an inversion recovery (IR) pulse. Portal venous flow, especially superior mesenteric venous (SMV) flow, is known to significantly increase after food intake. To evaluate the visualization of sequential MR portography examinations using the Time-SLIP flow-in technique after food intake, and to determine an appropriate timing of the examination.

METHOD AND MATERIALS

MR portography was performed on 5 healthy volunteers with inversion time (TI) = 900 msec, 1200 msec, 1500 msec before and after intake of 2 packs of CalorieMate (Otsuka Pharmaceutical Co., Japan), at following 7 phases; pre-meal, just after meal, 30 minutes after, 1 hour after, 2 hours after, 3 hours after, and 4 hours after. Time-SLIP tag pulse was applied obliquely to cover the liver so that SMV flows into the tagged region. The visualization of intra- and extra-hepatic portal branches was evaluated in all 7 phases both subjectively with a 4-point grading system and objectively in contrast-to-noise (CNR) of portal vein to hepatic parenchyma. The degree of signal suppressions was also evaluated on hepatic parenchyma and hepatic vein, and intestinal movement artifacts.

RESULTS

The visualization of portal vein was improved at all phases after food intake, among which the improvement at 1 hour (mean CNR=6.4) and 2 hours (mean CNR=6.5) was prominent. The visualization of intrahepatic portal branches was excellent even at TI=900 msec, which was thought to be too short under normal fasting situation; however, high velocity of portal venous flow was expected after food intake. The signals of hepatic parenchyma and hepatic veins were well suppressed at TI=900 msec, which permitted higher CNR of portal vein than at TI=1500 msec, where the hepatic parenchyma signal recovered. The image quality of portograms was not interfered by any intestinal peristalsis artifacts.

CONCLUSION

The visualization of intra- and extra-hepatic portal veins with Time-SLIP flow-in portography was significantly improved after food intake rather than during the fasting period.

CLINICAL RELEVANCE/APPLICATION

Non-contrast portography examination using the Time-SLIP flow-in technique should perform after food intake rather than fasting period.
PURPOSE
Radiofrequency ablation (RFA) is usually performed under ultrasonographic (US) guidance. However, if a target lesion was isoechoic on gray-scale ultrasound, it would be hard to perform RFA under US-guidance. Recently introduced contrast-enhanced ultrasound (CEUS) can demonstrate isoechoic HCC with arterial enhancement and delay washout. The purpose of this study is to evaluate the effectiveness and safety of RFA under CEUS guidance in the treatment of HCC.

METHOD AND MATERIALS
Total 15 isoechoic HCCs on gray-scale ultrasound from 15 patients were included in this study. Nine patients were male, 6 female. Mean age was 61 years old. Mean size of HCCs was 1.8 cm (range, 1.0-4.8). HCC was confirmed by typical imaging findings of arterial enhancement and delay washout on CT and/or MRI. All HCCs were isoechoic on gray-scale ultrasound. Targeting of the tumors was performed under CEUS-guidance using sulphur hexafluoride (SonoVue®, Bracco Imaging S.p.A., Milan, Italy). RFA was performed once in 10 cases, twice in 5 cases (mean, 1.3).

RESULTS
Technical success was achieved in all cases (100%). Marginal recurrence was developed in 3 cases. Clinical success rate was 80% (12/15). Mean interval between the RFA and marginal recurrence was 9.7 months (range, 2-20). The mean follow-up period was 17.6 months (range, 5-24). No complication was observed in all cases.

CONCLUSION
Technical success rate of CEUS-guided RFA was 100% and clinical success rate, 80% without any RFA-related complication. CEUS-guided RFA appears an effective and safe treatment modality when a target HCC is isoechoic on gray-scale ultrasound.

CLINICAL RELEVANCE/APPLICATION
CEUS-guided RFA appears to be an effective treatment option when ablating isoechoic HCC.

GI342-SD-MOA4 Endocrine Tumors of the Pancreas: Correlation between MDCT Features and Pathology

Station #4

Participants
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Maria Chiara Ambrosetti, MD, Verona, Italy (Abstract Co-Author) Nothing to Disclose
Caterina Zivelonghi, Verona, Italy (Abstract Co-Author) Nothing to Disclose
Giovanni Butturrini, Verona, Italy (Abstract Co-Author) Nothing to Disclose
Roberto Pozzi Mucelli, Verona, Italy (Abstract Co-Author) Nothing to Disclose

PURPOSE
To describe the MDCT features of pancreatic endocrine tumors and correlate them with tumor biology on histopathology.

METHOD AND MATERIALS
We reviewed the multiphasic CTs performed on 118 patients with pancreatic endocrine tumors. For 81 patients, Ki-67/grading based on primary tumor histology was available. We analyzed the following CT features of the lesions: location, size, homogeneity, degree of enhancement in the arterial and venous phases, diameter of the main pancreatic duct, presence of calcifications, vascular invasion, lymph nodes enlargement, and liver metastases. The association between MDCT features and pathological findings was associated with Fisher's test.

RESULTS
Mean tumor diameter was 4.12 (range 0.5-14.5 cm). Pathological grading revealed G1 in 44 patients (54.3%), G2 in 29 patients (35.8%) and G3 in 8 patients (9.9%). Tumor diameter and arterial phase vascularization were significantly associated with G1 (p<0.001 and p=0.0334). Vascularization in the venous phase, on the contrary, was not associated with malignancy or with metastases. Heterogeneous enhancement, arterial and venous invasion were correlated with the presence of hepatic metastases (p=0.0073, p=0.0098 and p=0.0078 respectively). In addition, vascular invasion was strongly associated with tumor grade (p<0.001). The remaining features did not associate with malignant behavior.

CONCLUSION
Our findings show that hypovascularity in the arterial phase, larger size, vascular invasion and non-homogeneity are predictors of tumor aggressiveness and poor patient prognosis.

CLINICAL RELEVANCE/APPLICATION
Identification of tumor features at CT predictive of aggressive behaviour might improve diagnosis and treatment.

GI343-SD-MOA5 Photon Counting CT with Dual-contrast Enhancement

Station #5

Participants
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Peter B. Noel, PhD, Munich, Germany (Abstract Co-Author) Nothing to Disclose

PURPOSE
To test the feasibility of dual-contrast enhanced imaging of the liver using simulations of Photon Counting CT Imaging (PCT).
METHOD AND MATERIALS

PCT images of the liver were simulated for an examination performed with two different contrast agents (CA), iodine (CA 1) and gadolinium (CA 2). Image reconstruction was performed for different contrast phases for each CA, and image acquisition was calculated at the time point with portal venous contrast distribution of CA 1 and arterial contrast phase for CA 2. Native, arterial, and portal venous contrast enhanced images were calculated with the spectral separation of PCT.

RESULTS

In simulated PCT images we were able to differentiate between the tissue enhancement of CA 1 and CA 2. The distribution of both CA within the parenchyma of the liver was illustrated with perfusion maps for CA 1 and CA 2. So it was possible to achieve arterial and portal venous phase images at one time point. In addition, virtual non-contrast enhanced image were calculated.

CONCLUSION

Dual contrast PCT offers the possibility to achieve three phases CT imaging of the liver at one time point by a single scan CT examination.

CLINICAL RELEVANCE/APPLICATION

Multi-phase PCT imaging of the liver based on a single scan is a completely new approach for multi-energy CT imaging, offering detailed contrast information in a single scan volume and a significant reduction of radiation dose.

PURPOSE

To review the current range of PV-SMV reconstruction procedures that may be performed in conjunction with pancreaticoduodenectomy, and to establish patterns of imaging findings associated with these vascular procedures in order to more accurately distinguish post-surgical findings from recurrent malignancy, both of which can demonstrate venous attenuation and perivenous induration.

METHOD AND MATERIALS

We reviewed our database of patients who underwent PV-SMV reconstruction from 2004-2014 and identified patients who met the following criteria: 1. CT available within 60 days following surgery, 2. pathologic R0 or R1 resection. We restricted our analysis to cases with recent post-operative CT and complete surgical resection because recurrent malignancy is highly unusual in the immediate post-operative period in patients for whom a complete surgical resection has been achieved; therefore the observed CT findings could be attributed to post-surgical changes rather than to recurrent or residual disease. 71 patients in the database met the inclusion criteria. Two radiologists and two surgeons reviewed the CTs and the operative notes. The configuration and caliber of the post-reconstruction portal vein and SMV (referred to as the PV-SMV complex) were analyzed, and the perivenous tissue was characterized. The findings were correlated with the details of the type of venous reconstruction.

RESULTS

There are four patterns of the PV-SMV complex following reconstruction: concentric smooth narrowing, eccentric/irregular narrowing or defect, thrombosis, and changes in venous configuration without significant caliber change. There are two patterns of the perivenous tissue: soft tissue density thickening, and a range of low attenuation induration/inflammation/ fluid. The post-operative imaging findings can be correlated with the type of venous reconstruction performed. Some of the post-operative imaging appearances overlap with findings considered suspicious for recurrent malignancy.

CONCLUSION

There are specific patterns of imaging findings after portal venous reconstruction. In some cases, the normal post-surgical findings mimic recurrent disease. Knowledge of the expected post-surgical appearances may allow for more accurate interpretation of follow-up CT.

CLINICAL RELEVANCE/APPLICATION

Recognition of the patterns of the PV-SMV complex after pancreaticoduodenectomy with venous reconstruction may prevent erroneous diagnosis of recurrent/residual disease.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Elliot K. Fishman, MD - 2012 Honored Educator
Elliot K. Fishman, MD - 2014 Honored Educator
Participants
Yanyan Xu, Beijing, China (Abstract Co-Author) Nothing to Disclose
Hongliang Sun, MD, Beijing, China (Presenter) Nothing to Disclose
Wu Wang, MD, PhD, Beijing, China (Abstract Co-Author) Nothing to Disclose

PURPOSE
To evaluate DW-MRI related parameters characteristics and potential differences among different KRAS mutation status in rectal cancers.

METHOD AND MATERIALS
Fifty-one patients including 29 men and 22 women with histologically proved rectal cancer were enrolled. Diffusion-weighted MR imaging was performed with eight b values. ADCs (including Max-ADC, Min-ADC and Mean-ADC) and IVIM parameters \( (D, \text{ pure diffusion}; f, \text{ perfusion fraction}; D^*, \text{ pseudodiffusion coefficient}) \) were respectively calculated by mono-exponential and bi-exponential analysis. Patients were stratified into two groups - KRAS wild-type and mutant. According to different mutation locations, patients with KRAS mutant were divided into codon 12 and codon 13 two subgroups. The DW-MRI relative parameters between KRAS wild-type group and KRAS mutant group were compared by using independent samples t test or Mann-Whitney U test. ROC analysis of discrimination between KRAS wild-type and KRAS mutant tumor was performed for Mean-ADC, D and D* values. \( P < 0.05 \) was considered to indicate a statistically significant difference.

RESULTS
51 patients including 38 KRAS wild-type, 13 KRAS mutant, and the latter group were then divided into 8 of codon 12 mutation and 5 of codon 13 mutation. Mean-ADC, D and D* values were significantly higher in KRAS mutant group (Mean-ADC=[1.43±0.24]×10^{-3}mm²/s, D=[1.13±0.33]×10^{-3}mm²/s, D*=[70.77±67.77]×10^{-3}mm²/s) than in KRAS wild-type group (Mean-ADC=[1.27±0.39]×10^{-3}mm²/s, D=[0.94±0.30]×10^{-3}mm²/s, D*=[32.98±43.74]×10^{-3}mm²/s) \( (P = 0.008, P = 0.029 \text{ and } P = 0.025, \text{ respectively}) \). However, DW-MRI related parameters showed no significant differences between codon 12 and codon 13 subgroups. According to ROC curve, Mean-ADC, D and D* values showed diagnostic significance with the AUC values of 0.750, 0.704 and 0.710, respectively. The cutoff values for Mean-ADC, D and D* were 1.405×10^{-3}mm²/s, 0.897×10^{-3}mm²/s, 26.502×10^{-3}mm²/s, respectively.

CONCLUSION
Mean-ADC, D and D* values showed significant diagnostic performance in differentiating rectal cancers with different KRAS status, potentially reflecting the possible KRAS status of rectal cancer.

CLINICAL RELEVANCE/APPLICATION
The apparent diffusion coefficient (ADC) and Intravoxel Incoherent Motion (IVIM)-derived parameters are helpful for differentiation of rectal cancer KRAS mutant status. It has potential value to reflect tumor molecular biological characteristics and for making treatment plan.

G1346-SD-MOA8

Incremental Yield of CT/MR Enterography/enteroclysis in Diagnosis and Management of Suspected Inflammatory Small Bowel Disease versus Endoscopic Techniques

Station #8

Participants
Sonal Krishan, MD, Gurgaon, India (Presenter) Nothing to Disclose

PURPOSE
The aim of this retrospective review was to evaluate the incremental yield of CTE/MRE versus endoscopic techniques in a tertiary care setting. The secondary aim was to critically evaluate the practice patterns in a large tertiary care centre vis a vis the current AGA(2012) and ESGAR(2013) recommendations.

METHOD AND MATERIALS
150/750 consecutive patients with suspected IBD and positive CTE/MRE for non malignant bowel wall pathology were included. Histopathological ,surgical, endoscopic correlation was sought from relevant records. The images were evaluated by radiologist blinded to the report for: bowel wall enhancement, pattern of enhancement, location, length of involvement, locoregional extramural pathology and extra-intestinal findings. These were than correlated with endoscopy, histopathology and surgical findings. Data on patients with suspected and established inflammatory bowel disease in both remittance, relapse, stricturing and non-stricturing disease were analyzed separately. Weighted incremental yield (IYW) and 95% confidence intervals (CIs) of comparative modalities were calculated. Referral patterns of the referring clinicians were also recorded.

RESULTS
In non-stricturing disease \( (n=110) \) endoscopy had a slightly higher diagnostic yield compared to CTE/MRE \( (IYW 13%; 95\%CI 9-17\%) \). In n=25 patients extra-intestinal findings were detected by CTE/MRE. In n=66 patients CTE/MRE were initially used to plan the endoscopic approach. CTE and MRE had comparable results for establishing diagnoses \( (IYW 5%; 95\% CI 1-9\%) \). The pooled sensitivity of CTE and MRE was 87% \( (95\% CI, 82-92\%) \) and 89% \( (95\% CI, 85-93\%) \). MRE scored over CTE \( (IYW 12%; 95\%CI 7-17\%) \) in evaluating patients on disease modifying agents \( (n=10) \). In n=30 patients CTE/MRE picked extra-intestinal findings which altered diagnosis. In n=20 patients extraintestinal findings allowed for planning of surgical options. There were significant individual variations in referral patterns precluding for optimal evaluation of adherence to guidelines.

CONCLUSION
Endoscopy slightly scores over CTE/MRE in non stricturing disease. MRE/CTE had comparable diagnostic yields. In significant number MRE/CTE positively effected patient management in offering alternative diagnosis, planning endoscopic approach and detecting extra-mural findings. There are wide variations in practice.

**Participants**
Shuangshuang Xie, Tianjin, China (Presenter) Nothing to Disclose
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Jianzhong Yin, MD, Tianjin, China (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
To investigate the optimal time point for liver function evaluation in normal and cirrhotic livers on gadolinium ethoxybenzyl diethyleneetriamine pentaacetic acid (Gd-EOB-DTPA)-enhanced MR imaging.

**METHOD AND MATERIALS**
Sixty-six subjects (cirrhotic liver, n=43; normal liver, n=23) underwent Gd-EOB-DTPA-enhanced MRI. Images were obtained before Gd-EOB-DTPA injection and in the hepatobiliary phase (5, 10, 15 and 20 min) for each subject. Signal intensity of the liver in all phases was measured for relative enhancement (RE) calculation. The differences of RE between normal and cirrhotic livers were compared at all phases, and also the differential diagnostic efficiency for diagnosing cirrhosis and moderate-severe cirrhosis.

**RESULTS**
From 5 to 20 minutes, RE appeared increase in normal liver function and Child-Pugh class A group, plateau in Child-Pugh class B group, and decrease in Child-Pugh class C group. At 15 and 20 minutes, significant differences were found between all groups (P<0.05). The area under the receiver-operator curves of 10, 15 and 20 minutes for diagnosing cirrhosis (0.833, 0.849, 0.842) and moderate-severe cirrhosis (0.957, 0.963, 0.968) had no statistical differences (P>0.05).

**CONCLUSION**
RE at 15 minutes is useful for differentiating all liver cirrhosis stages, and 10 minutes has equal diagnostic efficiency for diagnosing cirrhosis and moderate-severe cirrhosis.

**CLINICAL RELEVANCE/APPLICATION**
The study demonstrates the optimal time of liver enhancement for differentiating normal-liver and patients in different Child-Pugh groups, and diagnosing cirrhosis and moderate-severe cirrhosis.
To discuss the pitfalls and limitations in assessment of PCI.
Gastrointestinal Monday Poster Discussions

Monday, Nov. 30 12:45PM - 1:15PM Location: GI Community, Learning Center

Participants
Anthony E. Samir, MD, Boston, MA (Moderator) Consultant, Pfizer Inc; Consultant, General Electric Company; Consultant, PAREXEL International Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Siemens AG; Research Grant, Toshiba Corporation; Research Grant, General Electric Company; Research Grant, Samsung Electronics Co, Ltd; Research Grant, Analogic Corporation; Research support, SuperSonic Imagine; Research support, Hitachi, Ltd

Sub-Events
GI348-SD-MOB1 Prospective Evaluation of Local Recurrence after Radiofrequency Ablation (RFA) of Liver Tumors: Effectiveness of Immediate Second-Look Evaluation after Procedure using Pre-RFA MRI and Post-RFA CT Registration
Station #1

Participants
Jeong Hee Yoon, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
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Ernst Klotz, DiplPhys, Forchheim, Germany (Abstract Co-Author) Employee, Siemens AG
Joon Koo Han, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

PURPOSE
To evaluate the clinical impact of second look radiofrequency ablation (RFA) using prototype software allowing registration of pre- and post-RFA images.

METHOD AND MATERIALS
This prospective study was approved by institutional review board and informed consent was obtained. A total of 77 patients (M:F=61:16, mean age, 63.1± 9.7 years) with 99 liver tumors (89 hepatocellular carcinoma, 1 cholangiocarcinoma, 9 metastases) who underwent RFA were enrolled. Pre-RFA magnetic resonance imaging (MRI) and post-RFA computed tomography (CT) images were analyzed for evaluating sufficient safety margin, with either side-by-side visual comparison by attending radiologist or with registration software. Accordingly, patients were classified into sufficient and insufficient margin groups. Additional RFA was performed depending on technical feasibility in an insufficient group, and safety margin was re-assessed. Finally, local tumor progression (LTP) and progression free survival (PFS) were assessed in sufficient or insufficient safety margin groups.

RESULTS
The second RFA session was done in five patients who showed insufficient margin on registration software only, considering technical feasibility. All showed sufficient safety margin in reassessment done by visual and software inspection. After reassessment, insufficient margin was observed in five patients on both method, 13 patients on visual inspection only, and 10 patients on registration software only. During follow-up period (median, 33 months), insufficient margin group classified by registration software showed significantly higher LTP rate (53.3% [8/15] vs. 14.3% [12/84]) and shorter PFS (20.5 months [95% CI, 11.3-29.8] vs. 36.5 months [95% CI, 31.7-36.5], P=0.0001) than sufficient margin group. However, sufficient (n=86) and insufficient (n=13) margin groups classified by visual inspection did not show significant difference of LTP (P=0.86).

CONCLUSION
Safety margin assessment using registration software is able to provide information regarding LTP prediction than visual inspection, by assessing safety margin accurately.

CLINICAL RELEVANCE/APPLICATION
Additional RFA session following immediate second look safety margin evaluation using automatic registration software may reduce local tumor recurrence after RFA.

GI349-SD-MOB2 Pancreatic Metastases from Renal Neoplasms and Neuroendocrine Pancreatic Tumors: Differential Diagnosis at CT
Station #2

Participants
Giulia A. Zamboni, MD, Verona, Italy (Presenter) Nothing to Disclose
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PURPOSE
Pancreatic metastases from renal-cell carcinoma (PRCC) and neuroendocrine pancreatic tumors (PNET) are both hypervascular, and the differential diagnosis can be difficult. Purpose of this study is to compare the multiphasic CT features of these two lesions.

**METHOD AND MATERIALS**

We retrospectively compared the CTs performed on 28 patients with PRCC with 28 patients with PNETs matched by size. All patients underwent multiphasic CT: unenhanced, late-arterial and portal-venous images were available for review. In patients with multiple PRCCs, the largest lesion was analyzed. One reader evaluated the site, margins, enhancement intensity and homogeneity (subjective comparison to normal parenchyma) in the arterial and venous phases, vascular invasion and main pancreatic duct (MPD) dilatation.

**RESULTS**

No significant difference was observed in lesion distribution. In the arterial phase 26/28 PRCC and 24/28 PNET were hypervascular, while in the venous phase 17/28 PRCC and 17/28 PNET were hyperattenuating; enhancement was homogeneous in 14/28 PRCC and in 17/28 PNET (all: p=n.s.). Homogeneous PNETs were smaller than inhomogeneous PNET (21.4±4.2mm vs 43.18±6.92mm, p=0.0073), while the difference was not significant for PRCCs (22.6±5.56mm vs 38.64±6.75mm). All lesions had well-defined margins in both populations; vessel invasion was noted in 3/28 PRCC and 6/28 PNET. MPD was dilated in 5/28 cases in both populations.

**CONCLUSION**

Both RCC and PNET are well-defined hypervascular lesions, usually without MPD dilatation or vessel infiltration. We did not find CT features helpful for a differential diagnosis. The best diagnostic clue for PRCC is a history of renal cell carcinoma.

**CLINICAL RELEVANCE/APPLICATION**

The CT features of pancreatic metastases from renal cell carcinoma and endocrine tumors of the pancreas overlap significantly. Patient history is therefore fundamental for an accurate diagnosis.

**GI350-SD-MO83 CT Diagnosis of Internal Hernia in Patients Post Laparoscopic Roux-en-Y Gastric Bypass: Validation of CT Signs in a Large Cohort**

Station #3

**Participants**

Marc DiLauro, MD, MSc, Ottawa, ON (Presenter) Nothing to Disclose
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Ania Z. Kielar, MD, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
Joseph Mamazza, Ottawa, ON (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

The determine frequency of nine CT signs of internal hernia in patients who have had laparoscopic Roux-en-Y gastric bypass (LRYGB) surgery.

**METHOD AND MATERIALS**

We identified a consecutive retrospective cohort of 78 post LRYGB patients (from 2011-2014), who had a surgically confirmed internal hernia and a computer tomography (CT) study of the abdomen performed within 30 days of the surgery date. Two fellowship trained abdominal radiologists were asked to assess for the presence of each of the following signs on each CT study: 1) swirled mesenteric fat/vessels 2) criss cross of mesenteric vessels (meaning that the orientation of the SMV and SMA is reversed) 3) mushroom shape of bowel 4) tubular distal mesenteric fat surrounded by bowel 5) small bowel obstruction 6) clustered loops of small bowel 7) bowel other than duodenum posterior to the SMA 8) right sided location of the distal jejunal anastomosis and 9) ‘beaking’ or compression of the SMV. Inter-reader agreement was assessed using kappa statistics.

**RESULTS**

The most frequent sign determined by readers 1 and 2 was mesenteric swirl, which was present in 76 (97%) and 81% of cases, respectively (Κ=0.199). The least frequent sign was small bowel obstruction: 17 (22%) and 11 (14%), respectively (Κ=0.741). The frequencies for the remaining signs were: criss cross: 75 (96%) and 45 (56%) (Κ=0.044), mushroom: 60 (77%) and 54 (69%) (Κ=0.353), tubular mesenteric fat: 48 (62%) and 61 (78%) (Κ=0.027), clustered loops of small bowel: 24 (31%) and 34 (44%) (Κ=0.299), bowel posterior to the SMA: 59 (76%) and 44 (54%) (Κ=0.015), right-sided location of the distal anastomosis: 15 (19%) and 16 (21%) (Κ=0.557), and SMV beaking/compression: 65 (83%) and 63 (81%) of cases, respectively (Κ=0.391).

**CONCLUSION**

The best CT indicators of internal hernia post LRYGB are mesenteric swirl, mushroom shape of bowel, right-sided positioning of the distal jejunal anastomosis, and SMV beaking/compression.

**CLINICAL RELEVANCE/APPLICATION**

The prompt diagnosis of internal hernia in post LRYGB patients is currently based on a CT study.
To assess whether reduced dose (RD) CT with Model-Based Iterative Reconstruction (MBIR) provides equal or better diagnostic image quality and lesion conspicuity compared to standard dose (SD) CT in patients undergoing oncological follow-up imaging.

In this IRB-approved, HIPAA compliant study, 44 cancer patients (mean age, 59 years; mean weight, 170 pounds) who had undergone a staging SD CT within 12 months (mean, 106 days) were prospectively included to undergo a weight-based RD CT of the chest, abdomen, and pelvis on a 64-slice CT scanner (GE Discovery 750 HD) with MBIR technique. Radiation dose was recorded and tissue attenuation and image noise of four tissue types was measured objectively at a predetermined site by one reader. Image quality was evaluated subjectively by three readers by assessing image sharpness, image noise, overall quality, and artifacts utilizing 4 or 5-point grading scales. Lesion conspicuity of up to 5 target lesions per patient were analyzed objectively by one reader by repeated target lesion size measurements. Lesions were also analyzed subjectively by three readers using a 3-point grading scale.

Mean radiation dose reduction for RD CT was 44% (range, 6-69%; mean dose=8 mGy) compared to SD CT imaging (P<0.01). Mean image noise across all measured tissue types was significantly (P<0.01) lower in RD CT than in SD CT (mean percent reduction: fat=33%, aorta=53%, liver=50%, muscle=48%). Subjective image quality for RD CT was significantly (P<0.01) higher than for SD CT in regards to image noise and overall image quality; however, there was no statistically significant difference in regards to image sharpness (P=0.59). Additionally, there were subjectively less artifacts on RD CT (P<0.01) than on SD CT. Lesion conspicuity was subjectively better in RD CT compared to SD CT (P<0.01). Repeated target lesion size measurements were highly reliable both on SD CT (ICC=0.987) and RD CT (ICC=0.97).

To compare the accuracy of and the time required for image fusion between real-time ultrasonography (US) and pre-procedural magnetic resonance (MR) images utilizing sweeping auto-registration and positioning auto-registration, respectively, both of which are newly developed automatic fusion imaging techniques from Samsung Medison.

The study protocol was approved by the institutional review board in our institution and all patients gave written informed consent before being enrolled. This prospective study consisted of 22 patients who were referred for planning US to assess the feasibility of radiofrequency ablation for focal hepatic lesions. The accuracy, evaluated by measuring the registration error, the number of point locks used and the time spent for image fusion for both methods were recorded using in-house softwares and were compared respectively using Wilcoxon signed rank test.

Image fusion was successful in all 22 patients. The number of point lock required for image fusion was statistically lower in sweeping auto-registration than positioning auto-registration (median, 1 point lock; range, 1 - 2 point locks; mean, 1.4 point locks; standard deviation, 0.5 point locks vs. median, 2 point locks; range, 1 - 3 point locks; mean, 2.0 point locks; standard deviation, 0.4 point locks, p = 0.001). The time required for image fusion was significantly shorter with positioning auto-registration than with sweeping auto-registration (median, 28.5 seconds; range, 18 - 47 seconds vs. median, 44.5 ms; range, 29 - 74 ms, p < 0.001). The registration error was not significantly different between the two methods (median, 3.75 mm; range, 1.0 - 15.8 mm vs. median, 4.15 mm; range, 1.8 - 9.9 mm, p = 0.808).

Positioning auto-registration offers faster image fusion between real-time US and pre-procedural MR images than sweeping auto-registration while providing similar degree of accuracy but requiring higher number of point locks.
**Variability in Tissue Attenuation Measurements with Dual Energy Spectral CT at Different Table Heights**

**Station #7**

**Participants**
- Ronak N. Shah, MD, Atlanta, GA (*Presenter*) Nothing to Disclose
- Lauren F. Alexander, MD, Atlanta, GA (*Abstract Co-Author*) Spouse, Stockholder, Abbott Laboratories; Spouse, Stockholder, AbbVie Inc; Spouse, Stockholder, General Electric Company
- Qingpo Cai, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
- Jian Kang, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
- William C. Small, MD, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
- Desiree E. Morgan, MD, Birmingham, AL (*Abstract Co-Author*) Research support, General Electric Company
- Courtney A. Coursey Moreno, MD, Suwanee, GA (*Abstract Co-Author*) Nothing to Disclose

**PURPOSE**
To determine if table height alters the measured attenuation values on calculated monoenergetic images from dual energy spectral CT datasets.

**METHOD AND MATERIALS**
An anthropomorphic phantom was imaged using Discovery HD 750 with gemstone spectral imaging (GE Healthcare; Waukesha, WI). The phantom was imaged in centered position and mis-centered positions (3, 6 and 9 cm above, and 3, 6 and 9 cm below center). Attenuation values were recorded in the center of phantom for soft tissue and posterior phantom for bone at different virtual monoenergetic energies (VME) (40, 52, 70 and 140 keV). For each table position and VME, eight soft tissue and eight bone attenuation values were recorded. Attenuation was measured at the same locations in the phantom regardless of table height. ANOVA analysis was performed to determine if mean soft tissue and bone attenuation values differ at various table heights.

**RESULTS**
For VME of 40, 52 and 70 keV, mean soft tissue attenuation values were lowest at -3 cm table position [mean(SD) of 46(20), 44(12) and 43(8) HU, respectively], and highest at -9 cm table position [mean(SD) of 71(21), 60(13) and 51(8) HU, respectively] and +9 cm table position [mean(SD) of 73(16), 61(8) and 52(7) HU, respectively]. For 140 keV monoenergetic images, mean soft tissue attenuation was lowest at -3 cm table position [42(8) HU] and highest at +6 cm table position [46(6) HU]. Mean soft tissue attenuation values were significantly different at different table heights for 40 and 52 keV (p < 0.05), but not for 70 and 140 keV. Mean bone attenuation values were significantly different at different table heights for 40, 52 and 140 keV (p < 0.05), but not for 70 keV.

**CONCLUSION**
Vendor formulae used to compute simulated monoenergetic energy levels resulted in significantly different attenuation values based on the table height during the scan. Differences were greatest for lower monoenergetic images and at extremes of table positioning (+9 cm and -9 cm).

**CLINICAL RELEVANCE/APPLICATION**
Tissue attenuation measurements with dual energy spectral CT vary with table height, especially for lower virtual monoenergetic energy levels. Thus, consistent centering in the CT gantry is important if absolute attenuation values are used for clinical decision making.

**Acute Gastrointestinal Vaso-occlusive Ischemia in Sickle Cell Disease: Incidence, CT Imaging Features, and Clinical Outcome**

**Station #8**

**Participants**
- Carly S. Gardner, MD, Houston, TX (*Presenter*) Nothing to Disclose
- Tracy A. Jaffe, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose

**PURPOSE**
To determine the incidence, specific imaging features, and outcome of gastrointestinal vaso-occlusive ischemia (GVOI) in sickle cell patients undergoing CT for acute abdominal pain.

**METHOD AND MATERIALS**
This HIPAA-compliant, IRB-approved retrospective study evaluated sickle cell patients with an abdominal pain crisis and acute gastrointestinal abnormalities on CT from 1/2006 to 1/2014. CT findings were divided into those compatible and incompatible with bowel ischemia or GVOI. Two abdominal radiologists (1, 13 years’ experience) reviewed the CTs for specific imaging features of ischemia. Clinical laboratory values (lactate, WBC) and outcome were recorded. Descriptive statistics and Wilcoxon-Mann-Whitney two-sample rank-sum test were performed.

**RESULTS**
Of 217 CTs, 33 had acute gastrointestinal abnormalities: 75% (25/33) consistent with ischemia. Complications of ischemia occurred in 16% (4/25): ileus (50%), perforation (25%), pneumatosis (25%). In uncomplicated cases, all had bowel wall thickening.
segmental 52% (11/21) or diffuse 48% (10/21). The colon was commonly involved (76%, 16/21), particularly the ascending (57%, 12/21). Most abnormalities (52%, 11/21) were in the superior mesenteric artery distribution. Average lactate (4.3±4.0 mmol/L, p=0.02) and WBC count (20.1±10.4, x1000 cells/microliter, p=0.01) were significantly higher in GVOI. Overall mortality in patients with GVOI was 17% (3/18).

CONCLUSION

GVOI is an important feature of the acute abdominal crisis in patients with sickle cell disease and can be seen in up to 75% of patients with abnormal bowel findings on CT.

CLINICAL RELEVANCE/APPLICATION

The diagnosis should be strongly considered in sickle cell patients with CT findings of diffuse or segmental bowel wall thickening, particularly involving the colon.

A Primer of the Fluoroscopic Examination of the Post Surgical Gastrointestinal Tract

Station #9

Awards

Certificate of Merit

Participants

Alberto I. Carbo, MD, Shreveport, LA (Presenter) Nothing to Disclose
Dean D. Maglinte, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

Fluoroscopic examination of the post operative (PO) gastrointestinal (GI) tract has remained essential despite advances in cross sectional imaging. Teaching points of the exhibit are: To describe the most common operations performed on the GI tract To detail the rationale for each surgery. To provide basic knowledge of contrast agents, patient positioning, anatomic areas and radiologic features to evaluate these patients properly tailored to the operations they have had. To illustrate the normal PO appearance, as well as the most common early and late complications

TABLE OF CONTENTS/OUTLINE


Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Alberto I. Carbo, MD - 2015 Honored Educator

A Pattern-based Approach to the Differential Diagnosis of Biliary Dilatations

Station #10

Participants

Carolina L. Vaz, Rio de Janeiro, Brazil (Presenter) Nothing to Disclose
Guilherme M. Cunha, MD, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Gabriel Bolsoi, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Dafne D. Melquades, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Andreí S. Puryskó, MD, Cleveland, OH (Abstract Co-Author) Nothing to Disclose
Leonardo K. Bittencourt, MD, PhD, Rio De Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Erick S. Hollanda, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

- Biliary dilation is a frequent indication for MR and MRCP examination. The most frequent causes are choledocolithiasis, malignancy and iatrogenic disease. However, a range of differential diagnoses includes other diseases, such as primary sclerosing cholangitis, recurrent pyogenic cholangitis, bile duct cysts, portal biliopathy, pancreatobiliary malignancy and IgG4-related cholangiopathy.
- The pattern and distribution of biliary dilation can help on narrowing the differential diagnosis.
- The authors propose an algorithm for differential diagnosis of biliary duct dilatation, in accordance with MRCP findings of pattern and distribution

TABLE OF CONTENTS/OUTLINE

- MRCP: protocols, tips and tricks
- Biliary tract dilatation patterns at MRCP: a didactic algorithm
- Classifying the main lesions that present with biliary duct dilatation: o Cholelithiasis o Iatrogenic and post-surgical stenosis o Pancreatic malignancy o Klatskin’s Tumor o Peripheral cholangiocarcino o Liver metastasis o Primary sclerosing cholangitis o IgG4-related cholangiopathy o Eosinophilic cholangitis o Caroli disease o Choledochal cyst o Acute cholangitis o Recurrent pyogenic cholangitis
Gadoxetic Acid-enhanced Magnetic Resonance Imaging of the Liver: Differential Diagnosis of Hyperintense Observations on Hepatobiliary Phase

Participants
Vandre B. Lima, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Antonio Eiras-Araujo, MD, Rio De Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Daniella B. Parente, MD, Rio de Janeiro, Brazil (Presenter) Nothing to Disclose
Jaime A. Oliveira Neto, MD, Rio De Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Ricardo V. Batista Sr, MD, Niteroi, Brazil (Abstract Co-Author) Nothing to Disclose
Carolina A. Heming, MD, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Ana Livia G. Brum, MD, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
The aims of this review are to:- To review the utility of Gadoxetic Acid-enhanced MR Imaging of the Liver.- To illustrate several hepatic observations that may show hyperintensity on hepatobiliary phase (HBP) images on Gadoxetic Acid-enhanced Magnetic Resonance Imaging of the Liver.- To describethe advantages of the HBP in detection and characterization of liver observations.

TABLE OF CONTENTS/OUTLINE
Gadoxetic Acid is a contrast agent with combined properties of a conventional non-specific extracellular and a hepatocyte-specific contrast agent. Use of Gadoxetic Acid improves both detection and characterization of focal hepatic observations. Hyperintense Liver Observations on Hepatobiliary phase (HBP) are Hepatocyte-containing lesions. Most benign hepatocellular observations, such as Focal Nodular Hyperplasia, Nodular Regenerative Hyperplasia and Transient Hepatic Intensity Differences are characterised by iso to hyperintensity on HBP images. Cirrhosis-related nodules, such as Regenerative Nodules and Dysplastic Nodules are typically iso to hyperintense on HBP images, since uptake and excretion of the contrast agent are preserved. Most malignant lesions, such as Hepatocellular Carcinoma and metastases are hypointense on HBP images, although hyperintense HCCs are also sometimes encountered.

Cytoreductive Surgery (CRS) with Hyperthermic Intraperitoneal Chemotherapy (HIPEC) and Peritoneal Carcinomatosis Index (PCI) Part 2: What Surgeons Want To Know, Critical Spreading Features of Peritoneal Metastases of Beyond Colorectal Cancer

Awards
Identified for Radiographics

Participants
Chikako Suzuki, MD, PhD, Stockholm, Sweden (Presenter) Nothing to Disclose
Gabriella Palmer, MD, PhD, Stockholm, Sweden (Abstract Co-Author) Nothing to Disclose
Lennart Blomqvist, Stockholm, Sweden (Abstract Co-Author) Patent agreement, Bayer AG

TEACHING POINTS
To illustrate the specific tumor spreading pathways with critical impact for CRS with HIPEC. To illustrate pearls and pitfalls in the evaluation of peritoneal metastases of various primary organs other than colorectum. To discuss limitations and future perspectives of radiological imaging of peritoneal metastases in cases of CRS with HIPEC.

TABLE OF CONTENTS/OUTLINE
CRS with HIPEC has been recognized as an effective treatment for patients with peritoneal carcinomatosis from primary or recurrent colorectal cancer. To achieve the maximum efficacy of this procedure, complete cytoreductive surgery is essential. Specific tumor spreading features such as carcinomatosis in the liver hilum and extensive small bowel involvement, may have critical negative impact on CRS because of surgical difficulties. Extensive knowledge about pattern of tumor spreading on various primary tumors other than colorectum may improve diagnostic accuracy. In this exhibition, first, specific tumor spreading pathways that may have critical impact on surgery will be illustrated. Second, pearls and pitfalls in evaluation of peritoneal metastases will be illustrated. Finally, limitations and future perspectives of preoperative radiological imaging will be discussed.
Interventional Oncology Series: Hepatocellular Carcinoma

Monday, Nov. 30 1:30PM - 6:00PM Location: S406B

LEARNING OBJECTIVES

1) To learn the indications for image-guided ablation and transcatheter-based therapies for patients with HCC. 2) To understand the potential limitations, pitfalls, side effects and toxicities associated with ablative and transcatheter therapies for patients with HCC. 3) To know the results, imaging responses and survival benefit of various ablative and transcatheter therapies. 4) To know the future ablative and transcatheter therapies and understand their potential. 5) To learn the various combination therapies available and undergoing clinical evaluation for HCC.

ABSTRACT

Participants
Riccardo A. Lencioni, MD, Pisa, Italy (Moderator) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the increasing incidence of HCC in the Western Hemisphere. 2) Learn about scoring the cirrhosis and staging the cancer. 3) Identify sorafenib as the standard care treatment for advanced HCC.

Sub-Events

Epidemiology, Staging, and Medical Therapy

Monday, Nov. 30 1:30PM - 1:50PM Location: S406B

Participants
Ghassan K. Abou-Alfa, MD, New York, NY (Presenter) Research Grant, Abbott Laboratories; Research Grant, Amgen Inc; Research Grant, AstraZeneca PLC; Research Grant, Bayer AG; Research Grant, Eli Lilly and Company; Research Grant, Exelixis, Inc; Research Grant, F. Hoffmann-La Roche Ltd; Research Grant, Immunomedics, Inc; Research Grant, Incyte Corporation; Research Grant, Momenta Pharmaceuticals; Research Grant, Myriad Genetics, Inc; Research Grant, Novartis AG; Research Grant, OncoMed Pharmaceuticals, Inc; Research Grant, Polaris Group; Research Grant, Viscs Therapeutics, LLC; Consultant, Aduro BioTech, Inc; Consultant, Astellas Group; Consultant, Onxeo SA; Consultant, Boston Scientific Corporation; Consultant, Boston Therapeutics, Inc; Consultant, Bristol-Myers Squibb Company; Consultant, CASI Pharmaceuticals Inc; Consultant, Celgene Corporation; Consultant, Cipla Ltd; Consultant, Eli Lilly and Company; Consultant, Gilead Sciences, Inc; Consultant, IntegraGen SA; Consultant, Merck Pharmaceuticals, Inc; Consultant, Momenta Pharmaceuticals; Consultant, Novartis AG; Consultant, Onxeo SA; Consultant, AbbVie Inc; Consultant, sanofi-aventis Group; Consultant, Silenseed Ltd; Consultant, SillaJen, Inc; Consultant, Viscs Therapeutics, LLC

LEARNING OBJECTIVES

1) Recognize the increasing incidence of HCC in the Western Hemisphere. 2) Learn about scoring the cirrhosis and staging the cancer. 3) Identify sorafenib as the standard care treatment for advanced HCC.

Critical Evaluation and Validation of the 9-Stage Hong Kong Liver Cancer Staging System in North American Hepatocellular Carcinoma Patients Who Underwent TACE

Monday, Nov. 30 1:50PM - 2:00PM Location: S406B

Participants
Jae Ho Sohn, MD,MS, New Haven, CT (Presenter) Nothing to Disclose
Rafael Duran, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Julius Chaparo, MD, Berlin, Germany (Abstract Co-Author) Nothing to Disclose
Yan Zhao, MS, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Florian N. Fleckenstein, MS, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Sonia P. Sahu, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Howard Lee, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Ruediger E. Schernthaner, MD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Li Zhao, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Ming De Lin, PhD, Cambridge, MA (Abstract Co-Author) Employee, Koninklijke Philips NV
Jean-Francois H. Geschwind, MD, Westport, CT (Abstract Co-Author) Researcher, BTG International Ltd; Consultant, BTG International Ltd; Researcher, Koninklijke Philips NV; Consultant, Koninklijke Philips NV; Researcher, Guerbet SA; Consultant, Guerbet SA; Consultant, Terumo Corporation; Consultant, Threshold Pharmaceuticals, Inc; Consultant, preScience Labs, LLC; Researcher, Boston Scientific Corporation; Consultant, Boston Scientific Corporation

PURPOSE

The new Hong Kong Liver Cancer (HKLC) staging offers 9-stage and 5-stage classification for survival and treatment allocation for hepatocellular carcinoma (HCC), thought to be superior to the Barcelona Clinic Liver Cancer (BCLC) staging. A known limitation of the HKLC staging is the need for validation in non-HBV patient cohort. The purpose of this study is to compare the 9-stage HKLC against BCLC staging in a North American cohort and then identify any needs for improvement.

METHOD AND MATERIALS

969 HCC patients at a single institution who underwent TACE were retrospectively reviewed. 890 had sufficiently complete record to calculate the 9-stage HKLC and BCLC stages. Overall survival (OS) from date of first TACE to death or last note date was recorded. The performances of the HKLC and BCLC systems were compared through homogeneity, survival discrimination, monotonicity of gradients, and reduction in error of survival prediction. The staging systems were evaluated through Kaplan-Meier
(KM) estimate, Cox model's likelihood ratio (LHR), linear trend (LT), Harrell's C, Akaike's information criterion (AIC), and % error reduction in survival.

RESULTS
The HCC etiologies in this cohort included 132 (14.8%) hepatitis B, 427 (48.0%) hepatitis C, 254 (28.5%) alcoholic, 60 (7.8%) NASH, and 60 (6.7%) no identifiable cause (some patients with overlapping etiologies). Median OS in months for HKLC were I (62.6), IIa (35.8), IIb (24.3), IIIa (12.3), IIIb (10.9), IVa (11.0), IVb (4.3), Va (10.5), and Vb (2.7), notable for similarity in OS among a few stages. Median OS for BCLC were A (51.6), B (24.3), C (12.2), and D (4.3). The 9-stage HKLC performed better on all statistical measures. Better homogeneity was found for HKLC (LHR: 249) than BCLC (LHR: 119). Superior survival discrimination was shown for HKLC (C=0.72, AIC=6200) than BCLC (C=0.64, AIC=6320). Monotonicity was better in HKLC (LT: 261) than in BCLC (LT: 111). Reduction in error of prediction for HKLC was 15.9% while BCLC was 11.8%.

CONCLUSION
The 9-stage HKLC staging system outperformed the BCLC staging system as a prognostic classification system on overall statistical measures, but similarity in survival for stages IIIa/b, IVa, and Va should be further explored and addressed.

CLINICAL RELEVANCE/APPLICATION
The HKLC staging system may become the next HCC staging system of choice after addressing some of the identified issues and completing further validations.

VSIO21-03 TACE Techniques, Indications, and Results: Western Perspective

Participants
Jean-Francois H. Geschwind, MD, Westport, CT (Presenter) Researcher, BTG International Ltd; Consultant, BTG International Ltd; Researcher, Koninklijke Philips NV; Consultant, Koninklijke Philips NV; Researcher, Guerbet SA; Consultant, Guerbet SA; Consultant, Terumo Corporation; Consultant, Threshold Pharmaceuticals, Inc; Consultant, PreScience Labs, LLC; Researcher, Boston Scientific Corporation; Consultant, Boston Scientific Corporation

LEARNING OBJECTIVES
1) To understand the indications for TACE and describe the various technical issues and clinical results of TACE.

VSIO21-04 Does DEB-TACE Enhance the Local Effect of IRE? Imaging and Histopathological Evaluation in a Porcine Model

Participants
Peter Isfort, MD, Aachen, Germany (Presenter) Nothing to Disclose
Philip Rauen, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
Hong-Sik Na, MD, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
Nobutake Ito, MD, Yokohama, Japan (Abstract Co-Author) Nothing to Disclose
Christoph Wilkmann, DIPLENG, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
Christiane K. Kuhl, MD, Bonn, Germany (Abstract Co-Author) Nothing to Disclose
Philipp Bruners, MD, Aachen, Germany (Abstract Co-Author) Nothing to Disclose

PURPOSE
Irreversible electroporation (IRE) is associated with a hypervascular penumbra of vital temporarily damaged tissue due to reversible electroporation. Transarterial treatment of this penumbra could increase local efficacy of IRE. We conducted an in-vivo trial on swine to compare the ablation volumes of an IRE/DEB-TACE combination vs. IRE-only.

METHOD AND MATERIALS
Nine swine underwent IRE in one liver lobe and DEB-TACE immediately followed by IRE in a different liver lobe. For DEB-TACE, 100-300 µm beads (DC-Beads®) were loaded with 50mg doxorubicin. For IRE, the NanoKnife® was used with two IRE electrodes according to the vendor's recommended protocol. After one day (n=3), three days (n=3) and seven days (n=3) animals were sacrificed, and ablation volumes were evaluated histopathologically. Imaging follow-up was performed using contrast-enhanced CT and MRI. Lesion volumes were measured one day (n=9), three days (n=6) and 7 days (n=3) after the procedure.

RESULTS
Mean histopathological ablation volume of IRE/DEB-TACE combination lesions after one, three and seven days were 15.7 ± 11.1 ml, 11.8 ± 9.3 ml and 4.2 ± 1.4 ml. Mean histopathological ablation volumes of IRE-only lesions after one, three and seven days were 7.2 ± 4.5 ml, 4.0 ± 1.0 ml and 1.7 ± 1.5 ml. In intra-individual comparison the ablation volumes of the IRE/DEB-TACE combination group were on average 199.6 %, 163.4% and 98.5% larger than IRE-only lesions after one, three and seven days.

CONCLUSION
Combination of IRE followed by DEB-TACE resulted in larger ablation volumes compared to IRE alone suggesting that local efficacy of IRE can be enhanced by post-IRE DEB-TACE.

CLINICAL RELEVANCE/APPLICATION
Results suggest that local efficacy of IRE can be enhanced when additional DEB-TACE is performed in the target liver segment after ablation.

VSIO21-05 TACE Techniques, Indications, and Results: Eastern Perspective

Participants
**VSIO21-06  Anti-tumor Effects of TAE Administered in Combination with Sorafenib in a Rabbit VX2 Liver Tumor Model**

**Monday, Nov. 30 2:50PM - 3:00PM Location: S406B**

**Participants**
Yuki Tomozawa, MD, Otsu, Japan (Presenter) Nothing to Disclose
Norihisa Nitta, MD, Kyoto, Japan (Abstract Co-Author) Nothing to Disclose
Shinichi Ohta, MD, PhD, Otsu, Japan (Abstract Co-Author) Nothing to Disclose
Shou Watakeya, MD, Otsu, Japan (Abstract Co-Author) Nothing to Disclose
Akinori Sonoda, MD, PhD, Otsu, Japan (Abstract Co-Author) Nothing to Disclose
Ayumi Seko, Otsu, Japan (Abstract Co-Author) Nothing to Disclose
Keiko Tsuchiya, Chicago, IL (Abstract Co-Author) Nothing to Disclose
Kiyoshi Murata, MD, Otsu, Japan (Abstract Co-Author) Nothing to Disclose

**LEARNING OBJECTIVES**

1) To describe the various techniques and approaches used in TACE treatment. 2) To understand the indications and results of TACE in the treatment of HCC. 3) To discuss differences and similarities between Eastern and Western approaches in TACE.

**METHOD AND MATERIALS**

20 Japanese white rabbits were randomly assigned to four equal groups two weeks after of VX2 tumor transplantation to the liver. We then performed the combination treatment with Sorafenib and TAE on the four groups in the according ways; Group 1(TAE prior to administration of Sorafenib), Group 2(TAE on the second day after administration of Sorafenib), Group 3(TAE on the fourth day after administration of Sorafenib) and Group 4(TAE after the end of administrating Sorafenib). Sorafenib (40mg/day) was orally administrated for consecutive 7 days starting on the day two week after tumor implantation. The anti-tumor effects were assessed by comparing the pre- and post-treatment tumour volumes measured on a contrast-enhanced CT scans and by immuno-histochemical analysis of the number of intra-tumoral vessels two weeks after the treatment.

**RESULTS**

Among the four groups, the tumor growth rate tended to be lower in Group 1 and Group 2 than in Group 3 and Group 4. The difference between Group 1 and Group 3 was significant. The number of CD31-positive intra-tumor vessels in specimens tended to be higher in Group 3 than in the other groups, although there was no significant difference.

**CONCLUSION**

We suggest that the ideal time of TAE is prior to or early after commencement of administration Sorafenib.

**CLINICAL RELEVANCE/APPLICATION**

To date, limited data has focused on the timing parameters when Sorafenib is combined with TACE.

**VSIO21-07  Y90 Radioembolization: What We Know, and What We Need to Know**

**Monday, Nov. 30 3:00PM - 3:20PM Location: S406B**

**Participants**
Riad Salem, MD, MBA, Chicago, IL (Presenter) Research Consultant, BTG International Ltd; Research Grant, BTG International Ltd; ;

**LEARNING OBJECTIVES**

1) To describe techniques and approaches used for Y90 treatment of liver cancers. 2) To understand the available data for Y90 in the treatment of primary and metastatic liver tumors. 3) To discuss differences and similarities between Eastern and Western approaches in TACE.

**VSIO21-08  Predicting the Hepato-pulmonary Shunt Fraction Using 3D Quantification of Tumor Enhancement on Contrast-enhanced CT Imaging in Patients with Hepatocellular Carcinoma before Y90 Radioembolization**

**Monday, Nov. 30 3:20PM - 3:30PM Location: S406B**

**Participants**
Julius Chapiro, MD, Berlin, Germany (Presenter) Nothing to Disclose
David Wainstein, Berlin, Germany (Abstract Co-Author) Nothing to Disclose
Duc Do Minh, BSc, Berlin, Germany (Abstract Co-Author) Nothing to Disclose
Christoph Erolken, Berlin, Germany (Abstract Co-Author) Nothing to Disclose
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Jean-Francois H. Geschwind, MD, Westport, CT (Abstract Co-Author) Researcher, BTG International Ltd; Consultant, BTG International Ltd; Research Consultant, Koninklijke Philips NV; Consultant, Koninklijke Philips NV; Researcher, Guerbet SA; Consultant, Guerbet SA; Consultant, Terumo Corporation; Consultant, Threshold Pharmaceuticals, Inc; Consultant, PreScience Labs, LLC; Researcher, Boston Scientific Corporation; Consultant, Boston Scientific Corporation
Dirk Schnapauff, MD, Berlin, Germany (Abstract Co-Author) Nothing to Disclose
Bernd K. Hamm, MD, Berlin, Germany (Abstract Co-Author) Research Consultant, Toshiba Corporation; Stockholder, Siemens AG; Stockholder, General Electric Company; Research Grant, Toshiba Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Siemens AG; Research Grant, General Electric Company; Research Grant, Elbit Imaging Ltd; Research Grant, Bayer AG; Research Grant, Guerbet SA; Research Grant, Bracco Group; Research Grant, B. Braun Melsungen AG; Research Grant, KRAUTH medical KG; Research Grant, Boston Scientific Corporation; Equipment support, Elbit Imaging Ltd; Investigator, CMC Contrast AB
This study explored the ability of 3D quantitative CT image analysis to predict the hepato-pulmonary shunt fraction (HPSF) in patients with hepatocellular carcinoma (HCC) before Yttrium90 (Y90) radioembolization.

**METHOD AND MATERIALS**

This IRB-approved, retrospective analysis included a total of 26 patients with HCC, who underwent an evaluation study to calculate the HPSF from SPECT/CT after infusion of Tc-99m macroaggregated albumin into the proper hepatic artery. All patients underwent tri-contrast-enhanced CT imaging within six weeks before the evaluation study. A semi-automatic, segmentation-based 3D quantification of the total tumor volume (TTV) was used to calculate the enhancing tumor volume (ETV), measured in cm3 and as a relative ratio (%; TTV/ETV). TTV as well as ETV were correlated with the HPSF for each patient. Statistical analysis included the One-way ANOVA test and linear regression analysis to calculate the R2 values.

**RESULTS**

N=24 (92%) patients had preserved liver function (Child-Pugh A) and N=2 (8%) had Child-Pugh B. The mean HPSF was 13.5% (Range, 2.9-32.8; SD, 7.4) and the mean TTV was 569cm3 (Range, 18-2998; SD, 584). The mean absolute ETV was 120cm3 (Range, 7-431; SD, 116) and the mean relative ETV was 28% (Range, 6-60; SD, 19). A low correlation between TTV and the HPSF was observed (R2=0.29) and relative ETV (%) showed no correlation with the HPSF (R2<0.1). However, some correlation between the absolute ETV (cm3) and the HPSF was observed (R2=0.59). More importantly, patients with HPSF≤10% showed significantly lower mean ETVs as compared to patients with a HPSF≥10% (53cm3; Range, 7-96; SD, 21 vs. 187cm3, Range, 104-431; SD, 87, p<0.0001). No patient with HPSF≤10% exceeded the ETV of 100cm3. No statistically significant differences were observed for TTV and relative ETV (%).

**CONCLUSION**

The quantification of the absolute ETV (cm3) using semi-automatic 3D tools allows for an estimation of the HPSF in patients with HCC before Y90 Radioembolization. TTV and relative ETV (%) did not appear as reliable predictors of the HPSF.

**CLINICAL RELEVANCE/APPLICATION**

These preliminary results may introduce absolute ETV (cm3) as a new imaging biomarker for HPSF, potentially allowing to narrow down the selection of patients who will undergo shunt evaluation studies prior to Y90 radioembolization.

**ABSTRACT**

**VSIO21-09 Response Assessment and the Concept of Treatment Failure**

Monday, Nov. 30 3:30PM - 3:50PM Location: S406B

Participants

Riccardo A. Lencioni, MD, Pisa, Italy (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) To learn the imaging criteria used for response assessment in patients with HCC. 2) To understand the limitations and the pitfalls associated with conventional response evaluation models. 3) To know the basic concepts of modified RECIST (mRECIST) criteria and how response predicts survival. 4) To understand the concept of treatment failure in patients undergoing loco-regional therapies. 5) To learn the novel volumetric response criteria currently undergoing clinical evaluation.

**ABSTRACT**

**VSIO21-10 Which Response Criteria can Predict Early Tumor Progression in Hepatocellular Carcinoma Patients Treated with Conventional TACE: RECIST, mRECIST, EASL or qEASL?**

Monday, Nov. 30 3:50PM - 4:00PM Location: S406B

Participants

Yan Zhao, MS, Baltimore, MD (Presenter) Nothing to Disclose

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**PURPOSE**

In this preliminary study, we compared the ability of RECIST, modified RECIST (mRECIST), EASL and quantitative EASL ([qEASL], a volumetric enhancement criterion) to assess early tumor progression after transarterial chemoembolization (TACE) in hepatocellular carcinoma (HCC) patients.

**METHOD AND MATERIALS**

A total of 53 consecutive patients (77.4% men; mean age, 51 years) with intermediate-stage HCC were included. All patients underwent conventional TACE and contrast-enhanced computed tomography (CT) scan at baseline and 1 month after TACE. Tumor response was determined by RECIST, mRECIST, EASL, and qEASL on CT. qEASL classifies progression as ≥73% increase in...
enhancing tumor volume. The Kaplan-Meier method with the log-rank test was used to compare median overall survival (OS) between progression and non-progression.

**RESULTS**

Median follow-up period was 15.4 months (range 1.2-54.1). The mean value of enhancing tumor volume (qEASL) at baseline and post-treatment were 214± 263.5 cm³ and 58.5 ± 21.9 cm³, respectively. RECIST, mRECIST and EASL, identified progression in 2 (4%), 1(2%) and 2 (4%) patients at 1 month after TACE treatment. Notably, qEASL had a higher sensitivity for early tumor progression and it identified 9 (17%) patients with progression. Too few patients showed progression to perform survival analysis for the RECIST, mRECIST, and EASL. However, the patients who experienced progression according to qEASL demonstrated a significantly shorter median OS than those with non-progression [6.5 months (95%CI 4.2-8.8) vs. 21.1 months (95%CI 14.1-28.1), P<0.001].

**CONCLUSION**

qEASL is a more sensitive biomarker for tumor progression and survival than RECIST, mRECIST and EASL one month after TACE in hepatocellular carcinoma patients.

**CLINICAL RELEVANCE/APPLICATION**

Defining early tumor progression may help guide the decisions of further treatment. qEASL gave a better discrimination for early progression than other 1D or 2D criteria.

**Participants**

Nima Kokabi, MD, Atlanta, GA (Presenter) Nothing to Disclose
Minzhi Xing, MD, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Richard Duszak JR, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
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Juan C. Carracho, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
David H. Howard, PhD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Hyun S. Kim, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To investigate the socio-demographic determinants of receipt of HCC-directed locoregional therapies (LRT’s) and comparative effectiveness of different therapies in American Joint Commission on Cancer (AJCC) Stage I and II unresectable hepatocellular carcinoma (HCC) using Surveillance Epidemiology and End Results (SEER) registries linked to Medicare database.

**METHOD AND MATERIALS**

Patients diagnosed with HCC during 2000 to 2010 were identified with unresectability defined using "no cancer-directed surgery recommended" and no HCC directed surgical claim. Patients were stratified by AJCC staging and the following therapies: ablation, trans-arterial chemoembolization (TACE), Yttrium-90 (Y90) radioembolization, sorafenib, systemic chemotherapy (CTX), external beam radiation (EBRT) or no cancer directed therapy (NCDT). Sociodemographic predictors of receipt of LRT’s (i.e. TACE and Y-90) were evaluated by chi-square. Overall survival (OS) was estimated using Kaplan-Meier analysis.

**RESULTS**

Total of 9,169 patients with unresectable HCC were identified with the followings staging composition: I (25%), II (10%), III (13%), IV (17%), and unstaged (35%). All therapies demonstrated OS benefit compared to no therapy with the following median OS (months): ablation (30.8), Y90 (15.6), TACE (15.5), EBRT (7.6), Sorafenib (5.6), CTX (5.10), NCDT (3.7; p<0.001). One year survival rate of stage I and II patients treated with TACE was 67% and 53% vs. 27% and 14% for NCDT respectively (p<0.001). Overall, 38% of patients received any cancer directed therapy including TACE (18%), EBRT (8%), sorafenib (4%), ablation (3%), and Y-90 (2%) and CTX (1%). Specifically, 56% and 65% of stage I and II patients had NCDT respectively. There was no OS difference between TACE and Y90 group (p=0.31). There was a significantly prolonged OS in LRT group vs. EBRT/CTX groups (p=0.001) and the LRT vs. NCDT group (p<0.001). The receipt of LRT significantly correlated with being married and of Asian decent, living on the pacific coast and in urban areas, being insured with higher income and education levels (p's <0.05).

**CONCLUSION**

Favorable sociodemographic factors were determinant of receipt of HCC directed LRT’s. Less than 50% of of Stage I and II patients received LRT’s. LRT’s in Stage I and II significantly prolonged survivals over CTX/EBRT/NCDT.

**CLINICAL RELEVANCE/APPLICATION**

There is a national underutilization of effective HCC directed LRT’s in patients with unresectable HCC.

**Participants**

Stephen B. Solomon, MD, New York, NY (Presenter) Research Grant, General Electric Company
LEARNING OBJECTIVES
1) To describe techniques and approaches used for image-guided ablation. 2) To understand the available data for novel thermal and non-thermal technologies. 3) To discuss strategies to improve clinical outcomes.

VSIO21-14 Hepatocellular Carcinomas Treated with Percutaneous Ablation Using a High-power Microwave System with a Single Antenna: 5 Years’ Experience

Monday, Nov. 30 5:00PM - 5:10PM Location: S406B

Participants
Giovanni Mauri, MD, San Donato Milanese, Italy (Presenter) Consultant, Esaote SpA
Luca Cova, MD, Busto Arsizio, Italy (Abstract Co-Author) Nothing to Disclose
Tiziana Ierace, MD, Busto Arsizio, Italy (Abstract Co-Author) Nothing to Disclose
S. Nahum Goldberg, MD, Ein Kerem, Israel (Abstract Co-Author) Consultant, AngioDynamics, Inc; Research support, AngioDynamics, Inc; Research support, Cosman Medical, Inc; Consultant, Cosman Medical, Inc;
Luigi Solbiati, MD, Busto Arsizio, Italy (Abstract Co-Author) Nothing to Disclose

PURPOSE
To report our 5 year experience treating hepatocellular carcinoma (HCC) using a third-generation high-power microwave system and a single antenna.

METHOD AND MATERIALS
From 2009, 223 HCCs (mean 2.2 cm, size range 0.7-5.5 cm) in 109 patients (mean age 67.7 ± 6.2 years) underwent US-guided ablation using a high-power (140 Watt, 2.45 GHz) microwave system (AMICA-Probe: Hospital Service, Aprilia, Italy) with a single insertion of an internally-cooled antenna. Power and time of energy application ranged between 45-100 Watts and 4-10 min, respectively. Follow-up from a minimum of 1 year to 6 years (mean: 2.2yr) was performed with contrast-enhanced CT at 4-6 months intervals. Results were classified according to index tumor size (<=2cm; 2.1-3 cm; > 3 cm). Chi Square test was used for comparison.

RESULTS
Immediate complete ablation (i.e. technical success) was achieved in 221/223 (99.1%) HCCs. Local tumor progression within 1 year from ablation occurred in 23/223 (10.3%) HCCs: 4/103 (3.9%) <= 2cm; 8/68 (11.8%) sized 2.1-3 cm; and 11/52 (21.2%) > 3 cm (p = 0.003). In 9/23 (39.1%) HCCs, local progression underwent successful re-treatment. Major complications occurred in 6/151 (4.0%) ablation sessions and only 2 required surgical repair. No deaths related to ablation were seen. In 29/109 (26.6%) patients, new HCCs were detected on follow-up.

CONCLUSION
With an affordable and efficient high-power microwave system, local control of HCCs can be safely achieved in the vast majority of cases with the simplest and fastest technique, i.e. single insertion of single antenna.

CLINICAL RELEVANCE/APPLICATION
Percutaneous ablation with a high-power, affordable microwave system allows successfully treatment for a large majority of HCCs using a simple technique of single insertion of a single antenna with a short energy deposition time.

VSIO21-15 TACE Segmentectomy for Small, Solitary HCC: Just for the Unfit for Resection and Ablation?

Monday, Nov. 30 5:10PM - 5:30PM Location: S406B

Participants
Jin Wook Chung, MD, Seoul, Korea, Republic Of (Presenter) Research Grant, BTG International Ltd
Rafael Duran, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
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Jae Ho Sohn, MD,MS, New Haven, CT (Abstract Co-Author) Nothing to Disclose
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PURPOSE
There has been a growing interest in smaller caliber beads which can penetrate deeper into tumors for transarterial chemoembolization (TACE). This prospective clinical trial examined the safety and efficacy of TACE using 70-150 µm doxorubicin-eluting beads (LC BeadM1,BTG, UK) in patients with hepatocellular carcinoma (HCC).
METHOD AND MATERIALS

This single-center prospective study was HIPPA compliant and IRB approved. Patients with HCC who were locoregional therapy naïve, Eastern Cooperative Oncology Group performance status 0-2, Barcelona Clinic Liver Cancer stage A-C, and Child-Pugh A-B were eligible. Adverse events were graded by severity and in relationship to TACE using CTCAE V4.03. Tumor response at 1 month follow-up was assessed by modified RECIST (mRECIST), European Association for the Study of the Liver (EASL), and volumetric tumor enhancement [quantitative EASL (qEASL)] on T1-weighted contrast-enhanced MR. qEASL response was defined as ≥65% decrease in volumetric tumor enhancement.

RESULTS

24 patients (men: 21, median age: 62 years) with a mean tumor size of 4.28 cm (range: 1.2 - 21.2) were enrolled and successfully treated with TACE. 2 serious adverse events unrelated to TACE occurred in 2 patients [upper GI bleed (n=1) and cardiac arrest (n=1)]. Possible to definitive device related toxicities were seen in 10 patients and were all grade 1-2 in severity [hypoalbuminemia (n=3), pain (n=3), elevated AP (n=2), headache (n=2), fatigue (n=2), leukopenia (n=1), anemia (n=1), anorexia (n=1), elevated AST (n=1), fever (n=1), flu-like symptoms (n=1), hyperbilirubinemia (n=1), weight loss (n=1)]. One month tumor response was assessed in 21 patients [died before follow-up (n=1), pending follow-up (n=2)]. 10 (45.5%) patients were classified as responders regardless of the criteria utilized.

CONCLUSION

TACE with 70-150 µm doxorubicin-eluting beads was well tolerated and had good tumor response after 1 month in patients with HCC.

CLINICAL RELEVANCE/APPLICATION

Smaller caliber 70-150 µm doxorubicin-eluting beads are a safe and promising alternative to the conventional sized 100-500 µm beads in TACE for patients with hepatocellular carcinoma

VSIO21-17 HCC Tumor Board

Monday, Nov. 30 5:40PM - 6:00PM Location: S406B

Participants
SSE07

Gastrointestinal (CT Technique and Contrast)

Monday, Nov. 30 3:00PM - 4:00PM Location: E353A

AMA PRA Category I Credit ™: 1.00
ARRT Category A+ Credit: 1.00

Participants
Jeong Min Lee, MD, Seoul, Korea, Republic Of (Moderator) Grant, Guerbet SA; Support, Siemens AG; Support, Koninklijke Philips NV; Grant, Bayer AG; Consultant, Bayer AG; Grant, General Electric Company; Support General Electric Company; Grant, STARmed Co, Ltd; Grant, RF Medical Co, Ltd; Grant, Toshiba Corporation; Grant, Dong-Seo Medical Industrial Col, Ltd

Avinash R. Kambadakone, MD, Boston, MA (Moderator) Nothing to Disclose

PURPOSE
To prospectively compare objective image quality of best temporal arterial and portal venous (PV) images generated from low dose dynamic volume perfusion CT (dVPCT) datasets with standard 120-kVp arterial and venous datasets in patients with hepatocellular carcinoma (HCC).

METHOD AND MATERIALS
21 dVPCT and standard CT datasets of 13 patients with HCC were analyzed in this study. The scan protocol included a 70kVp/220mAs (n=14) or 80kVp/190 or 200mAs (n=7) dVPCT acquisition for quantitative evaluation of HCC perfusion over 60s with an interscan delay of 2.5s. In addition, the patients underwent a standard dual-energy (90/150 kVp) arterial and PV acquisition 15 minutes after the dVPCT. The 3-5 single phases from all dVPCT datasets in which the abdominal aorta (AA) or the main portal vein (MPV) showed best contrast were manually selected by reviewing all dVPCT datasets. Best temporal arterial and PV images were then reconstructed from the 3-5 single phases to one best arterial and best PV temporal dataset. The standard 120-kVp images were generated from dual-energy CT data. Image noise, SNRs of the liver, AA and MPV as well as CNRs of AA and MPV were measured and compared to the 120 kVp datasets. The results were analyzed using paired-samples t-test.

RESULTS
Best temporal arterial and PV images were superior to standard 120-kVp arterial and venous images for all quantitative measurements (all p<0.05) except for image noise within the MPV in the PV phases, which showed no significant differences between the two groups. The SNRs of AA (arterial phase), liver and MPV (PV phase) were 25.4, 5.0 and 7.2 within the best temporal images, which were significantly higher compared to the standard 120-kVp images (8.8, 3.7 and 4.6 respectively) (all p<0.01). Similarly, best temporal images showed higher CNRs of AA (arterial phase; 17.8 vs. 4.7, P=0.018) and MPV (PV phase; 3.2 vs. 1.6, P<0.001) compared to 120-kVp images.

CONCLUSION
Best temporal images calculated from low-dose dVPCT datasets can replace additional standard CT acquisitions in patients with HCC that undergo quantitative dVPCT.

CLINICAL RELEVANCE/APPLICATION
Low-dose dVPCT datasets can be used to calculate standard arterial and PV phase CT images with even superior image quality when compared to standard 120-kVp arterial and PV images.

SSE07-02 Single-Energy Metal Artifact Reduction Algorithm: Utility for Improvements of Image Quality and Anatomical Assessment on Dynamic Contrast-enhanced CT in Patients with Surgical or Endovascular Treatment for Hepatocellular Carcinoma

Monday, Nov. 30 3:10PM - 3:20PM Location: E353A

Participants
Keitaro Sofue, Kobe, Japan (Presenter) Nothing to Disclose
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Yoshinari Ohno, MD, PhD, Kobe, Japan (Abstract Co-Author) Research Grant, Toshiba Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Bayer AG; Research Grant, GSI; Research Grant, Eisai Co, Ltd; Research Grant, Terumo Corporation; Research Grant, Fuji Yakuhin Co, Ltd; Research Grant, FUJIFILM Holdings Corporation; Research Grant, Guerbet SA;
Noriyuki Negi, RT, Kobe, Japan (Abstract Co-Author) Nothing to Disclose
In a clinical setup a gbPCCT scanner may have the potential to improve diagnostics and therapy monitoring of chronic liver disease.

CLINICAL RELEVANCE/APPLICATION

Grating-based phase contrast computed tomography allows ex vivo quantification of liver fibrosis in human specimens.

CONCLUSION

In a clinical setup a gbPCCT scanner may have the potential to improve diagnostics and therapy monitoring of chronic liver disease.

RESULTS

To evaluate the potential of grating-based phase contrast computed tomography (gbPCCT) for the quantification of fibrosis in human liver specimens and to correlate with histological diagnosis.

METHODOLOGY AND MATERIALS

This prospective study was approved by the local ethics committee. Fifty-eight patients (48 men, 10 women; mean age, 68 years; age range, 23-85 years) with metal implants were imaged at 40 kVp with a Talbot-Lau interferometer with a rotating-anode X-ray tube and a photon-counting detector. Phase-contrast images were acquired using a 5-point scale. Additional, a software-based method was used for tissue decomposition and quantification. Specimens were sliced and stained for histological analysis including classification of fibrosis. Two readers independently evaluated image quality of the liver and pancreas by means of 5-point visual score. To evaluate quantitative image quality improvement on CE-CT with and without SEMAR technique mean CT number and artifact index within liver were compared by t-test. To assess qualitative image quality between two methods, a linear-weighted κ statistic and Wilcoxon signed rank test were performed.

RESULTS

The mean CT number and artifact index within the liver on CT with SEMAR were significantly lower compared that without SEMAR on both planes (p<0.0001). Inter-observer agreements of image quality assessment of liver and pancreas were substantial or almost perfect (0.61<κ<0.84). Image qualities of the liver and pancreas was significantly improved on CT with SEMAR as compared with that without SEMAR in both planes (p<0.0001).

CONCLUSION

Semar is considered as useful for image quality improvement on dynamic CE-CT in patients who had surgical or endovascular treatment for HCC.

CLINICAL RELEVANCE/APPLICATION

Semar is considered as useful for image quality improvement on dynamic CE-CT in patients who had surgical or endovascular treatment for HCC.

SSE07-03 Quantification of Liver Fibrosis in Human Specimens using Grating-based Phase Contrast Computed Tomography

Monday, Nov. 30 3:20PM - 3:30PM Location: E353A

Participants

Alexander A. Fingerle, MD, Munich, Germany (Presenter) Nothing to Disclose
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Daniela Muenzel, MD, Munich, Germany (Abstract Co-Author) Nothing to Disclose
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Peter B. Noel, PhD, Munich, Germany (Abstract Co-Author) Nothing to Disclose
Franz Pfeiffer, Munich, Germany (Abstract Co-Author) Nothing to Disclose

PURPOSE

To evaluate the potential of grating-based phase contrast computed tomography (gbPCCT) for the quantification of fibrosis in human liver specimens and to correlate with histological diagnosis.

METHODOLOGY AND MATERIALS

IRB approval was obtained. Thirty human liver specimens with varying degrees of fibrosis were prospectively collected during autopsy at the institute of forensic medicine. Tissue samples were fixed in 4% formalin solution and imaged using a Talbot-Lau interferometer with a rotating-anode X-ray tube and a photon-counting detector. Phase-contrast and attenuation-contrast image sets were visually graded according to fibrotic stage using a 5-point scale. Additionally, a software-based method was used for tissue decomposition and quantification. Specimens were sliced and stained for histological analysis including classification of fibrosis. Results of visual and software-based staging of hepatic fibrosis were compared to histology.

RESULTS

In phase-contrast images fibrous tissue shows high signal intensity and delineates from surrounding liver tissue. Visual evaluation and software-based tissue decomposition correlated with the histological grading. On the contrary, attenuation-contrast images did not allow quantification of liver fibrosis.

CONCLUSION

Grating-based phase contrast computed tomography allows ex vivo quantification of liver fibrosis in human specimens.

CLINICAL RELEVANCE/APPLICATION

In a clinical setup a gbPCCT scanner may have the potential to improve diagnostics and therapy monitoring of chronic liver disease.
**Evaluation of the Recently Transplanted Liver with Computed Tomography Perfusion Imaging and Correlation with Clinical Outcome**

Monday, Nov. 30 3:30PM - 3:40PM Location: E353A

Participants

Nicholas Hilliard, MBBChir, Cambridge, United Kingdom (Presenter) Nothing to Disclose
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James Tanner, MBBCHIR, MA, Cambridge, United Kingdom (Abstract Co-Author) Nothing to Disclose
Tristan Barrett, MBBS, BSc, Guildford, United Kingdom (Abstract Co-Author) Nothing to Disclose
David J. Lomas, MD, Cambridge, United Kingdom (Abstract Co-Author) Nothing to Disclose
Ashley S. Shaw, MBBCh, Cambridge, United Kingdom (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

The integrity of vascular anastomoses performed during liver transplantation is critical to the proper function of the graft. In particular, hepatic arterial stenosis or thrombosis has major impact on patient morbidity and mortality. Standard assessment of vascular supply relies upon ultrasound and angiography (both conventional and by computed tomography (CT)), however these may not detect vascular abnormality until graft function has already been compromised. In this study we evaluate a CT perfusion technique to measure blood flow in recently implanted liver grafts.

**METHOD AND MATERIALS**

Patients with a recent liver transplant were imaged between 10-14 days post transplantation with a perfusion CT sequence. A dual-input single-compartment pharmacokinetic model was applied to the tissue uptake curve and the arterial and portal venous input functions to yield standard perfusion indices (total blood perfusion, arterial fraction, mean transit time and distribution volume).

**RESULTS**

34 complete datasets were obtained. Mean total perfusion was 159ml/min/100ml +/- 32, arterial fraction was 17% +/- 14.2, mean transit time was 14.9s +/- 5.8 and distribution volume was 22.5% +/- 2.9. In comparison with previously published data from native normal livers, there was a significant difference in mean transit time and distribution volume (p<0.001). In subgroup analysis, there was no significant difference in results for patients with and without biopsy proven acute rejection. In 6 patients that developed hepatic artery stenosis or thrombosis there was a decreased arterial fraction (mean 7.3%, p<0.06). In 8 patients who developed cholangiopathy the arterial fraction was also decreased (mean 10.1%, p<0.11).

**CONCLUSION**

This study shows that perfusion CT can produce reproducible results in a group of patients post liver transplant. There was a trend of decreased arterial fraction for patients that subsequently developed hepatic artery stenosis or thrombosis; increased recruitment and clinical follow-up is awaited. Further refinement of the technique may provide useful prognostic information for graft arterial function, allowing diagnosis of potentially serious complications at an earlier time point.

**CLINICAL RELEVANCE/APPLICATION**

Development of CT perfusion may allow early prediction of complications following liver transplantation, particularly for problems involving the hepatic artery.

**Noninvasive Liver Iron Content Determination by Dual-Source Dual-Energy CT: Initial Results in Patients Suspected of Liver Iron-overload**

Monday, Nov. 30 3:40PM - 3:50PM Location: E353A

Participants

Xianfu Luo, Yangzhou, China (Presenter) Nothing to Disclose
Jingtao Wu, Yangzhou, China (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To prospectively assess the feasibility of dual-source dual-energy (DSDE) CT for evaluation of liver iron content (LIC) in patients suspected of liver iron-overload and to compare its accuracy with magnetic resonance (MR) imaging.

**METHOD AND MATERIALS**

Fifty-eight subjects with elevated ferritin and suspected of liver iron-overload were enrolled in our study. Upper abdomen DSDE CT and MR were then performed. Hepatic attenuation difference between 80 kVp and 140 kVp (ΔH) was calculated. Hepatic R2* and LIC determined by FerriScan (F-LIC) were obtained. The correlations between CT measurement (ΔH) and MR measurements (R2* and F-LIC) were analyzed. Diagnostic performance of ΔH in discriminating different LIC thresholds (1.8, 3.2, 7.0, 15.0mg/g dry tissue) was evaluated by receiver operating characteristic (ROC) analysis.

**RESULTS**

F-LIC was from 0.20 to 39.59mg Fe/g. ΔH was correlated well with F-LIC and the Spearman's coefficient was 0.975. ΔH showed perfect linear positive with LIC (r2=0.925, P<0.001). For discriminating clinically significant LIC thresholds (1.8, 3.2, 7.0, 15.0mg/g dry tissue), ROC analysis revealed that the corresponding optimal cutoff value of ΔH was 3.15, 3.40, 5.38, 12.50 HU, respectively. With the cutoff value of VIC= 5.38 HU, the highest sensitivity (100%) and specificity (100%) were obtained at LIC threshold of 7.0mg Fe/g dry tissue.

**CONCLUSION**

DSDE CT can accurately quantify liver iron content with similar diagnosis performance with MR for grading clinically significant iron accumulation.
Characterization of Portal Venous Thrombus (Bland vs Neoplastic) on CT Using Software Based Textural Analysis

Participants
Rodrigo Canellas, MD, Boston, MA (Presenter) Nothing to Disclose
Farhad Mehrkhani, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Manuel Patino, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Andrea Prochowski Iamurri, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Avinash R. Kambadakone, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Dushyant V. Sahani, MD, Boston, MA (Abstract Co-Author) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc

PURPOSE
To investigate the role of textural analysis (CTTA) in distinguishing bland thrombus from neoplastic thrombus in the portal venous system.

METHOD AND MATERIALS
In a IRB approved analysis, CECT scans of 63 patients with reference standard verified PV thrombus (30 bland and 33 neoplastic) were processed for texture features using the CTTA software (TexRAD Ltd). This software works of the DICOM data to generate various parameters: Mean gray-level pixel intensity, Entropy, SD of pixel intensity, mean of positive pixels (MPP), Kurtosis and Skewness. Independent Sample T Test was applied for statistical significance.

RESULTS
There were statistically significant differences between MPP of bland (mean 47.2 ± 12.8) and neoplastic (mean 71.6 ± 16.8) thrombus (P=0.001) and between Mean gray-level pixel intensity of bland (mean 45.4 ± 11.8) and neoplastic (mean 71.2 ± 16.2) thrombus (P=0.001). Other parameters such as SD and Entropy were also statistically different between the two thrombi.

CONCLUSION
A simple software based texture analysis can reliably stratify bland and neoplastic thrombus in the portal venous system on CECT images.

CLINICAL RELEVANCE/APPLICATION
Portal venous thrombus impacts treatment decision and prognosis. Advanced imaging studies such as multiphasic CT or MRI can reliably characterize the venous thrombi into benign and malignant but portal venous CT is less effective. Software based thrombus texture parameter MPP can fulfill this important clinical need thereby potentially eliminating additional imaging studies and interventions.

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Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator
Gastrointestinal (Gastrointestinal Bleeding and Ischemia)

Diagnostic Yield and Efficacy of Multi-phase CT Enterography (mpCTE) in Patients with Obscure GI Bleeding

PURPOSE
We sought to estimate the diagnostic yield of multi-phase CT enterography (mpCTE) in patients with obscure GI bleeding (OGIB).

METHOD AND MATERIALS
We retrospectively examined medical records for OGIB patients who underwent mpCTE from 2006 to 2014. mpCTE was performed using IV contrast (with arterial, enteric, and delayed phases) and 1850 cc of neutral oral contrast. Clinical mpCTE reports were reviewed and causes of OGIB (small bowel (SB) mass, vascular lesion, inflammation, hemorrhage, or other pathology) were recorded. mpCTE results were compared to further evaluation (surgery (n=108), balloon-assisted endoscopy (BAE, n=247), capsule endoscopy (n=416), angiography (n=31), and other tests (n=171)).

RESULTS
1087 patients (90% with prior upper and lower endoscopy) underwent mpCTE for OGIB (486 overt, 601 occult). Total diagnostic yield was 31.6% (344/1087), with 269 patients having small bowel findings (24.7%). Positive exams included 126 SB vascular causes, 72 SB masses, 52 with SB inflammation, 7 SB hemorrhage only and 87 other findings. In 344 patients a definitive cause of GI bleeding established by secondary testing, 187 (54%) had concordant mpCTE diagnoses. In this group, positive predictive value varied by etiology (mass 98% (55/56); inflammation 94% (31/33); vascular 82% (44/54); hemorrhage 100% (3/3); other 76% (31/41); Figure 1). The most common cause of non-SB GI bleeding was cecal and rectal vascular lesions (27%; 24/89). For patients with further clinical testing or intervention and 1 year follow-up (n = 205), the rate of re-bleeding or continued iron supplementation was recorded.

CONCLUSION
mpCTE has an estimated diagnostic yield of 31.6% and a significantly reduced rate of re-bleed or continued iron dependence following a positive exam. It is a reliable screen for causes of SB bleeding in OGIB patients, and identifies many etiologies of GI bleeding outside of the SB.

Clinical Significance of Pneumatosis Intestinalis in the Emergency Department - Correlation of MDCT Findings with Patients’ Outcome

PURPOSE
To evaluate the clinical significance of pneumatosis intestinalis (PI) found on multidetector computed tomography (MDCT) in the emergency department.
MDCT scans of 149 consecutive emergency patients (53 women, mean age 64) with PI of the stomach (n=4), small (n=68) and/or large bowel wall (n=96) were reviewed by two radiologists. PI extension, distribution and possible association with portomesenteric venous gas (PMVG) were correlated with other MDCT-findings (e.g. bowel wall thickening, mural contrast-enhancement, target sign, luminal dilation), patients’ symptoms, risk factors, clinical management, laboratory, histopathology, final diagnosis and outcome.

RESULTS

The most frequent cause of PI (n=80 [53.7%]) was bowel ischemia, followed by infection (n=18 [12.1%]), obstructive (n=12 [8.1%]) and non-obstructive (n=10 [6.7%]) bowel dilatation, unknown aetiologies (n=8 [5.4%]), drugs (n=8 [5.4%]), inflammation (n=7 [4.7%]), and others (n=6 [4%]). Neither distribution nor extension of PI significantly correlated with underlying ischemia. Overall mortality was 41.6% (n=62), mostly related to intestinal ischemia (p=0.003). Associated PMVG or the distribution of PMVG significantly correlated with underlying ischemia (p=0.001 and p= 0.004, respectively). Absence of mural contrast-enhancement was the only MDCT-feature significantly associated with ischemia (p=7.48x10^-6). The degree of calcified atherosclerosis, as evaluated by MDCT, significantly correlated with underlying ischemia (p=0.024), unlike other cardiovascular risk factors (p=0.723). Patients with PI due to ischemia had a significantly higher fatal outcome (p=0.003) compared to non-ischemic aetiologies, regardless of their age.

CONCLUSION

PI was caused by various disorders with intestinal ischemia being the most common aetiology with the highest mortality. PMVG and/or absence of mural contrast-enhancement in association with PI may be considered signs of underlying bowel ischemia.

CLINICAL RELEVANCE/APPLICATION

Although intestinal ischemia is the most common aetiology of PI, this sign can be seen with other disorders. Thus it is mandatory to look for other signs such as PMVG and/or absence of mural contrast-enhancement associated with PI to correctly diagnose bowel ischemia in the appropriate clinical context.

SSE08-03 Pneumatosis Intestinalis in Oncology Patients: CT Findings, Clinical Correlates and Outcomes

Monday, Nov. 30 3:20PM - 3:30PM Location: E353C

Participants
Carlton Smith, MD, Baltimore, MD (Presenter) Nothing to Disclose
Lei Zheng, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Karen B. Bleich, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Elliot K. Fishman, MD, Owings Mills, MD (Abstract Co-Author) Research support, Siemens AG Advisory Board, Siemens AG Research Support, General Electric Company Advisory Board, General Electric Company Co-founder, HipGraphics, Inc
Pamela T. Johnson, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose

PURPOSE

We have observed oncology patients who develop pneumatosis intestinalis without clinical indicators of an acute abdominal process. This study was designed to evaluate these patients in an attempt to guide management.

METHOD AND MATERIALS

A retrospective search of CT reports from 2004-2014 identified 21 adult subjects undergoing cancer treatment with new pneumatosis on CT. Electronic medical records were reviewed to determine underlying malignancy, medications, presentation, lactate level and course. CT images were reviewed for location of pneumatosis, pneumoperitoneum, mesenteric or portal vein gas and follow up CT findings.

RESULTS

Subjects included 15 men and 7 women with mean age 60 years (range 25-79 years). Four subjects with bowel obstruction were excluded. Chemotherapeutic agents in the remaining 17 were: FOLFOX (5FU, oxapliatin) FOLFOX (5FU, oxapliatin) + bevacizumab irinotib cisplatin + gemcitabine pemetrexed, carboplatin + bevacizumab, then erlotinib + bevacizumab rituximab-chOP docetaxel + bevacizumab chemoradiation + temozolamide rituximab +methypridnimsole amertuzumab ara-C + DLI afatinib + metformin everolimus sunitinib carboplatin, 5FU + cetuximab s/p induction with 7+3 and HiDACIn 17 nonobstructed subjects, pneumatosis involved small bowel in 3, small and large bowel in 2, right colon in 10, left colon in 1, entire colon in 1. Nine of 17 (53%) had localized or free pneumoperitoneum and 1 had mesenteric vein gas. One post-op patient who died likely had ischemic bowel, and the diagnosis was equivocal in a 2nd. A 3rd patient’s death was attributed to refractory GVHD. These 3 subjects had elevated lactate. Two others underwent surgery, with surgical diagnosis of no small bowel ischemia in 1 and pathologic diagnosis of colon ulceration and mucosal bacterial overgrowth in the 2nd. A benign clinical course and resolution of pneumatosis on CT was documented in 12 observed patients with adequate clinical follow up, ranging from 2-46 months. Lactate was normal in 6/6 tested.

CONCLUSION

In oncology patients, intestinal pneumatosis without bowel obstruction may be self limited. Lactate level was elevated in life threatening causes in this small series.

CLINICAL RELEVANCE/APPLICATION

Management algorithms should consider that pneumatosis may be a nonsurgical complication of chemotherapy rather than bowel ischemia in the oncology patient population.

Honored Educators

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Elliot K. Fishman, MD - 2012 Honored Educator
CT Angiography in the Setting of Suspected Acute Mesenteric Ischemia: Prevalence of Ischemic and Alternative Diagnoses

**Participants**
Frank Oliver G. Henes, MD, Hamburg, Germany (Presenter) Nothing to Disclose
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Research Consultant, Bracco Group; Research Consultant, KIT; Research Grant, Koninklijke Philips NV
Utaro Motosugi, MD, Yamanashi, Japan (Abstract Co-Author) Nothing to Disclose
Meghan G. Lubner, MD, Madison, WI (Abstract Co-Author) Grant, General Electric Company; Grant, NeuWave Medical, Inc; Grant, Koninklijke Philips NV
Gerhard B. Adam, MD, Hamburg, Germany (Abstract Co-Author) Nothing to Disclose
Gerhard Schon, Hamburg, Germany (Abstract Co-Author) Nothing to Disclose
Peter Bannas, MD, Hamburg, Germany (Abstract Co-Author) Nothing to Disclose

**Purpose**
To determine the prevalence of ischemic and alternative diagnoses and the diagnostic accuracy of CT angiography (CTA) in the setting of suspected acute mesenteric ischemia (AMI).

**Method and Materials**
This retrospective study was HIPAA- and IRB-compliant; informed consent was waived. We included 959 patients that underwent CTA for evaluation of suspected AMI. The final clinical diagnosis as determined by the treating clinician was used to determine the prevalence of ischemic and alternative diagnoses. Prevalence of diagnoses by age, sex and admission status was compared using the Cochran-Armitage Trend-Test. The diagnostic accuracy of CTA was calculated using the final clinical diagnosis as standard of reference.

**Results**
The prevalence was 18.7% (179/959) for AMI and 62.4% (598/959) for a specific alternative diagnosis, in the remaining 20.7% (198/959) no final clinical diagnoses was established. The most frequent type of AMI was occlusive arterial ischemia (53.3%; 88/179), followed by nonocclusive ischemia (40.6%; 67/179), and mesenteric vein thrombosis (6.1%; 10/179). The most frequent alternative diagnoses were small bowel obstruction (11.6%; 62/598), colitis (10.2%; 54/598), cholecystitis (6.8%; 36/598), diverticulitis (6.6%; 35/598), and pneumonia (6.4%; 34/598). The prevalence of AMI was significantly higher in older patients (P<.001) and the prevalence of specific alternative diagnoses varied significantly according to both age (P<.0001) and admissions status (P=0.0015). CTA had a sensitivity and specificity for diagnosis of AMI of 89%/99% and for alternative diagnoses of 87%/86%.

**Conclusion**
In the vital clinical setting of suspected AMI, the prevalence of ischemic and alternative diagnoses varies significantly by age, sex and admission status. CTA provides for rapid and non-invasive diagnosis with high diagnostic accuracy, allowing for triage of 80% of the patients.

**Clinical Relevance/Application**
The high diagnostic accuracy for both ischemic and alternative diagnoses demonstrates the high diagnostic yield of CTA and further supports the triage role of CT in the setting of suspected AMI. Knowledge of the prevalence and the demographic distribution of the alternative diagnoses in the setting of suspected AMI may help the radiologist with diagnosis finding and thereby the referring clinicians in their treatment decisions.

**Honored Educators**
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Perry J. Pickhardt, MD - 2014 Honored Educator
Meghan G. Lubner, MD - 2014 Honored Educator
Meghan G. Lubner, MD - 2015 Honored Educator

Dual-Energy Computed Tomography and Iodine Mapping are Superior to Conventional CT in the Diagnosis of Early and Established Intestinal Ischemia and Infarction

**Participants**
Pedro Lourenco, MD, Vancouver, BC (Presenter) Nothing to Disclose
Ryan Rawski, BSc, MSc, Vancouver, BC (Abstract Co-Author) Nothing to Disclose
Mohammed F. Mohammed, MBBS, Vancouver, BC (Abstract Co-Author) Nothing to Disclose
Kathryn Darras, MD, Vancouver, BC, Vancouver, BC (Abstract Co-Author) Nothing to Disclose
Savvas Nicolaou, MD, Vancouver, BC (Abstract Co-Author) Institutional research agreement, Siemens AG
Patrick D. McLaughlin, FFRCSI, Cork, Ireland (Abstract Co-Author) Speaker, Siemens AG

**Purpose**
Acute intestinal ischemia and infarction are devastating abdominal emergencies, with mortality rates up to 93%. Clinical presentation is varied, with significant overlap with other acute abdominal disease. CT sensitivity for detection of acute bowel ischemia is poor, with reported values ranging from 60-80%. CT detection of bowel ischemia is challenging given that CT findings are non-specific. Here, we evaluate the utility of dual-energy CT (DECT) and iodine mapping in the diagnosis of acute intestinal
METHOD AND MATERIALS

64 consecutive patients presented to the emergency department of a quaternary hospital with features of acute intestinal ischemia or infarction between 2013 and 2014. Abdominal DECT (100 and 140 keV) with derived iodine maps (Liver VNC algorithm, Siemens) were reconstructed. An iodine map window of 270/160 was determined optimal for assessment of the intestinal mucosa (data not shown). Laboratory, clinical and pathological outcomes were recorded. Two abdominal trained radiologists were blinded to outcomes and independently rated the concordance of conventional CT and iodine maps with pathological outcomes. Qualitative analysis was also performed.

RESULTS

18 of 64 cases were confirmed to represent intestinal ischemia or infarction on surgical pathology, colonoscopy or due to death from intestinal infarction. Conventional 120 keV CT sensitivity, specificity, PPV and NPV for acute ischemia or infarction were 77.8% (95% CI 52.4-93.5), 89.1% (76.4-96.33), 73.7% (48.8-97.8) and 91.1% (78.8-97.5), respectively. Iodine maps were more robust than conventional 120 keV CT in the diagnosis of this disease entity, demonstrating sensitivity, specificity, PPV and NPV of 94.4% (72.6-99.1), 93.5% (82.1-98.6), 85.0% (62.1-96.6) and 97.7% (87.9-99.6), respectively. Quantitative evaluation showed good intra and inter observer reproducibility. Iodine maps increased interpreter confidence by 20%, and interpreters considered iodine maps useful in 83% of cases.

CONCLUSION

DECT iodine mapping increase conspicuity of ischemic bowel and allow for evaluation of intestinal perfusion. Iodine maps are a reliable and reproducible imaging adjunct, which offer a robust increase in sensitivity and specificity in the diagnosis of acute intestinal ischemia or infarction over conventional CT, up to 94.4% and 93.5%, respectively.

CLINICAL RELEVANCE/APPLICATION

DECT iodine maps are superior to conventional CT in the diagnosis of intestinal ischemia.

SSE08-06  Retrospective Evaluation of Small Bowel Gastrointestinal Stromal Tumors: Impact of CT Enterography

Participants

Rogerio Vasconcelos, MD, Rochester, MN (Presenter) Nothing to Disclose
Steven Dolan, MD, Rochester, MN (Abstract Co-Author) Nothing to Disclose
John M. Barlow, MD, Rochester, MN (Abstract Co-Author) Nothing to Disclose
Michael L. Wells, MD, Rochester, MN (Abstract Co-Author) Nothing to Disclose
Shannon P. Sheedy, MD, Rochester, MN (Abstract Co-Author) Nothing to Disclose
Jeff L. Fidler, MD, Rochester, MN (Abstract Co-Author) Research Grant, Beekley Corporation
Thomas C. Smyrk, Rochester, MN (Abstract Co-Author) Nothing to Disclose
Joel G. Fletcher, MD, Rochester, MN (Abstract Co-Author) Grant, Siemens AG

PURPOSE

Small bowel Gastrointestinal Stromal Tumors (sbGISTs) often have an indeterminate malignant potential and can be discovered in the workup of obscure GI bleeding (OGIB) or incidentally at abdominopelvic CT. We sought to determine the impact of CT enterography for sbGIST detection at our institution in a consecutive series of pathologically proven tumors.

METHOD AND MATERIALS

We retrospectively evaluated all histologically proven sbGISTs from 1998 to 2013. We created a biologic Aggressiveness Score (AS) based on initial histologic grading (low, intermediate, or high grade; or malignant) and clinical follow-up. All low to high grade sbGISTs were upgraded to AS category of malignant if local or distant metastases developed during clinical follow-up. Date and findings at clinical presentation, CT protocol {single-phase CTE [spCTE], multi-phase CTE [mpCTE], and other abdominopelvic CT (oAPCT)} were compared with the AS score.

RESULTS

83 patients with proven sbGISTs had low (n=42), intermediate (n=9), high-grade (n=10), or malignant tumors (n=22) AS. 23 patients (28%) had mpCTE, 15 (18%) had spCTE, and 45 (54%) had oAPCT exams. Mean clinical follow up was 36 months (for CTE and oAPCT exams). Over the time interval, the number of malignant sbGISTs remained constant (1-2 per year), but the number of low and intermediate grade tumors increased substantially (mean 0.7 per year from 1998-2005 to mean 5.8 per year from 2006-2013), as did the total number of sbGISTs. 34 pts with sbGISTs underwent CT for OGB, with 5/27 (19%) of CT exams identifying malignant sbGISTs, compared to 4/7 (57%) for oAPC. CTE exams detecting sbGISTs were predominantly performed for OGB (27/38; 71%), while oAPCT exams identified sbGISTs incidentally for non-OGB indications (29/45; 64%). The average size of sbGISTs detected by CTE was 3.9 vs. 7.5 cm for oAPCT.

CONCLUSION

The incidence of sbGISTs appears to be increasing, in large part due to the increased detection of these tumors with CTE, usually performed in OGB patients. The majority of sbGISTs detected with CTE are not malignant.

CLINICAL RELEVANCE/APPLICATION

The incidence of non-malignant small bowel GIST tumors is increasing dramatically, likely due to the use of CTE in OGB, while the number of malignant GISTs has remained stable since 1998.
**SSE09**

**Gastrointestinal (Liver Functional Imaging)**

Monday, Nov. 30 3:00PM - 4:00PM Location: E451A

**GI**  **MR**

AMA PRA Category 1 Credit ™: 1.00  
ARRT Category A+ Credit: 1.00  
FDA

**Discussions may include off-label uses.**

**Participants**

Claude B. Sirlin, MD, San Diego, CA (Moderator) Research Grant, General Electric Company; Speakers Bureau, Bayer AG; Consultant, Bayer AG ; ;

Aliya Qayyum, MBBS, Houston, TX (Moderator) Nothing to Disclose

**Sub-Events**

**SSE09-01 MR Elastography in Combination with MRI Proton Density Fat Fraction for Prediction of Advanced Hepatic Fibrosis in Adults with Non-Alcoholic Fatty Liver Disease**

Monday, Nov. 30 3:00PM - 3:10PM Location: E451A

**Participants**

Paul Manning, MSc, La Jolla, CA (Presenter) Nothing to Disclose

Kang Wang, PhD, San Diego, CA (Abstract Co-Author) Nothing to Disclose

Jonathan C. Hooker, BS, San Diego, CA (Abstract Co-Author) Nothing to Disclose

William Haufe, San Diego, CA (Abstract Co-Author) Nothing to Disclose

Tanya Watson, MS, San Diego, CA (Abstract Co-Author) Nothing to Disclose

Anthony Garnet, PhD, San Diego, CA (Abstract Co-Author) Nothing to Disclose


Richard L. Ehman, MD, Rochester, MN (Abstract Co-Author) CEO, Resoundant, Inc; Stockholder, Resoundant, Inc; Stockholder, Resoundant, Inc; Research Grant, Resoundant, Inc

Rohit Loomba, MD, MSc, La Jolla, CA (Abstract Co-Author) Nothing to Disclose

Claude B. Sirlin, MD, San Diego, CA (Abstract Co-Author) Research Grant, General Electric Company; Speakers Bureau, Bayer AG; Consultant, Bayer AG ; ;

**PURPOSE**

To determine in adults with non-alcoholic fatty liver disease (NAFLD), whether the combination of magnitude MRI (M-MRI)-estimated proton density fat fraction (PDFF) with MR elastography (MRE)-estimated liver stiffness improves the prediction of advanced fibrosis compared to MRE-estimated liver stiffness alone.

**METHOD AND MATERIALS**

This retrospective analysis included 123 adults with confirmed NAFLD (49 men, mean age 52 yrs, range 19-76 yrs) who underwent M-MRI and MRE within 90 days of liver biopsy. Biopsies were scored based on NASH CRN criteria; 46%, 27%, 14%, 9% and 4% of adults had stage 0, 1, 2, 3, and 4 fibrosis, respectively. Fibrosis stages 3-4 were considered to be advanced fibrosis. PDFF was estimated by M-MRI performed with low flip angle to avoid T1 weighting, and with six nominally in- and out-of-phase echoes to correct for T2*. Stiffness was estimated by each of two MRE methods (3D 40Hz, 3D 60Hz). Logistic regression was performed for each MRE method alone, and for each MRE method in combination with PDFF, to predict advanced fibrosis. AUROCs were calculated for each logistic regression model and compared pairwise using chi-squared tests.

**RESULTS**

For 3D MRE 40Hz and 3D MRE 60Hz, AUROCs (95% CI) for predicting advanced fibrosis with MRE alone were 0.960 (0.907, 1) and 0.948 (0.881, 1), respectively. AUROCs (95% CI) for predicting advanced fibrosis with MRE in combination with PDFF for these two methods were 0.970 (0.920, 1) and 0.962 (0.906, 1), respectively. Each of these AUROCs was significantly greater than the corresponding AUROC achieved with MRE alone (p-values 0.007 and 0.012).

**CONCLUSION**

In adults with NAFLD, M-MRI estimated PDFF combined with MRE-estimated liver stiffness provided a small but statistically significant improvement for predicting advanced fibrosis compared to MRE alone.

**CLINICAL RELEVANCE/APPLICATION**

Estimation of both hepatic PDFF and liver stiffness in a single MR examination may improve prediction of advanced fibrosis in adults with NAFLD, but further study is needed to confirm the results.

**SSE09-02 Liver Hemodynamics Quantification with DCE-MRI for Hepatic Reserve Function Assessment in Patients with Post-hepatitic Liver Cirrhosis (PHLC)**

Monday, Nov. 30 3:10PM - 3:20PM Location: E451A

**Participants**

Lan Zhang, Zhengzhou, China (Presenter) Nothing to Disclose

**PURPOSE**
To evaluate the value of (dynamic contrast-enhanced magnetic resonance imaging, DCE-MRI) for hepatic reserve function assessment in patients with Post-hepatic liver cirrhosis (PHLC)

**METHOD AND MATERIALS**

Ten normal subjects, ten mild PHLC patients (Child-Pugh score 5-6) and ten moderate PHLC patients (Child-Pugh score 7-9) were prospectively enrolled and underwent DCE-MRI before clinical treatment. All data were calculated with Exchange Model fitting Pharmacokinetic curve and various parameters were measured, including volume transfer constant of the contrast agent (Ktrans), Reverse reflux rate constant (Kep), Volume fraction of EES (Ve), full perfusion (FP), hepatic arterial perfusion index (HPI), blood volume (BV), blood flow (BF) mean transit time (MTT). All data was assessed with ANOVA and LSD test was used to compare the differences between each two groups. P < 0.05 was considered statistically significant.

**RESULTS**

Compared with normal liver, increases of HPI and FP were found significant in mild PHLC group (p < 0.05), as well as in moderate PHLC group (p < 0.01). MTT was constant between normal group and mild PHLC group, but increased in moderate PHLC group (p < 0.05). BF was found no significant difference between normal and mild PHLC group, but decreased in moderate PHLC group (p < 0.05). BV was found no statistical difference between each two groups of three groups. Compared with normal group, Ktrans, Kep and Ve were found no significant in mild PHLC group (p > 0.05), only Ve increased in moderate PHLC group (p < 0.05).

**CONCLUSION**

The quantified DCE-MRI parameters, such as HPI, FP, MTT and Ve could be helpful to evaluate hepatic reserve function of PHLC.

**CLINICAL RELEVANCE/APPLICATION**

DCE-MRI suggests that it could be used as an important index for the degree of PHLC and hepatic reserve function assessment.

**SSE09-03 Biliary Tract Enhancement during the Hepatobiliary Phase in Gadoxetic Acid-enhanced MRI: Correlation with Non-invasive Biomarker Associated with Liver Function and Fibrosis**

**Monday, Nov. 30 3:20PM - 3:30PM Location: E451A**

Participants

Yoshifumi Noda, MD, Gifu, Japan (Presenter) Nothing to Disclose
Satoshi Goshima, MD, PhD, Gifu, Japan (Abstract Co-Author) Nothing to Disclose
Haruo Watanabe, MD, Gifu, Japan (Abstract Co-Author) Nothing to Disclose
Hiroshi Kawada, MD, Gifu, Japan (Abstract Co-Author) Nothing to Disclose
Nobuyuki Kawai, MD, Gifu, Japan (Abstract Co-Author) Nothing to Disclose
Hiromi Ono, MD, Gifu, Japan (Abstract Co-Author) Nothing to Disclose
Masayuki Kanematsu, MD, Gifu, Japan (Abstract Co-Author) Nothing to Disclose
Kyongtae T. Bae, MD, PhD, Pittsburgh, PA (Abstract Co-Author) Patent agreement, Medtronic, Inc; Consultant, Otsuka Holdings Co, Ltd

**PURPOSE**

To evaluate the correlation between the magnetic resonance (MR) imaging measurements and non-invasive biomarker associated with liver function and fibrosis in gadoxetic acid-enhanced MR imaging.

**METHOD AND MATERIALS**

This retrospective study was approved by our institutional review board and written informed consent was waived. One hundred thirty nine consecutive patients (89 men and 50 women, age range 33-87 years, mean age 67 years ± 12.6 [standard deviation]) with suspected a liver disease or liver tumor underwent gadoxetic acid-enhanced MR imaging. Patients were classified into two groups according to the model for end-stage liver disease (MELD) score: MELD group A, MELD score ≤ 10 (n = 129); MELD group B, MELD score > 10 (n = 10). We calculated the following liver function indices: the biliary tract structure-to-muscle signal intensity ratio (SIR), relative enhancement of the liver and, liver-to-spleen ratio. MR imaging measurements and Child-Pugh score or MELD score were then compared.

**RESULTS**

Multiple regression analysis showed that SIR of common bile duct and cystic duct were the most significantly correlated with Child-Pugh score (P < 0.0001) and MELD score (P = 0.0017), respectively. The sensitivity, specificity, and area under the receiver-operating-characteristic curve for the detection of patients with Child-Pugh class B or C, and MELD group B were 74%, 68%, and 0.86 with the SIR of common bile duct and 100%, 87%, and 0.94 with the SIR of cystic duct, respectively.

**CONCLUSION**

The SIRs of cystic duct and common bile duct can be a non-invasive and valuable imaging biomarker for the estimation of liver function.

**CLINICAL RELEVANCE/APPLICATION**

Our study demonstrated the SIRs of cystic duct and common bile duct possibly correlate with non-invasive biomarker associated with liver function and fibrosis. This index may be an important quantitative biomarker for the evaluation of liver function and fibrosis.

**SSE09-04 Multidisciplinary Evaluation of Congestive Hepatopathy after Fontan Procedure - Preliminary Results**

**Monday, Nov. 30 3:30PM - 3:40PM Location: E451A**

Participants

Nataly d. Horvat, MD, Sao Paulo, Brazil (Presenter) Nothing to Disclose
Rocha Manoel, MD, PhD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Hilton M. Leao Filho, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Nana Ikari, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
The T1 relaxation time for Gd-EOB-DTPA enhanced MRI has the potential to serve as a representative of MRI-based liver functional

**CONCLUSION**

HH15, R2=0.38; T1 versus LHL 15, R2=0.30; T1 versus ICG clearance R2=0.57; HH15 versus ICG clearance R2=0.48; LHL 15 versus showed a correlation between T1 relaxation times for Gd-EOB-DTPA enhanced MRI and other liver functional parameters (T1 versus functional damage (normal, 313 ± 43 ms; mild, 349 ± 89 ms; moderate, 489 ± 143 ms; severe, 491 ± 11 ms). Regression analysis showed a constant increase from normal hepatic function to severe hepatic function (p < 0.01) or mild hepatic functional damage (p < 0.05) and modelate hepatic functional damage defined by HH15. The T1 relaxation times for Gd-EOB-DTPA-enhanced MRI showed significant differences between patients with normal hepatic function (p < 0.01) or mild hepatic functional damage (p < 0.05) and moderate hepatic functional damage defined by HH15. The T1 relaxation times for Gd-EOB-DTPA-enhanced MRI showed a constant increase from normal hepatic function to severe hepatic functional damage (normal, 313 ± 43 ms; mild, 349 ± 89 ms; moderate, 489 ± 143 ms; severe, 491 ± 11 ms). Regression analysis showed a correlation between T1 relaxation times for Gd-EOB-DTPA enhanced MRI and other liver functional parameters (T1 versus HH15, R2=0.38; T1 versus LHL 15, R2=0.30; T1 versus ICG clearance R2=0.57; HH15 versus ICG clearance R2=0.48; LHL 15 versus ICG clearance R2=0.45).

**RESULTS**

Patients' mean age was 9 years (range 2 - 15) at the time of the final FP and 24 years (range 18 - 31) at the time of this study. No patients had clinical signs of liver disease or laboratorial findings indicating other hepatic disorders. Radiological features of hepatopathy were found in 14 (93%) patients at US, in 7 patients (73%) at CT and in all 15 (100%) patients at MRI with overall agreement of 94%. Hepatic nodules were detected in 2 patients at US. Among the 12 patients that underwent CT, 3 presented hepatic nodules (25%), with a total of 12 nodules with mean size of 1.2 cm (range 1.1 - 2.2 cm). All nodules were hypervascular on arterial phase and were also characterized on MRI. Hepatic nodules were detected in 4 patients at MRI (27%) with a total of 13 nodules with mean size of 1.3 cm (range 1.1 - 2.2 cm). All nodules presented isosignal on T2WI, one was hypointense on T2WI, none presented diffusion restriction and all nodules were hypervascular in the arterial and hepatobiliary phases, except one that was hypovascular in these phases. Small hypervascular foci in the hepatobiliary phase MRI was seen in 11 patients (75%). All patients presented increasing liver stiffness at Fibroscan®, mean 20.0 kPa (range 6.7 - 24.0 kPa) and at ARFI, mean 1.96 (range 0.82 - 3.93).

**CONCLUSION**

Hepatic complications are frequent in patients who underwent FP including hepatic fibrosis, cirrhosis and hepatic nodules.

**CLINICAL RELEVANCE/APPLICATION**

A proper evaluation in patients submitted to FP is important to allow early recognition and treatment of liver complications. Hepatic nodules have been observed in FP patients but the nature of these nodules remains uncertain, although there are reports of malignancy.

**SSE09-05 Measuring Hepatic Functional Reserve Using T1 Mapping with Gadoxetic Acid Enhanced 3T MR Imaging: A Preliminary Study Comparing 99mTc GSA Scintigraphy with Indocyanine Green (ICG) Retention**

*Monday, Nov. 30 3:40PM - 3:50PM Location: E451A*

**Participants**

Tomohiro Namimoto, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Masatake Nakagawa, Kumamoto, Japan (*Presenter*) Nothing to Disclose
Kie Shimizu, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
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**PURPOSE**

To test whether T1 mapping of liver parenchyma on gadoxetic acid (Gd-EOB-DTPA) enhanced 3T MRI correlates with the parameters of Technetium-99m galactosyl serum albumin (99mTc-GSA) scintigraphy and indocyanine green (ICG) retention for the measurement of liver functional reserve.

**METHOD AND MATERIALS**

Sixty-six patients (43 HCC, 18 metastasis, 5 CCC) awaiting liver resection or TACE were included in this retrospective study. T1 relaxation times of the liver post-contrast enhancement images were measured using Look-Locker sequences 20 minutes after Gd-EOB-DTPA administration. For 99mTc-GSA scintigraphy, the blood clearance index HH15 and LHL15 was recorded. ICG retention at 15 min was also recorded. Statistical analysis involved Kruskal-Wallis test and Pearson correlation.

**RESULTS**

The T1 relaxation time for Gd-EOB-DTPA-enhanced MRI showed significant differences between patients with normal hepatic function (p < 0.01) or mild hepatic functional damage (p < 0.05) and moderate hepatic functional damage defined by HH15. The T1 relaxation times for Gd-EOB-DTPA-enhanced MRI showed a constant increase from normal hepatic function to severe hepatic functional damage (normal, 313 ± 43 ms; mild, 349 ± 89 ms; moderate, 489 ± 143 ms; severe, 491 ± 11 ms). Regression analysis showed a correlation between T1 relaxation times for Gd-EOB-DTPA enhanced MRI and other liver functional parameters (T1 versus HH15, R2=0.38; T1 versus LHL 15, R2=0.30; T1 versus ICG clearance R2=0.57; HH15 versus ICG clearance R2=0.48; LHL 15 versus ICG clearance R2=0.45).

**CONCLUSION**

The T1 relaxation time for Gd-EOB-DTPA enhanced MRI has the potential to serve as a representative of MRI-based liver functional
reserves. It is strongly correlated with ICG clearance and moderately correlated HH15/LHL15 with 99mTc-GSA.

**CLINICAL RELEVANCE/APPLICATION**

The T1 relaxation time for Gd-EOB-DTPA enhanced MRI has the potential to serve as a representative of MRI-based liver functional reserve.

**SSE09-06**  
**Visual Assessment of Graft Dysfunction in Liver Transplant Recipients Using Gadoxetic Acid-enhanced MRI**

**Participants**

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**PURPOSE**

To evaluate whether a qualitative visual scoring system, using specific features of gadoxetic acid-enhanced MRI, could be applied to estimate liver graft (OLT) function and survival probability.

**METHOD AND MATERIALS**

85 patients, 31 females (36.5%) and 54 males (63.5%) with a median age of 54.6 years were examined on a 3 Tesla MR. All patients received a bolus injection of 0.025 mmol/kg body weight of gadoxetic acid at 1 mL/sec. Dynamic imaging was subsequently performed, including a 20 minute hepatobiliary phase (HBP). Two readers independently analyzed the unenhanced and HBP-enhanced MR images qualitatively. The degree of contrast parenchymal enhancement, i.e., enhancement quality score (EnQS) (0-2) and biliary CM excretion, i.e., excretion quality score (ExQS) (0-4) as well as the persistence of signal intensity (SI) in the portal vein, the so-called 'portal vein sign (PVS) quality score (PVSQS) (0-1) on the HBP were assessed. A quantitative measurement on the unenhanced and HBPEnhanced MR images was performed, as well, to measure the relative liver parenchymal enhancement (RLE) at 20 minutes (i.e., HBP). The probabilities of graft survival were calculated by Kaplan-Meier survival estimates and Cox proportional hazard regression models with Firth's correction.

**RESULTS**

The inter-reader agreement for the qualitative assessment of EnQS, ExQS, PVSQS according to the suggested scale was almost perfect (k: 0.81). Univariate survival analysis showed that the EnQS, ExQS, and PVSQS were independently associated with the probability of graft survival, respectively.

**CONCLUSION**

Qualitative assessment using PVSQS, EnQS, and ExQS on gadoxetic acid enhanced-MRI allows us to estimate the graft survival probability after OLT.

**CLINICAL RELEVANCE/APPLICATION**

Gadoxetic acid-enhanced MRI can be used as a non-invasive imaging biomarker to predict the liver graft survival probability.
Nuclear Medicine (Endocrine and Gastrointestinal Imaging)

Monday, Nov. 30 3:00PM - 4:00PM Location: S505AB

SSE16-01 Parathyroid Imaging with Simultaneous Acquisition of Tc-99m-Sestamibi and I-123: The Relative Merits of Pinhole Collimation and SPECT-CT.

Participants
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Christopher Raeburn, MD, Aurora, CO (Abstract Co-Author) Nothing to Disclose
Phillip J. Koo, MD, Aurora, CO (Abstract Co-Author) Advisory Board, Bayer AG; ;

PURPOSE
To determine the relative localization utility of three state-of-the-art parathyroid imaging protocols: 1) single time point simultaneous acquisition of Tc-99m-sestamibi and I-123 images with pinhole collimation in the anterior and bilateral anterior oblique projections, 2) single time point simultaneous acquisition of Tc-99m-sestamibi and I-123 images with SPECT-CT, and 3) the combination of protocols one and two.

METHOD AND MATERIALS
Fifty-nine patients with surgical proof of parathyroid adenomas were evaluated retrospectively. All three protocols included perfectly co-registered subtraction images created by subtracting the I-123 images from the Tc-99m-sestamibi images, plus an anterior parallel hole collimator image of the neck and upper chest. The pinhole protocol was performed first followed by the SPECT-CT protocol. Three image sets were derived from each study in each patient according to the above protocols. Two experienced observers recorded the size, location and degree of certainty of any identified lesion.

RESULTS
The 59 patients had sixty-one adenomas. For the two observers combined, the localization success rate was 88% for the pinhole protocol, 69% for the SPECT-CT protocol, and 81% for the combined protocol. The pinhole protocol detected more adenomas than the SPECT-CT protocol and missed fewer adenomas than either the SPECT-CT protocol or the combined pinhole and SPECT-CT protocol (P < 0.01). The two protocols that included SPECT-CT provided superior anatomic information relative to the location and size of the parathyroid adenomas.

CONCLUSION
Overall, the pinhole protocol localized significantly more adenomas than the SPECT-CT protocol. However, the protocols that included SPECT-CT provided more anatomic information than pinhole imaging alone.

CLINICAL RELEVANCE/APPLICATION
Accurate preoperative identification and localization of parathyroid adenoma(s) allows surgeons to perform image guided minimally invasive surgery with improved success rates, shorter operating times, and less morbidity. Consequently, it is important to optimize the accuracy of preoperative imaging in determining the presence, size, and location of parathyroid adenomas. Our hope with this study is to determine the most accurate imaging protocol with current available imaging modalities to overall optimize patient outcomes.

SSE16-02 Influence of Multigland Parathyroid Disease on Tc-99m-Sestamibi SPECT/CT Sensitivity

Participants
Kenneth Nichols, PhD, New Hyde Park, NY (Presenter) Royalties, Syntermed, Inc;
Gene G. Tronco, MD, New Hyde Park, NY (Abstract Co-Author) Nothing to Disclose
Christopher J. Palestro, MD, New Hyde Park, NY (Abstract Co-Author) Nothing to Disclose

PURPOSE
Tc-99m-sestamibi (MIBI) imaging is a mainstay for preoperative parathyroid lesion localization in pts with primary hyperparathyroidism (PHP). Decreased sensitivity in multigland disease (MGD) compared to single gland disease (SGD) is a well recognized phenomenon for planar and SPECT protocols, but few data are available on the effect of MGD on the sensitivity of MIBI parathyroid SPECT/CT.
METHOD AND MATERIALS
We retrospectively analyzed 272 pts (220 female pts, 52 male pts, age = 59±13 years) with PHP who underwent preoperative MIBI SPECT/CT. We used surgical and pathology reports to confirm numbers and weights of excised parathyroid lesions. Two experienced physicians read SPECT/CTs on 2 separate occasions without reference to each other's readings or final diagnoses. Lesion certainty was graded on a 5-point scale (0 = normal, 1 = probably normal, 2 = equivocal, 3 = probably abnormal, 4 = definitely abnormal). Mean scores were obtained for the 2 observers. Readings were compared for MGD and SGD lesions matched by weight and location.

RESULTS
230 pts had SGD, 42 had MGD (28 pts with 2 lesions, 11 pts with 3 lesions and 3 pts with 4 lesions). Lesion weight decreased progressively with increasing numbers of lesions (888±941 mg for 1 lesion, 436±570 mg for 2 lesions, 395±686 mg for 3 lesions, 89±120 mg for 4 lesions, p = -0.43, p < 0.0001). It was possible to match equal numbers of SGD and MGD lesions by weight for 132 lesions, with similar mass (526±678 versus 525±686 mg, p = 0.99), and similar location distributions (p = 0.47). Despite being matched by weight and location, reading confidence was significantly lower for SGD than MGD lesions (2.0±1.4 versus 3.4±0.8, p < 0.0001); confidence decreased progressively with increasing lesion numbers (2.2±1.3 for 2 lesions, 1.8±1.5 for 3 lesions, 1.0±0.9 for 4 lesions, ps = -0.51, p < 0.0001). Sensitivity was significantly lower for SGD than MGD lesions (64% versus 98%, p < 0.0001); sensitivity decreased progressively with increasing lesion numbers (67% for 2 lesions, 65% for 3 lesions, 25% for 4 lesions, ps = -0.45, p < 0.0001).

CONCLUSION
As with planar and SPECT MIBI, in PHP,Tc-99m-MIBI SPECT/CT reading confidence and sensitivity are significantly lower in multigland disease than in single gland disease.

CLINICAL RELEVANCE/APPLICATION
MIBI SPECT/CT is less sensitive for detecting lesions in MGD than lesions in SGD and therefore it must be used together with rapid intraoperative parathyroid hormone assay to ensure that all offending lesions are removed.

SSE16-03 Prognostic Value of FDG-PET/CT in Papillary Thyroid Cancer with the TENIS Syndrome

Monday, Nov. 30 3:20PM - 3:30PM Location: S505AB

Participants
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Yusuke Furuta, MD, PhD, Sapporo, Japan (Abstract Co-Author) Nothing to Disclose
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Masayuki Sakurai, Sapporo, Japan (Abstract Co-Author) Nothing to Disclose

PURPOSE
Postsurgical papillary thyroid cancer (PCA) with thyroglobulin elevation and negative iodine scintigraphy (TENIS) generally show resistance to high-dose I-131 therapy. However, prognostic factors for PCA with the TENIS syndrome have not been well established. The aim of the study was to determine whether FDG uptake is linked with clinical behavior of the tumor in the TENIS syndrome.

METHOD AND MATERIALS
93 patients with PCA, who had previously undergone total thyroidectomy and remnant tissue ablation and were diagnosed as the TENIS syndrome, underwent FDG-PET/CT. Serum Tg levels at PET/CT ranged 2.9-225.4(ng/ml). Uptake of FDG was visually assessed and classified as positive or negative. When FDG uptake was positive, semi-quantitative analysis (SUVmax) was performed. If a patient had multiple tumors, average of SUVmax in the 2 largest tumors were used for evaluation. Patients were followed up for 28-83 months (median 46). Tg levels were measured at least 5 times or more after imaging of FDG-PET/CT. to determine Tg doubling time (Tg-DT). As a rule, changes in the tumor size were evaluated based upon RECIST1.1.

RESULTS
Of 93 patients, 74 showed positive FDG uptake while the remaining 19 showed negative FDG uptake. In the FDG positive group, 21 (28%) showed Tg-DT of < 1yr. Progressive disease (PD) was observed in 32 pts. (42%). SUVmax was significantly higher in patients with PD than others (6.7 vs.4.1, p<0.01). 5 pts. died of PCA. In contrast, all patients in the FDG negative group had Tg-DT of either >=3yrs. or minus value regardless of baseline Tg value. PD was seen in only 1(5%). Cancer-associated death was not observed in any of the patients. There was an inverse correlation between SUVmax and Tg-DT in the positive FDG uptake group (r=-0.56).

CONCLUSION
Positive FDG uptake in the TENIS syndrome indicates shorter Tg-DT and higher risk of PD. In contrast, negative FDG uptake is associated with longer Tg-DT and gentle behavior of the tumor. FDG-PET/CT is helpful in characterizing prognosis of postsurgical PCA with the TENIS syndrome.

CLINICAL RELEVANCE/APPLICATION
In patients with TENIS who have high FDG uptake, early start of additional therapies such external radiation, local ablation therapy such as RFA or PEI, or chemotherapy using sorafenib or lenvatinib may improve their prognosis. In contrast, the majority of patients with negative FDG uptake do not require aggressive additional treatments.

SSE16-04 Effectiveness of Semi-quantitative Analysis in I-123 Metaiodobenzylguanidine Scintigraphy for Diagnosing Pheochromocytoma

Monday, Nov. 30 3:30PM - 3:40PM Location: S505AB

Participants
Yoshiyuki Kitamura, Fukuoka, Japan (Presenter) Nothing to Disclose

METHOD AND MATERIALS
We retrospectively analyzed 272 pts (220 female pts, 52 male pts, age = 59±13 years) with PHP who underwent preoperative MIBI SPECT/CT. We used surgical and pathology reports to confirm numbers and weights of excised parathyroid lesions. Two experienced physicians read SPECT/CTs on 2 separate occasions without reference to each other's readings or final diagnoses. Lesion certainty was graded on a 5-point scale (0 = normal, 1 = probably normal, 2 = equivocal, 3 = probably abnormal, 4 = definitely abnormal). Mean scores were obtained for the 2 observers. Readings were compared for MGD and SGD lesions matched by weight and location.

RESULTS
230 pts had SGD, 42 had MGD (28 pts with 2 lesions, 11 pts with 3 lesions and 3 pts with 4 lesions). Lesion weight decreased progressively with increasing numbers of lesions (888±941 mg for 1 lesion, 436±570 mg for 2 lesions, 395±686 mg for 3 lesions, 89±120 mg for 4 lesions, p = -0.43, p < 0.0001). It was possible to match equal numbers of SGD and MGD lesions by weight for 132 lesions, with similar mass (526±678 versus 525±686 mg, p = 0.99), and similar location distributions (p = 0.47). Despite being matched by weight and location, reading confidence was significantly lower for SGD than MGD lesions (2.0±1.4 versus 3.4±0.8, p < 0.0001); confidence decreased progressively with increasing lesion numbers (2.2±1.3 for 2 lesions, 1.8±1.5 for 3 lesions, 1.0±0.9 for 4 lesions, ps = -0.51, p < 0.0001). Sensitivity was significantly lower for SGD than MGD lesions (64% versus 98%, p < 0.0001); sensitivity decreased progressively with increasing lesion numbers (67% for 2 lesions, 65% for 3 lesions, 25% for 4 lesions, ps = -0.45, p < 0.0001).

CONCLUSION
As with planar and SPECT MIBI, in PHP,Tc-99m-MIBI SPECT/CT reading confidence and sensitivity are significantly lower in multigland disease than in single gland disease.

CLINICAL RELEVANCE/APPLICATION
MIBI SPECT/CT is less sensitive for detecting lesions in MGD than lesions in SGD and therefore it must be used together with rapid intraoperative parathyroid hormone assay to ensure that all offending lesions are removed.
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Masayuki Sasaki, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

I-123 Metaiodobenzylguanidine (MIBG) scintigraphy is a sensitive and specific imaging tool for the diagnosis of suspected adrenal pheochromocytoma. Hybrid single photon emission computed tomography / computed tomography (SPECT/CT) is expected to provide additional anatomical information and more efficient diagnostic capability. Visual evaluation is usually used to diagnose the abnormality. However, evaluation standard is not yet established. In addition, the appearance of fusion image of SPECT /CT is largely depend on the window level of SPECT image. This may lead to equivocal or wrong diagnosis. In this study, we introduced a semi-quantitative method for the evaluation of I-123 MIBG. The purpose of this study is to evaluate the performance of this method with that of conventional visual evaluation.

**METHOD AND MATERIALS**

Twenty six patients (Male/Female=17/9, Age=57.5±14.4) with suspected pheochromocytoma were incorporated in this study. I-123 MIBG scintigraphy and adrenal SPECT/CT was performed in all patients. Twelve pheochromocytomas and 14 cortical adenoma were diagnosed histopathologically or based on the clinical course including MRI. For semi-quantitative analysis, tumor-to-liver ratio (T/L) was defined as ratio of maximum count of adrenal mass divided by maximum count of normal liver of right lobe. For visual evaluation of planar scintigraphy and SPECT/CT fusion image, adrenal uptake was classified as visual score (1 = lower than liver, 2 = equal to liver and 3 = higher than liver). Diagnostic performances of the three methods (T/L: SPECT, visual: planar and visual: SPECT/CT) were compared using receiver operating characteristic (ROC) analyses.

**RESULTS**

In ROC analysis, AUC of SPECT, planar and SPECT/CT were 0.98, 0.67 and 0.76 with cut-off value of 2.26, 3 and 3, respectively. There were significant difference between SPECT and planar (p < 0.01), SPECT and SPECT/CT (p < 0.01). No significant difference between planar and SPECT/CT (p = 0.50).

**CONCLUSION**

Semi-quantitative method using SPECT/CT was more sensitive and specific than visual evaluation in the diagnosis of pheochromocytoma in patients with adrenal tumor.

**CLINICAL RELEVANCE/APPLICATION**

Semi-quantitative method using SPECT/CT was more sensitive and specific than visual evaluation in the diagnosis of pheochromocytoma in patients with adrenal tumor.

**SSE16-05 Postablation Radioiodine Scintigraphy SPECT/CT: Functional and Anatomic Correlation**

**METHOD AND MATERIALS**

In this retrospective study, one nuclear medicine physician and one neuroradiologist reviewed SPECT/CT findings to assess accuracy of radioiodine uptake localization on planar whole-body images in the central neck region. Inclusion criteria included thyroid carcinoma patients at our institution who underwent postablation planar and SPECT/CT I-131 scintigraphy from October 1, 2013 to June 1, 2014. Radioiodine dose was 50-200 mCi.

**RESULTS**

44 consecutive patients were included in the study (10 male, 34 female). Age range was 20 - 74. Most of the patients, 40 (91%) had obvious foci of radioiodine uptake in the central neck on planar and SPECT imaging, while remaining 4 patients had no significant radioiodine uptake in the neck. Of the patients with radioiodine uptake in the neck, 12 (27%) had uptake within the thyroid bed region only, 13 (30%) had focal uptake corresponding just to the thyroglossal duct remnant, and 15 (34%) had uptake within both, thyroid bed region and thyroglossal duct remnants. Therefore, majority of the patients with central neck uptake 28/40 (70%) had visualization of the thyroglossal duct remnant activity.

**CONCLUSION**

The anatomic CT correlation with planar and SPECT images demonstrated the majority of the focal radioiodine uptake to be located exclusively within the thyroid bed and thyroglossal duct remnant.

**CLINICAL RELEVANCE/APPLICATION**

In low risk patients with thyroid cancer, our findings may support low dose consideration prior to radioiodine ablation.

**SSE16-06 Evaluate Correlation of Duodenogastric Reflux Detected on Tc-99m Mebrofenin Hepatobiliary Scintigraphy with Symptomatic Gastroesophageal Reflux Disease: A Retrospective Study**

**METHOD AND MATERIALS**

In low risk patients with thyroid cancer, our findings may support low dose consideration prior to radioiodine ablation.
PURPOSE

GERD is thought to result primarily from gastric acid reflux. Recent literature suggests that symptomatic GERD also occurs from duodenogastric reflux of bile acids. This has been termed alkaline variant GERD and appears to be more damaging to the esophagus and has a more symptomatic clinical course. We aim to evaluate whether the presence of duodenogastric reflux (DGR) seen on Tc-99m mebrofenin hepatobiliary scintigraphy (MHBS) correlates with presence of clinical GERD and whether degree of DGR seen correlates with clinical severity of GERD.

METHOD AND MATERIALS

300 Tc-99m MHBS exams conducted from January 2011-December 2014 were included in this study and were evaluated for presence of DGR. Patients’ chart were reviewed to identify for clinical diagnosis of GERD and the severity of GERD that was determined using clinical data points including endoscopic evaluation of GERD, oral medications for treatment of GERD and presence/absence Barrett's esophagus, etc.

RESULTS

83 patients (45 females and 38 males) with mean age 47.9 (range: 13 - 93 years old) were identified to have evidence of DGR. Of these patients, 31.3% patients were diagnosed with cholecystitis and 7.2% patients were diagnosed with biliary colic. 25.3% patients had only clinical history of GERD and no additional significant history. Of the patients with clinical evidence of GERD, 42.9% patients had evidence of severe DGR, 38.1% had moderate DGR and 19% had mild DGR noted. 4.7% patients with GERD and severe DGR had histopathologic evidence of Barrett’s esophagus.

CONCLUSION

DGR is easily detected and frequently identified on Tc-99m MHBS. Our study shows 25% of patients with otherwise unremarkable Tc-99mHBS scintigraphy have evidence of DGR and majority of these have moderate to severe GERD. As emerging literature is demonstrating stronger correlation between bile acid reflux and symptomatic GERD, DGR is an important diagnostic consideration as the cause of patients presenting symptoms in an otherwise normal HIDA study.

CLINICAL RELEVANCE/APPLICATION

DGR is easily detected and frequently identified on Tc-99m MHBS and a significant proportion patients with scintigraphic evidence of DGR have GERD. Reporting severity of reflux in report can facilitate patient management by alerting clinician to DGR as an important diagnostic consideration as the cause of patients presenting symptoms in an otherwise normal HIDA study.
Purpose/Objective(s): To assess outcomes of patients with anal canal cancer treated with intensity-modulated radiation therapy (IMRT) after a long time follow-up. Materials/Methods: From August 2007 to January 2011, 39 patients were treated by IMRT for anal squamous cell carcinoma. Radiation course consisted in delivering 45 Gy in 1.8 Gy daily-fractions, 5 days a week, to the primary tumor and the risk area including pelvic and inguinal nodes (PTV1). A second plan of 14.4-20 Gy was administered to the periphery of the lesion in 3 fractions. Median follow-up was 8 months (1-37 months). Actuarial 1-year local control for HCC and metastatic patients was 84% and 54% respectively. Distant progression free survival at one year was 49%. Treatment was well tolerated with CTCAE v3 grade 1 acute gastrointestinal toxicity in 3 patients, grade 3 nausea in 1 patient and grade 3 acute dermatitis in another patient. No late toxicity was seen. Conclusion: Stereotactic body radiotherapy is a safe and effective alternative option for inoperable patients with low toxicity.

SSE24-02 Single-Institutional Experience on Stereotactic Body Radiation Therapy for Inoperable Liver Tumors

Participants
Hussam Hijazi, Montreal, QC (Presenter) Nothing to Disclose
Gulia Delouya, Montreal, QC (Abstract Co-Author) Nothing to Disclose
Marie-Pierre Carmean, MD,FRCP, Montreal, QC (Abstract Co-Author) Nothing to Disclose
Real Lapointe, Montreal, QC (Abstract Co-Author) Nothing to Disclose
David Roberge, MD, Montreal, QC (Abstract Co-Author) Nothing to Disclose
David Donath, MD, Montreal, QC (Abstract Co-Author) Nothing to Disclose
Daniel Taussky, Montreal, QC (Abstract Co-Author) Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Stereotactic body radiation therapy is an emerging treatment option for liver tumors unsuitable for ablation or surgery. We report our experience to evaluate the feasibility and safety of SBRT in the treatment of liver tumors unsuitable for standard local treatment. Materials/Methods: From July 2009 to January 2015, all patients with inoperable primary or secondary liver cancer treated with SBRT were reviewed. Patients who had previous surgical resection, chemotherapy, TACE or radio frequency ablation were eligible. The primary end point of this study was in-field local control (LC). The secondary end points were progression free survival, overall survival (OS) and toxicity. Results: Sixty-six patients with a total of 70 liver lesions (4 patients had 2 liver tumors) were treated in this study. The median age was 71 (27-89 years). Hepatocellular carcinoma (HCC) in 21 cirrhotic patients (32%) with Child-Pugh A (47%), B (33%) and C (10%) was treated. Six patients (9%) had intrahepatic cholangiocarcinoma. The remaining 59% (39 patients) had metastatic liver lesions. Colorectal adenocarcinoma was the most common primary tumor type (31 patients). Median size for HCC and metastatic lesions was 5cm (2-9cm) and 4cm (1-8cm) respectively. Median prescribed dose was 45 Gy (45-50 Gy) in 5 fractions (2-8). The most common prescription was 45 Gy to the periphery of the lesion in 3 fractions. Actuarial 1-year local control for HCC and metastatic patients was 84% and 54% respectively. Distant progression free survival at one year was 49%. Treatment was well tolerated with CTCAE v3 grade 1 acute gastrointestinal toxicity in 3 patients, grade 3 nausea in 1 patient and grade 3 acute dermatitis in another patient. No late toxicity was seen. Conclusion: Stereotactic body radiotherapy is a safe and effective alternative option for inoperable patients with low toxicity.
respectively. Median follow-up was 66 months CI95%[62-73], 24 patients (77.4%) had at least one grade 1 toxicity among anal incontinence, intestinal, urinary or skin disorders. One patient had grade 3 vaginal toxicity. 5-year overall survival rate was 79.2% CI95%[62.6-89.0], and 5-year local disease-free survival was 68.6% CI95% [51.3-80.9], with a 5-year colostomy-free survival rate of 76.6% CI95% [58.1-87.8].Conclusion: IMRT is effective and well tolerated in the long term.

**SSE24-05 Implementing a Well Follow-up Care Plan for Colorectal Cancer Patients: Quality Assurance and Lessons Learned**

Monday, Nov. 30 3:40PM - 3:50PM Location: S104A

Participants
Chunzi Jenny Jin, MD, Oak Brook, IL (Presenter) Nothing to Disclose
Jim Bagi, MD, Kingston, ON (Abstract Co-Author) Nothing to Disclose
Hugh Langley, Kingston, ON (Abstract Co-Author) Nothing to Disclose
Candice Christmas, Kingston, ON (Abstract Co-Author) Nothing to Disclose
Julia Niblett, Kingston, ON (Abstract Co-Author) Nothing to Disclose
Aamer Mahmud, MD, FRCR, Kingston, ON (Abstract Co-Author) Nothing to Disclose

**ABSTRACT**

Purpose/Objective(s): With an increasing number of cancer survivors and limited resources, a trend of follow-up outside cancer clinics is emerging. There is little consensus on how to operationalize plan delivery. Our aims were to pilot a sustainable colorectal cancer well follow-up care plan (WFU) with embedded quality assurance measures, to ascertain satisfaction of stakeholders and identify potential barriers.

Materials/Methods: Toolkits were developed for primary care providers (PCP) i.e. standardized discharge letters, guidelines on frequency of visits and investigations, CEA form and a receipt letter. Patients received a discharge letter; a brochure on follow-up; a list of symptoms, common issues and questions; and healthy living and useful community resources. Toolkits are also available on the hospital website. Satisfaction surveys were developed for patients, PCPs and specialists.

Results: Since July 2014, 48 stable patients meeting the criteria for transfer of care were discharged to PCPs for WFU when seen at the 3-month visit following treatment completion. Completion rate of patient survey was 25%, reporting an overall satisfaction. Feedback from PCPs has been positive with an interest in additional information and timely access to specialists. Some raised concerns over additional work load. Receipt letters were received in 35% of cases and reminders are being sent for the rest. Oncology specialists supported this initiative when surveyed. Barriers to discharge included not having a PCP, concern about communication between physicians, and a lack of patient education. We continue to collect data and will update the results. Conclusion: Key features of a sustainable WFU care plan includes user-friendly toolkits for patients, PCPs and engagement of specialists. We are evaluating feasibility and safety as well as satisfaction measures. This study may also help to identify ways of knowledge translation to meet the needs of patients and PCPs.

**SSE24-06 Use of Functional MRI Imaging to Identify Area to be Boosted in Anal Cancer Treatments**

Monday, Nov. 30 3:50PM - 4:00PM Location: S104A

Participants
Ivan Fazio, MD, Palermo, Italy (Presenter) Nothing to Disclose
Vittorio Macchiarella, MD, Palermo, Italy (Abstract Co-Author) Nothing to Disclose
Massimiliano Spada, MD, cefalu, Italy (Abstract Co-Author) Nothing to Disclose
Antonella Mazzonello, MD, Palermo, Italy (Abstract Co-Author) Nothing to Disclose

**ABSTRACT**

Purpose/Objective(s): Evaluating if functional MRI imaging in the treatment of anal cancer, can help in identifying hypercellularity in the site of the primary tumor or in case of nodal involvement, selecting patients in which dose has to be increased to obtain remission of disease.

Materials/Methods: From January to September 2013, 10 patients affected by anal cancer in different stage of disease, had a simulation using CT and MRI imaging. In the MRI imaging we performed the DWI B 800 study which can identify in squamous cell carcinomas areas of hypercellularity which can suggest the presence of tumor tissue. All patients underwent IMRT radiation for 45 Gy in 25 fractions plus chemotherapy and a boost of 14.4 Gy using VMAT only on DWI MRI positive areas.

Results: In the short follow-up (2-8 months), we observed a clinical and radiologic complete response in 8 patients and a partial response in 2 patients (with inguinal nodes involvement). The treatment was well tolerated with only grade II skin and rectal toxicity in all 10 patients. In the follow-up functional MRI imaging we observed a progressive decreasing of the extension of DWI positivity (fig.1) up to the disappearance of it. Conclusion: Clinical use of hyperconformal treatments as IMRT or VMAT need a precise identify of areas to be treated with high doses. Functional MRI DWI study can help in squamous cell carcinomas (less in other histologies) in recognizing areas of subclinical extension of disease. Functional MRI imaging seems to be effective in differentiate inflammatory areas which seems to be positive at FDG-PET imaging.
Participants
Paul J. Chang, MD, Chicago, IL, (pchang@radiology.bsd.uchicago.edu) (Presenter) Co-founder, Stentor/Koninklijke Philips NV; Researcher, Koninklijke Philips NV; Medical Advisory Board, lifeIMAGE Inc; Medical Advisory Board, Merge Healthcare Incorporated
Gregory L. Katzman, MD, Chicago, IL (Presenter) Nothing to Disclose
Neety Panu, MD, FRCPC, Thunder Bay, ON (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) The participant will be introduced to a series of radiology case studies via an interactive team game approach designed to encourage "active" consumption of educational content. 2) The participant will be able to use their mobile wireless device (tablet, phone, laptop) to electronically respond to various imaging case challenges; participants will be able to monitor their individual and team performance in real time. 3) The attendee will receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.
Participants
Vincent M. Mellnick, MD, Saint Louis, MO (Presenter) Nothing to Disclose
Matthew C. McDermott, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Ryan W. Buss, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Aarti Sekhar, MD, Brookline, MA (Abstract Co-Author) Nothing to Disclose
Tarek N. Hanna, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Gayatri Joshi, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Meghan G. Lubner, MD, Madison, WI (Abstract Co-Author) Grant, General Electric Company; Grant, NeuWave Medical, Inc; Grant, Koninklijke Philips NV
Perry J. Pickhardt, MD, Madison, WI (Abstract Co-Author) Co-founder, VirtuoCTC, LLC; Stockholder, Cellectar Biosciences, Inc; Research Consultant, Bracco Group; Research Consultant, KIT; Research Grant, Koninklijke Philips NV
Lauren Saling, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Simon Onderi, MD, Mineola, NY (Abstract Co-Author) Nothing to Disclose
Natalie Chen, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Rex A. Parker III, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
John J. Hines JR, MD, New Hyde Park, NY (Abstract Co-Author) Nothing to Disclose
Melanie Wegener, Garden City, NY (Abstract Co-Author) Nothing to Disclose
Douglas S. Katz, MD, Mineola, NY (Abstract Co-Author) Nothing to Disclose
Lori M. Gettle, MD, MBA, Hummelstown, PA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
1) Each GI case of the day will be taken from disorders of the luminal GI tract as well as the liver, spleen, pancreas, and biliary system. The findings may be uncommon manifestations of common diseases or common manifestations of uncommon diseases.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Meghan G. Lubner, MD - 2014 Honored Educator
Meghan G. Lubner, MD - 2015 Honored Educator
Perry J. Pickhardt, MD - 2014 Honored Educator
Douglas S. Katz, MD - 2013 Honored Educator
Douglas S. Katz, MD - 2015 Honored Educator
RSNA Diagnosis Live™: 'Tic Tac D’Oh' - Test Your Diagnostic Skills at the Crack of Dawn

Tuesday, Dec. 1 7:15AM - 8:15AM Location: E451B

Participants
Adam E. Flanders, MD, Penn Valley, PA (Presenter) Nothing to Disclose
Christopher G. Roth, MD, Philadelphia, PA (Presenter) Nothing to Disclose
Sandeep P. Deshmukh, MD, Philadelphia, PA, (sandeep.deshmukh@jefferson.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) The participant will be introduced to a series of radiology case studies via an interactive team game approach designed to encourage "active" consumption of educational content. 2) The participant will be able to use their mobile wireless device (tablet, phone, laptop) to electronically respond to various imaging case challenges; participants will be able to monitor their individual and team performance in real time. 3) The attendee will receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.
Participants
Douglas S. Katz, MD, Mineola, NY (Moderator) Nothing to Disclose
Michael N. Patlas, MD,FRCPC, Hamilton, ON, (patlas@hhsc.ca) (Moderator) Nothing to Disclose
Hani H. Abujudeh, MD, MBA, Boston, MA (Moderator) Nothing to Disclose

Sub-Events

RC308-01  CT and MR of Acute Appendicitis

Participants
Perry J. Pickhardt, MD, Madison, WI (Presenter) Co-founder, VirtuoCTC, LLC; Stockholder, Cellectar Biosciences, Inc; Research Consultant, Bracco Group; Research Consultant, KIT ; Research Grant, Koninklijke Philips NV

LEARNING OBJECTIVES
1) Assess the relative advantages and disadvantages for CT and MR imaging in the setting of suspected appendicitis. 2) Compare the diagnostic performance of CT and MR for both appendicitis and alternative conditions. 3) Describe the increasing use of MR for abdominal imaging in the ED setting.

ABSTRACT

Participants
Ilah Shin, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Yong Eun Chung, MD, PhD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Myeong-Jin Kim, MD, PhD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

PURPOSE
To evaluate the diagnostic value of T1 bright appendix sign for the diagnosis of acute appendicitis in pregnant women

METHOD AND MATERIALS
This retrospective study included 125 pregnant women with suspected appendicitis who underwent MRI, including axial T2WI with/without fat saturation, coronal and sagittal T2WI, and 3D T1WI. Total of 22 patients were surgically confirmed as acute appendicitis. T1 bright appendix sign was defined as T1 high signal intensity (SI) material filling more than half length of appendix while this T1 high SI did not result from appendicolith on 3D T1WI. MR images were reviewed by two experienced radiologists in consensus and visibilities of the appendices were evaluated. The maximal diameter of visible appendix with presence or absence of T1 bright appendix sign was evaluated from MR. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of T1 bright appendix sign were calculated

RESULTS
In patients with acute appendicitis (n=22), appendix was visualized in all patients and the mean diameter of the appendix was 9.4 ± 2.7 mm (range, 6.0-14.6 mm). In patients with a normal appendix (n=103), appendix was not visualized in 14 patients (13.6%). The mean diameter of the visualized normal appendix was 5.0 ± 0.7 mm (range, 3.1-6.8 mm). Among patient without appendicitis, T1 bright appendix sign was seen in 40 patients (45%), whereas it was noted in only 1 patient with acute appendicitis (4.5%). Fourteen patients had borderline sized appendix (appendix diameter between 6 - 7 mm) and 4 out of 14 patients were diagnosed as appendicitis. Among them, T1 bright appendix sign was seen in 4 patients without appendicitis. The sensitivity, specificity, PPV and NPV of T1 bright appendix sign for the diagnosis of normal appendix were 45%, 96%, 98%, and 30% for all patients and 60%, 100%, 100%, and 50% for patients with borderline sized appendix

CONCLUSION
T1 bright appendix sign was a specific finding for the diagnosis of normal appendix in pregnant women suspected of acute appendicitis

CLINICAL RELEVANCE/APPLICATION
If T1 bright appendix sign is seen in pregnant women with suspected appendicitis, the probability of acute appendicitis might be low
**RC308-03  Optimization of MR Protocols in Pregnant Women with Suspected Acute Appendicitis**

Participants
Ilah Shin, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Yong Eun Chung, MD, PhD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Myeong-Jin Kim, MD, PhD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
To investigate the optimal MR protocols in pregnant women who were suspected of acute appendicitis

**METHOD AND MATERIALS**
This retrospective study included 125 pregnant women (mean IUP, 21.6; range, 16-30 weeks) with suspected appendicitis. MR images were reviewed by two experienced radiologists in consensus in 3 separate sessions. On session 1, axial single shot(SSH) T2WI, respiratory gated fat saturated T2WI, 3D T1 weighted images (set 1) were reviewed. In session 2 and 3, set 1 + coronal T2WI (set 2) and set 2 + sagittal T2WI were reviewed respectively. The visibility of appendix (1: not identified - 5: entirely visualized) and probability of appendicitis (1: not appendicitis - 5: definite appendicitis) were evaluated in each session. If diseases other than appendicitis were suspected, reviewers were asked to provide specific diagnosis with a 5-point scale confidence level. Visualization score and diagnostic performance were compared by ANOVA and chi-square test. Area under the curve (Az) value was compared with DeLong methods.

**RESULTS**
Visualization scores of appendix was slightly increased in both set 2 (4.5±1.3) and set 3 (4.5±1.3) compared to set 1 (4.2±1.3) without statistical significance (ANOVA, P=0.214). There was no significant differences in confidence level among three groups, in both patients with appendicitis (4.9 in all sets, P=0.999) and without appendicitis (1.2 in all sets, P=0.914). Eighteen patients had been diagnosed to other diseases including ureter stone (1), obstruction (3), torsion (7), acute pyelonephritis (2), hemoperitoneum (2), colon cancer (2), and terminal ileitis (1). Sensitivity and accuracy were increased in set 2 (77.8%, 96.8%) and set 3 (83.3%, 97.6%) compared to set 1 (66.7%, 95.2%) for the diagnosis of other disease. Az value was significantly higher in set 3 (Az, 0.917) compared to both set 2 (Az, 0.889) and set 1 (Az, 0.833, P < 0.05)

**CONCLUSION**
Axial T2WI with/without fat saturation and 3D T1WI were sufficient for the diagnosis of acute appendicitis. However, additional coronal and sagittal SSH T2WI were required for the accurate diagnosis of disease other than appendicitis in pregnant women

**CLINICAL RELEVANCE/APPLICATION**
Although axial T2WI and 3D T1WI is sufficient for the diagnosis of appendicitis, coronal and sagittal T2WI might be needed for the accurate diagnosis of diseases other than acute appendicitis in pregnant women who are suspected of acute appendicitis.

**RC308-04  "Saving Time without Sabotaging Diagnosis"- The FAST MR Protocol for Evaluating Acute Appendicitis in the Emergency Setting**

Participants
Memonna Mian, MD, FRCR, Vancouver, BC (Abstract Co-Author) Nothing to Disclose
Issmail T. Ali, MBChB, MD, Vancouver, BC (Presenter) Nothing to Disclose
Teresa I. Liang, MD, Vancouver, BC (Abstract Co-Author) Nothing to Disclose
Patrick D. McClaughlin, FFRRCSI, Cork, Ireland (Abstract Co-Author) Speaker, Siemens AG
Savvas Nicolaou, MD, Vancouver, BC (Abstract Co-Author) Institutional research agreement, Siemens AG
Thiona M. Walshe, FFR(RCSI), Vancouver, BC (Abstract Co-Author) Nothing to Disclose
Silvia D. Chang, MD, Vancouver, BC (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
Acute appendicitis is a major concern especially in young females presenting to ER with right iliac fossa pain. Prompt diagnosis/exclusion has major implications in the urgent care setting. Due to concerns for radiation exposure with CT scan, MR is gaining popularity as the imaging of choice given the low yield of ultrasound in such cases. In this study, we assess the diagnostic performance of FAST MR protocol comprising T2 HASTE and DW imaging for investigating such patients in the Emergency department.

**METHOD AND MATERIALS**
50 patients (49 Females; mean age 25.4 +/-5.2 yrs) with MR imaging between July 2017 and March 2015 for possible acute appendicitis were reviewed. MR abdomen/pelvis performed on 1.5 T MR per departmental protocol included axial T1 gradient echo in-out of phase, transverse FSE T2 with fat sat/motion correction, axial/coronal T2 HASTE and axial DWI images. In a randomized blinded fashion, two independent radiologists with > 5 years' experience in acute imaging reviewed both protocols for presence/absence of acute appendicitis with interpretation confidence on a five point scale(5 : highly confident to 1: nondiagnostic).Mean acquisition and interpretation times for both protocols were calculated. Sensitivity, specificity and accuracy for the FAST protocol was calculated, using clinical disposition of the patient as gold standard.

**RESULTS**
Mean scan time for FAST and FULL protocol was calculated to be 21.1 min and 40.5 min respectively. Mean interpretation time for FAST protocol for reader one and two was 4.1+/-.1.5 min and 4.5 +/-.1.4 min and for FULL protocol was 8.1+/-.1.8 min and 7.1+/-.1.4 min respectively. The appendix was not confidently identified in 3 scans which were considered negative for the purpose of this study given the absence of indirect signs of inflammation like fat standing, free fluid. Sensitivity, specificity and accuracy for the FAST protocol were calculated to be 100% each for reader one and 75%, 100% and 94% respectively for reader two.
CONCLUSION
The FAST MR protocol with high diagnostic accuracy in detecting/excluding appendicitis and significant reduction in scan/interpretation time can be a valuable tool for assessing patients with possible acute appendicitis in the ER setting.

CLINICAL RELEVANCE/APPLICATION
FAST MR protocol significantly reduces scan/read times without sabotaging diagnostic accuracy for evaluating acute appendicitis, thus is an efficient and cost-effective technique in the ER setting.

RC308-05 CT Angiography for Gastrointestinal Hemorrhage
Tuesday, Dec. 1 9:25AM - 9:50AM Location: N228

Participants
Jorge A. Soto, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) To review an appropriate algorithm for the evaluation of patients presenting with overt lower intestinal bleeding, with emphasis on CT angiography. 2) To describe the proper CT angiographic technique for overt gastrointestinal bleeding. 3) Illustrate with multiple examples the CT angiographic findings of active gastrointestinal bleeding, as well as potential pitfalls in interpretation.

ABSTRACT
Overt gastrointestinal bleeding is a common and serious condition that may threaten a patient's life depending on the severity and duration of the event. Precise identification of the location, source and cause of bleeding are the primary objectives of the diagnostic evaluation. The diagnostic algorithm implemented in these acutely ill patients include various imaging modality options, as well as upper endoscopy and colonoscopy. For patients presenting with hematochezia, implementation of colonoscopy in the emergency setting poses multiple challenges, especially the inability to adequately cleanse the colon and poor visualization owing to the presence of intraluminal blood clots. Scintigraphy with technetium 99m-labeled red blood cells is highly sensitive but also has some limitations, such as imprecise localization of the source of bleeding. CT angiography offers logistical and diagnostic advantages in the detection of active hemorrhage. A three-phase examination (non-contrast, arterial and portal venous) is typically performed. Potential technical and interpretation pitfalls should be considered and will be explained. The information derived from CT angiography helps direct therapy and select the most appropriate hemostatic intervention (when necessary): endoscopic, angiographic, or surgical. Precise anatomic localization of the bleeding point also allows a targeted endovascular embolization. The high diagnostic performance of CT angiography makes this test a good alternative for the initial emergent evaluation of patients with acute lower intestinal bleeding.

Honored Educators
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Jorge A. Soto, MD - 2013 Honored Educator
Jorge A. Soto, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2015 Honored Educator

RC308-06 The Association of the Hypovolemic Shock Complex and Patient Mortality in Patients with Acute Internal Hemorrhage of the Abdomen and Pelvis
Tuesday, Dec. 1 9:50AM - 10:00AM Location: N228

Awards
RSNA Country Presents Travel Award

Participants
Benjamin Fritz, MD, Freiburg, Germany (Presenter) Nothing to Disclose
Jan Fritz, MD, Baltimore, MD (Abstract Co-Author) Research Grant, Siemens AG; Research Consultant, Siemens AG; Speaker, Siemens AG
Philippe A. Dovi-Akue, MD, Freiburg, Germany (Abstract Co-Author) Nothing to Disclose
Maximilian Russe, MD, Freiburg, Germany (Abstract Co-Author) Nothing to Disclose
Mathias F. Langer, MD, PhD, Freiburg, Germany (Abstract Co-Author) Nothing to Disclose
Elmar C. Kotter, MD, MSc, Freiburg, Germany (Abstract Co-Author) Editorial Advisory Board, Thieme Medical Publishers, Inc

PURPOSE
The hypovolemic shock complex (HSC) constitutes computed tomography (CT) signs that are believed to be related to hypovolemic shock; however, its association with patient prognosis is unclear. We, therefore, sought to determine the frequency of HSC signs in patients with acute internal hemorrhage of the abdomen and pelvis and their association with patient mortality.

METHOD AND MATERIALS
A retrospective search of our hospital database between 2012 and 2014 derived 197 patients with clear contrast-enhanced MDCT demonstration of acute internal hemorrhage of the abdomen and pelvis. Experienced observers evaluated the CT studies for 10 different radiological signs of HSC. The frequencies of HSC signs were correlated with death during hospitalization.

RESULTS
44/197 (22.3%) of the patients died. The mortality group showed an average of 3.0 HSC signs, whereas the survival group showed 1.1 (p<0.001). Mortality and survival groups showed differences of the frequency of hyperenhancing adrenal glands (70.5% (31/44) vs. 19.0% (29/153), p<0.001), halo sign (54.5% (24/44) vs. 32% (48/153), p=0.01), splenic hypoperfusion (37.2% (16/43) vs. 4% (6/151), p=0.001), altered renal enhancement (15.9% (7/44) vs. 3.3% (5/153), p=0.033), shock bowel (22.7% (10/44) vs. 3.3% (5/150), p=0.005), liver hypoperfusion (15.9% (7/44) vs. 3.3% (5/153), p=0.004), and hyperenhancement/edema of the gallbladder.
HSC signs are common in patients with acute internal hemorrhage. Patient mortality significantly increases if 2 or more signs are present. While several signs are associated with increased mortality, inferior vena cava, aorta and pancreas signs have the weakest association.

CONCLUSION

HSC signs are common in patients with acute internal hemorrhage. Patient mortality significantly increases if 2 or more signs are present. While several signs are associated with increased mortality, inferior vena cava, aorta and pancreas signs have the weakest association.

CLINICAL RELEVANCE/APPLICATION

Timely MDCT diagnosis and reporting of the HSC can contribute to appropriate management of the acute patient care and prognosis.

PURPOSE

To compare the diagnostic performance of abdominal CT performed with and without oral contrast, in patients presenting to the ED with acute nontraumatic abdominal pain.

METHOD AND MATERIALS

Our prospective study was conducted on a sample of adult patients presenting with nontraumatic abdominal pain to the ED of a large tertiary medical center. 250 patients with acute abdominal pain that underwent IV contrast-enhanced abdominal CT were enrolled over a 9-month period. 125 patients were recruited for the study group using convenience sampling, and underwent CT without oral contrast. A control group of 125 patients was recruited, matching the cohort groups' gender and age and underwent abdominal CT during the same week - with oral contrast material. Exclusion criteria were: pregnancy, history of IBD, recent abdominal operation, suspected renal colic, AAA rupture or intestinal obstruction. The exams were first reviewed by the senior attending radiologist to determine if an additional scan with oral contrast was required. Two senior radiologists then performed consensus reading to determine the significance of the lack of oral contrast administration. The reviewers also determined specific technical and imaging findings, including the presence of oral contrast in the pathological area and the influence of the technique on some radiological findings.

RESULTS

Each group consisted of 67 males and 58 females. The average age of the two groups was 46.9 years. The main diagnoses were appendicitis (20%), diverticulitis (8.4%), colitis (6.4%) and a normal CT exam (40.4%). There was no significant difference between the groups regarding the history of the patients and the technique of the studies. Among the 125 patients of the study group, no patient had to undergo additional scan in order to establish the correct diagnosis. In only 1 patient from each group (0.8%), contrast material was considered to be necessary. In 8 patients from the study group (6.4%) and 5 patients from the control group (4%) oral contrast was considered helpful.

CONCLUSION

Our study indicates that examination of patients with acute nontraumatic abdominal pain with CT scans without oral contrast material - are diagnostic and have comparable performance to scans performed after oral contrast administration.

CLINICAL RELEVANCE/APPLICATION

Our study indicates that patients presenting to the ED with acute nontraumatic abdominal pain, may be examined with CT without
 Assessing the Prevalence and Clinical Relevance of Positive Abdominal and Pelvic CT Findings in Senior Patients Presenting to the Emergency Department.

Tuesday, Dec. 1 10:50AM - 11:00AM Location: N228

Participants
Abdullah Alabousi, MD, Hamilton, ON (Abstract Co-Author) Nothing to Disclose
Michael N. Patlas, MD,FRCPC, Hamilton, ON (Abstract Co-Author) Nothing to Disclose
Malek Meshki, MD, Hamilton, ON (Presenter) Nothing to Disclose
Sandra Monteiro, PhD, Hamilton, ON (Abstract Co-Author) Nothing to Disclose
Douglas S. Katz, MD, Mineola, NY (Abstract Co-Author) Nothing to Disclose

PURPOSE
To retrospectively evaluate the prevalence and clinical relevance of positive abdominal and pelvic CT(A/P CT) findings for patients ages 65 and older, when compared with all other Emergency Department (ED) patients undergoing A/P CT during the same time period.

METHOD AND MATERIALS
An IRB-approved retrospective review of all adult patients who underwent an emergency 64-MDCT of the abdomen and pelvis for acute non-traumatic abdominal complaints over a two-year period at a single institution was performed. The prevalence and clinical relevance of positive CT findings was assessed for patients <65 and >65. Statistical comparisons were made with Student t-tests.

RESULTS
2102 patients between 10/1/2011 and 9/30/2013 were reviewed. 1009 patients were excluded as their CT was performed to assess for trauma, for post-operative changes, or because the patients had a known diagnosis or the CT examination was performed for cancer staging. 631 patients were included in the <65 group (298 men and 333 women; mean age 46, age range 18-64), and 462 were included in the >65 group (209 men and 253 women; mean age 78, age range 65-99). Overall, there were more positive CT findings explaining the abdominal/pelvic pain for patients <65 (388 positive cases, 61.5%), compared with the >65 group (258 positive cases, 55.8%), which was a statistically significant difference (p<0.03). However, patients >65 were more likely to have clinically/surgically relevant findings. 50% of patients >65 presenting with appendicitis had complications evident on the initial CT, compared with 27% of those <65 (p<0.05). In addition, bowel obstruction (41 vs 27 patients, p<0.05), ruptured abdominal aortic aneurysm (7 vs 2 patients, p<0.05) and malignancy (19 vs 12 patients, p<0.05) were all more common in individuals presenting to the ED >65 years of age.

CONCLUSION
The findings of our retrospective study refute the hypothesis that there is increased prevalence of positive abdominal and pelvic CT findings in patients >65. However, older patients in our series were more likely to present with clinically/surgically relevant findings, and a lower threshold for ordering imaging examinations in this patient population should be considered.

CLINICAL RELEVANCE/APPLICATION
64-MDCT shows more clinically/surgically relevant findings in individuals older than 65 than in younger patients presenting to the Emergency Department with acute non-traumatic abdominal complaints.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Douglas S. Katz, MD - 2013 Honored Educator
Douglas S. Katz, MD - 2015 Honored Educator

MR of the Acute Abdomen
Tuesday, Dec. 1 11:00AM - 11:25AM Location: N228

Participants
Stephan W. Anderson, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) To overview the current utilization of MR of the acute abdomen, with an emphasis on protocol optimization, and correct interpretation, using case examples. 2) To examine potential pitfalls in the interpretation of MR of the acute abdomen. 3) To review the current literature of MR of the acute abdomen.

The "Onyx Rim" Sign in Pelvic MRI: Perifollicular Hemorrhage as a Potential Predictor of Viability in the Setting of Ovarian Torsion
Tuesday, Dec. 1 11:25AM - 11:35AM Location: N228

Participants
Iva Petkovska, MD, Tucson, AZ (Presenter) Nothing to Disclose
Zeenia Irani, MD, MS, Tucson, AZ (Abstract Co-Author) Nothing to Disclose
Bobby T. Kalb, MD, Tucson, AZ (Abstract Co-Author) Nothing to Disclose
Christopher Geffre, MD, Tucson, AZ (Abstract Co-Author) Nothing to Disclose
Janiel Cragun, MD, Tucson, AZ (Abstract Co-Author) Nothing to Disclose
James R. Costello, MD, PhD, Tucson, AZ (Abstract Co-Author) Nothing to Disclose
Hina Arif Tiwari, MD, Tucson, AZ (Abstract Co-Author) Nothing to Disclose
PURPOSE
To correlate noncontrast MRI features of perifollicular hemorrhage with ovarian viability in the clinical setting of torsion.

METHOD AND MATERIALS
This is an IRB-approved retrospective review of 8 patients with ovarian torsion on MRI confirmed with intraoperative exam. Preoperative MR exams were performed on either a 1.5T/3.0T system (Siemens Magnetom Aera/Skyra) using 18-channel anterior abdominal and pelvic surface coils. Images were acquired without breath holding using multiplanar T2-weighted Half-Fourier Single-shot T Echo-train (HASTE) sequences, repeated with fat-suppression using SPECTral Adiabatic Inversion Recovery (SPAIR). All MRIs were retrospectively reviewed in a blinded fashion separately by two radiologists for the presence or absence of a T2-hypointense perifollicular rim. This finding, when present, was utilized as a predictor of nonviability of the torsed ovary. Each torsed ovary was categorized as either a) viable or b) nonviable based on presence/absence of a perifollicular T2-hypointense rim. Clinical outcomes were determined by either a) histopathologic correlation, or b) imaging follow-up and review of the patient’s medical records.

RESULTS
Of 8 patients with ovarian torsion on MRI, 5 were categorized as non-viable on MRI due to the presence of a perifollicular T2 hypointense rim, and 3 as viable due to a lack of perifollicular T2-hypointense rim. Using the reference standards of pathology (n=5) and medical chart review and imaging follow-up (n=3), MRI demonstrated a sensitivity of 100 %, and specificity of 100 % for predicting viability of a torsed ovary based on presence of a perifollicular T2-hypointense rim. Histopathological correlation demonstrated perifollicular hemorrhage separating the theca interna and externa in every patient with non-viable ovaries, corresponding to the perifollicular T2-hypointensity identified on preoperative MRI.

CONCLUSION
Preoperative noncontrast MRI may hold promise for the prediction of ovarian viability in clinical setting of torsion.

CLINICAL RELEVANCE/APPLICATION
Preoperative MRI for the diagnosis of ovarian torsion may provide a biomarker for prediction of ovarian viability, with potential impact on preoperative planning and management.

RC308-13 Diagnostic Performance of Individual and Combined MR Signs of Acute Cholecystitis

Participants
Avneesh Gupta, MD, Boston, MA (Presenter) Nothing to Disclose
Christina A. LeBedis, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Stephan W. Anderson, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Jorge A. Soto, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

PURPOSE
To determine the performance of individual and combined MR signs of acute cholecystitis, and to propose a rapid non-contrast MR protocol for emergency diagnosis of right upper quadrant pain.

METHOD AND MATERIALS
The institutional review board approved this HIPAA-compliant retrospective study. Informed consent was waived. 288 patients presenting to the emergency department with acute right upper quadrant pain between 10/3/2010 and 11/28/2012 undergoing MR within 48 hours of US were included. MR was performed in all included patients due to equivocal US and persistent symptoms. Individual MR signs were graded in a blinded fashion using single shot T2, diffusion (b=0, b=600) and 3D GRE post contrast sequences. Sensitivity and specificity values for individual and combined imaging signs were calculated using surgical diagnosis as the reference standard for acute cholecystitis.

RESULTS
Of 288 patients, 128 were treated conservatively and excluded from analysis. 160 underwent cholecystectomy and 77 were diagnosed with acute cholecystitis at surgery. S敏itivity of the MR findings of gallstones, distention, wall thickening, pericholecystic fluid, gallbladder fossa restricted diffusion, wall restricted diffusion, gallbladder fossa hyper enhancement and wall hyper enhancement for the detection of acute cholecystitis were 96%, 59.7%, 72.7%, 49.4%, 47.3%, 26.7%, 55% and 11%, respectively. Corresponding specificities were 24.6%, 71%, 55.9%, 78.2%, 74.8%, 88.3%, 82.2% and 98.4%. Combining stones, distention, pericholecystic fluid and gallbladder fossa restricted diffusion yielded sensitivity of 35% and specificity of 92.7%, and these findings were identifiable using single shot T2 and diffusion sequences only. The combination of stones, distention and gallbladder fossa hyper enhancement was 43.8% sensitive and 89.6% specific for acute cholecystitis.

CONCLUSION
Individual and combined MR features show high specificity for acute cholecystitis. Most signs can be detected by diffusion and single shot T2 weighted sequences only. Gallbladder fossa restricted diffusion is a novel imaging sign, and when combined with the presence of gallstones, pericholecystic fluid and distention yields a specificity of 92.7% for acute cholecystitis.

CLINICAL RELEVANCE/APPLICATION
A highly specific, rapid non-contrast MR protocol consisting of diffusion and single shot T2 weighted sequences can be effective for the diagnosis of acute cholecystitis when US findings are equivocal.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at:
Jorge A. Soto, MD - 2013 Honored Educator
Jorge A. Soto, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2015 Honored Educator

**RC308-14  Question and Answer**

Tuesday, Dec. 1 11:45AM - 12:00PM Location: N228

Participants
Pitfalls in Abdominal Imaging
Tuesday, Dec. 1 8:30AM - 10:00AM Location: E353C

Participants

Sub-Events

RC309A  Pitfalls in Bowel Imaging

Participants
David H. Kim, MD, Madison, WI (Presenter) Consultant, Viatronix, Inc; Co-founder, VirtuoCTC, LLC; Medical Advisory Board, Digital ArtForms, Inc; Stockholder, Cellectar Biosciences, Inc

LEARNING OBJECTIVES
1) List the advantages/disadvantages of positive and negative oral contrast
2) Recognize common pitfalls that mimic disease
3) Devise practical approaches to manage common bowel imaging scenarios

RC309B  Atypical Liver Lesions

Participants
Rendon C. Nelson, MD, Durham, NC, (rendon.nelson@duke.edu) (Presenter) Consultant, General Electric Company Consultant, Nemoto Kyorindo Co, Ltd Consultant, VoxelMetrix, LLC Research support, Bracco Group Research support, Becton, Dickinson and Company Speakers Bureau, Siemens AG Royalties, Wolters Kluwer nv

LEARNING OBJECTIVES
1) To understand the typical imaging appearance of various focal liver lesions on CT and MR and how they can present in an atypical fashion (i.e. the imaging spectrum).

ABSTRACT
Active Handout: Rendon C. Nelson

RC309C  Pitfalls in Hepatic Doppler Sonography

Participants
Jonathan B. Kruskal, MD, PhD, Boston, MA, (jkruskal@bidmc.harvard.edu) (Presenter) Author, UpToDate, Inc

LEARNING OBJECTIVES
1) Discuss the common technical pitfalls that occur when performing the liver Doppler examination, and how these can be mitigated.
2) Discuss the perceptual and interpretive errors that occur when performing the liver Doppler examination, and how these can be minimized.
3) Describe the clinical impact of technical and interpretive errors.

ABSTRACT

Honored Educators

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https://www.rsna.org/Honored-Educator-Award/

Jonathan B. Kruskal, MD, PhD - 2012 Honored Educator

RC309D  Pearls and Pitfalls in Pancreatic Diseases

Participants
Khaled M. Elsayes, MD, Ann Arbor, MI (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Describe most commonly encountered imaging pitfalls of the pancreas.
2) Describe relevant technical background, pathophysiology and hemodynamics of these pitfalls.
3) Discuss tips to avoid erroneous diagnosis and pearls to reach correct diagnosis.

ABSTRACT
There is a wide range of common pitfalls in pancreas imaging, which can lead to frequent incorrect diagnoses mainly because many radiologists are not completely familiar with anatomical, morphological, physiological, hemodynamic and biological principles as well as deficiency of modern clinical and radiological knowledge. This leads to common misinterpretations which would further results in
wrong management with potentially negative outcome. In this course, we will review important typical features of common pancreatic pathologies and mimics of these pathologies that may require different treatment and improved prognosis.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Khaled M. Elsayes, MD - 2014 Honored Educator
Essentials of GI Imaging

Tuesday, Dec. 1 10:30AM - 12:00PM Location: S100AB

Participants

Sub-Events

MSES32A  Imaging Esophageal Cancer

Participants

Peter L. Davis, MD, Pittsburgh, PA, (davispl@upmc.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss how esophageal cancer treatment and prognosis is initially determined by stage of the cancer. 2) Understand the present TMN staging system for esophageal cancer. 3) Know how imaging techniques such as endoscopic ultrasound, computed tomography and PET/CT are used to determine the stage and, therefore, the treatment of esophageal cancer.

ABSTRACT

The treatment of esophageal cancer is initially determined by its pretreatment stage. The American Joint Committee on Cancer and the Union for International Cancer Control have recently revised the TNM (primary Tumor, lymph Node involvement, distant Metastasis) staging of esophageal cancer to reflect evidence-based findings supporting different treatments at different stages. The primary tumor stage is dependent on the depth of invasion of the esophageal wall. The T stage will determine if the tumor is resectable. The depth of tumor invasion is best determined by endoscopic ultrasound. CT may help tumor staging by identifying invasion of adjacent structures. Since there is an extensive submucosal lymphatic network that enables early lymph node spread, local-regional lymph node involvement is an important prognostic factor. Although esophageal cancers with lymph node involvement may be treated with just surgical resection, clinical trials have shown increased survival with the addition of neoadjuvant chemoradiotherapy or chemotherapy. Lymph node involvement is also best detected by endoscopic ultrasound, but may be supplemented by PET/CT and CT. Metastatic esophageal cancer has a very poor survival rate that is not significantly improved with surgical resections. Therefore, only chemotherapy is commonly used to treat patients with metastatic disease. PET/CT appears to be best for detecting and precisely locating metastatic disease, but may be supplemented by high quality CT. This lecture will review the recent staging changes. The appropriate use and imaging findings of endoscopic ultrasound, computed tomography, and PET/CT to determine the proper stage will be shown.

MSES32B  Imaging of Colorectal Cancer

Participants

Seong Ho Park, MD, Seoul, Korea, Republic Of, (parksh.radiology@gmail.com) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Define the role of radiological imaging in the management of colorectal cancer patients. 2) Apply state-of-the-art imaging techniques to evaluate colorectal cancer patients. 3) Explain the typical and atypical imaging findings of colorectal cancer lesions and differentiate them from treatment-related findings.

ABSTRACT

Not applicable

Handout: Seong Ho Park


MSES32C  Liver Lesions in Cancer Patients

Participants

Jeong Min Lee, MD, Seoul, Korea, Republic Of (Presenter) Grant, Guerbet SA; Support, Siemens AG; Support, Koninklijke Philips NV; Grant, Bayer AG; Consultant, Bayer AG; Grant, General Electric Company; Support General Electric Company; Grant, STARmed Co, Ltd; Grant, RF Medical Co, Ltd; Grant, Toshiba Corporation; Grant, Dong-Seo Medical Industrial Co, Ltd

LEARNING OBJECTIVES

1) Describe common incidental lesions in the liver at various stages of a cancer patient's journey. 2) To recognize the role of MRI in comparison with CT in characterization of incidental liver lesion in cancer patients, and explain how technical advances in MR can help address challenges in characterization of those incidental lesions. 3) To illustrate the diagnostic assessment of morphologic features of incidental liver lesions in cancer patients and review
SSG04

Gastrointestinal (Liver Masses)
Tuesday, Dec. 1 10:30AM - 12:00PM Location: E350

GI CT MR OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants
Ernst J. Rummeny, MD, Munich, Germany (Moderator) Nothing to Disclose
Sudhakar K. Venkatesh, MD, FRER, Rochester, MN (Moderator) Nothing to Disclose

Sub-Events

SSG04-01 Predictive Value of MRI Combined with MR Cholangiography in the Preoperative Assessment of Perihilar Cholangiocarcinoma
Tuesday, Dec. 1 10:30AM - 10:40AM Location: E350

Participants
Claudio Sallemi, MD, Milan, Italy (Presenter) Nothing to Disclose
Francesca Ratti, Milan, Italy (Abstract Co-Author) Nothing to Disclose
Paolo Marra, Milan, Italy (Abstract Co-Author) Nothing to Disclose
Luca Aldrighetti, MD, Milano, Italy (Abstract Co-Author) Nothing to Disclose
Alessandro Del Maschio, MD, Milano, Italy (Abstract Co-Author) Nothing to Disclose
Francesco A. de Cobelli, Milano, Italy (Abstract Co-Author) Nothing to Disclose

PURPOSE
To evaluate the predictive value of contrast enhanced MR images with MR cholangiography (MRC) in the preoperative evaluation of perihilar cholangiocarcinoma.

METHOD AND MATERIALS
Twenty-five patients that underwent MRI/MRC and surgical treatment were included. Two radiologists evaluated the biliary MR images, including 3D-MRC and gadolinium-enhanced dynamic images, regarding the tumor resectability (including longitudinal tumor extent, vascular involvement of the bile duct cancer, and lymph node metastasis) and the surgical radicality, intended as tumor-free\tumor-involved margins (R0\R1) of biliary ducts and portal vein. The results of preoperative and retrospective (blinded) assessment of diagnostic data were compared with the surgical and pathology findings used as the reference standards.

RESULTS
The prospective assessment of the resection to be performed was correct in 80% of cases. For determining the assessment of tumor margins (R0\R1) of biliary ducts and portal vein, the overall accuracy was, respectively, 84% and 88% for each reviewer. The area under the receiver operating characteristic curve (Az) of the 2 reviewers for evaluation of tumor margins (R0\R1) was 0.83 and 0.78 for biliary ducts, and 0.68 and 0.97 for portal vein. In the assessment of lymph node metastasis, the overall accuracy was 0.75 for each reviewer.

CONCLUSION
MR imaging combined with MRC showed excellent diagnostic capability for assessing the tumor resectability of bile duct cancer, although it generally underestimated the tumor involvement of lymph nodes, and predicted with good diagnostic accuracy surgical radicality.

CLINICAL RELEVANCE/APPLICATION
MRI combined with MRC can predict in advance R0\R1 resection in perihilar cholangiocarcinoma. In case of R1, it can lead to a focused neo adjuvant therapy or change of the treatment strategy.

SSG04-02 Correlation between Standardized Uptake Value and Apparent Diffusion Coefficient in Focal FDG-PET Positive Hepatic Metastasis
Tuesday, Dec. 1 10:40AM - 10:50AM Location: E350

Participants
Vaseemali J. Mulla, MBBS, DMRD, Gokak, India (Presenter) Nothing to Disclose
Vishal Agrawal, Bangalore, India (Abstract Co-Author) Nothing to Disclose
Kapil K. Shirodkar, DMRD, MBBS, Mapusa, India (Abstract Co-Author) Nothing to Disclose
Govindrajan J. Mallarajaputra, MBBS, MD, Bangalore, India (Abstract Co-Author) Nothing to Disclose
Anura R. Patil, MD, FRCR, Bangalore, India (Abstract Co-Author) Nothing to Disclose

PURPOSE
1)To evaluate a potential correlation of the maximum standard uptake value (SUVmax) and the minimum apparent diffusion coefficient (ADCmin) in FDG-PET positive hepatic metastasis
2) To study the role of Diffusion Weighted MR Imaging in patients with FDG-PET positive hepatic metastasis

METHOD AND MATERIALS
Twenty patients with a known and histopathologically proven extrahepatic primary lesion, who were referred for FDG PET and found...
to have FDG avid hepatic lesion were enrolled. Regions of interest were drawn on the PET images and SUV mean was calculated. Patients with a SUVmean more than 4 were further imaged with MRI within 30-60 min of acquisition of PET images. Diffusion-weighted imaging was performed with free breathing and with b values of 0, 500, and 800. ADC map was generated using the above raw diffusion data. Regions of interest were manually drawn along the contours of neoplastic lesions, which were identified on PET and diffusion-weighted images. Maximum SUV (SUVmax) and mean SUV (SUVmean) were recorded from PET-CT fusion images using fusion viewer (Philips medical systems). Minimum ADC (ADCmin), and mean (ADCmean) were recorded on MRI for each FDG-avid lesion. Pearson correlation coefficient was used to assess the following relations: SUVmax versus ADCmin and SUVmean versus ADCmean. A total of 33 lesions were studied.

RESULTS
Thirty three lesions were evaluated in a total of 20 patients. The mean SUVmax was 13.5 with standard deviation of 5.1; SUVmean, 8.3 with standard deviation of 3.1; mean ADCmin, 491 with standard deviation of 235; and mean ADCmean, 809 with standard deviation of 263. Pearson correlation coefficient of 0.026 was found between SUVmean and ADCmean. Pearson correlation coefficient of 0.002 was found between SUVmax and ADCmin.

CONCLUSION
There was no correlation between SUVmax and ADCmin or SUVmean and ADCmean. Focal hepatic lesions visualized on PET/CT were visualized clearly with a high contrast in the background of reduced signal from normal liver on b 0,500 and 800 maps of DWI.

CLINICAL RELEVANCE/APPLICATION
Liver metastases are the most frequently encountered malignant liver lesions. DWI is a non-contrast technique that is easy to perform, fast, has the potential to provide tissue characterization, and gives qualitative and quantitative information that can be helpful for tumor assessment. DWI gives visually comparable imaging which can be approximated to PET CT.

SSG04-03 Improving Detection of Vascular Structure and Intratumoral Hemorrhage in Primary Hepatic Carcinoma with a Multi-breath-hold Susceptibility-weighted Imaging Technique

Tuesday, Dec. 1 10:50AM - 11:00AM Location: E350

Participants
Ling Zhang, MD, Nanning, China (Presenter) Nothing to Disclose
Zhongkui Huang, Nanning, China (Abstract Co-Author) Nothing to Disclose
Yongming Dai, Shanghai, China (Abstract Co-Author) Nothing to Disclose
Wenmei Li, Nanning, China (Abstract Co-Author) Nothing to Disclose

PURPOSE
The purpose is to evaluate the role of abdominal susceptibility-weighted imaging (SWI) in the detection of vascular structure and intratumoral hemorrhage of primary hepatic carcinoma.

METHOD AND MATERIALS
Nineteen patients with pathologically identified primary hepatic carcinoma were imaged at 3T (MAGNETOM Verio, A Tim System, Siemens, Germany) using a standard body matrix-coil. Imaging included precontrast transverse T1-weighted GRE (flip angle 70°, TR/TE 140/2.46 msec), transverse T2-weighted fat-suppressed 2D turbo-spin-echo (TSE, flip angle 122°, TR/TE 3700/84 msec, ETL 9) and transverse abdominal 2D SWI (flip 20°, TR/TE 150/2.5 msec). For all sequences, the following parameters were used: field of view (FOV) 380×285 mm2; matrix 320-384×250, slice thickness 5 mm with a gap of 1 mm. Two to three 15-20 second breath-hold acquisitions were acquired to cover the liver. Two radiologists prospectively analyzed all magnetic resonance imaging (MRI) studies. Vascular structure and hemorrhage detected by each imaging technique were evaluated for comparison.

RESULTS
Nineteen lesions were found in nineteen patients. 2D SWI showed the evidence of hemorrhage in 12 of all 19 cases. SWI displayed vasculature of tumors in 11 cases. Only 5 cases found vasculature in conventional sequences. On 2D SWI, the hemorrhage or vasculature in the lesions manifested dot-like, streak, circular areas with hypointensity signal. In the evaluation of blood products, SWI is superior to the conventional T1WI and T2WI for visualizing the intra vascular structure and hemorrhage (X2= 4.17, P < 0.05). There was close correlation between pathological results and SWI in depicting internal architecture of lesions.

CONCLUSION
SWI surpassed conventional MRI sequences in discovering vascular structure in tumor and intratumoral hemorrhage. SWI offers a new way to show the internal structures of primary hepatic carcinoma. It is more useful than conventional MRI in showing blood products and details of tumor related veins.

CLINICAL RELEVANCE/APPLICATION
SWI offers a new way to show the internal structures of primary hepatic carcinoma. It is more useful than conventional MRI in showing blood products and details of tumor related veins.

SSG04-04 Subtraction Images of Gadoxetic Acid-enhanced MR: The Impact on Image Interpretation of Focal Hepatic Lesions in Patients at Risk for HCC

Tuesday, Dec. 1 11:00AM - 11:10AM Location: E350

Participants
Sang Hyun Choi, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
So Yeon Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Seung Soo Lee, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Seong Ho Park, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jae Ho Byun, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Yong Moon Shin, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Moon-Gyu Lee, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
PURPOSE
To evaluate the impact of subtraction images of gadoxetic acid-enhancement on image interpretation of hepatic lesions in patients at risk for hepatocellular carcinoma (HCC)

METHOD AND MATERIALS
We retrospectively identified 228 patients (181 men, 47 women; mean age, 55.2 years) with chronic viral hepatitis or liver cirrhosis who underwent gadoxetic acid-enhanced liver MR for the evaluation of focal hepatic lesions and then hepatic resection. The patients were confirmed to have 243 focal hepatic lesions including 227 HCCs, and 16 cholangiocarcinomas. We compared the detection rate of arterial hyperemia on subtraction images and that on visual assessment of arterial phase images. Subgroup analysis was performed according to the pathology and the size of the lesions (≤ 3 cm vs. > 3 cm). We assessed the impact of subtraction images in diagnosing HCC according to the American Association for the Study of Liver Diseases (AASLD) guidelines in comparison with that of visual assessment.

RESULTS
Subtraction images (92.6%, 225/243) detected arterial hyperemia of all the focal hepatic lesions more sensitively than visual assessment (85.6%, 208/243; \(P = .001\)). On the subgroup analysis according to the pathology, the same trend was also observed in HCC (96.0% vs. 90.3%; \(P = .011\)), and in cholangiocarcinomas (43.8% vs. 18.8%; \(P = .125\)). In the 113 lesions ≤ 3 cm, subtraction images (91.2%, 103/113) depicted arterial hyperemia significantly better than visual assessment (81.4%, 92/113; \(P = .013\)), while they did not significantly differ in detecting arterial hyperemia in the 130 large lesions (> 3 cm, \(P = .109\)). When we included arterial hyperemia detected on subtraction images, it increased the sensitivity from 86.3% to 92.5% in diagnosing HCCs with the increased false positive rate from 0.8% to 2.5%.

CONCLUSION
Subtraction images can enhance the sensitivity of the non-invasive diagnosis of HCC by detecting arterial hyperemia more sensitively especially in small focal hepatic lesions, with minimal increase in a false positive rate.

CLINICAL RELEVANCE/APPLICATION
Subtraction images may be considered as an option to enhance the diagnostic performance of the non-invasive diagnosis for HCC.

PURPOSE
To compare the diagnostic performance of contrast-enhanced ultrasonography (CEUS) with MRI with gadobenate dimeglumine (CEMRI) for the diagnosis of focal nodular hyperplasia (FNH) and hepatocellular adenoma (HCA) in a tertiary referral center for hepatobiliary diseases.

METHOD AND MATERIALS
One hundred-nineteen patients (111 female and 8 male, mean age 39 years) referred to a tertiary center for hepatobiliary diseases were included. Patients had undergone standard diagnostic work-up with CEUS and CEMRI for the diagnosis of FNH or HCA. Final diagnosis was considered correct when outcome of CEUS and CEMRI were concordant. Histopathologic assessment (PA) followed in case of discrepancy between outcome of CEUS and CEMRI. CEMRI was considered as the reference method for final diagnosis when lesion biopsy for PA was considered undesirable or contra-indicated. Agreement between CEUS and CEMRI was calculated with Cohen's kappa and sensitivity, specificity, predictive values and likelihood ratios were calculated for CEUS and CEMRI.

RESULTS
Outcomes of CEUS and CEMRI were concordant in the majority of patients (n=80, 67%) (\(p<0.001\)) with an unweighted kappa of 0.34 (95% CI 0.20-0.49). In case of discrepancy between CEUS and CEMRI (n=39, 33%), PA followed in fourteen cases (12% of total), where CEMRI was correct in thirteen cases (93%) and CEUS in one case (7%) (\(p=0.002\)). In the remaining twenty-five cases (21% of total), CEMRI was considered as reference for final diagnosis. For HCA, sensitivity was 64% (95% CI 48% - 78%) with CEUS and 100% (95% CI 92% - 100%) with CEMRI. For FNH, sensitivity was 67% (95% CI 55% - 77%) with CEUS, and 99% (95% CI 93% - 100%) with CEMRI.

CONCLUSION
In our study, agreement between CEUS and CEMRI was fair and the diagnostic performance of CEUS was inferior to CEMRI for diagnosis of FNH and HCA, especially with emphasis on PA proven cases.

CLINICAL RELEVANCE/APPLICATION
In case of discordance between CEUS and CEMRI, it may be justifiable to be prudent with liver biopsy and prefer CEMRI-outcome as final diagnosis, especially when the diagnosis on CEMRI is firm.
PURPOSE

Hypoenhancement on delayed phase contrast-enhanced MRI using extracellular contrast agents, such as gadobutrol, is often used as a sign to diagnose colorectal liver metastases. Some studies have suggested that MRI with intravascular contrast agent, gadofosveset, may be useful in diagnosing focal liver lesions. The goal of this study is to determine the diagnostic accuracy of this sign using gadofosveset versus gadobutrol.

METHOD AND MATERIALS

This is an interim analysis on an institutional REB-approved, prospective study. Patients with known colorectal cancer referred for a clinical gadobutrol-enhanced MRI at our institution met inclusion criteria for our study. Patients with known contraindication to MRI or MR contrast agents were excluded. Patients received both gadobutrol- and gadofosveset-enhanced liver MRIs, performed within 4 weeks of each other. Lesion-liver contrast-to-noise ratios (CNR) of all solid focal liver lesions (cysts were excluded) were measured on 10-minute delayed phase imaging for both contrast agents. Lesions with CNR<0 were considered hypoenhancing and lesions with CNR>20 were considered hyperenhancing. We calculated the sensitivity, specificity, and likelihood ratio's of the ability of hypoenhancement to predict malignancy. Weighting was performed to account for the effects of clustering. The generalized estimating equation (GEE) was used to determine the effect of the contrast agent on the ability of the sign to predict malignancy.

RESULTS

There were a total of 265 lesions from 14 patients. The weighted sensitivity and specificity of gadofosveset was 89.2% (SD: 25.0%) and 81.3% (SD: 37.2%) respectively, which corresponds to positive and negative likelihood ratio's of 4.76 and 0.13, respectively. The weighted sensitivity and specificity of gadobutrol was 41.6% (SD: 40.9%) and 98.1% (SD: 5.6%), which corresponds to positive and negative likelihood ratio's of 0.59 and 22.5 respectively. In the GEE model, hypoenhancement on delayed phase significantly predicted malignancy (p=0.005) as did the interaction of hypoenhancement and contrast agent (p=0.006).

CONCLUSION

Hypoenhancement on delayed phase contrast-enhanced MRI with gadofosveset is a more sensitive sign of malignancy in colorectal cancer patients than with gadobutrol.

CLINICAL RELEVANCE/APPLICATION

Delayed phase gadofosveset-enhanced MRI may be a helpful problem-solving tool for excluding malignancy in colorectal cancer patients.
CONCLUSION
The extended washout sign on gadoxetic acid-enhanced MRI can be applied to hypervascular as well as to non-hypervascular liver metastases to help in distinguishing them from hemangiomas.

CLINICAL RELEVANCE/APPLICATION
Extended washout sign, particularly when used in conjunction with T2 signal intensity, can be used to increase accuracy of differentiating hemangiomas from metastases on gadoxetate-enhanced MRI.

SSG04-09 Fully Integrated PET/MRI for the Colorectal Cancer Liver Metastases: Diagnostic Performance and Prognostic Value

Tuesday, Dec. 1 11:50AM - 12:00PM Location: E350

Participants
Dong Ho Lee, MD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Jeong Min Lee, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Grant, Guerbet SA; Support, Siemens AG; Support, Koninklijke Philips NV; Grant, Bayer AG; Consultant, Bayer AG; Grant, General Electric Company; Grant, STARmed Co, Ltd; Grant, RF Medical Co, Ltd; Grant, Toshiba Corporation; Grant, Dong-Seo Medical Industrial Col, Ltd
Ijin Joo, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Bo Yun Hur, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Joon Koo Han, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

PURPOSE
To evaluate the diagnostic performance and prognostic value of fully integrated PET/MRI in patients with colorectal cancer liver metastases (CRLMs)

METHOD AND MATERIALS
between January 2013 and June 2014, 55 patients with 98 CRLMs who underwent fully integrated PET/MRI and MDCT were included in this study. Among these CRLMs, 66 CRLMs in 34 patients were diagnosed by histopathology after hepatic resection, and 32 CRLMs in 21 patients were diagnosed by follow-up imaging. Among the 34 patients who underwent hepatic resection for CRLMs, 17 patients received neoadjuvant chemotherapy (NAC) and then followed by surgery. Two board-certificated radiologists independently and randomly assessed both MDCT and fully integrated PET/MRI for detection of CRLMs. In order to compare the diagnostic performance of PET/MRI for detecting CRLMs to MDCT, jackknife alternative free-response receiver-operating characteristic (JAFROC) and generalized estimating equations (GEE) were used. For the evaluation of prognostic value of PET, we analyzed recurrence-free survival in 17 patients who underwent NAC and followed by hepatic resection for CRLMs.

RESULTS
reader average figure-of-merit of PET/MRI was significantly higher than that of MDCT for detecting CRLMs (0.842 for MDCT vs. 0.932 for PET/MRI, P=0.004). Sensitivity per tumor as well as per patients of PET/MRI was also significantly higher than those of MDCT in both two readers. Especially, PET/MRI showed significantly higher sensitivities for CRLMs ≤1cm and CRLMs treated by NAC in both two readers. According to the PET imaging findings of PET/MRI, six of 17 patients who underwent NAC were classified as having iso-metabolic CRLMs on PET, while 11 patients as having hyper-metabolic CRLMs. 1-year recurrence-free survival rate was 80.0% in 6 patients with iso-metabolic CRLMs, compared to 15.2% in 11 patients with hyper-metabolic CRLMs: this difference was statistically significant (P=0.034).

CONCLUSION
fully integrated PET/MRI can provide significantly higher diagnostic performance for detecting CRLMs compared to MDCT, especially for small CRLMs and CRLMs treated by NAC. PET imaging findings of PET/MRI after NAC was a significant affecting factor for recurrence-free survival after hepatic resection.

CLINICAL RELEVANCE/APPLICATION
fully integrated PET/MRI can be helpful for patients with CRLMs.
**SSG05**

**Gastrointestinal (CT Dose Reduction)**

Tuesday, Dec. 1 10:30AM - 12:00PM Location: E352

**CT** **GI** **SQ**

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

**Participants**
William P. Shuman, MD, Seattle, WA (Moderator) Research Grant, General Electric Company
Kathryn J. Fowler, MD, Chesterfield, MO (Moderator) Research support, Bracco Group
Achille Mileto, MD, Durham, NC (Moderator) Nothing to Disclose

**Sub-Events**

**SSG05-01** Automated Tube Voltage Adaptation in Combination with Advanced Modeled Iterative Reconstruction in Thoracoabdominal Oncological Follow-up Third-generation Dual-Source Computed Tomography: Effects on Image Quality and Radiation Dose

Tuesday, Dec. 1 10:30AM - 10:40AM Location: E352

Participants
Jan-Erik Scholtz, MD, Frankfurt, Germany (Presenter) Nothing to Disclose
Moritz H. Albrecht, MD, Frankfurt am Main, Germany (Abstract Co-Author) Nothing to Disclose
Kristina Husers, Frankfurt, Germany (Abstract Co-Author) Nothing to Disclose
Martin Beeres, MD, Frankfurt Am Main, Germany (Abstract Co-Author) Nothing to Disclose
Claudia Frellesen, Frankfurt, Germany (Abstract Co-Author) Nothing to Disclose
Julian L. Wichmann, MD, Charleston, SC (Abstract Co-Author) Nothing to Disclose
Thomas Lehnerd, MD, Frankfurt Am Main, Germany (Abstract Co-Author) Nothing to Disclose
Ralf W. Bauer, MD, Frankfurt, Germany (Abstract Co-Author) Research Consultant, Siemens AG Speakers Bureau, Siemens AG
Thomas J. Vogl, MD, PhD, Frankfurt, Germany (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
To evaluate image quality and radiation exposure of portal-venous-phase thoracoabdominal third-generation 192-slice dual-source computed tomography (DSCT) with automated tube voltage adaptation (TVA) in combination with advanced modeled iterative reconstruction (ADMIRE).

**METHOD AND MATERIALS**
Fifty-one patients underwent oncological portal-venous-phase thoracoabdominal follow-up CT twice within 7 months. The initial examination was performed on second-generation 128-slice DSCT with a fixed tube voltage of 120 kV in combination with filtered back projection reconstruction (FBP). The second examination was performed on a third-generation 192-slice DSCT using automated TVA in combination with ADMIRE. Attenuation and image noise of liver, spleen, renal cortex, aorta, vena cava inferior, portal vein, psoas muscle and perinephric fat were measured. Signal-to-noise (SNR) and contrast-to-noise ratios (CNR) were calculated. Radiation dose was assessed as size-specific dose estimates (SSDE). Subjective image quality was assessed by 2 observers using five-point Likert scales. Interobserver agreement was calculated using intraclass correlation coefficients (ICC).

**RESULTS**
Automated TVA set tube voltage of follow-up CT to 90 kV (n=8), 100 kV (n=31), 110 kV (n=11), or 120 kV (n=1). Average SSDE was decreased by 34.9% with 192-slice DSCT compared to 128-slice 120-kV DSCT (SSDE, 7.8±2.4 mGy vs. 12.1±3.2 mGy; p<0.001). Image noise was substantially lower, SNR and CNR were significantly increased with 192-slice DSCT compared to 128-slice DSCT (all p<0.005). Image quality was voted excellent for both acquisition techniques (5.00 vs. 4.93; p=0.083) without significant differences.

**CONCLUSION**
Automated TVA in combination with ADMIRE in third-generation 192-slice portal-venous-phase thoracoabdominal DSCT reduces average radiation dose by 34.9% compared to 128-slice DSCT while providing improved objective image quality.

**CLINICAL RELEVANCE/APPLICATION**
Automated TVA in combination with ADMIRE is feasible in routine thoracoabdominal follow-up CT on a third-generation DSCT and results in substantial dose reduction without impairment of image quality.

**SSG05-02** Assessment of Sinogram-affirmed Iterative Reconstruction Techniques for Reduced Dose Abdomen CT

Tuesday, Dec. 1 10:40AM - 10:50AM Location: E352

Participants
Atul Padole, MD, Boston, MA (Presenter) Nothing to Disclose
Nisha Sainani, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Shelly Mishra, Boston, GA (Abstract Co-Author) Nothing to Disclose
Azadeh Tabari, Boston, MA (Abstract Co-Author) Nothing to Disclose
Alexi Otrakji, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Mannudeep K. Kalra, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Subba R. Digumarthy, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
To assess the different settings of Sinogram-affirmed iterative reconstruction (Safire, Siemens Healthcare, Germany) techniques for reduced dose (RD) abdomen CT to the standard dose (SD) CT.

METHOD AND MATERIALS
In an IRB approved retrospective study, 20 patients (age 68 ± 6 years, M:F 11:9) undergoing SD abdominal CT on 128-MDCT (Definition Edge with Stellar detectors) scanner gave informed consent for acquisition of an additional RD CT. The RD series were acquired with reduced tube current but identical scan length compared to the SD CT. The sinogram data of RD CT were reconstructed with three settings of Safire (S1, S3, S5) and SD CT reconstructed with Safire (S3) (n= 4*20=80 series). Radiologists performed independent, random, and blinded comparison for lesion detection, lesion conspicuity, and visibility abdominal structures, first for all patients on RD dose images and subsequently for SD images.

RESULTS
Mean CTDIvol were 94±3 mGy and 1.44±0.1 mGy for SD CT and RD CT, respectively. There were total 70 lesions detected on SD CT. There were five missed lesions (4 liver lesions, 2-4 mm, and a liver mass < 1.2 cm) and a pseudo liver lesion (<4 mm) on RD images regardless of Safire settings and size of patients. The lesion conspicuity was sufficient for clinical diagnostic performance for 2/5 lesions with RD S1, 27/45 lesions with RD S3, and 24/45 lesions with RD S5 images regardless of patient size. Visibility of normal liver and renal parenchyma was sufficient on 15/20 patients with RD S1, 16/20 patients with RD S3, and 9/20 patients with RD S5. Other abdominal structures such as adrenals, pancreas, gall bladder, and bowels were sufficiently seen in most patients on RD CT.

CONCLUSION
SubmSv radiation doses for routine abdominal CT are associated with missed lesions and suboptimal image quality despite use of higher strength iterative reconstruction techniques.

CLINICAL RELEVANCE/APPLICATION
Abdominal CT acquired at CTDIvol of 1.4 mGy is not sufficient for diagnostic confidence.

REFERENCES
Venkatesh Anumugam Murugan, MBBS, Somerville, MA (Abstract Co-Author) Nothing to Disclose

SUGGESTED REFERENCES
Subba R. Dugumathy, MD - 2013 Honored Educator

SSG05-03 Contrast Enhanced CT Exams of the Abdomen Obtained at Low kVp: Impact on Radiation Dose and Image Quality

Tuesday, Dec. 1 10:50AM - 11:00AM Location: E352

Participants
Yasir Andrabi, MD, MPH, Boston, MA (Abstract Co-Author) Nothing to Disclose
Rani S. Sewatkar, MBBS, Edison, NJ (Abstract Co-Author) Nothing to Disclose
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Avinash R. Kambadakone, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Dushyant V. Sahani, MD, Boston, MA (Presenter) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc

PURPOSE
Low tube potential (kVp) is increasingly being applied for contrast enhanced (CE) CT exams due to availability of software solutions for automated kVp selection on new generation scanners. Therefore, we studied the impact of low kVp imaging on the radiation dose and image quality of CE abdominal CT exams obtained on new generation scanners with automated kVp selection.

METHOD AND MATERIALS
In this IRB approved retrospective study, 362 patients (age=55 years, weight=77.6 kg) underwent CE abdominal CT exams on one of our 4 scanners from same vendor (Siemens) during one month period. All of these 4 CT scanners [Stellar Detectors=3 (Definition Force, Flash and Edge) and conventional Solid detector=1 (Force)] have automated kvp selection (80-140) option. Radiation dose information and applied scan parameters (kVp and mA) were retrieved. For 85 randomly sampled patients, contrast-to-noise ratio (CNR) was determined and subjective IQ assessment was done by 2 radiologists.

RESULTS
Low kVp (≤110 kVp) was applied in 78%(281) CT exams [80 kVp=4(1%);90 kVp=22(6%);100kVp=251(70%); 110kVp=4(1%)] while 22% of exams (n=81) were obtained at high kVp [120kVp=78(21%);140kVp=3(1%)]. The radiation doses showed a strong correlation with kVp (CTDI(mGy); 80:6.1;90:6.3;100=8.1;110=10.9; 120=14.1;140=22.9; r²=0.46,p<0.001). For patients ≤91 kg, 80% of exams were performed at low kVp corresponding to 49% lower radiation doses (mGy;≤110 kVp =6.5,120kVp=12.6; p<0.001). For >91kg, 69% of exams were obtained at low kVp (mGy;≤110 kVp =9.6,≥120kVp=17.2, 44% reduction; p<0.001). The CNR showed a linear decrease with an increase in the kvp with highest values noted for exams obtained at low kVp (r²=0.18,p<0.001). All 85 exams received high subjective image quality ratings.

CONCLUSION
A substantial (78%) of abdominal CT exams are obtained at low kVp [80% (≤91 kg) and 69% (>91kg)]. Regardless of the patient body weight, CT exams obtained on new generation scanners with automated kVp selection option results in a significant reduction
in radiation doses (44-49%) while preserving objective and subjective IQ.

**CLINICAL RELEVANCE/APPLICATION**

The clinical benefits of low kVp imaging are well recognized, however, image quality concerns may limit its implementation in clinical practice. The new generation scanners with automated kVp selection, stellar detectors as well as iterative reconstructions facilitate low kVp exams without degrading image quality, especially, in large sized patients.

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Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator

**SSG05-04** Personalized Liver CT Examination Protocol Based on BMI: Combination of Optimized kVp and Optimized Iodine Injection Method

**Tuesday, Dec. 1 11:00AM - 11:10AM Location: E352**

**Participants**

Jian Jiang, MD, Beijing, China (Presenter) Research Grant, General Electric Company
Xiaoying Wang, MD, Beijing, China (Abstract Co-Author) Nothing to Disclose
Wei Li, Beijing, China (Abstract Co-Author) Nothing to Disclose
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Mengxi Jiang, Beijing, China (Abstract Co-Author) Research Grant, General Electric Company
Xiaochao Guo, MD, Beijing, China (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To investigate whether the personalized liver CT examination protocol based on body mass index (BMI) could obtain the diagnostic image quality.

**METHOD AND MATERIALS**

This prospective study was approved by IRB. Informed patient consent was obtained. From 2014 May to 2015 March, patients with known or suspected HCC were recruited consecutively, who underwent MDCT. Patients were scanned with different tube voltage (80-120 kVp) in combination with different amount of iodine contrast medium (352 to 550 mgI/kg) based on their BMI: BMI 18.0-24.0, 80-kVp, 352mgI/kg; BMI 24.1-28.0, 100-kVp, 440 mgI/kg; BMI 28.1-35.0, 120-kVp, 550 mgI/kg. All the other scanning parameters were set as the same. For each patient, the late arterial phase images were reconstructed into 6 sets of images, filter back projection (FBP) and sonogram-affirmed iterative reconstruction (SAFIRE) 1 to 5 (S1 to S5). The image noise, attenuation, contrast-to-noise ratio (CNR), and figure of merit (FOM) of the liver parenchyma and portal vein and estimated effective dose (ED) were measured and calculated. Radiologists were independently blinded to grade images quality (sharpness, image noise, beam-hardening artifacts and reconstruction artifact).

**RESULTS**

Totally 133 patients were recruited, according to BMI, 37 in 80-kVp group, 50 in 100-kVp group, 47 in 120-kVp group. Image subjective score of S3 was significantly higher than that of the other reconstructions on the 80-kVp. Images of S2 had the highest image subjective score compared with the other reconstructions on the 100-kVp (p<0.05) and 120-kVp (p<0.05). The estimated ED was 49.6%, 56.8% lower at 80-kVp than at 100-kVp and 120-kVp. CNR of the portal vein was 16.3% higher at the 80-kVp S3 images than of 120-kVp S2 images (p>0.05). FOM of liver on the 80-kVp S3 images was higher than on 100-kVp and 120-kVp S2 images (p<0.05). The subjective score of image quality was significantly higher for 120-kVp S2 images than for 80-kVp S3 images and 100-kVp S2 images; however, there was no significant difference among them.

**CONCLUSION**

High quality liver CT images could be obtained by using personalized liver CT protocol based on BMI, with combination of optimized kVp and iodine injection method.

**CLINICAL RELEVANCE/APPLICATION**

This method will be of benefit to the patients with lower BMI, who will receive lower contrast dosage, significantly less radiation dose compared with the conventional uniform method.

**SSG05-05** Can 3rd Generation Dual-source CT Achieve 70kV-imaging for Routine Contrast-enhanced Body CT?

**Tuesday, Dec. 1 11:10AM - 11:20AM Location: E352**

**Participants**

Satoru Takahashi, MD, Kobe, Japan (Presenter) Nothing to Disclose
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Kazuo Sugimura, MD, PhD, Kobe, Japan (Abstract Co-Author) Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, Elsal Co, Ltd Research Grant, DAIICHI SANKYO Group

**PURPOSE**

Low-kV CT can dramatically reduce contrast media (CM) volume with maintaining sufficient contrast enhancement thanks to...
Low-kV CT can dramatically reduce contrast media (CM) volume with maintaining sufficient contrast enhancement thanks to improved iodine absorption of lower kV. Although low-kV CT has been applied to vascular imaging, its application to parenchymal organs is limited due to high image noise or beam hardening artifact. The purpose of this investigation is to compare quantitative and qualitative data in two contrast enhanced CT protocols acquired with 3rd generation dual-source CT scanner; 70 kV CT with 60% dose of CM and 120 kV CT with a standard dose.

METHOD AND MATERIALS

We retrospectively compared 100 consecutive patients (57±12 kg) who underwent post-contrast body CT (thorax to pelvis) on 192-slice 3rd generation dual-source CT scanner at 70 kV with 60% dose of diluted 270 mgI/Kg CM (50.8±9.6 mL), with 103 historical control patients (59±13 kg) at 120 kV with a standard dose of 450 mgI/Kg CM (84.4±16.4 mL). CT values of the vessels and the visceral organs, as well as contrast to noise ratio (CNR) of hepatic and renal cysts were compared between the groups. Subjective assessment of image quality, severity of beam hardening artifact was scored on a 4-point scale. Radiation dose (CTDVol) was recorded in each case.

RESULTS

CT values of the abdominal aorta, portal vein, liver, kidney, pancreas, spleen at 70 kV with 60% CM were statistically significantly greater than those at 120 kV with a standard dose of CM (p<0.0001). There were no significant differences in CNR of hepatic or renal cysts between 70 kV and 120 kV techniques (p=0.93, p=0.11, respectively). The beam-hardening artifact at the level of thoracic inlet and the pelvis was stronger at 70 kV (120 kV, 1.1 and 1.0, 70 kV, 1.6 and 1.3, respectively), while streak artifact from intravenous CM was significantly more prominent at 120 kV technique (120 kV, 2.1, 70 kV, 1.5, respectively). Radiation dose was significantly higher in the 120 kV than 70 kV group [CTDVol; 9.1±1.7 mGy, and 8.3± 2.0 mGy, respectively (p<0.01)].

CONCLUSION

70kV-CT would be sufficient for routine clinical body CT study with reduced CM and radiation dose. Although beam hardening artifact may be seen in the pelvis and the thoracic inlet, streak artifact from CM could be reduced.

CLINICAL RELEVANCE/APPLICATION

70kV imaging can provide sufficient image quality not only for the vessels but also for the organs with reduced dose of CM and radiation.

SSG05-06 Observer Performance at Varying Dose Levels and Reconstruction Methods for Detection of Hepatic Metastases

Tuesday, Dec. 1 11:20AM - 11:30AM Location: E352

Participants

Joel G. Fletcher, MD, Rochester, MN (Presenter) Grant, Siemens AG; Jeff L. Fidler, MD, Rochester, MN (Abstract Co-Author) Research Grant, Beekley Corporation

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Naoki Takahashi, MD, Rochester, MN (Abstract Co-Author) Nothing to Disclose

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Shuai Leng, PhD, Rochester, MN (Abstract Co-Author) Nothing to Disclose

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Rickey Carter, PhD, Rochester, MN (Abstract Co-Author) Nothing to Disclose

Cynthia H. McCollough, PhD, Rochester, MN (Abstract Co-Author) Research Grant, Siemens AG

PURPOSE

To estimate the ability of abdominal radiologists to detect hepatic metastases (HM) at varying dose levels with or without iterative reconstruction (sinogram-affirmed iterative reconstruction; IR) using a two-stage study design.

METHOD AND MATERIALS

For stage I, CT projection data from 44 CT contrast-enhanced exams were collected (22 with HM). HM was defined by histopathology, progression/regression on CT/MR. Using a validated noise insertion technique, 12 datasets were reconstructed with filtered back projection (FBP) or IR for each patient at 6 dose levels (automatic exposure control settings of 60, 80, 100, 120, 160 and 200 Quality ref. mAs [QRM]; 528 cases). In each reading session, 3 abdominal imagers randomly evaluated each patient’s dataset once. Using a dedicated computer workstation, readers circled all liver lesions, selecting diagnosis and confidence score (0 - 100), and then graded image quality. Automated matching of reference and reader lesions was performed using overlapping spheres. A successful reading was defined as ≥ 2 readers localizing all "essential" HM (or no non-lesion localizations in negative cases), where an essential HM was identified by the reference standard and ≥ 2 readers at 200 QRM FBP. Sample size calculations (p0=0.8, p1=0.9, alpha=0.05 (one sided)) determined ≥ 37 cases to pass through stage I. JAFROC analysis was also performed on a per-lesion basis for HM using a non-inferiority limit of -0.1.

RESULTS

There were 75 HM with a median size of 1.2 +/- 0.6 cm. Of the 12 configurations passed through stage I screening, corresponding to dose levels of ≥120 QRM (or at 100 QRM with IR). Using non-inferiority criterion and JAFROC FOM, all but the IR 60 QRM met the a priori definition of having the lower limit of 95% CI > -0.1. At dose levels ≤ 120 QRM, IR improved diagnostic confidence (p<0.05).

CONCLUSION

Lower dose CT images reconstructed at dose levels corresponding to 120 and 160 QRM, or at 100 QRM for IR only, performed similar to 200 QRM FBP in this pilot study for detection of hepatic metastases. IR improved diagnostic image quality but not performance at lower dose levels.

CLINICAL RELEVANCE/APPLICATION

Pilot data obtained over a range of doses suggests that substantial dose reduction is possible without compromising performance.
IR improved performance only over a narrow range of radiation doses.

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Naoki Takahashi, MD - 2012 Honored Educator

**SSGOS-07  Single- and Dual-Energy Acquisition with 2nd and 3rd Generation Abdominal Dual-Source CT: Direct Comparison of Scan Modes Regarding Radiation Dose and Image Quality**

**Tuesday, Dec. 1 11:30AM - 11:40AM Location: E352**

**Participants**

Julian L. Wichmann, MD, Charleston, SC (Presenter) Nothing to Disclose  
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Andrew D. Hardie, MD, Charleston, SC (Abstract Co-Author) Nothing to Disclose  
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U. Joseph Schoepf, MD, Charleston, SC (Abstract Co-Author) Research Grant, Bracco Group; Research Grant, Bayer AG; Research Grant, General Electric Company; Research Grant, Siemens AG; Research support, Bayer AG; ;  
Akos Varga-Szemes, MD, PhD, Charleston, SC (Abstract Co-Author) Nothing to Disclose  
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Stephen R. Fuller, Charleston, SC (Abstract Co-Author) Nothing to Disclose  
Christian Canstein, Charleston, SC (Abstract Co-Author) Employee, Siemens AG  

**PURPOSE**

To compare dual-energy (DE) and single-energy (SE) abdominal computed tomography (CT) in matched cohorts of routine clinical patients performed with third-generation dual-source CT (DSCT) and to assess differences in radiation dose and image quality compared to second-generation DSCT.

**METHOD AND MATERIALS**

This retrospective study was approved by the local institutional review board with a waiver of written informed consent. A total of 200 patients divided into four groups of 50 patients matched by gender and body mass index underwent portal-venous-phase abdominal DECT with standard scan protocols on second-generation DSCT (SE 120-kV, group A; DE 80/140-kV, group C) and third-generation (100-kV SE, group C; 90/150-kV DE, group D) DSCT. Radiation dose was normalized for a typical scan length of 40 cm. Dose-independent figure-of-merit (FOM) contrast-to-noise ratios (CNR) were calculated for various organs and vessels. Subjective overall image quality and image artifacts and reader confidence were assessed by three observers using five-point scales. Results were compared with two-way analysis of variance and intra-class-correlation coefficients.

**RESULTS**

Effective dose normalized for 40-cm acquisition was lowest in groups D (5.3 ± 1.9 mSv) and C (6.2 ± 2.0 mSv, P =0.103), significantly lower (both P <0.0001) compared to groups A (8.8 ± 2.3 mSv) and B (9.7 ± 2.4 mSv). Dose-independent FOM CNR peaked for liver, kidney, and portal vein measurements (all P ≤0.0285) in group D. Results for pancreas and aorta did not reach significance compared to group C (both P ≥0.0719), but did compared to groups A and B (all P ≤0.0077). Overall subjective image quality and image artifacts and reader confidence were consistently rated as excellent in all groups (all ≥1.53 out of 5).

**CONCLUSION**

Both acquisition modes with third-generation abdominal DSCT result in significantly lower radiation dose compared to second-generation DSCT while maintaining image quality. Third-generation abdominal DE DSCT can be routinely performed without any dose penalty compared to SE acquisition.

**CLINICAL RELEVANCE/APPLICATION**

Third-generation DSCT is more dose-efficient than second-generation DSCT; the spectral imaging opportunities of DE acquisition can be utilized without radiation dose penalty.

**SSGOS-08  CT Enterography: Diagnostic Value Of 4th Generation Iterative Reconstrution Algorithm with Low Dose CT-Protocol In Comparison with Standard Dose Protocol for Clinical Follow-Up of Patients with Crohn’s Disease**

**Tuesday, Dec. 1 11:40AM - 11:50AM Location: E352**

**Participants**

Sophie Lombardi, Vimercate, Italy (Presenter) Nothing to Disclose  
Davide Ippolito, MD, Monza, Italy (Abstract Co-Author) Nothing to Disclose  
Alessandra S. Casiraghi, Casatenovo, Italy (Abstract Co-Author) Nothing to Disclose  
Pietro A. Bonaffini, MD, Monza, Italy (Abstract Co-Author) Nothing to Disclose  
Carmillo R. Talei Franzesi, Milan, Italy (Abstract Co-Author) Nothing to Disclose  
Sandro Sironi, MD, Monza, Italy (Abstract Co-Author) Nothing to Disclose  

**PURPOSE**

To compare radiation dose, image quality and diagnostic performance of low dose CT-enterography protocol (256 MDCT scanner) combined with iterative reconstruction algorithm (iDose4), with standard dose CT-enterography in follow-up of patients with known Crohn's disease.
**METHOD AND MATERIALS**

Fifty-one patients (32 male; mean BMI 24.9), with CD underwent low-dose CTE scan in a single venous phase on 256 MDCT scanner (iCT, Philips) with following parameters: 120 kV, automated mAs dose modulation, slice thickness 2mm, with iDose4 iterative reconstruction algorithm. The same patients underwent a standard dose examination on 256-rows CT scan (120kV, 200–400mAs, depending on patient weight, slice thickness 2mm). Two radiologists, blinded to clinical and pathological findings, independently evaluated, in each scan, HU values in bowel wall and presence of CD activity features (mural thickening and enhancement pattern, mesenteric fat stranding, comb sign, lymphoedemageny and disease's complications). Image noise and diagnostic quality were evaluated using a 4-point scale. Dose-length product (DLP) was calculated and data from both examinations were compared and statistically analyzed.

**RESULTS**

Low-dose CTE protocol showed high diagnostic quality in assessment of Crohn's disease features (i.e. mural thickening and enhancement, halo sign, mesenteric fat stranding, lymphadenopathy), which were detected in 43/51 (82%) of our series. Total DLP and CTDI were significantly ($p<0.001$) lower for CTE studies with iDose (607 mGy*cm and 12 mGy) as compared to standard dose examinations (891 mGy*cm and 19.13 mGy), allowing an overall dose reduction of 35%. The objective noise measurements were slightly higher in iDose images (DS 12.9) than in standard dose studies (DS 10.37) but not statistically significant difference was achieved ($p=0.06$).

**CONCLUSION**

Low dose CTE protocol combined with iDose4 reconstruction algorithm offers high quality images with lower radiation dose, being a useful tool in CD patients management, in regard of their young age and the frequent imaging follow-up required.

**CLINICAL RELEVANCE/APPLICATION**

Low-dose CTE protocol combined with iDose4 algorithm allows a significant reduction of radiation dose, while providing an appropriate diagnostic image quality for the evaluation of CD manifestations.
**4th Generation Iterative Reconstruction Algorithm: Image Quality and Diagnostic Accuracy of Low Dose Abdominal CT Study in the Assessment of Cystic Pancreatic Lesion**

**PURPOSE**
To evaluate the diagnostic performance and the radiation dose exposure of the iterative reconstruction algorithm (iDose4) in MDCT studies of patients with pancreatic cystic lesions.

**METHOD AND MATERIALS**
A total of 88 patients (52 men; mean age 72.2 ± 10.1 years) were retrospectively reviewed. They underwent low-dose (120 kV, mAs determined by x-, y- and z-axis dose modulation) abdominal MDCT study on a 256-slice scanner (iCT; Philips) with iDose4 modulation and a standard MDCT examination (120 kV; 200-400 mAs) on a 16-row scanner (Brilliance, Philips). For each cystic lesion the following parameters were evaluated: location in the pancreas (head, uncinate process, neck, body, tail), number and size, communication with the main pancreatic duct (MPD), maximum MPD diameter, presence of septa, mural enhancing nodules and wall thickening. Radiation dose information in terms of dose-length product (DLP, mGy*cm) and CT dose index (CTDI, mGy) were also recorded. Image quality, noise and sharpness were also evaluated using a 4-point scale.

**RESULTS**
A total of 157 cystic pancreatic lesions in 88 patients were evaluated. 54 lesions were located in the head, 17 in the uncinate process, 8 in the neck, 29 in the body and 49 in the tail. The mean size was 12.9±8.6 mm and the mean MPD diameter was 2.7±0.7 mm. 85 (54%) cystic lesion had a communication with MPD, 50 (32%) presented wall thickening, 46 (30%) inner septa and 18 (11%) mural nodules. The radiation dose in low kV protocol was significantly lower (DLP 583.3±273.6 mGy*cm; CTDI 9.8±4 mGy) as compared to the control group (DLP 1024.9±362 mGy*cm; CTDI 21.1±3.6 mGy). Diagnostic quality and image sharpness in low-dose group was almost similar (2.5±0.7; 2.6±0.8) as compared to the control group (2.4±0.7; 2.7±0.7) and noise too (2.2±0.8 vs 2.2±0.8).

**CONCLUSION**
The iDose4 reconstruction algorithm offers high quality MDCT images useful in assessment of pancreatic cystic lesions, also significantly reducing radiation dose exposure (about 44%).

**CLINICAL RELEVANCE/APPLICATION**
I.Dose4 iterative reconstruction algorithm represents an effective technique for proper evaluation of pancreatic cystic lesions, with a significant reduction in radiation dose maintaining high diagnostic quality.

**Can Functional Parameters from Hepatobiliary Phase of Gadoxetate MRI Predict Clinical Outcomes in Liver Disease?**

**PURPOSE**
To determine if functional parameters measured using MRI with gadoxetate disodium (Eovist, Bracco Diagnostics, Monroe, NJ) may be used as an adjunct to clinical models in predicting outcomes in patients with liver disease.
METHOD AND MATERIALS
This retrospective HIPAA-compliant, and IRB-approved study reviewed the clinical and radiological data in patients who had a gadoxetate MRI scan between January 2011 and December 2013. 98 patients (mean age 56.6 years, males=52) had enhancement ratio of liver at 15 minutes (ER 15) [(liver SI @ 15 min-liver SI precontrast)/(liver SI precontrast)] and contrast enhancement index at 15 minutes (CEI 15) [(liver SI @ 15 min/muscle SI @ 15 min)/(liver SI precontrast/muscle SI precontrast)] measured by two independent reviewers by drawing 1-2 cm2 regions-of-interest in right lobe of liver and right paraspinal muscle away from blood vessels. Clinical outcomes recorded were onset of GI bleeding (GIB) or encephalopathy ("enceph"), major nonfatal event in first year (GIB, enceph, liver transplantation), survival less than 1 and 2 years.

RESULTS
26 patients had no known diffuse liver disease and were scanned for characterizing benign liver lesions. The remaining 72 had chronic fibrosis of varying severity. On multivariate logistic regression analysis, the only parameter that predicted survival of < 1 year was MELD score (p=0.05). Less than 2-year survival correlated only with ER 15 (p=0.04). Major 1-year nonfatal event and onset of "enceph" correlated with CEI 15 (p=0.01 and 0.04, respectively). On ROC curve analysis, ER 15 of less than 0.57 had sensitivity and specificity of 80% and 63% in predicting a major 1-year event.

CONCLUSION
ER 15 and CEI 15 are functional parameters of gadoxetate imaging which predict important outcomes in patients with liver disease.

CLINICAL RELEVANCE/APPLICATION
ER15 and CEI 15 may be useful to predict outcomes in liver patients and should be included in MRI reports.

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Kumaresan Sandrasegaran, MD - 2013 Honored Educator
Kumaresan Sandrasegaran, MD - 2014 Honored Educator
Temel Tirkes, MD - 2013 Honored Educator
Temel Tirkes, MD - 2014 Honored Educator
Fatih Akisik, MD - 2014 Honored Educator

PURPOSE
To evaluate the clinical feasibility, and accuracy of ARFI elastography for detection of liver fibrosis in patients of chronic viral hepatitis.

METHOD AND MATERIALS
ARFI based US elastography was performed in 69 patients of CLD of viral etiology. Fifty eight patients of CLD underwent a liver biopsy as well.

RESULTS
ARFI was feasible in all 69 CLD patients while valid measurements could be obtained in 65 patients (95.6%). A gradual increase in mean SWVs was noted from F0 to F6 grades of fibrosis (Ishak's score) and a high positive correlation was found between the mean SWV on ARFI and fibrosis scores on liver biopsy (rho=0.789). The difference between the mild (F1 and F2) vs significant fibrosis (F3 and F4) groups was also statistically significant (p<0.001). The difference in the SWV measurements obtained from consecutive groups (i.e. F1vsF2, F2vsF3 and F3vsF4) was not statistically significant. Using area under ROC, the best calculated cutoff SWV for presence of fibrosis (>=F1), significant fibrosis (>=F3), severe fibrosis (>=F4) and cirrhosis (F6) were found to be 1.207m/s, 1.347m/s, 1.513m/s and 1.920m/s respectively. In cirrhotic patients, ARFI gave significantly higher values than in the other patients (p < 0.001).

CONCLUSION
ARFI elastography allows valid and non invasive evaluation of liver stiffness and may help in distinguishing between no/mild fibrosis and significant fibrosis and guiding management decisions.

CLINICAL RELEVANCE/APPLICATION
ARFI can correctly and non invasively detects and quantitate fibrosis to prognosticate and plan therapeutical decisions and avoid complications and limitations of liver biopsy.

PURPOSE
To evaluate the clinical feasibility, and accuracy of ARFI elastography for detection of liver fibrosis in patients of chronic viral hepatitis.

METHOD AND MATERIALS
ARFI based US elastography was performed in 69 patients of CLD of viral etiology. Fifty eight patients of CLD underwent a liver biopsy as well.

RESULTS
ARFI was feasible in all 69 CLD patients while valid measurements could be obtained in 65 patients (95.6%). A gradual increase in mean SWVs was noted from F0 to F6 grades of fibrosis (Ishak's score) and a high positive correlation was found between the mean SWV on ARFI and fibrosis scores on liver biopsy (rho=0.789). The difference between the mild (F1 and F2) vs significant fibrosis (F3 and F4) groups was also statistically significant (p<0.001). The difference in the SWV measurements obtained from consecutive groups (i.e. F1vsF2, F2vsF3 and F3vsF4) was not statistically significant. Using area under ROC, the best calculated cutoff SWV for presence of fibrosis (>=F1), significant fibrosis (>=F3), severe fibrosis (>=F4) and cirrhosis (F6) were found to be 1.207m/s, 1.347m/s, 1.513m/s and 1.920m/s respectively. In cirrhotic patients, ARFI gave significantly higher values than in the other patients (p < 0.001).

CONCLUSION
ARFI elastography allows valid and non invasive evaluation of liver stiffness and may help in distinguishing between no/mild fibrosis and significant fibrosis and guiding management decisions.

CLINICAL RELEVANCE/APPLICATION
ARFI can correctly and non invasively detects and quantitate fibrosis to prognosticate and plan therapeutical decisions and avoid complications and limitations of liver biopsy.
PURPOSE
To evaluate the role of growth kinetics in differentiating between untreated hepatocellular carcinoma (HCC) and mass-forming intrahepatic cholangiocarcinoma.

METHOD AND MATERIALS
This Health Insurance Portability and Accountability Act compliant retrospective study was approved by the institutional review board. Eighteen patients with HCC and sixteen patients with cholangiocarcinoma imaged at two different time points before treatment were evaluated. Tumor growth kinetics was obtained by calculating the reciprocal of doubling time (RDT). Unpaired t-test was used for analysis. Significance was set at 0.05.

RESULTS
Mean age of patients with HCC and cholangiocarcinoma was comparable (64.9 ± 10.0 years for HCC vs. 63.6 ± 13.4 years for cholangiocarcinoma, P=0.745). Mean interscan interval was 105 and 141 days for HCC and cholangiocarcinoma, respectively. HCC and cholangiocarcinoma had a mean diameter of 48.5 ± 31.2 mm and 60.2 ± 43.5 mm, respectively on initial CT scan. Mean RDT was significantly lower for HCC when compared with cholangiocarcinoma (1.91 ± 1.36 for HCC vs. 3.81 ± 2.74 for cholangiocarcinoma, P=0.02), reflecting significantly slower growth rate of HCC.

CONCLUSION
Tumor growth kinetics of untreated HCC and intrahepatic mass forming cholangiocarcinoma are significantly different. 

CLINICAL RELEVANCE/APPLICATION
Compared to cholangiocarcinoma, HCC is a relatively slow growing tumor with approximately 50% slower growth rate. Our results suggest that more than 50% growth rate in 6 months as a diagnostic feature of OPTN class 5G lesion may need to be re-evaluated.

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Improve the Image Quality of Portal Vein by Combination of Monochromatic Images and Adaptive Statistical Iterative Reconstruction (ASiR)

Participants
Jing Zhao, Beijing, China (Presenter) Nothing to Disclose

PURPOSE
To investigate and evaluate the quantitative and subjective quality of the portal vein images combining monochromatic spectral CT with adaptive statistical iterative reconstruction (ASiR).

METHOD AND MATERIALS
90 patients with tumor history routinely receiving abdomen CT scans were randomly divided into three groups. Group A (optimal monochromatic group) included 30 patients who underwent fast kVp-switching dual-energy abdominal enhanced CT, from which 101 sets of portal phase recombinant monochromatic (∼40–140 keV) images were generated, and the optimal monochromatic set with the highest contrast to noise ratio (CNR) were obtained. Group B (60keV+40%ASiR group) included 30 patients who underwent fast kVp-switching dual-energy abdominal enhanced CT, and portal phase 60keV recombinant monochromatic images were obtained and reconstructed with 40% ASiR. Group C (conventional multi-detector CT group) included 30 patients who underwent traditional abdominal enhanced multi-detector CT, whose portal phase images were obtained. The average CT values of the portal vein and the hepatic parenchyma, as well as the portal-hepatic HU difference, the image noise and the CNR, were obtained and compared among the three groups using the single factor analysis of variance. 2 board-certified radiologists interpreted the selected image sets independently for image quality scores.

RESULTS
The monochromatic images were found to yield the optimal CNR for portal vein at 55.87keV. In group A, B and C, the CNR were 6.81±1.87, 8.09±2.29 and 3.30±1.08, and the image quality scores were 4.28±0.58, 4.35±0.56 and 3.58±0.46, respectively. The CNR and image quality scores of group A and B were significantly higher than group C (all p<0.001).

CONCLUSION
Compared to conventional CT imaging, the 60keV monochromatic spectral CT imaging with 40%ASiR and the optimal monochromatic CT imaging both can significantly improve the image quality of portal vein.

CLINICAL RELEVANCE/APPLICATION
Both of the 60keV monochromatic spectral CT imaging with 40%ASiR and the optimal monochromatic CT imaging can be applied to clinic for great manifestation of portal vein.

**GI361-SD-TUA6 High Radiation Exposure in Symptomatic Crohn’s Disease Patients and the Need for Reduction in Utilization of CT Imaging**

**Participants**
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Jorge A. Soto, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
Patients with Crohn's disease are at risk of high radiation exposure, particularly from CT imaging. Symptomatic Crohn's patients are often scanned repeatedly due to broad differential diagnoses associated with the presenting complaint. While CT is a valuable tool in the assessment of Crohn's disease and its complications, we must be cognizant of its overutilization. Herein, we evaluated the utilization rate and indications for CT imaging of Crohn's patients at our institution.

**METHOD AND MATERIALS**
We performed a retrospective chart review of 100 consecutive Crohn's disease patients who received a CT scan from 2000 to 2015. All incidences of radiation from CT imaging were noted. The total and average number of CT scans were tallied. CT scans were categorized by indication; the total number of normal studies was also obtained.

**RESULTS**
100 patients with Crohn's disease were evaluated, 53 female and 47 male, a mean age of 48, with a range of 22 to 88 years. In this study population 491 CT scans were performed. The indications for the imaging studies included assessment of nonspecific abdominal or pelvic pain (46.8%), evaluation of suspected Crohn's flare or Crohn's related complications (30.5%), surgical complication or surgical follow up (9.5%), flank pain (5.2%), trauma (0.4%), or other (7.6%). In this population, the average number of CT scans performed was 4.9, with a range of 1 to 23. A total of 43 patients received >= 5 CTs, 12 received >= 10 CTs, 4 received >= 15 CTs and 2 received >= 20 CTs. Of the 491 CT scans performed, 135 (27.5%) were reported as normal or with stable chronic changes related to the patients underlying Crohn's disease.

**CONCLUSION**
The average number of CT scans per patient in this population approached 5 scans with a maximum of 23 scans in a single patient. Prior studies have shown that radiation above 50mSv (~5 CT scans) increases the risk of cancer, which is particularly pertinent for the Crohn's patient population. Of the scans performed a significant proportion were recorded as normal or with stable chronic changes from Crohn's disease, thus not providing a cause for the patient's symptoms.

**CLINICAL RELEVANCE/APPLICATION**
Our findings elucidate there is considerable room for reducing the use of CT imaging in symptomatic Crohn's patients, given the significant number of scans with normal or stable chronic findings.

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Jorge A. Soto, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2015 Honored Educator


**Participants**
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Negar Iranpour, MD, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Mitchell E. Tublin, MD, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
Virtual Unenhanced (VUE) is a new material decomposition method allowing creation of noncontrast-like images based on single-source rapid kv-switching dual-energy CT (SS-DECT) acquisition. The purpose of this study is to compare the attenuation values of intra-abdominal organs obtained on true nonconstrast (TNC) and VUE studies.
METHOD AND MATERIALS

43 consecutive patients who underwent non-contrast single-kvp CT and postcontrast dual-energy CT of the abdomen in the same session, using a SS-DECT scanner (HD750 GE), were retrospectively studied. Post-contrast CT was obtained during late arterial and portal venous phases. VUE images were reconstructed from both arterial and venous-phase series. Attenuation values (HU) of the liver, spleen, pancreas, kidneys, adrenal glands, aorta, IVC, portal vein, paraspinous muscle, and subcutaneous fat were measured on TNC, arterial phase VUE (VUE-art), and venous phase VUE (VUE-ven) studies using a similar ROI. BMI and hemoglobin level were also recorded. Virtual and true HU were compared using Pearson correlation and Bland-Altman plot. The effect of BMI and hemoglobin was assessed using multi-variable linear regression. The portion of cases with >10 HU error (an arbitrary threshold) between VUE and TNC attenuation values were calculated for each organ.

RESULTS

The $R^2$ for the correlation between VUE and TNC attenuation values ranged from 0.01 (IVC, RMSE = 6.8) to 0.77 (central liver, RMSE = 7.1), with the median $R^2$ being 0.42 (RMSE = 7.6) and 0.39 (RMSE = 7.9) for VUE-art and VUE-ven, respectively. These results were unchanged when corrected for BMI and hemoglobin. The VUE attenuation was significantly different from TNC attenuation for left kidney ($p=0.006$) and muscle ($p<0.001$). There was significant difference between VUE-art and VUE-ven for liver, muscle, subcutaneous fat, and aorta ($p<0.05$). The percentage of cases which had a >10HU difference between VUE and TNC ranged from 16% (central liver and kidneys) to 39% (IVC).

CONCLUSION

There was large variability in correlation between TNC and VUE attenuation values. The portion of cases with >10 HU error between VUE and TNC attenuation values varied by organ and ranged between 16% and 38%. VUE-ven generally offered a better estimate of TNC attenuation.

CLINICAL RELEVANCE/APPLICATION

VUE is a less-than-optimal technique for quantitative assessment of attenuation of abdominal organs.

GI363-SD-TUA8  The Efficacy of MRI in the Diagnostic Workup of Cystic Fibrosis-Associated Liver Disease

Participants
Sarah Poetter-Lang, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Dina Muin, MD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Nina Bastati, MD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Dietmar Tamandl, MD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Jacqueline C. Hodge, MD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Ahmed Ba-Ssalamah, MD, Vienna, Austria (Presenter) Nothing to Disclose

PURPOSE

To evaluate the morphologic features of hepatobiliary disease in cystic fibrosis (CF) patients on gadoxetic acid-enhanced MRI.

METHOD AND MATERIALS

Forty-six CF patients, 24 females and 22 males (mean age 30.8), who underwent gadoxetic acid-enhanced MRI were included. Two radiologists assessed in consensus the MRI findings including the presence of fatty infiltration, liver fibrosis or cirrhosis, gallbladder and bile duct alterations. Furthermore, the volume of the liver and spleen, the signal intensity (SI) of the liver on in- and opposed- phase were measured. On post-contrast images, liver uptake intensity, contrast distribution and excretion were scored. These findings were compared to a control group of 30 age- and gender-matched patients. Additionally laboratory tests as well as clinical data, and when available histopathological results, were correlated with MRI findings.

RESULTS

The splenic volume was significantly higher in the CF-group compared to the control-group ($p<0.05$) while the liver volume did not differ significantly. The degree of steatosis, as well as periportal fat deposition, were significantly higher in the CF-group ($p<0.05$). Additionally, periportal tracking and bile duct abnormalities were detected significantly more often in the CF-group. Furthermore the number of gallbladder alterations was significantly higher in the CF-group. However the liver uptake of the gadoxetic acid as well as the hepatobiliary excretion did not differ significantly between the groups and in the majority of CF patients the laboratory parameters were not elevated.

CONCLUSION

Gadoxetic acid-enhanced MRI is an emerging tool to detect early hepatobiliary involvement in CF patients.

CLINICAL RELEVANCE/APPLICATION

Early detection of cystic fibrosis-associated liver disease (CFLD) is crucial since it impacts patient management and prognosis.

GI316-ED-TUA9  Small Bowel Gastrointestinal Stromal Tumors: Imaging and Clinical Correlates

Participants
Franco Verde, MD, Baltimore, MD (Presenter) Nothing to Disclose
Ralph H. Hruban, Baltimore, MD (Abstract Co-Author) Royalties, Myriad Genetics, Inc

TEACHING POINTS

Gastrointestinal Stromal Tumors (GIST) are uncommon mesenchymal neoplasms with predilection for duodenal, jejunal and ileal locations, in order of decreasing frequency. Malignant GIST must be suspected when greater than 5 cm and demonstrate necrosis. Metastatic disease may be present with locoregional adenopathy and hepatic disease.
TABLE OF CONTENTS/OUTLINE

Small Bowel Gastrointestinal Stromal Tumors (SB-GISTs)
A. History
   a. various terminology
   b. recent naming
B. Histopathology
   a. understanding the pathology report
   b. significance of histologic grade
   c. assigning risk assessment
C. MDCT
   a. Optimizing protocol
   b. Examples of duodenal GISTs
   c. Examples of jejunal GISTs
   d. Examples of ileal GISTs
D. Surgical approach per site
E. Prognosis
   a. according to risk assessment
   b. compared to gastric GISTs

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Elliot K. Fishman, MD - 2014 Honored Educator

GIZ03-ED-TUA10 Nodular Regenerative Hyperplasia of the Liver: A Regenerative Response to Longstanding Ischaemia-induced Injury

Station #10

Participants
Kelvin Cortis, MD, FRCR, Msida, Malta (Presenter) Nothing to Disclose
Sarah Aquilina, Naxxar, Malta (Abstract Co-Author) Nothing to Disclose
Adrian Mizzi, MD, Glasgow, United Kingdom (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

This educational exhibit aims to:
- Define Nodular Regenerative Hyperplasia (NRH) in radiological and histological terms
- Outline the underlying causes and possible complications
- Depict the radiological findings of NRH on various imaging modalities, including ultrasound, CT, MRI, and PET-CT.
- Compare and contrast NRH to the regenerative nodules seen in cirrhosis
- Present a differential diagnosis for NRH

TABLE OF CONTENTS/OUTLINE

A. Pathogenesis of NRH
B. Histological criteria for diagnosis: Wanless Criteria
C. Underlying causes classified into:
   - Pre-sinusoidal: large congenital porto-systemic shunts (including the Abernethy malformation), chronic portal vein thrombosis, portal vein agenesis
   - Sinusoidal: veno-occlusive disease, congenital hepatic fibrosis, rheumatological and autoimmune conditions, myeloproliferative and lymphoproliferative disorders, drugs (including chemotherapeutic agents)
   - Post-Sinusoidal: chronic Budd-Chiari syndrome, congestive heart failure
D. Multimodality imaging findings - arterialisation of RNH nodules as opposed to lack of arterial enhancement in regenerative nodules seen on a background of cirrhosis
E. Distinguishing NRH from focal nodular hyperplasia (FNH), hepatocellular adenoma or carcinoma, and cirrhosis
F. Possible complications: Non-cirrhotic portal hypertension, Hepatocellular carcinoma

GIZ07-ED-TUA11 Precancerous Lesions of the Pancreaticobiliary Pract: A Current Comprehensive Update

Station #11

Participants
Krishna Prasad Shanbhogue, MD, New York, NY (Presenter) Nothing to Disclose
Christine O. Menias, MD, Scottsdale, AZ (Abstract Co-Author) Nothing to Disclose
Srinivasa R. Prasad, MD, Houston, TX (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

To provide an update on epidemiology, natural history/biology, clinical, pathological and imaging findings of precancerous lesions of the pancreaticobiliary tract. To emphasize the current and future role of imaging in triaging the patients to 'surgical resection' versus 'surveillance'.

TABLE OF CONTENTS/OUTLINE

A. Current update on epidemiology, natural history/biology, and clinical manifestations of precancerous lesions of the pancreaticobiliary tract. Typical pathological and imaging features with emphasis on suspicious and worrisome imaging features of entities including but not limited to biliary and pancreatic intraepithelial neoplasia (BilIN/PanIN), Intraductal papillary neoplasms of bile duct and pancreas (IPNB/IPMN), mucinous cystic neoplasm (MCN), intraampullary and intracholecystic papillary tubular neoplasms (IAPN/ICPN), biliary papillomatosis and biliary hamartoma. Review of current international consensus criteria for management. Differential diagnosis and pitfalls in imaging diagnosis.

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Christine O. Menias, MD - 2015 Honored Educator
Srinivasa R. Prasad, MD - 2012 Honored Educator

G105-EB- Anatomic Variants of the Biliary Tree and Their Clinical Significance
TEACHING POINTS

1. To review the normal anatomy of the biliary tree.
2. To review common variants of biliary anatomy with a particular emphasis on their clinical relevance.
3. To gain insight into the importance of reporting clinically relevant biliary anatomic variants in order to minimize surgical and procedural complications.

TABLE OF CONTENTS/OUTLINE

1. Normal biliary anatomy
2. Common variants of biliary anatomy and their clinical relevance
   Incidence of biliary variants
   MRCP and ERCP examples of the most relevant variants
   Right posterior duct into common hepatic duct
   Right posterior duct into left hepatic duct
   Low insertion and medial course of the cystic duct
   Accessory bile duct (duct of Luschka)
3. Biliary complications following surgical, endoscopic, or percutaneous intervention
4. Importance of reporting certain variants of biliary anatomy prior to intervention in order to minimize complications
Useful CT Findings in the Differentiation between Autoimmune Pancreatitis and Pancreatic Cancer: Comparison of Diagnostic Performance Between Small and Large Lesions

Station #1

Participants:
Dushyant V. Sahani, MD, Boston, MA (Moderator) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc

Sub-Events:
GI364-SD-TUB1

**PURPOSE**
To investigate the diagnostic performance of CT findings both in small and large lesions.

**METHOD AND MATERIALS**
82 lesions of autoimmune pancreatitis (AIP) in 67 patients and 68 lesions of pancreatic cancer (PC) were selected and classified into 2 groups based on size (small group, <= 40 mm; large group, > 40 mm, respectively). The frequency of patchy enhancement area (PEA), capsule-like rim (CLR), homogeneous delayed enhancement (HDE), duct-penetrating sign (DPS), enhanced duct sign (EDS) and no main pancreatic duct upstream dilatation (NMPDD), was compared between AIP and PC, and calculated sensitivity, specificity and accuracy.

**RESULTS**
The frequency of PEA, CLR, HDE, and NMPDD was significantly higher in AIP than that in PC independently of lesion size. Accuracy of each finding in the small/large groups were as follows: PEA, 87.8%/95.0%; CPL, 73.3%/68.3%; HDE, 85.6%/91.7%; DPS, 70.0%/30%; EDS, 67.8%/19.0%; NMPDD, 78.9%/95.0%, respectively. Accuracy of PEA, HDE and NMPDD was over 85% independently of lesion size. Accuracy of the combined three findings in the small and large group was 95.6% and 86.7%, respectively.

**CONCLUSION**
PEA, HDE, and NMPDD were useful CT findings for the differentiation both in small and large lesions. In small lesions, combination of the three findings improved accuracy.

**CLINICAL RELEVANCE/APPLICATION**
Radiologists need to know which is the useful finding for differentiating small autoimmune pancreatitis from small pancreatic cancer to eliminate unnecessary surgical resection.

Quantitative Differential Enhancement Patterns on Dynamic and Hepatobiliary Phase MRI can Discriminate Hepatocellular Adenoma Genotypic Subtypes

Station #2

Participants:
Justin Tse, Cerritos, CA (Presenter) Nothing to Disclose
Bita Naini, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
David S. Lu, MD, Los Angeles, CA (Abstract Co-Author) Consultant, Medtronic, Inc Speaker, Medtronic, Inc Consultant, Johnson & Johnson Research Grant, Johnson & Johnson Consultant, Bayer AG Research Grant, Bayer AG Speaker, Bayer AG
Steven S. Raman, MD, Santa Monica, CA (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
To determine if quantitative contrast-enhanced MR imaging features can discriminate histologically-proven hepatocellular adenoma (HCA) genotypic subtypes.

**METHOD AND MATERIALS**
In this IRB and HIPAA compliant study, we reviewed MR imaging of 49 histologically-proven HCAs from 21 consecutive patients. Quantitative features included the measured lesion-to-liver signal intensity (SI) ratio on the pre-contrast (PC), arterial (art.), portal...
venous (PV), and hepatobiliary (HB) phases. A pathologist reviewed HCA tissues stained with genotypic subtype-specific markers. Imaging data were correlated with pathology findings and compared using student’s t-tests, with two-sided P values<0.017 considered for statistical significance. Data are presented as mean±standard deviation.

RESULTS

49 HCAs were classified into 14 inflammatory (inf.; 9 patients; age 41±13), 21 hepatocyte nuclear factor-1A-mutated (HNF1α; 6; 40±10), 1 β-catenin-activated (BCA; 1; 25), and 14 unclassified lesions (UC; 5; 39±12). Inf. lesions demonstrated a lesion-to-liver SI ratio of 0.95±0.15 (PC), 1.29±0.16 (art.), 1.13±0.10 (PV), and 0.73±0.18 (HB). SI ratios of HNF1α lesions were 0.80±0.17 (PC), 1.10±0.24 (art.), 0.80±0.17 (PV), and 0.47±0.18 (HB). SI ratios of the BCA lesion were 0.71 (PC), 0.89 (art.), 0.88 (PV), and 0.82 (HB). SI ratios of UC lesions demonstrated the least gain in SI ratio (0.15±0.19), compared to 0.33±0.10 (inf.; p=0.005), 0.31±0.19 (HNF1α; p=0.027), and 0.18 (BCA). Between the art. and PV phases, HNF1α lesions lost the most SI (-0.30±0.12), compared to -0.15±0.21 (inf.; p=0.01), -0.31±0.19 (UC; p=0.20), and -0.01 (BCA). Between PV and HB phases, inf. lesions lost the most SI (-0.56±0.35), compared to -0.26±0.08 (HNF1α; p=0.002), -0.40±0.25 (UC; p=0.4), and -0.05 (BCA).

CONCLUSION

HCA subtypes demonstrate phase-specific MRI features, and both their measured lesion-to-liver SI ratio and differential enhancement patterns may help noninvasively discriminate subtypes.

CLINICAL RELEVANCE/APPLICATION

Quantitative MRI may help noninvasively subtype HCAs and determine if patients should undergo imaging surveillance or surgery based on the HCA subtype.

PURPOSE

To evaluate ablated region volume decrease, progression time, recurrence rates and survival rates in patients with hepatocellular carcinoma (HCC) microwave ablation (MWA) comparing low frequency system (LF-MWA) (Covidien™ (Tyco, Colorado, USA; 915 MHz) vs. high frequency system (HF-MWA) (AMICA™, Aprilia, Italy; 2450 MHz).

RESULTS

Volume decrease after 6 months (70.52%), 12 months (73.67%) and 18 months (72.37%) was higher with LF-MWA vs. HF-MWA (6 months: 58.22%; 12 months: 66.97%; 18 months: 82.86%) but no statistically significant differences were documented at 3 and 24 months post ablation. Also no statistically significant differences were measured in stable disease. Recurrence rates were seen in HF-MWA vs. LF-MWA at 24 (p=0.018) months. With HF-MWA 4 lesions (p=0.102) were recurrent, with LF-MWA 8 lesions (p=0.266). The progression rate was significantly lower with HF-MWA (p=0.128) vs. LF-MWA (p=0.216). Median time to progression was 6.75 months with LF-MWA vs. 5.6 months with HF-MWA. Regarding survival, no statistically significant differences were documented at 1-, 2-, 3- and 4+ year survival rates. 2-year survival rate was 96.77% (30 of 31) for HF-MWA vs 91.3% (21 of 23) for LF-MWA, and 4-year survival rate was 87.99% (27 of 31) for HF-MWA vs 73.91% (17 of 23) for LF-MWA.

CONCLUSION

Both MWA generator systems are effective treatment methods for hepatocellular liver metastases with differences seen in ablated, recurrence rates and progression time. No difference was seen in volume decrease, stable response and survival rates between two different MWA systems.

CLINICAL RELEVANCE/APPLICATION

HF-MWA is superior to LF-MWA in patients with HCC.

PURPOSE

To evaluate radiation dose and image noise in abdominal spectral CT imaging with manual and automatic gemstone spectral imaging(GSI) protocol selection as compared with conventional 120kVp CT.
METHOD AND MATERIALS
This study received institutional review board approval, and all participants provided written informed consent. 71 patients underwent dynamic enhanced CT scans were divided into three groups based on the scanning phases. In group A, plain CT scan was performed with the mode of 120 kVp and automatic exposure control technique. According to the mA table of scout view, corresponding GSI scan parameters were manually selected for arterial phase (group B). With GSI-assist on and given noise index, GSI parameters were automatically selected for portal venous phase (group C). 65 keV monochromatic images with 5mm slice thickness were reconstructed for GSI enhanced series. Image noise of liver, muscle and fat; volume CT dose index (CTDlvol), effective dose (ED) were recorded and compared by the analysis of variance and bonferroni test among the three groups.

RESULTS
The CTDlvol and ED in group B (12.4mGy±5.2 and 8.2mSv±1.2) were lowest among the three groups (P=0.041, 0.037). No significant differences in CTDlvol and ED were showed between group A (14.5mGy±7.3 and 9.8mSv±1.4) and group C (15.7mGy±7.9 and 10.4mSv±1.7) (both P>0.05). The image noise of liver (10.1HU±1.0), muscle (11.1HU±1.6) and fat (8.8HU±0.9) in group A were higher than those in group B (7.9HU±0.9, 8.4HU±1.2 and 6.4HU±0.8) and group C (6.8HU±0.7, 7.6HU±1.3 and 7.0HU±0.9) (all P<0.05). Image noise of liver, muscle and fat between group B and group C showed no significant difference (P>0.05).

CONCLUSION
The radiation dose of conventional 120kVp scan and spectral CT scan with GSI assist mode was approximately equivalent, and both higher than that of manual GSI selection mode. Monochromatic images (65keV) from spectral CT with GSI assist mode or manual mode had lower image noise than conventional 120kVp images.

CLINICAL RELEVANCE/APPLICATION
Spectral CT with GSI assist mode is equivalent to conventional 120kVp mode in radiation dose and can reduce image noise. This mode is recommended in clinical as its easy operation.

Participants
Long Cui, MD, PhD, Shenyang, China (Presenter) Nothing to Disclose
Ke Ren, MD, ShenYang, China (Abstract Co-Author) Nothing to Disclose
Ke Xu, MD, Shenyang, China (Abstract Co-Author) Nothing to Disclose
Songbai Li, Shenyang, China (Abstract Co-Author) Nothing to Disclose

PURPOSE
To investigate the influence of 320-detector row CT using low tube voltage and iterative reconstruction algorithm on image quality and radiation dose.

METHOD AND MATERIALS
50 patients with lung cancer or breast cancer underwent 320-detector row CT, tracking no less than 3 scans for each patient. The scan was focused on the arterial phase only. The voltages for arterial phase were 80kV (group A), 120kV (group B), 100kV (group C) respectively, and other phases were adopted 120kV. Images were processed using both filtered back-projection (FBP) reconstruction algorithm (group B) and adaptive iterative dose reduction 3D (AIDR 3D) algorithm (group A, group C). The image quality was blindly evaluated using a 5-score classification system by two experienced radiologists. Noise of hepatic parenchyma, pancreas, stomach, and left erector muscle were measured. CNR of the three groups were calculated and compared. Independent samples t test or Mann-Whitney U test were used to compare the image quality of liver, pancreas, and stomach; then, χ² test were used to compare the radiation dose.

RESULTS
Compared with portal venous phase, the arterial phase mean effective radiation dose was 49.1% reduction in group A and 25.2% reduction in group C. There was no statistical difference in revealing rate of image quality scores and objective noise among the three groups (p>0.05). The noise of each organ of group B was higher than that of group A and group C. The CNR of liver and stomach among the three groups has no statistical difference (CNRhepA=1.52±0.94, CNRhepB=0.85±0.47, CNRhepC=1.20±1.21) (p>0.05), (CNRstaA=1.20±1.54, CNRstaB=0.68±0.41, CNRstaC=1.18±0.95) (p>0.05). But there was a trend that CNRhepA is higher than CNRhepB (p=0.053), and that CNRstaA is higher than CNRstaB (p=0.052). The CNR of pancreas of group B is lower than that of group A and C (CNRpanA= 3.13±1.65, CNRpanB= 1.19±0.58, CNRpanC= 2.33±1.32) (p<0.05).

CONCLUSION
Lowering tube voltage combined with AIDR 3D can reduce the effective radiation dose but maintain a comparable image quality to that using conventional reconstruction algorithm.

CLINICAL RELEVANCE/APPLICATION
Optimal voltage imaging can reduce the effective radiation dose without sacrificing the image quality and be a good choice for patient-care.

Participants
Jin Wang, Rochester, MT (Presenter) Nothing to Disclose
Kevin J. Glaser, Rochester, MN (Abstract Co-Author) Intellectual property, Magnetic Resonance Innovations, Inc; Stockholder, Resoundant, Inc
Tianhui Zhang, Guangzhou, China (Abstract Co-Author) Nothing to Disclose
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Meng Yin, Rochester, MN (Abstract Co-Author) The Mayo Clinic and Meng Yin have intellectual property rights and a financial interest in MRE technology.
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Richard L. Ehman, MD, Rochester, MN (Abstract Co-Author) CEO, Resoundant, Inc; Stockholder, Resoundant, Inc; Research Grant, Resoundant, Inc

**PURPOSE**

To assess the success rate of 4 different spin-echo-based (SE) 2D/3D MRE sequences in patients with different liver iron concentration (LIC), using MR IDEAL-IQ to measure the liver R2* value as a surrogate for LIC.

**METHOD AND MATERIALS**

This study was approved by the IRB of the third affiliated Hospital of SYSU, Guangdong, China. 1269 patients were enrolled between April 2014 and February 2015. The study group had a mean age of 45 years (range: 10-85 years), were mostly male (n=980), and the majority had chronic hepatitis B. All patients were imaged using a 3T scanner and underwent the IDEAL-IQ scan for R2* measurement. 246 patients also underwent 4 different SE-based MRE acquisitions, including 2D/3D MRE using a standard 2D SE-EPI acquisition, and 2D MRE using SE-EPI and SE (non-EPI) acquisitions with a shorter TE for iron-overloaded tissue. 20 patients were excluded due to incomplete data, loose or disconnected MRE driver or breath-hold artifacts. Liver R2* was recorded by one radiologist (XHZ). The quality of the 4 MRE acquisitions were assessed by one experienced radiologist (JW) and one experienced engineer (KJG) who reviewed the images and determined if the MRE analysis was a “success” or “failure” and the reason for any failures.

**RESULTS**

The incidence of R2* values<100Hz, 100-200Hz, 200-400Hz and > 400Hz is 86.2%, 10.9%, 2.6%, and 0.32% in 1269 patients, respectively. The prevalence of patients who had elevated R2* (≥ 100 Hz) was 13.8% (175/1269) in the full cohort and 10.6% (24/226) in the MR patients. The two “iron-overload” MRE sequences succeeded in all patients who had R2* ≥ 100 Hz, but failed in one patient with R2*<100 Hz due to ghosting artifacts (1/202, 0.5%). The two “standard” MRE sequences succeeded in all patients with R2*<100 Hz, but failed in only two patients with R2* ≥ 100Hz due to low SNR (2/24, 8.3%).

**CONCLUSION**

The failure rate for the “standard” MRE sequences due to low SNR was 8.3%. The “iron-overload” MRE sequences had a 100% success rate for patients with R2* ≥ 100 Hz. These results suggest that these 4 SE-based MRE sequences can have a very high success rate in a clinical environment.

**CLINICAL RELEVANCE/APPLICATION**

Future work will include validation of hepatic fibrosis measurements in iron-overloaded livers using these techniques at 3.0T.

**G1I43-ED-TUB8**

Complex Morbidity - Perianal Fistulae And Involvement Of External Genitalia: MR Imaging Findings And Significance Of Fistulogram

Station #8

Participants
Srilehar Devu, Hyderabad, India (Abstract Co-Author) Nothing to Disclose
Umamahesh Matapathi, MD, MBBS, Hyderabad, India (Abstract Co-Author) Nothing to Disclose
Pritheam Panthangal, Hyderabad, India (Abstract Co-Author) Nothing to Disclose
Kranthi K. Marathu, MBBS, Hyderabad, India (Presenter) Nothing to Disclose
Rajani Sharath, Hyderabad, India (Abstract Co-Author) Nothing to Disclose
Ralabandi Kumar, MBBS, Hyderabad, India (Abstract Co-Author) Nothing to Disclose

**TEACHING POINTS**

The intention of the exhibit : 1.To understand the anal sphincter and pelvic anatomy. 2.To describe the perianal tract(s) morphology including , tract’s course, relation to external and internal anal sphincters, extension into adjacent organs and internal opening into anal canal. 3.To evaluate the significance of MR fistulogram in preoperative delineation of perianal tracks. 4.To characterise the anterior extension of inflammatory changes and tracks into genitalia. 5.To establish a classification of perianal fistula involving genitalia and other anterior structures.

**TABLE OF CONTENTS/OUTLINE**

Normal MR pelvic anatomy Anal Sphincter Mechanism MR Imaging and Significance of Fistulogram Anterior Extension in Males: Involvement of Urinary bladder,Prostate, Seminal Vesicles, Root of scrotum and Root of Penis. Anterior Extension in Females: Involvement of Urinary bladder, Cervix, Vagina and Labia Majora. Representative cases New Classification system

**G1208-ED-TUB9**

Current Concepts in Molecular Genetics and Management Guidelines for Pancreatic Cystic Neoplasms: An Essential Update for Radiologists

Station #9

**Awards**

Certificate of Merit

Participants
Matthew H. Kulzer, MD, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Anil K. Dasyam, MD, Pittsburgh, PA (Presenter) Nothing to Disclose
Alessandro Furlan, MD, Pittsburgh, PA (Abstract Co-Author) Author, Reed Elsevier; Research Grant, General Electric Company
Aatur Singh, MD, PhD, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Venkata S. Katabathina, MD, San Antonio, TX (Abstract Co-Author) Nothing to Disclose
Matthew T. Heller, MD, Pittsburgh, PA (Abstract Co-Author) Consultant, Reed Elsevier; Author, Reed Elsevier

TEACHING POINTS
- Review classification of pancreatic cystic neoplasms (PCN) - Illustrate the multimodality imaging appearances of common and uncommon pancreatic cystic lesions - Review current concepts in molecular genetics of pancreatic cystic neoplasms - Review current management guidelines for pancreatic cystic neoplasms

TABLE OF CONTENTS/OUTLINE
IntroductionRole of various imaging modalities in evaluation of PCN- Strengths of each imaging modality in evaluation of key phenotypical characteristics of PCNClassification of PCNClinical, imaging and pathological features of each cystic neoplasmCurrent concepts in Molecular Genetics of PCN- Molecular markers for each cystic neoplasm- Implications of each molecular marker (KRAS, GNAS, p53, PIK3, CTNNB1, VHL mutation, PTEN, etc) in establishing the diagnosis and prognosis (e.g. KRAS and GNAS help in diagnosis of IPMN but p53 indicates high likelihood of adenocarcinoma in IPMN)- Current status and future directionCurrent Management Guidelines- International consensus guidelines for management of intraductal papillary mucinous neoplasms and mucinous cystic neoplasms of the pancreas (2006)- American Gastroenterological Association Institute Guideline on the Diagnosis and Management of Asymptomatic Neoplastic Pancreatic Cysts (Apr 2015)

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/
Venkata S. Katabathina, MD - 2012 Honored Educator

GI310-ED- TUB10 Imaging Following Radiologically Inserted Gastrostomy: Complications and Normal Findings
Station #10

Participants
Laura Ward, MBBS, London, United Kingdom (Presenter) Nothing to Disclose
Shahrooz Mohammadi, MBBS, London, United Kingdom (Abstract Co-Author) Nothing to Disclose
Lakshri A. Ratnam, MBChB, London, United Kingdom (Abstract Co-Author) Nothing to Disclose
Graham Munneke, London, United Kingdom (Abstract Co-Author) Nothing to Disclose
Michael Gonsalves, MBBS, London, United Kingdom (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Radiologically inserted gastrostomy (RIG) is a widely used method for providing nutritional support in the medium and long term in patient who cannot tolerate sufficient oral intake. Radiologist should be familiar with the possible complications that may be encountered and their appearances on cross sectional imaging and fluoroscopy. Understand the normal fluoroscopic and cross-sectional appearances post RIG insertion. Be aware of the incidence, types and presentation of post RIG complications. Know the imaging appearance of post RIG complications including; Peritonitis and peri-RIG leak Trans-colonic insertion of gastrostomy Intraperitoneal displacement of RIG

TABLE OF CONTENTS/OUTLINE
Introduction; Indications for RIG insertion Types and incidence of complications Basic overview of the insertion technique Imaging appearances of Peri-RIG leak Imaging appearances of a trans-colonic RIG Intraperitoneal displacement of a RIG Gastric Haemorrhage Conclusion

GI017-EB- TUB Virtual Colonoscopy Checklist
Hardcopy Backboard

Participants
David J. Vining, MD, Houston, TX (Presenter) Royalties, Bracco Group; CEO, VisionSR; Stockholder, VisionSR

TEACHING POINTS
Practitioners of virtual colonoscopy (VC) anticipate that the United States Preventative Services Task Force (USPSTF) will update its recommendations for colorectal cancer screening in favor of VC in 2015, thus heralding an increase in the number of exams being performed in the US. Attention to detail is essential for achieving optimal VC results. In the spirit of Atul Gawande's The Checklist Manifesto, the use of a checklist to follow required steps while performing VC is beneficial for nurses, technologists, and radiologists.

TABLE OF CONTENTS/OUTLINE
Check the prep. Snug the plug. Opacify the water. Pass the gas. Distend the colon. Vent the patient. Drop the balloon. Verify distention and coverage.
Case-based Review of Nuclear Medicine: PET/CT Workshop-Cancers of the Abdomen and Pelvis (In Conjunction with SNMMI) (An Interactive Session)

Tuesday, Dec. 1 1:30PM - 3:00PM Location: S406A

LEARNING OBJECTIVES

1) Identify the utility of PET CT in staging a wide variety of primary and recurrent GI, GU and gynecological cancers. 2) Differentiate patterns of physiological FDG uptake from pathologic processes. 3) Explain the importance of CT correlation for selected cancer subgroups. 4) Describe the role of PET CT in assessing patient response to radiation therapy and chemotherapy, including early assessment and PET influenced treatment strategies.
LEARNING OBJECTIVES

1) Identify the limitations of abdominal radiographs in necrotizing enterocolitis. 2) Describe sonographic findings in necrotizing enterocolitis. 3) Define the role of sonography in necrotizing enterocolitis.

ABSTRACT

Necrotizing enterocolitis (NEC) is a relatively common disease affecting neonates, especially preterm infants, but can also be seen in term neonates. Despite the progress in neonatal medicine, it remains associated with significant morbidity and mortality, with reported death rates up to 20-30%. Traditionally, neonatal NEC has been imaged with abdominal radiographs, and in fact radiographic findings are part of the Bell staging clinical criteria. Radiographic assessment mainly relies in the evaluation of the bowel gas pattern and in the detection of extraluminal gas. However, most of the radiographic findings are indirect signs of bowel involvement in NEC or its complications and are not always present even in severe cases. Sonography, which can be done by the bedside and without the need of radiation, has the advantage that allows direct visualization of the bowel wall and can assess for the presence of pneumatosis, changes in wall echogenicity, wall thickening, peristalsis and even wall perfusion, including hyperemia and decrease or absent vascularity, all of which can be signs of NEC. Sonography also allows direct visualization of the peritoneal cavity and may detect complex free fluid and localized fluid collections, more often associated with complicated NEC. Furthermore, sonography may also detect portal venous gas and pneumoperitoneum, the latter indicative of bowel perforation. Therefore, sonography may provide information not available on radiographs and aid in the diagnosis of NEC and detection of complications. For example, sonography may allow diagnosis of bowel necrosis before perforation occurs and pneumoperitoneum becomes evident on abdominal radiographs thus facilitating early intervention. In summary, sonography has at least a complementary role to radiographs and its use may affect management of patients with neonatal NEC and possibly their outcome.

RESULTS
NIR signal was detected from the location of gastro-intestinal (GI) tract. Animals that developed NEC showed stronger signal than those that did not go on to develop NEC. Figure 1.C shows representative images from a NEC positive and NEC negative animal.

CONCLUSION

The promising results from this preliminary study suggest that NIR optical imaging can aid in early detection of NEC.

CLINICAL RELEVANCE/APPLICATION

NEC is an inflammatory disease of the gastro-intestinal tract that affects pre-term infants. Early detection is critical to reducing mortality. This study reports an NIR imaging method that could be used for early detection of NEC. This technique eliminates the use of radiation, and is conducive to imaging within the NICU, and without the need for sedation.

PURPOSE

The purpose of this study was to establish the effectiveness of a staged ultrasound (US) and magnetic resonance imaging (MRI) algorithm for the diagnosis of pediatric appendicitis.

METHOD AND MATERIALS

A staged imaging algorithm using US and MRI in pediatric patients with suspected appendicitis was implemented at our institution on January 1, 2011, with US as the initial modality, followed by MRI when US findings were equivocal. A search of the radiology database revealed 2180 pediatric patients who underwent imaging for suspected appendicitis, 1,982 (90.9%) of whom were evaluated according to our established imaging algorithm. A review of the electronic medical record (EMR) of all patients was performed. All imaging reports were reviewed and classified as positive, negative or indeterminate/equivocal for appendicitis, and correlated with surgical and pathology reports.

RESULTS

The prevalence of appendicitis in our patient population was 20.5% (407/1982). Ultrasound alone was performed in 1905 patients (96.1%), yielding sensitivity of 98.7% and specificity of 97.1% for appendicitis. An additional 77 patients underwent MRI following equivocal US, yielding an overall staged imaging algorithm sensitivity of 98.2% and specificity of 97.1%. 0.35% of patients experienced false negative results under the staged protocol. The negative predictive value of the staged protocol was 99.5%.

CONCLUSION

A staged protocol of US and MRI for pediatric appendicitis is effective. Our study demonstrates a staged protocol of US and MRI has a sensitivity of 98.2% and specificity of 97.1% for appendicitis in pediatric patients.

CLINICAL RELEVANCE/APPLICATION

We believe staged protocol of US and MRI could supplant other imaging protocols for pediatric appendicitis. Additionally, staged US and MRI is an effective algorithm to assess pediatric appendicitis without the use of ionizing radiation.

PURPOSE

MRI is increasingly employed as a diagnostic modality for suspected appendicitis in children. However, there is discrepancy as to which MRI sequences are sufficient for safe, timely, and accurate diagnosis. We hypothesized that diffusion weighted imaging (DWI) in conjunction with T2-weighted sequences are sufficient for diagnosis.

METHOD AND MATERIALS

All MRI examinations (n=112) performed at our institution for the evaluation of appendicitis in children were retrospectively collected for re-evaluation. Exams were re-read by blinded pediatric radiologists first as non-contrast exams, including T2-weighted and DWI sequences, then secondly as contrast exams, including T1-weighted contrast enhanced sequences. Samples were scored as positive, negative, or equivocal for appendicitis, or non-visualized appendix. Findings were compared to pathologic or clinical data in the medical record.

RESULTS

The sensitivity (with contrast: 1.0, without contrast: 1.0) and specificity (with: 1.0, without: 0.98) of the exams were not significantly different. However, the percentage of nondiagnostic scans was higher for noncontrast exams (with: 26.1%, without: 37.7%). To test the role of contrast in improving certainty of interpretation, nondiagnostic without contrast scans were re-read...
with addition of contrast sequences. With addition of contrast sequences, the number of equivocal scans was reduced from 10 to 2 (80% RR, 9.1% AR) and the number of non-visualized appendix scans was reduced from 23 to 15 (35% RR, 9.1% AR).

**CONCLUSION**

In the evaluation of appendicitis in children, non-contrast MRI examinations provide similar sensitivity/specificity to contrast-enhanced examinations, however, the number of nondiagnostic studies is higher without contrast. We propose a scanning algorithm whereby an exam is initialized as a noncontrast study and reviewed by a radiologist for diagnostic quality prior to contrast administration, if necessary. With this approach, fewer children will receive intravenous contrast without deterioration in overall diagnostic quality.

**CLINICAL RELEVANCE/APPLICATION**

MRI diagnosis of acute appendicitis can be performed without contrast for most patients; injection of contrast can be reserved for only those patients with nondiagnostic noncontrast imaging.

**RC413-05 Shear-wave Elastography for Evaluation of Clinically Significant Portal Hypertension and Hepatic Fibrosis in Children**

Tuesday, Dec. 1 3:50PM - 4:00PM Location: S102AB

Participants
Hee Mang Yoon, MD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Young Ah Cho, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Ah Young Jung, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jin Seong Lee, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Chong Hyun Yoon, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To evaluate the correlation among the liver stiffness (LS) measured by shear wave elastography (SWE), clinically significant portal hypertension (CSPH), and degree of hepatic fibrosis in children with liver diseases.

**METHOD AND MATERIALS**

We evaluated 38 consecutive pediatric patients (mean age, 9.7±4.6 years) who underwent ultrasound SWE and transjugular liver biopsy with hepatic venous pressure gradient (HVPG) measurement between June 2012 and March 2015. The patients had various liver diseases. Clinical and laboratory data were retrospectively collected. CSPH was defined as a HVPG ≥ 10 mmHg. Hepatic fibrosis was evaluated based on METAVIR classification of fibrosis. Linear regression analysis was performed to correlate LS with clinically significant PHT. Kruskal-Wallis test was conducted to correlation between LS and degree of hepatic fibrosis. Diagnostic performance of predicting clinically significant PHT and degree of hepatic fibrosis were assessed based on receiver operating characteristic (ROC) curve.

**RESULTS**

LS showed moderate to strong positive correlation with HVPG (r=0.603, p<0.001). On multivariate analysis, LS was a significant associated factor for diagnosis of CSPH (OR =1.275, p =0.009). The area of under the curve (AUC) for predicting CSPH was 0.839 (p<0.001) and the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for an LS cutoff value of 19.7 kPa were 77.8%, 93.1%, 77.8%, and 93.1%, respectively. There was a significant positive correlation between hepatic fibrosis and LS (p=0.007). The AUC for predicting advanced hepatic fibrosis (METAVIR stage, F3 or F4) was 0.845 (p<0.001) and the sensitivity, specificity, PPV and NPV of an LS cutoff value of 16.2 kPa were 78.6%, 87.5%, 78.6% and 87.5%, respectively.

**CONCLUSION**

LS exhibited significant correlation with HVPG and hepatic fibrosis. Cutoff values for predicting CSPH and advanced hepatic fibrosis were 19.7 kPa and 16.2 kPa , respectively.

**CLINICAL RELEVANCE/APPLICATION**

Measurement of LS using SWE can be used for noninvasive assessment and monitoring of CSPH and hepatic fibrosis in pediatric patients with various liver diseases.

**RC413-06 US Elastography of Liver and Bowel in Children**

Tuesday, Dec. 1 4:00PM - 4:20PM Location: S102AB

Participants
Jonathan R. Dillman, MD, Ann Arbor, MI, (jonathan.dillman@cchmc.org) (Presenter) Research support, Bracco Group; Research support, Siemens AG

**LEARNING OBJECTIVES**

1) Compare and contrast the different US elastography techniques that can be used in children. 2) Apply US elastography to the evaluation of the pediatric abdomen.

**ABSTRACT**

Multiple forms of ultrasound (US) elastography are available on state-of-the-art clinical ultrasound systems. In general, these techniques are based on either strain or shear wave imaging, and they can easily be performed in children. The basic physics behind each type of US elastography will be explained, and specific advantages and disadvantages will be discussed. Applications of US elastography in the evaluation of the pediatric abdomen will be presented, including assessment of the liver (e.g., for detection of parenchymal fibrosis) and bowel (e.g., for detecting fibrosis within segments of intestine affected by Crohn's disease). Recently published investigations related to US elastography in pediatric populations will be highlighted.
The purpose of this study was to evaluate differences in perfusion of undescended testes (UDT) compared with normal testes in young children using this technique.

METHOD AND MATERIALS

Participants

C. Matthew Hawkins, MD, Decatur, GA (matt.hawkins@emory.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the spectrum of pediatric hepatobiliary disorders in which invasive imaging is required (using vascular and nonvascular interventional techniques). 2) To describe important hepatobiliary disorders where IR plays a central role in patient management (hepatic vascular malformations, vascular shunts, transplant issues). 3) To emphasize collaboration and communication between clinicians, diagnostic and interventional radiology in managing pediatric hepatobiliary disease.

RC413-08 Accuracy of Multi-echo Magnitude-based MRI Proton Density Fat Fraction to Estimate Longitudinal Change in Hepatic Steatosis in Children with Known or Suspected Non-alcoholic Fatty Liver Disease Using MRS as Reference

Tuesday, Dec. 1 5:00PM - 5:10PM Location: S102AB

Participants

Elhamy R. Heba, MBBCh, MD, San Diego, CA (Presenter) Nothing to Disclose
Kevin A. Zand, MD, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Omid Yeganeh, MD, La Jolla, CA (Abstract Co-Author) Nothing to Disclose
Tanya Wolfson, MS, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Gavin Hamilton, PhD, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Jeffrey B. Schwimmer, MD, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Claude B. Sirlin, MD, San Diego, CA (Abstract Co-Author) Research Grant, General Electric Company; Speakers Bureau, Bayer AG; Consultant, Bayer AG ;

PURPOSE

To assess the accuracy of magnitude-based MRI (M-MRI) proton density fat fraction (PDFF) to estimate hepatic steatosis longitudinal change for two to six echoes in children with known or suspected non-alcoholic fatty liver disease (NAFLD), using magnetic resonance spectroscopy (MRS) as reference.

METHOD AND MATERIALS

This IRB-approved, HIPAA-compliant, single center, retrospective, longitudinal analysis included children with at least two MR visits between 2008 and 2011. Two-dimensional, spoiled gradient-echo unenhanced M-MRI was used to estimate hepatic PDFF. Low flip angle (10°) and repetition times of 120 to 270 ms were used to minimize T1 dependence. To correct for T2* decay, six nominally in- and out-of-phase echoes were obtained. Single-voxel MR spectra (STEAM) were analyzed by an experienced MR spectroscopist (8 cm3 voxel size, right lobe of liver away from artifact and vessels, long TR to avoid T1 dependence, five echoes to permit T2 correction, AMARES algorithm and jMRUI platform for analysis). Three circular regions of interest were placed on fifth-echo MR images on three consecutive slices co-localized to MRS voxel location, and propagated to images for the other echoes. M-MRI estimated PDFF was calculated for each visit from the first two to six echoes using a custom Matlab algorithm. M-MRI PDFF accuracy was assessed by Bland-Altman analysis and linear regression modeling of change in MRS PDFF vs. change in M-MRI PDFF, for each M-MRI method (two to six echoes).

RESULTS

Seventy-two children (158 MR examinations) were included in this analysis (50 M, 22 F; mean body mass index 33.6 ± 6.0 kg/m2; range 46.1 to 23.2 kg/m2). Regression analysis showed close agreement between change in M-MRI PDFF and change in MRS across all methods, with slope and intercept ranges for two to six echoes of 1.02 - 1.04 and 0.008 - 0.017%, respectively (close to the slope and intercept of the identity line), and R2 ranging from 0.93 to 0.95.

CONCLUSION

In comparison to MRS, M-MRI PDFF using two to six echoes provides an accurate estimate of hepatic steatosis change in children with known or suspected NAFLD.

CLINICAL RELEVANCE/APPLICATION

M-MRI PDFF may be used to evaluate hepatic steatosis changes in children since it shows strong agreement with MRS PDFF.

RC413-09 Superb Microvascular Imaging for the Detection of Parenchymal Perfusion in Undescended Testes in Young Children

Tuesday, Dec. 1 4:40PM - 5:00PM Location: S102AB

Participants

Mi-Jung Lee, MD, PhD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Yong Seung Lee, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Myung-Joon Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Hyun Joo Shin, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

PURPOSE

Superb Microvascular Imaging (SMI) is a novel, highly sensitive technique that can detect low velocity microvascular flow. The purpose of this study was to evaluate differences in perfusion of undescended testes (UDT) compared with normal testes in young children using this technique.

METHOD AND MATERIALS

Participants

Hyun Joo Shin, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

METHOD AND MATERIALS

This IRB-approved, HIPAA-compliant, single center, retrospective, longitudinal analysis included children with at least two MR visits between 2008 and 2011. Two-dimensional, spoiled gradient-echo unenhanced M-MRI was used to estimate hepatic PDFF. Low flip angle (10°) and repetition times of 120 to 270 ms were used to minimize T1 dependence. To correct for T2* decay, six nominally in- and out-of-phase echoes were obtained. Single-voxel MR spectra (STEAM) were analyzed by an experienced MR spectroscopist (8 cm3 voxel size, right lobe of liver away from artifact and vessels, long TR to avoid T1 dependence, five echoes to permit T2 correction, AMARES algorithm and jMRUI platform for analysis). Three circular regions of interest were placed on fifth-echo MR images on three consecutive slices co-localized to MRS voxel location, and propagated to images for the other echoes. M-MRI estimated PDFF was calculated for each visit from the first two to six echoes using a custom Matlab algorithm. M-MRI PDFF accuracy was assessed by Bland-Altman analysis and linear regression modeling of change in MRS PDFF vs. change in M-MRI PDFF, for each M-MRI method (two to six echoes).

RESULTS

Seventy-two children (158 MR examinations) were included in this analysis (50 M, 22 F; mean body mass index 33.6 ± 6.0 kg/m2; range 46.1 to 23.2 kg/m2). Regression analysis showed close agreement between change in M-MRI PDFF and change in MRS across all methods, with slope and intercept ranges for two to six echoes of 1.02 - 1.04 and 0.008 - 0.017%, respectively (close to the slope and intercept of the identity line), and R2 ranging from 0.93 to 0.95.

CONCLUSION

In comparison to MRS, M-MRI PDFF using two to six echoes provides an accurate estimate of hepatic steatosis change in children with known or suspected NAFLD.

CLINICAL RELEVANCE/APPLICATION

M-MRI PDFF may be used to evaluate hepatic steatosis changes in children since it shows strong agreement with MRS PDFF.
We prospectively performed testicular ultrasonography including Power Doppler Imaging (PDI) and SMI in young children. The diagnosis of UDT or normal testes was determined according to physical examination by experienced pediatric urologists. Testicular size, volume, and microvascular flow for each testis were evaluated by both PDI and SMI. Microvascular flow was categorized into four grades: grade 0, no detectable intratesticular flow; grade 1, one or two focal areas of flow; grade 2, one linear or more than two focal areas of flow; and grade 3, more than one linear flow. Statistical analysis was performed to compare the differences between descended and normal testes.

RESULTS

We imaged 40 testes from 20 boys (age, 2-29 months). Eleven boys had normal testes, seven had unilateral UDT, and two had bilateral UDT. The mean age was younger in boys with UDT (7.8 vs. 15.9 months, p < 0.001). Testis sizes and volumes were similar between the 29 normal and 11 UDT. However, SMI, but not PDI, detected differences in flow grades between the groups (p < 0.001). In univariate analysis, age (odds ratio [OR], 0.629; p = 0.012) and low grade flow on SMI (OR of grade 0, 51.886 with p < 0.001 and OR of grade 1, 14.29 with p = 0.017) were associated with UDT. These parameters were also significant in multivariate analysis (area under the curve, 0.892).

CONCLUSION

This study demonstrated decreased perfusion in the UDT in young children using SMI, which can be helpful for visualizing microcirculation and informing prognosis.

CLINICAL RELEVANCE/APPLICATION

Superb Microvascular Imaging (SMI) can demonstrate microcirculation that cannot be detected using conventional Doppler imaging in young children with undescended testes.

RC413-10  **Assessment of Pediatric Hydronephrosis via Quantitative Ultrasound Imaging**

Participants
Juan Cerrolaza, PhD, Washington, DC (Abstract Co-Author) Nothing to Disclose
Nora Lee, Washington, DC (Abstract Co-Author) Nothing to Disclose
Craig A. Peters, MD, Washington, DC (Abstract Co-Author) Nothing to Disclose
Marius G. Linguraru, DPhil, MS, Washington, DC (Presenter) Nothing to Disclose

PURPOSE

To create new ultrasound (US) based quantitative imaging (QI) biomarkers of pediatric hydronephrosis (HN) to identify thresholds of safety for the hydronephrotic renal units where diuretic nuclear renography could be avoided.

METHOD AND MATERIALS

The retrospective dataset (IRB approved) consists of 50 patients (mean age 9.6 months; range 0-168 months) of variable severity (grade 1 to 4 according to the Society for Fetal Urology HN scale (SFU-HS)) with concurrent renal 2DUS imaging and diuretic renography (MAG-3). Mean differential uptake was: 49% (range 14-100%). Mean washout half time (T1/2) was: 37.3 min. (range 3 to >120 min.). Manual segmentation of renal parenchyma (RP) and collecting system (CS) was performed for calibration and algorithm development. 131 morphological parameters were computed (e.g. RP and CS size, curvature). Based on these parameters, machine learning techniques (support vector machines) were used to identify critical cases based on different T1/2 thresholds that would be clinically relevant at 20, 30 and 40 min. A best-fit model was derived for each threshold using optimal morphological parameters to categorize the renal units and receiver operating characteristic curve analysis was performed. For comparison similar thresholding was performed using the SFU-HS and the HN Index (HI).

RESULTS

For T1/2 thresholds of 20, 30 and 40 min. and at 100% sensitivity, the specificities were QI: 94, 70 and 74%, SFU-HS: 0, 39 and 33%, and HI: 52, 47, and 62%, respectively. Area under the curve values were QI: 0.98, 0.94 and 0.94, SFU-HS: 0.74, 0.78 and 0.88, and HI: 0.77, 0.78, and 0.80, respectively. The improvement obtained by the QI method was statistically significant (p < 0.05 in all the cases using McNemar's statistical test).

CONCLUSION

QI analysis of renal US allows to identify thresholds of clinically significant T1/2 with 100% sensitivity and clinically acceptable specificity. This technology can potentially and safely reduce the number of MAG-3 scans between 50 and 62%.

CLINICAL RELEVANCE/APPLICATION

QI analysis of renal US demonstrates higher diagnostic power than SFU-HS and HI, having the potential to provide robust assessment of HN non-invasively, minimizing the use of ionizing tests and reducing clinical cost.

RC413-11  **Comparison of Contrast-enhanced Voiding Urosonography (ceVUS) in Infants and Children Using Optison to Conventional Fluoroscopic Voiding Cystourethrography (VCUG): Preliminary Results**

Participants
Carol E. Barnewolt, MD, Boston, MA (Presenter) Nothing to Disclose
Jeanne S. Chow, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Catherine Stamoulis, PhD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Harriet J. Paltiel, MD, Boston, MA (Abstract Co-Author) Equipment support, Koninklijke Philips NV

PURPOSE

ceVUS is a radiation-free technique currently used in some European centers for diagnosis of vesicoureteral reflux (VUR) in children, but has not been adopted in the USA. There are no reports on the use of Optison, a second-generation US contrast agent available in the USA, for diagnosis of VUR. This study compares our early experience using Optison for ceVUS to conventional VCUG.
METHOD AND MATERIALS

We retrospectively reviewed 48 patients who underwent ceVUS with Optison immediately followed by VCUG for evaluation of fetal hydronephrosis (24), febrile UTI (16), solitary functioning kidney (5), urethral valves (2) and family history of VUR (1). 24 males and 24 females ranged in age from 2 days-10 years, median 5 months, (25th, 75th) quartiles (1.0, 11.5 months). Optison doses ranging from 0.125-1.25 cc were injected into 250 cc of saline and instilled via gravity through a urethral catheter into the bladder. Image clips of bladder, ureters and kidneys were obtained during bladder filling and voiding. Patients voided around the catheter and transperineal urethral images were obtained. A conventional VCUG was then performed. Studies were reviewed for presence of VUR. VUR grading for ceVUS was into the ureter (1), renal collecting system (2), upper tract dilation (3); for VCUG the International Grading system (I-V) was used.

RESULTS

No adverse events related to Optison occurred. Optimal visualization of the urethra, bladder and upper tracts during ceVUS was achieved with a contrast dose of 0.15 cc. Urethral images were obtained in 40/48 patients, with urethral anatomy well shown in all 40 (21M, 19F). Both studies were negative for VUR in 77/96 kidneys (80%), both positive in 7/96 (7%). In 12/96 (13%), ceVUS was positive and VCUG was negative. VUR by ceVUS was grade 1 (0), grade 2 (8), grade 3 (11). VUR by VCUG was grade I (0), grade II-III (2), grade IV-V (5). Compared to VCUG, ceVUS had a sensitivity for detection of VUR of 100% and specificity of 86%.

CONCLUSION

ceVUS with Optison was easily performed and well tolerated, with high sensitivity and relatively high specificity for diagnosis of VUR compared to VCUG, but without the need for ionizing radiation.

CLINICAL RELEVANCE/APPLICATION

The high-sensitivity, safety, and ease of performance of ceVUS using the US contrast agent Optison has the potential to largely replace conventional fluoroscopic VCUG for diagnosis of VUR which requires exposure to ionizing radiation. Further study is needed.

Participants
Ethan A. Smith, MD, Ann Arbor, MI (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Have a broad understanding of causes of hypertension in children. 2) Understand the basic pathophysiology behind renin-mediated hypertension. 3) Be familiar with the different imaging modalities available to evaluate suspected renin-mediated hypertension and to understand the advantages and limitations of these modalities.

ABSTRACT

Unlike adults, hypertension in children is most commonly secondary to an underlying condition. Renovascular hypertension accounts for between 5-10% of cases of pediatric hypertension and presents clinically with significantly elevated blood pressure, usually refractory to multiple medications. Renovascular hypertension is also associated with a variety of genetic syndromes, including neurofibromatosis type 1 and Williams syndrome. In patients with clinically suspected renovascular hypertension, imaging is employed to confirm the diagnosis, to characterize the renovascular abnormality and to guide surgical or endovascular therapy. Ultrasound with Doppler is the most frequently used initial imaging test, but has historically been thought to be unreliable due to suboptimal sensitivity and specificity. Computed tomography angiography (CTA) and magnetic resonance angiography (MRA) are both useful in the evaluation of suspected renovascular hypertension in adults, but may be less useful in children due to the frequency of intra-renal vascular abnormalities in children which are difficult to resolve with non-invasive imaging. Catheter-based digital subtraction angiography remains the gold standard imaging test because of its superior temporal and spatial resolution, allowing for excellent visualization of both extra-renal (aorta, main renal artery) and intra-renal vascular lesions. It is important for the diagnostic radiologist to understand the differences between pediatric and adult renovascular hypertension, and to understand the strengths and weaknesses of the different imaging modalities available, in order to help guide the treatment of these patients.
**SSJ07-01 Reproducibility of Magnetic Resonance Enterography Scores for the Assessment of Disease Activity in Crohn’s Disease Using Central Readers**

**Participants**
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- Cynthia S. Santillan, MD, San Diego, CA (Abstract Co-Author) Consultant, Robarts Clinical Trials Research Group
- Stuart A. Taylor, MBBS, London, United Kingdom (Abstract Co-Author) Research consultant to Robarts plc
- Karin van Gemert-Horsthuis, MD, Amsterdam, Netherlands (Abstract Co-Author) Nothing to Disclose
- Barrett G. Levesque, MD, San Diego, CA (Abstract Co-Author) Nothing to Disclose
- Brian Feagan, London, ON (Abstract Co-Author) Nothing to Disclose

**Purpose**
To evaluate the reproducibility of two MRE disease activity instruments, the MaRIA and London indices, when centrally read by four expert gastrointestinal body imaging radiologist readers in a multi-center trial setting.

**Method and Materials**
Four central reader radiologists at different centers in Europe and North America reviewed 50 MRE sequences of patients with a spectrum of Crohn's disease activity and location. Readers assessed the MaRIA and London indices, pre-specified individual MRE findings, and a global rating of severity based on a visual analogue scale (VAS). Intraclass correlation coefficients (ICCs) for intra- and inter-rater agreement were calculated for each assessment.

**Results**
Intra-rater ICCs (95% confidence intervals) for the MaRIA, London, London Extended indices and the VAS were 0.89 (0.84 to 0.91), 0.84 (0.76 to 0.88), 0.81 (0.71 to 0.85) and 0.86 (0.81 to 0.90). Corresponding inter-rater ICCs were 0.71 (0.61 to 0.77), 0.50 (0.32 to 0.62), 0.56 (0.40 to 0.64), and 0.71 (0.62 to 0.77). The correlation between each reader’s VAS and the MaRIA, London, and London Extended indices were 0.79 (0.71 to 0.85), 0.68 (0.58 to 0.77) and 0.67 (0.58 to 0.76), respectively. These results indicate that there was "almost perfect" intra-rater reproducibility of centrally read MaRIA and London indices. Inter-rater agreement was "substantial" for the MaRIA and "moderate" for the London indices.

**Conclusion**
The MaRIA index appears to have the best operating characteristics which further supports its implementation as an instrument for use in clinical trials.

**Clinical Relevance/Application**
Magnetic resonance enterography (MRE) will likely be increasingly utilized in clinical trials to improve Crohn's disease (CD) patient selection and because it may be more responsive to clinically important changes in inflammatory status than either symptom-based or endoscopic instruments. Reproducibility is a critical property of MRE CD activity indices if they are to be used as outcome measures in clinical trials.

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**SSJ07-02 Genetic Polymorphisms Associated with MR Enterography Imaging Features of Crohn’s Disease**

**Participants**
- Cinthia Cruz, MD, Boston, MA (Presenter) Nothing to Disclose
- Abra Guo, Boston, MA (Abstract Co-Author) Nothing to Disclose
- James H. Thrall, MD, Boston, MA (Abstract Co-Author) Board Member, Mobile Aspects, Inc; Board Member, WorldCare International Inc; Consultant, WorldCare International Inc; Shareholder, Antares Pharma, Inc; Shareholder, iBio, Inc; Shareholder, Peregrine Pharmaceuticals, Inc
- Vijay Vajnik, MD,PhD, Boston, MA (Abstract Co-Author) Nothing to Disclose
- Michael S. Gee, MD, PhD, Jamaica Plain, MA (Abstract Co-Author) Nothing to Disclose

**Purpose**
To evaluate for associations between genetic loci related to Crohn’s disease (CD) behavior and imaging features of disease.

**Method and Materials**
IRB approved HIPAA compliant single institution study of 76 patients with established CD who underwent MRE for disease evaluation. Scans were performed from 2009-2015 on a 1.5T clinical scanner using standard MRE protocol with oral and intravenous...
RESULTS

31 females and 22 males were analyzed (mean age 40 years ranging 20-83). Activity was classified as active in 37(70%), chronic in 8 (15%), and normal in 8(15%) patients; behavior was classified as inflammatory(1) in 27 (60%), structuring(S) in 6(13%), and fistulizing(F) in 12(26%) patients; mean length of involvement was 14.9 +/- 3.6 cm. Out of 168 SNP tested, the highest incidence was observed for IL23(100%) followed by PTNP22(91%) and IL31RA IL6ST(74%). HLA and CARD9(20%) were both observed in patients with active disease on imaging with a highly significant association (p<0.009). IL31R IL6ST showed a significantly lower incidence in chronic disease (p=0.03). Among MRE imaging features, HLA and CARD9 mutations were both significantly associated with BWT (p=0.02), with ME and T2 also significant (p=0.04). MAP3K8 and TNFR showed a significantly higher association with F disease (p<0.001) and (p=0.03) with evidence of abscess (4/37).

CONCLUSION

Multiple SNPs are associated with CD activity observed on MRE, with HLA and CARD9 significantly associated with active disease, fistulizing behavior and presence of abscesses. BWT, ME, and T2 are individual imaging features showing significant genetic associations.

CLINICAL RELEVANCE/APPLICATION

CD patient genotype impacts on imaging phenotype depicted by MRE.

SS307-03 Bowel Imaging with PET/MR Enterography: First Results

Participants

Karsten J. Beiderwellen, MD, Essen, Germany (Presenter) Speaker, Siemens AG; Speaker, Bracco Group
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PURPOSE

To evaluate hybrid PET/MR enterography for the diagnostic assessment of intestinal pathologies.

METHOD AND MATERIALS

43 patients with Crohn's Disease, bowel malignancies or fever of unknown origin (female: n=20, male: n=23, age: 51±13 years [20-74 years]) underwent PET/MR enterography (Biograph mMR, Siemens) with either [18F]FDG (n=34) or [68Ga]-DOTATOC (n=9). For small bowel distension 1500 ml of oral contrast solution containing mannitol and locust bean gum were ingested. PET was acquired as list mode for 8 min per bed. The MR protocol encompassed: a) coronal TrueFISP; b) coronal T2w HASTE with fat saturation; c) coronal T1w 3D VIBE pre and post gadolinium; d) axial and coronal T1w 2D FLASH post-gadolinium. Datasets were evaluated regarding co-registration of anatomical structures based on a 3-point ordinal scale (3: good co-registration, 2: slight misregistration, 1: significant misregistration) and image quality using a 4-point scale (1: non-diagnostic - 4: excellent quality). Furthermore, visualization of intestinal and extraintestinal pathologies was described.

RESULTS

PET/MR enterography resulted in a high overall image quality (mean score MRI: 3.3, PET: 2.4) with good results for PET and MRI co-registration (mean: 2.5 - 2.9). An excellent visualization of small and large bowel pathologies was achieved including inflammatory lesions (in 18 patients) as well as malignant lesions (in two patients). Furthermore, extraintestinal pathologies such as lymph node metastases (in two patients) were identified.

CONCLUSION

Integrated PET/MR enterography represents a technically robust examination allowing for good co-registration of bowel structures.

CLINICAL RELEVANCE/APPLICATION

The new method enables a multimodal assessment of bowel lesions in inflammatory as well as malignant disease. The simultaneous data acquisition might be of advantage in the interpretation of PET/MR in comparison to independently acquired PET and MRI data sets due to potential bowel motion artifacts and different patient positioning.

SS307-04 High Radiation Exposure in Symptomatic Crohn's Disease Patients and the Need for Reduction in Utilization of CT Imaging

Participants

Dorothy Tamayo-Murillo, MD, Dorchester, MA (Presenter) Nothing to Disclose
Alessandra Sax, Boston, MA (Abstract Co-Author) Nothing to Disclose
Christina Jeong, BS, MS, Boston, MA (Abstract Co-Author) Nothing to Disclose
Yu Chen, Boston, MA (Abstract Co-Author) Nothing to Disclose
Patients with Crohn's disease are at risk of high radiation exposure, particularly from CT imaging. Symptomatic Crohn's patients are often scanned repeatedly due to broad differential diagnoses associated with the presenting complaint. While CT is a valuable tool in the assessment of Crohn's disease and its complications, we must be cognizant of its overutilization. Herein, we evaluated the utilization rate and indications for CT imaging of Crohn's patients at our institution.

METHOD AND MATERIALS

We performed a retrospective chart review of 100 consecutive Crohn's disease patients who received a CT scan from 2000 to 2015. All incidences of radiation from CT imaging were noted. The total and average number of CT scans were tallied. CT scans were categorized by indication; the total number of normal studies was also obtained.

RESULTS

100 patients with Crohn's disease were evaluated, 53 female and 47 male, a mean age of 48, with a range of 22 to 88 years. In this study population 491 CT scans were performed. The indications for the imaging studies included assessment of nonspecific abdominal or pelvic pain (46.8%), evaluation of suspected Crohn's flares or Crohn's related complications (30.5%), surgical complication or surgical follow up (9.5%), flank pain (5.2%), trauma (0.4%), or other (7.6%). In this population, the average number of CT scans performed was 4.9, with a range of 1 to 23. A total of 43 patients received => 5 CTs, 12 received => 10 CTs, 4 received => 15 CTs and 2 received => 20 CTs. Of the 491 CT scans performed, 135 (27.5%) were reported as normal or with stable chronic changes related to the patients underlying Crohn's disease.

CONCLUSION

The average number of CT scans per patient in this population approached 5 scans with a maximum of 23 scans in a single patient. Prior studies have shown that radiation above 50mSv (~5 CT scans) increases the risk of cancer, which is particularly pertinent for the Crohn's patient population. Of the scans performed a significant proportion were recorded as normal or with stable chronic changes from Crohn's disease, thus not providing a cause for the patient's symptoms.

CLINICAL RELEVANCE/APPLICATION

Our findings elucidate there is considerable room for reducing the use of CT imaging in symptomatic Crohn's patients, given the significant number of scans with normal or stable chronic findings.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Jorge A. Soto, MD - 2013 Honored Educator
Jorge A. Soto, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2015 Honored Educator

SSJ07-05 Head-to-head Prospective Evaluation of Small Bowel Distension and Patient Tolerance of a New Enteric Contrast Agent for Enterography

Tuesday, Dec. 1 3:40PM - 3:50PM Location: E353A

Participants

Amy B. Kolbe, MD, Rochester, MN (Presenter) Nothing to Disclose
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Jeff L. Fidler, MD, Rochester, MN (Abstract Co-Author) Research Grant, Beekley Corporation
Joel G. Fletcher, MD, Rochester, MN (Abstract Co-Author) Grant, Siemens AG;

PURPOSE

To evaluate a new mannitol and sorbitol-containing flavored beverage (FB) as an enteric contrast agent for enterography compared to commercially available low Hounsfield barium sorbitol suspension (BS) for side effects, patient taste and willingness to repeat the exam, and small bowel distension.

METHOD AND MATERIALS

10 normal subjects ingested 5 different drinking algorithms on separate days (FB2: 1000 mL FB + 350 mL water; FB3: 1500 mL FB; BS2: 900 mL BS + 450 mL water; BS3: 1350 mL BS + 150 mL water; W3: 1500 mL water), with agents ingested over 45 minutes. Coronal SSFSE images were obtained through the bowel at 50 and 60 minutes following initiation of drinking. Subjects completed a questionnaire evaluating side effects, patient taste and willingness to repeat the exam. GI radiologists evaluated MR images using qualitative and quantitative scores for the jejunum, mid-ileum, and terminal ileum, blinded to imaging algorithm and time. Radiologists then ranked algorithms in order of preference based on distension of enteric contrast-filled bowel. Analyses were performed using ANOVA, pairwise Fisher's LSD, with p-values reporting overall significance of the 5 algorithms.
RESULTS

There was no significant difference in nausea or vomiting among regimens (p=0.20 and 0.42), but FB3 and V3 resulted in mild cramping (p=0.001). Using a 10 point scale, subjects rated taste of BS2 (mean=3.9) and BS3 (4.7) worst (p < 0.0001). Willingness to repeat drinking algorithm was highest for FB2 (9.8) and W3 (9.7) (p<0.05). There were significant overall differences in subjective small bowel distention for 2/3 readers (p=0.003, p<0.02), with both W3 regimens ranked significantly worse (Figure). For quantitative analyses, there was no significant difference in the diameter of the most distended small bowel loop for any segment or reader (p>0.23), with one reader identifying smaller representative loop diameters for W3 in the jejunum and ileum (p<0.03).

CONCLUSION

FB has a similar side effect profile and results in equivalent small bowel distention compared with BS. Normal subjects rated taste and willingness to repeat the exam with the new FB agent significantly higher.

CLINICAL RELEVANCE/APPLICATION

By improving taste and maintaining side effect profile and small bowel distention, a new flavored beverage oral contrast agent with sorbitol can result in improved willingness to undergo repeat enterography exams.

SSJ07-06  IBD Plus CTE Equals a New Equation for Disease Diagnosis

Tuesday, Dec. 1 3:50PM - 4:00PM Location: E353A

Participants
Jamaal Benjamin, MD, PhD, Dallas, TX (Presenter) Nothing to Disclose
Cecelia Brewington, MD, Dallas, TX (Abstract Co-Author) Nothing to Disclose

PURPOSE

The purpose of this study is to harness our expanding understanding of the basic mechanisms of Inflammatory Bowel Disease (IBD) in order to develop more accurate and useful avenues of molecular imaging and Crohn’s disease diagnosis.

METHOD AND MATERIALS

A cohort of 82 Crohn’s disease (CD) patients who underwent endoscopy and CT enterography (CTE) was examined for 5 predetermined CT findings - mural hyperenhancement, bowel wall thickening, increased mural fat attenuation, mural stratification and combs sign and 5 predetermined lab measurements - fecal calprotectin, fecal lactoferrin, C-reactive protein (CRP), fecal elastase and serum IgA. For Fecal Calprotectin (FC) a lab value of 16 (mcg/g) or less were set as 16, CRP of 5 (mg/L) or less were set as 5 and Stool elastase (SE) of 500 (μg/g) or more were set as 500. Relationships between the variables and whether there was Active IBD were evaluated. Fisher’s exact tests were performed on discrete variables while Wilcoxon rank sum tests were performed on continuous variables

RESULTS

Of the 5 evaluated clinical lab values, fecal calprotectin (FC) and CRP were the most useful predictors of active IBD. Both FC and CRP demonstrated statistically significant smaller median values in non-active IBD than active IBD. Utilizing logistic regression models and ROC curves, we determined threshold cutoff values of 142 (mcg/g) for FC and 5.4 (mg/L) for CRP. Following determination of individual variable threshold values, we then combined the two and developed the following predictive algorithm: If FC < 142 and CRP < 5.4 then categorize the case as “No IBD”; Otherwise categorize as “Yes IBD”. Utilizing this algorithm, the sensitivity for active IBD was 92.86%, specificity was 77.78%, PPV of 86.67%, NPV of 87.57% and an accuracy of 86.96%.

CONCLUSION

This work demonstrates that combining CTE and clinical labs can be a powerful tool in the diagnosis of IBD, and that the most useful lab values in CT enterography evaluation of IBD cases are fecal calprotectin and CRP. Therefore, we propose all CT enterography should also include evaluation of FC and CRP for specific numerical thresholds when considering IBD in the differential diagnosis.

CLINICAL RELEVANCE/APPLICATION

CTE findings for IBD are difficult to interpret, therefore, a methodology for incorporating clinical lab values with CTE findings is critical for accurate initial diagnosis and disease surveillance.
Low Dose Gemstone Spectral CT Imaging in Abdominal Patients: Evaluation of Whether the Virtual Non-enhanced Images from Contrast-enhanced Spectral CT Could Replace True Non-enhanced for Radiation Dose Reduction

Participants
Vahid Yaghmai, MD, Chicago, IL (Moderator) Nothing to Disclose
Mannudeep K. Kalra, MD, Boston, MA (Moderator) Nothing to Disclose

METHOD AND MATERIALS
Images of 50 consecutive adults (36 males and 14 females, ages: 21-79 years) who underwent 3-phase abdominal CT were retrospectively analyzed. TNE CT was performed with conventional 120kVp. The contrast-enhanced scans in arterial phase (AP) and portal venous phase (VP) were performed with low dose spectral CT mode. VNE images were generated from AP (VNEA) and VP (VNEP) spectral CT images. 2 board-certified radiologists reviewed both TNE and VNE images for image quality and lesion detection. Mean CT value, signal-noise-ratio (SNR) and contrast-noise-ratio (CNR) for liver, pancreas, spleen, kidney and muscle were measured. Lesion detection rate, subjective image rating and radiation dose were assessed and compared.

RESULTS
Both TNE and VNE images satisfied clinical needs for lesion detection and image quality. The image quality scores were 4.78±0.47, 4.56±0.76 and 4.68±0.59 for TNE, VNEA and VNEP, respectively with no difference. There was no difference for the lesion detection rate (number) with the plain CT scan (66.8% (135), 63.4% (128) and 65.8% (133), respectively) (p>0.05). CT number (in HU) in liver, pancreas, spleen, kidney and muscle were, respectively, (52.00±7.38, 34.00±6.41, 46.35±5.59, 30.03±4.48 and 45.56±7.80) on TNE, (53.01±6.13, 35.99±6.73, 49.74±5.74, 31.91±3.86 and 44.22±7.10) on VNEA and (56.17±5.87, 36.60±7.12, 50.94±4.55, 32.61±3.66, and 46.03±6.92) on VNEP. There was slight bias for CT numbers on VNE. However, the absolute CT number difference between VNE and TNE was less than 5HU, with the largest at VP for the spleen. VNEA had better CT number fidelity with the smallest difference for the liver. CNR values in 3 groups were similar. VNE images provided statistically higher SNR. The potential dose reduction for replacing TNE with VNE was 30.12%.

CONCLUSION
VNE image generated from the contrast-enhanced abdominal low dose spectral CT provides adequate image quality for lesion depiction, high CT number fidelity and 30% dose reduction compared with TNE.

Evaluation of Contrast Enhancement and Image Quality: A Comparison Study between Different Tube Voltages and Iodine Concentrations in Upper Abdominal Dynamic CT Scans in Minipigs

Participants
Maoqing Hu, Guangzhou, China (Abstract Co-Author) Nothing to Disclose
Zaiyi Lu, Guangzhou, China (Presenter) Nothing to Disclose
Chang Hong Liang, MD, Guangzhou, China (Abstract Co-Author) Nothing to Disclose
Xiao Mei Lu, MMed, Shenyang, China (Abstract Co-Author) Nothing to Disclose

PURPOSE
To investigate the enhanced effects of abdominal vessels and liver parenchyma and the image quality in abdominal dynamic CT
METHOD AND MATERIALS

Six minipigs underwent repeated upper abdominal dynamic enhanced CT scans (256-slice CT scanner) under 4 protocols: group A (270 mgI/mL, 80kVp + iterative reconstruction (IR, iDose4) algorithm), group B (370 mgI/mL, 80kVp + IR algorithm), group C (270 mgI/mL, 120kVp + FBP algorithm), group D (370 mgI/mL, 120kVp + FBP algorithm). The total iodine dose (600 mg I/kg) and iodine delivery rate (0.92 mg I/s) of injected contrast agents were the same in all groups. The enhanced attenuations of abdominal aorta, portal vein and liver parenchyma were measured and the image noise, SNR and CNR in peak enhancement of liver parenchyma were determined. The subjective image quality was evaluated by two radiologists.

RESULTS

There were no significant differences in peak enhanced attenuations of abdominal aorta, portal vein and liver parenchyma between 80kVp groups or 120kVp groups respectively (all P >0.05), the attenuations of vessels in 80kVp were significantly higher than in 120kVp (all P <0.05). There were no significant differences in image noise, SNR and CNR of liver parenchyma between groups (all P >0.05). The subjective image quality scores were no significant difference.

CONCLUSION

Different concentrations of iodinated contrast agents given an injection protocol with the same iodine delivery rate and total iodine dose achieved the same enhancement of the abdominal vessels and liver parenchyma, 80 kVp with IR (iDose4) algorithm acquired acceptable image quality.

CLINICAL RELEVANCE/APPLICATION

The injection protocols and bolus characteristics of iodinated contrast agent should be optimized to achieve best enhancement and reduce radiation dose meanwhile.

SSJ08-03 Objective Image Quality and Detectability of Simulated Low-Contrast, Low-Attenuation (LCLA) Liver Lesions on CT without and with an Integrated Circuit (IC) Detector and Iterative Reconstruction (IR): Effect of Radiation Exposure and Subject Size

Tuesday, Dec. 1 3:20PM - 3:30PM Location: E352

Participants
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Mark E. Baker, MD, Cleveland, OH (Abstract Co-Author) Research Consultant, Bracco Group; Researcher, Siemens AG; Research support, Siemens AG

PURPOSE

To assess image quality and LCLA liver lesion detection in semi-anthropomorphic phantom using either discrete circuit (DC) detector and FBP or IC detector and IR at varied radiation exposures and phantom diameters

METHOD AND MATERIALS

A phantom without and with 5-cm thick fat-mimicking ring (30- and 40-cm diameters) and containing liver inserts with 4 spherical lesions was scanned with 5 exposure settings [30-cm phantom:200 (CTDVol 13.5 mGy), 150, 100, 50, and 25 eff mAs; 40-cm phantom:400 (CTDVol 26.9 mGy), 300, 200, 100, and 50 eff mAs] on two CT scanners, one equipped with DC and other with IC detector. Images were reconstructed with FBP and IR (SAFIRE;S3) respectively. Image noise and lesion CNR were averaged at each exposure. Four radiologists evaluated lesion presence on a 5-point diagnostic confidence scale. Data analyses included ROC curve analysis, and noninferiority analysis (margin -0.10)

RESULTS

Image noise was significantly lower with IC-IR than with DC-FBP (P < .001) with greater reduction in 40-cm phantom and at lower exposures. Lesion CNR was significantly higher with IC-IR than with DC-FBP (P < .001). When compared to DC-FBP at highest exposures, mean reader accuracy with IC-IR was noninferior up to 50% (100 eff mAs) and 25% (300 eff mAs) exposure reductions for 30- and 40-cm phantoms respectively (adjusted P < .001 and P = .04). IC-IR improved readers' confidence in presence of a lesion (average difference 0.17 points) (P = .029) independent of phantom size or exposure level. At any given exposure level, however, there was no significant difference between mean AUCs with IC-IR and DC-FBP for either of 2 phantoms.

CONCLUSION

Moderate exposure reductions maintained non-inferior diagnostic accuracy for both detector-reconstruction combinations. Lesion detection in 40-cm phantom was inferior at smaller exposure reduction than in 30-cm phantom. IC-IR improved objective image quality and lesion detection confidence but did not result in superior diagnostic accuracy

CLINICAL RELEVANCE/APPLICATION

Impact of noise-reduction on threshold radiation exposure below which diagnostic information may be lost depends on the combination of patient size and imaging task. LCLA lesion detectability in simulated patients with larger girths is more sensitive to increased noise at reduced radiation exposures than in simulated smaller patients. Task-specific measures are critical in determining the clinical utility of newer noise-reduction technologies.
Comparison of Attenuation Based Automated versus Empirical Method for Tube Voltage Selection in Abdominal-pelvic CT Examinations

Tuesday, Dec. 1 3:40PM - 3:50PM Location: E352

Participants
Li Ye, Dalian, China (Presenter) Nothing to Disclose
Ailian Liu, MD, Dalian, China (Abstract Co-Author) Nothing to Disclose
Shifeng Tian, Dalian, China (Abstract Co-Author) Nothing to Disclose
Yijun Liu, Dalian, China (Abstract Co-Author) Nothing to Disclose
Jinghong Liu, MD, PhD, Dalian, China (Abstract Co-Author) Nothing to Disclose
Ting Zhang, Da Lian, China (Abstract Co-Author) Nothing to Disclose

PURPOSE
To investigate the use of low tube voltage and adaptive statistical iterative reconstruction (ASIR) algorithm to improve image quality and diagnostic confidence for tumor blood arteries under low contrast medium concentration.

METHOD AND MATERIALS
Fifty-eight patients (body mass index (BMI) ≤ 22 kg/m²) with suspected gastrointestinal tract malignant tumors CT scans were randomly divided into two groups. Group A (21 men and 11 women, ages 40-90 years) was scanned with 80kVp and low concentration of contrast medium (270mgI/ml) and reconstructed with 50% ASIR. Group B (22 men and 4 female, ages 40-76 years) underwent scanning with conventional 120 kVp and high concentration of contrast medium (350 mgI/ml). CT value and standard deviation (SD) of the tumor blood supplying artery and fat in anterior abdominal wall were measured, and contrast-to-noise ratio (CNR) and value were calculated. Image quality was evaluated by two radiologists using a 5-point rating scale. The inter-observer agreement was estimated by using weighted kappa statistics and Intra-class correlation coefficients (ICC) test. Image quality scores were compared by the Mann-Whitney U test. The paired Student t tests was used to compare the difference in CT value, SD value, CNR and CT dose index (CTDIfv) value between group A and B.

RESULTS
There was no difference in sex, age, BMI between two groups. The subjective image quality score of tumor blood supplying arteries of group A was better than that of group B (4.7 Vs. 4.3) with very good inter-observer agreement (Kappa value>0.80; ICC value>0.75). The CT value and CNR of group A (249.76±41.51HU and 9.31±1.89) were higher than those of group B (249.76±41.51HU and 9.31±1.89) (all P<0.001). The CTDIfv of group A (5.24±1.15 mGy) was lower than that of group B (13.47±4.73 mGy) (P<0.001).

CONCLUSION
For patients with BMI ≤22 kg/m², the low tube voltage and low contrast medium concentration scanning with 50% ASiR algorithm can reduce radiation dose and contrast medium concentration without sacrificing image quality.

CLINICAL RELEVANCE/APPLICATION
Low tube voltage with 50% ASiR algorithm may be used for CT angiography of slim patients with adequate image quality to dramatically reduce radiation and contrast dose.

SSJ08-05 Comparison of Attenuation Based Automated versus Empirical Method for Tube Voltage Selection in Abdominal-pelvic CT Examinations

Tuesday, Dec. 1 3:40PM - 3:50PM Location: E352

Participants
Faezeh Sodagari, MD, Chicago, IL (Presenter) Grant, Siemens AG
Adeel R. Seyer, MD, Chicago, IL (Abstract Co-Author) Grant, Siemens AG
Atilla Arslanoglu, MD, Chicago, IL (Abstract Co-Author) Grant, Siemens AG
Cecil G. Wood III, MD, Chicago, IL (Abstract Co-Author) Nothing to Disclose
Vahid Yaghmai, MD, Chicago, IL (Abstract Co-Author) Nothing to Disclose

PURPOSE
To compare the performance of attenuation based automated tube voltage (kV) selection software with known empirical method for kV selection in abdominal-pelvic CT examinations.

METHOD AND MATERIALS
The study was HIPAA compliant and IRB approved. Eighty patients who underwent abdominopelvic CT examinations were included in the study. All patients were scanned on the same CT scanner using automated kV selection. Lateral-width of the patient was determined and patients were grouped based on their lateral-widths. Each lateral width group corresponded to an optimal kV (lateral-width based kV selection). Comparison was made between the kV selected using the automated selection software and the optimal kV based on lateral-widths.

RESULTS
Attenuation based automated kV selection resulted in a lower optimal tube potential in 32 out of 80 (40%) patients when compared with kV selection based on patient lateral-width (P<0.0001). None of the patients were scanned with a higher kV using automated selection. Agreement between the two methods of kV selection was fair (κ-coefficient=0.28, 95% CI: 0.15 - 0.41).

CONCLUSION
Attenuation based automated tube voltage selection may be a more effective method for radiation dose reduction when compared to tube voltage selection based on patient width.

CLINICAL RELEVANCE/APPLICATION
Attenuation-based automated tube voltage selection allows greater reduction in radiation dose compared to empirical methods.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying
SSJ08-06  Application of kV Assist Associated with Adaptive Statistical Iterative Reconstruction (ASiR) in Reducing Radiation Dose of Hepatic Enhanced CT Scan

Tuesday, Dec. 1 3:50PM - 4:00PM Location: E352

Participants
Qingguo Wang, Shanghai, China (Presenter) Nothing to Disclose

Purpose
To evaluate the impact of kV assist associated with ASiR on dose and image quality in hepatic enhanced CT scan.

Method and Materials
This study included 46 patients who underwent CT angiography for upper abdomen using a 64-row CT scanner (GE Discovery CT750 HD). Patients were divided into two groups using kV assist technique. Group A (n=23, BMI: 20.72±2.37) and group B (n=23, BMI: 22.31±1.82) underwent CT scan with 120kVp and low tube kVp (≤100kVp), respectively. Data of group B were reconstructed with a fixed blending level (50% and 0% respectively) of ASiR for each image set. The baseline was 120 kVp, noise index (NI)=12.0(5mm). The CT values of abdominal fat layer, aorta (AR) and liver were measured. The contrast noise ratio (CNR) of AR and SMA were calculated respectively. The CT dose index volume (CTDvol) of each patient were recorded. The dose length product (DLP) was recorded and effective radiation dose was calculated.

Results
The mean CTDIvol and effective radiation dose in group B (6.06 ±2.80mGy, 2.31 ±1.06mSv) were significantly lower than group A (9.26±4.69mGy, 3.81 ±2.31mSv) (p<0.05). The mean CT value of liver in group A (70.33±8.09Hu) was not significantly different with that in group B (50% ASiR) (73.82±10.83Hu) and group B (0% ASiR) (73.94±10.80Hu) (each p>0.05), respectively. The SD value of subcutaneous fat in group A (8.17±1.49HU) was lower than group B (50% ASiR) (9.57±1.59HU) (p<0.05). The CNR of liver (16.64±3.66) in group B (50% ASiR) was not significantly different with that in group A (18.99±3.75) (p<0.05). The SNRs of liver in group B (50% ASiR) (9.33±2.07) were higher than in group A (7.57±1.61) (p<0.05).

Conclusion
KV assist recommended optimal scan protocol, and approximately 39% radiation dose was reduced without degradation of image quality.

Clinical Relevance/Application
KV assist helps to improve patient care through personalized protocols and simplify scan technique optimization.
**SSJ09**

**Gastrointestinal (Liver Fat and Fibrosis)**

Tuesday, Dec. 1 3:00PM - 4:00PM Location: E350

**Participants**
Frank H. Miller, MD, Chicago, IL (Moderator) Nothing to Disclose
Donald G. Mitchell, MD, Philadelphia, PA (Moderator) Consultant, CMC Contrast AB

**Sub-Events**

**SSJ09-01 MR Elastography of the Liver: Comparison of GRE and EPI Sequences**

Tuesday, Dec. 1 3:00PM - 3:10PM Location: E350

**Participants**
Mathilde Wagner, MD, PhD, Paris, France (Presenter) Nothing to Disclose
Temel K. Yasar, New York, NY (Abstract Co-Author) Nothing to Disclose
Cecilia Besa, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Jad M. Bou Ayache, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Octavia Bane, PhD, New York, NY (Abstract Co-Author) Nothing to Disclose
Maggie M. Fung, MEng, Bethesda, MD (Abstract Co-Author) Employee, General Electric Company
Bachir Taouli, MD, New York, NY (Abstract Co-Author) Consultant, Guerbet SA

**PURPOSE**

To compare 2D-GRE (gradient recalled echo) liver MR-Elastography (MRE) with 2D-SE-EPI (echoplanar imaging) MRE in terms of image quality (IQ) and liver stiffness (LS) measurements.

**METHOD AND MATERIALS**

36 patients with chronic liver disease or focal liver lesion (M/F:23/13, mean age 57.8 y) who underwent 3T liver MRI (MR750, GE) using 2D-GRE and 2D-SE-EPI liver MRE were enrolled in this single-center IRB approved study. Both sequences were acquired in the axial plane, with 4 slices (same location), 10 mm thickness, a 60Hz mechanical motion, similar FOV (2D-GRE: TR/TE 50/20, 256x80, 60 MEG frequency, ASSET 2 / SE EPI: TR/TE 1000/55.4, 80x80, 155Hz MEG frequency, ASSET 2). Scan time for EPI MRE was 4 sec and 14 sec for GRE MRE (for each slice). One radiologist placed ROIs in the liver parenchyma for measurements of LS (kPa). ROIs were drawn as large as possible, avoiding voxels with less than 95% confidence level on the confidence map, large vessels, parenchyma edge and fissures. IQ scores were assessed by a second radiologist using a four-point scale (0: no observable wave propagation/no confidence map; 3: excellent wave propagation in liver/confidence map covering more than 50% of liver slice). Mean LS values and IQ scores between EPI and GRE MRE were compared using Wilcoxon test. Reproducibility of LS between these two sequences was assessed with intraclass coefficient correlation (ICC), coefficient of variability (CV) and Bland-Altman limits of agreement (BALA).

**RESULTS**

In 4 patients, GRE MRE completely failed while there was no case of failure with EPI MRE. IQ scores were significantly higher using EPI versus GRE MRE(score 14.4 vs 8.6, P<0.0001). ROI size was significantly higher using EPI than GRE MRE (56.06 cm² vs. 14.47 cm², P<0.0001). LS measurements were not significantly different between the EPI and GRE MRE (3.41±1.36 kPa vs 3.42±1.56 kPa, P=0.51), were significantly correlated (ICC=0.908, P<0.0001) and showed a high reproducibility (mean CV=10.2% (0.2-28.2), bias=0.09±0.63 kPa (BALA[-1.15;1.32]).

**CONCLUSION**

IQ scores of EPI MRE were significantly higher than GRE MRE, with faster acquisition and equivalent measurements. Larger ROI in EPI MRE allows more comprehensive liver sampling.

**CLINICAL RELEVANCE/APPLICATION**

GRE MRE is the most common approach for LS assessment. EPI MRE performs superior in terms of IQ and liver coverage with less breath-holds. This approach might improve the performance of MRE.

**SSJ09-02 Associations between Nonalcoholic Fatty Liver Disease (NAFLD) Histologic Features and Magnetic Resonance Elastography (MRE)-estimated Liver Stiffness in Adults without Fibrosis**

Tuesday, Dec. 1 3:10PM - 3:20PM Location: E350

**Participants**
Alexandra A. Schlein, BS, San Diego, CA (Presenter) Nothing to Disclose
Chun Chieh K. Luo, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Kang Wang, PhD, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Paul Manning, MSc, La Jolla, CA (Abstract Co-Author) Nothing to Disclose
Jonathan C. Hooker, BS, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Catherine A. Hooker, BS, San Diego, CA (Abstract Co-Author) Nothing to Disclose
William Haufe, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Tanya Wolfson, MS, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Anthony Ganster, PhD, San Diego, CA (Abstract Co-Author) Nothing to Disclose
Kevin J. Glaser, Rochester, MN (Abstract Co-Author) Intellectual property, Magnetic Resonance Innovations, Inc; Stockholder, Resoundant, Inc
A liver biopsy followed by histopathological assessment is a common approach for staging liver fibrosis. However, a biopsy can account for when MRE is used to estimate fibrosis in adult patients.

METHOD AND MATERIALS

In this IRB approved study, adults receiving standard-of-care liver biopsy for NAFLD were consented and underwent MRE at 3T within 180 days of biopsy. MRE was performed using three methods (2D at 60 Hz, 3D at 40 Hz, and 3D at 60 Hz), from which MRE-estimated liver stiffness values were calculated. Histologic features were scored based on NASH CRN criteria; subjects with histologically-determined fibrosis were excluded. Associations between liver stiffness and inflammation or ballooning were assessed using t-tests. The association between liver stiffness and steatosis was assessed using Spearman rank correlation analysis. Multivariate linear regression analysis was used to test MRE stiffness against histologic features adjusted for age, BMI, and ALT.

RESULTS

Sixty-four adults (30 M; mean age 49.5 yrs, range 18.5 to 75.8 yrs) were enrolled in this study. Multivariate linear regression analysis showed a negative correlation of steatosis with log of 3D MRE-estimated liver stiffness at 40 Hz (-0.064, p = 0.043) and 60 Hz (-0.068, p = 0.018). Univariate analyses of MRE-estimated liver stiffnesses for all three methods showed no association with inflammation (p = 0.08 to 0.11), ballooning (p = 0.51 to 0.63), or steatosis (ρ = 0.29 to 0.39).

CONCLUSION

Hepatic steatosis has an independent, statistically significant association with the MR elastographic estimation of liver stiffness when BMI, ALT, and age are controlled for. Inflammation and ballooning do not have a statistically significant association with liver stiffness.

CLINICAL RELEVANCE/APPLICATION

This association between steatosis and liver stiffness is a possible confound in the MRE estimation of liver stiffness, and should be accounted for when MRE is used to estimate fibrosis in adult patients.

SSJ09-03 Noninvasive Hepatic Fibrosis Staging Using Magnetic Resonance Elastography: The Usefulness of the Bayesian Prediction Method

Tuesday, Dec. 1 3:20PM - 3:30PM Location: E350

Participants

Shintaro Ichikawa, MD, Chuo-Shi, Japan (Presenter) Nothing to Disclose
Utaro Motosugi, MD, Yamanashi, Japan (Abstract Co-Author) Nothing to Disclose
Hiroyuki Morisaka, MD, Kofu, Japan (Abstract Co-Author) Nothing to Disclose
Katsuhiro Sano, MD, PhD, Chuo, Japan (Abstract Co-Author) Nothing to Disclose
Tomohiro Ichikawa, MD, PhD, Yamanashi, Japan (Abstract Co-Author) Nothing to Disclose
Hiroshi Onishi, MD, Yamanashi, Japan (Abstract Co-Author) Nothing to Disclose

PURPOSE

To evaluate the usefulness of the Bayesian prediction method (BPM) for noninvasive hepatic fibrosis staging (HFS) using magnetic resonance elastography (MRE).

METHOD AND MATERIALS

Chronic liver disease patients (n = 309) were included and fibrosis staging and MRE was performed. Receiver operating characteristic analysis was used to determine the optimal cut-off stiffness value (cut-off method; COM) of MRE to distinguish between fibrosis stages. A uniform distribution was assumed for pre-MRE probability of stages using the BPM. The MRE stiffness value determined the post-MRE probability and confidence of HFS. The distinguishing ability of COM and BPM were compared in all patients (Bayesian-all) and in patients with strong confidence (≥ 90%) with BPM (Bayesian-strong).

RESULTS

The ability to distinguish between hepatic fibrosis stages was not significantly different between COM and Bayesian-all. In patients who had strong confidence with BPM, the sensitivity and negative predictive value (NPV) of Bayesian-strong for diagnosing ≥ F2, ≥ F3, and F4 were significantly higher than with COM (sensitivity: COM vs. Bayesian-all for ≥ F2, 94.5% vs. 99.1% (P = 0.0041); ≥ F3, 89.6% vs. 99.4% (P = 0.0001); F4, 89.3% vs. 100% (P = 0.0018); NPV: ≥ F2, 78.8% vs. 93.9% (P = 0.0059); ≥ F3, 85.0% vs. 98.7% (P < 0.0001); F4, 93.4% vs. 100% (P = 0.0009)). The specificity of Bayesian-strong for diagnosing F4 was significantly higher than that of COM (97.3% vs. 100% (P = 0.0428)).

CONCLUSION

BPM has better distinguishing ability than COM for HFS using MRE if the confidence is strong.

CLINICAL RELEVANCE/APPLICATION

A liver biopsy followed by histopathological assessment is a common approach for staging liver fibrosis. However, a biopsy can
cause several complications. Consequently, noninvasive methods have been developed for assessing hepatic fibrosis. Recent studies have indicated that MRE is a promising, highly reproducible tool with advanced diagnostic capacity for the non-invasive staging of hepatic fibrosis. Hepatic fibrosis can be assessed more correctly by using BPM.

**SS09-04 Direct Comparison of 3 Elastometry Devices (Fibroscan, Acoustic Radiation Force Impulse, Supersonic Shearwave Imaging) for the Non-Invasive Diagnosis of Liver Fibrosis in Chronic Liver Diseases**

**Participants**  
Victoire Cartier, MD, Angers, France (Presenter) Nothing to Disclose  
Jerome Boursier, Angers, France (Abstract Co-Author) Nothing to Disclose  
Jerome Lebigot, MD, Angers, France (Abstract Co-Author) Nothing to Disclose  
Frederic Oberti, MD, PhD, Angers, France (Abstract Co-Author) Nothing to Disclose  
Isabelle Fouchard-Hubert, Angers, France (Abstract Co-Author) Nothing to Disclose  
Sandrine Bertrais, Angers, France (Abstract Co-Author) Nothing to Disclose  
Paul Cales, MD, PhD, Angers, France (Abstract Co-Author) Research Consultant, Echosens SA  
Christophe Aube, MD, PhD, Angers, France (Abstract Co-Author) Speaker, Bayer AG Support, General Electric Company

**METHOD AND MATERIALS**

A total of 38 patients with NAFLD (F0, 11; F1, 5; F2, 1; F3, 9; and F4, 12) who underwent contrast-enhanced CT were enrolled. Metavir F staging on biopsy was taken as the reference for liver fibrosis. For each elastographic device, the median of 10 valid measurements was calculated to maximize the sum of sensitivity + specificity.

**RESULTS**

A total of 38 patients with NAFLD. The volume percentage of the caudate lobe had the best diagnostic accuracy for staging fibrosis (r = -0.563, P < 0.001). Contrarily, the volume percentage of the right lobe significantly decreased with fibrosis (r = -0.465, P = 0.003, respectively). AUROC for significant fibrosis (Metavir F>=2) were: FS: 0.863±0.027, ARFI: 0.789±0.025 (FS vs ARFI or SSI: p=0.020). AUROC for cirrhosis were: FS: 0.941±0.027, ARFI: 0.895±0.048, SSI: 0.870±0.035 (p=0.011; FS vs SSI: p=0.010). Diagnostic cut-offs for cirrhosis were: FS: 16.6 kPa, ARFI: 1.87 m/s, SSI: 1.93 m/s. Using this cut-offs, diagnostic accuracy for cirrhosis was: FS: 90.6%, ARFI: 79.5%, SSI: 75.4% (p=0.001, FS vs others: p=0.001).

**CONCLUSION**

ARFI and SSI have better feasibility and similar accuracy for the diagnosis of significant fibrosis than FS. However, FS has the best accuracy for the diagnosis of cirrhosis.

**CLINICAL RELEVANCE/APPLICATION**

Non-invasive diagnosis and evaluation of liver fibrosis in chronic liver diseases using acoustic based elastography.

**SS09-05 Fibrosis in Nonalcoholic Fatty Liver Disease: Noninvasive Assessment Using CT Volumetry**

**Participants**  
Nobuhiro Fujita, MD, PhD, Fukuoka, Japan (Presenter) Nothing to Disclose  
Akhiro Nishie, MD, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose  
Yoshiki Asayama, MD, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose  
Kousei Ishigami, MD, Fukuoka City, Japan (Abstract Co-Author) Nothing to Disclose  
Yasuhiro Ushijima, MD, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose  
Hiroshi Honda, MD, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose  
Yukihide Takayama, MD, Fukuoka, Japan (Abstract Co-Author) Research Grant, FUJIFILM Holdings Corporation  
Daisuke Okamoto, MD, Fukuoka City, Japan (Abstract Co-Author) Nothing to Disclose  
Koichiro Morita, Fukuoka, Japan (Abstract Co-Author) Nothing to Disclose

**METHOD AND MATERIALS**

A total of 38 patients with NAFLD (F0, 11; F1, 5; F2, 1; F3, 9; and F4, 12) who underwent contrast-enhanced CT were enrolled. The relationship between the volume percentage of each area and fibrosis stage was analyzed using Spearman’s rank correlation coefficient. Receiver operating characteristic (ROC) curve analysis was performed to determine the accuracy of CT volumetry for discriminating fibrosis stage.

**RESULTS**

The volume percentages of caudate lobe and left lateral segment significantly increased with fibrosis stage (r = 0.815, P < 0.001, and r = 0.465, P = 0.003, respectively). Contrarily, the volume percentage of the right lobe significantly decreased with fibrosis stage (r = -0.563, P < 0.001). The volume percentage of caudate lobe had the best diagnostic accuracy for staging fibrosis and
the area under the ROC curve values for discriminating fibrosis stage were as follows: ≥F1, 0.896; ≥F2, 0.929; ≥F3, 0.955; and ≥F4, 0.923. The best cut-off for advanced fibrosis (F3-F4) was 4.789% with sensitivity of 85.7% and specificity of 94.1%.

CONCLUSION

The volumes of caudate lobe and left lateral segment increase, and that of right lobe volume decreases with fibrosis stage in NAFLD. The volume percentage of caudate lobe calculated by CT volumetry is a useful diagnostic parameter for staging fibrosis in patients with NAFLD.

CLINICAL RELEVANCE/APPLICATION

CT volumetry is a powerful clinical tool to help diagnose fibrosis stage in NAFLD noninvasively. It may be useful in monitoring and making treatment decisions in patients with NAFLD.

SS309-06 Application of Ultrasound Texture Analysis For Detection of Liver Fibrosis

Tuesday, Dec. 1 3:50PM - 4:00PM Location: E350

Participants
David Podhaizer, MD, Boston, MA (Presenter) Nothing to Disclose
Hei Shun Yu, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Baojun Li, PhD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Jorge A. Soto, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Stephan W. Anderson, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Avneesh Gupta, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

PURPOSE

To determine the ability of ultrasound texture analysis to predict varying degrees of hepatic fibrosis in patients with known chronic liver disease.

METHOD AND MATERIALS

Following IRB approval, a retrospective chart review was performed on patients who underwent non-targeted ultrasound guided liver biopsies to include 29 patients with chronic liver disease (20 males, 9 females, mean age of 52 years old, range of 19 to 81 years old). For each patient, a single region of interest (ROI) was selected on two to three separate sonographic images that were obtained from the ultrasound guided liver biopsy examinations and the results were averaged. The ROIs were selected from the right lobe of the liver and excluded vessels and bile ducts. Texture analysis was performed on the ROIs using an in-house MATLAB-based program that extracted 45 texture features. Pearson product-moment correlation coefficients were calculated comparing texture features and degrees of hepatic fibrosis.

RESULTS

Of the 29 patients with chronic liver disease, the following Ishak fibrosis stages were represented, based on liver biopsy: Ishak 0, n=4; Ishak 1, n=4; Ishak 2, n=4; Ishak 3, n=4; Ishak 4, n=4; Ishak 5, n=4; Ishak 6, n=5. Comparisons of the texture features with the degrees of hepatic fibrosis demonstrate strong correlations between Ishak fibrosis stage and Histogram texture features (r-values ranging up to 0.89), GLRL features (r-values ranging up to 0.80), Laws' features (r-values ranging up to 0.93), and GLGM features (r-values ranging up to -0.80). Weak correlation between texture features and degrees of fibrosis were demonstrated with 2-D features (r-values ranging up to 0.36) and GLCM features (r-values ranging up to -0.47).

CONCLUSION

Sonographic texture features demonstrate strong correlation with Ishak liver fibrosis scores. This suggests that texture analysis of ultrasound images has the potential to non-invasively predict varying degrees of hepatic fibrosis.

CLINICAL RELEVANCE/APPLICATION

Texture analysis can potentially be applied to ultrasound as a non-invasive method to diagnose and monitor progression of liver fibrosis.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Jorge A. Soto, MD - 2013 Honored Educator
Jorge A. Soto, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2015 Honored Educator
Learning Objectives

1) Review the epidemiology and pathophysiology of colorectal cancer and justifications for colorectal screening. 2) Identify the targets of colorectal screening and provide the rationale for selective polypectomy. 3) Compare and contrast CT Colonography with other screening options.

Abstract

This presentation will provide a discussion of the causes of errors of interpretation on CT colonography. The appearances of common and common pitfalls will be demonstrated. The differential diagnosis of morphologic types of lesions will be presented. Accurate lesion measurement is essential for CT colonography since this directly impacts management recommendations. Causes of inaccurate measurements will be reviewed along with strategies as to how to improve measurement accuracy.
**Thyroid Elastography**

**LEARNING OBJECTIVES**
1) Explain the difference between strain and shear wave elastography. 2) Understand the techniques to be able to perform thyroid ultrasound elastography. 3) Apply ultrasound elastography into routine clinical practice of thyroid nodules.

**ABSTRACT**
Thyroid nodules are very common and work-up of these nodules remains challenging. Fine needle aspiration has been the method of choice for diagnosing suspicious lesions with a sensitivity of 54%-90% and specificity of 60-96% for detection of malignant lesions. Malignant thyroid lesions are statistically stiffer than benign lesions. Ultrasound elastography can assess the stiffness of thyroid lesions. Several studies have been performed evaluating strain and shear wave elastography to characterize thyroid nodules. Strain elastography is qualitative while shear wave elastography is quantitative. These studies suggest that ultrasound elastography may improve sensitivity and specificity of characterizing thyroid lesions over B-mode imaging alone. There is a learning curve for performing adequate thyroid ultrasound elastography. Both cystic lesions and calcified lesions are difficult to evaluate with elastography. There is some overlap of stiffness values between benign and malignant thyroid nodules and elastography should not eliminate biopsy of suspicious lesions based on B-mode imaging. Stiff lesions on elastography should increase the suspicion for malignancy. This presentation will discuss the differences between strain and shear wave elastography, discuss technique and pitfalls in performing the examination, review the literature, and discuss published guidelines.

**Renal Elastography: Where Are We?**

**LEARNING OBJECTIVES**
1) To become familiar with the advantages and limits of the different elastography technologies applied to kidney. 2) To understand the factors affecting reliability and reproducibility of elasticity measurement within the kidney. 3) To learn about the intrarenal changes responsible for elasticity changes. 4) To learn about the clinical impact of elasticity measurement in renal parenchymal diseases. 5) To learn about the clinical impact of elasticity measurement in renal tumors.

**ABSTRACT**
Ultrasound elastography is a new imaging technique under development that provides information about renal stiffness. Kidney elasticity quantification with ultrasound should be better performed with a quantitative technique, based on shear wave velocity measurements (ARFI or SSI methods). Kidney stiffness changes can be affected by mechanical factors such as external pressure induced by the probe and intrarenal characteristics such as tissue anisotropy, which is high in renal medulla, vascularization, which is high within the cortex, and hydronephrosis. Chronic kidney disease (CKD) incidence and prevalence are increasing in Western countries, due particularly to diabetes mellitus and hypertension-related nephropathies. During progression of such renal parenchymal diseases, cellular density may increase, mainly during acute inflammatory phases, and the interstitial matrix may be invaded by fibrosis. All components of these tissue changes may induce an increase of renal elasticity which is not specifically related to fibrosis. Tubular, glomerular, interstitial and vascular changes may also be responsible for an increase of stiffness. This is why, further studies are now necessary before to understand the real impact of elastography measurement in clinical nephrology. Considering characterization of renal tumors with elastography, clinical experience is still limited. Preliminary results show that benign tumors seem to have lower values of elasticity than malignant ones, but, here too, more experience is also necessary.

**Liver Elastography**

**LEARNING OBJECTIVES**
1) To understand the concept of liver fibrosis grading and the implications for healthcare management. 2) To review the basis for the assessment of liver fibrosis using elastography, with emphasis on the different techniques. 3) To understand the differences in the techniques and the variability in measurement assessment. 4) To achieve an overview of the need and position of this technique in clinical care.
Liver fibrosis and cirrhosis from many causes is an important cause of long term morbidity and mortality. Most cases are a consequence of chronic viral disease (Hepatitis B and C) with alcoholic liver disease an important etiological factor. The degree of liver fibrosis, and the presence of established cirrhosis confer different management strategies, with imaging playing an important role in the non-invasive assessment of patients with chronic liver disease. Fibrosis grading traditionally performed using the Metavir or Ishak scoring system is essentially a histological grading system. Ultimately the possibility to avoid a liver biopsy is the aim, if a non-invasive technique can stage the grade of fibrosis, establishing correct patient management. Liver ultrasound elastography is a developing technique that offers this possibility, with varying methods of assessment ranging form strain methods and shear wave methods. These techniques will be explained, the status of the current standing of the techniques will be summarised, and the level of technology offered by different machines will be reviewed. An overall summary of the current status and the implications for clinical practice will be discussed.
Hepatocellular Carcinoma in the Cirrhotic Liver and LI-RADS (An Interactive Session)

Tuesday, Dec. 1 4:30PM - 6:00PM Location: S402AB

Participants

Sub-Events

RC429A  LI-RADS Overview, Current Status, and Future Directions

Participants
Cynthia S. Santillan, MD, San Diego, CA, (csantillan@mail.ucsd.edu) (Presenter) Consultant, Robarts Clinical Trials Research Group

LEARNING OBJECTIVES
1) To teach participants how to apply the Liver Imaging Reporting and Data System (LI-RADS) to their interpretation of imaging studies for the evaluation of hepatocellular carcinoma in at-risk patients. 2) To inform radiologists about the various online resources available via the ACR LI-RADS website, including an atlas, lexicon, reporting templates, and flashcards. 3) To update radiologists about future content in LI-RADS, including ultrasound and treatment response assessment guidelines.

ABSTRACT
The Liver Imaging Reporting and Data System (LI-RADS) relies on major and ancillary CT and MRI features to categorize observations for assessment of hepatocellular carcinoma (HCC). The major features include arterial phase enhancement, diameter, "washout" appearance, "capsule" appearance and threshold growth. In this course, we will discuss the scientific literature supporting the major imaging features and criteria. This will include estimates of diagnostic performance, and intra- and inter-reader agreement. LI-RADS also includes ancillary imaging features that modify the likelihood of HCC. We will provide a brief overview of the evidence supporting these ancillary features.

RC429B  LI-RADS Imaging Features: What’s the Evidence?

Participants
An Tang, MD, Montreal, QC (Presenter) Speaker, Boehringer Ingelheim GmbH; Speaker, Siemens AG; Advisory Board, Imagia

LEARNING OBJECTIVES
1) To review the major and ancillary CT and MRI features used in LI-RADS categorization for assessment of hepatocellular carcinoma (HCC). 2) To highlight the scientific literature supporting the major imaging features and criteria. 3) To summarize the evidence supporting ancillary features.

ABSTRACT
The Liver Imaging Reporting and Data System (LI-RADS) relies on major and ancillary CT and MRI features to categorize observations for assessment of hepatocellular carcinoma (HCC). The major features include arterial phase enhancement, diameter, "washout" appearance, "capsule" appearance and threshold growth. In this course, we will discuss the scientific literature supporting the major imaging features. This will include estimates of diagnostic performance, and intra- and inter-reader agreement. LI-RADS also includes ancillary imaging features that modify the likelihood of HCC. We will provide a brief overview of the evidence supporting these ancillary features.

RC429C  LI-RADS and Hepatobiliary Agents

Participants
Kathryn J. Fowler, MD, Chesterfield, MO (Presenter) Research support, Bracco Group

LEARNING OBJECTIVES
1) To provide an overview of LI-RADS content that refers to hepatobiliary contrast agents. 2) To review the ancillary features that are described with hepatobiliary contrast agents. 3) To present case examples to illustrate the role of hepatobiliary contrast agents in the diagnosis of hepatocellular carcinoma.

ABSTRACT
Hepatobiliary contrast agents are routinely used in practice for diagnosing and staging HCC. Despite the potential diagnostic benefits, the role of hepatobiliary phase imaging has not been well defined in diagnostic algorithms. LI-RADS provides information on the use of these agents, their role in diagnosis, and potential pitfalls. The aim of this presentation is to provide an overview of hepatobiliary content included in the current version of LI-RADS.

RC429D  LI-RADS LR-5 versus LR-M

Participants
Thomas A. Hope, MD, San Francisco, CA, (thomas.hope@ucsf.edu) (Presenter) Advisory Committee, Guerbet SA; Research Grant, General Electric Company

LEARNING OBJECTIVES
1) Understand the LR-M categorization and its role in LI-RADS. 2) Review imaging features that suggest LR-M. 3) Apply LI-RADS categorizations in cases of LR-5 and LR-M.

ABSTRACT
In at patients at risk for hepatocellular carcinoma (HCC), the diagnosis of malignancies other than HCC can be difficult. LI-RADS provides a categorization (LR-M), which should be used to indicate lesions that may represent malignancies other than HCC. In this
course, we will review the LI-RADS categorization LR-M and its relationship to LR-5. We will discuss findings that suggest LR-M and provide case examples where the diagnosis of LR-M and LR-5 should be made. We will also discuss how a LR-M categorization may affect clinical decision making.
**Targeted Treatment and Imaging of Liver Cancers: Basic to Advanced Techniques in Minimally-Invasive Therapies and Imaging**

**Tuesday, Dec. 1 4:30PM - 6:00PM Location: S403A**

**AMA PRA Category 1 Credits ™:** 1.50

**ARRT Category A+ Credits:** 1.50

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**Participants**

John J. Park, MD, PhD, Duarte, CA (*Moderator* Proctor, Sirtex Medical Ltd; Advisory Board, Guerbet SA
Jinha Park, MD, PhD, Duarte, CA (*Moderator* Proctor, Sirtex Medical Ltd; Advisory Board, Guerbet SA
John J. Park, MD, PhD, Duarte, CA (*Presenter* Proctor, Sirtex Medical Ltd; Advisory Board, Guerbet SA
Jinha Park, MD, PhD, Duarte, CA (*Presenter* Proctor, Sirtex Medical Ltd; Advisory Board, Guerbet SA
Andrew C. Price, MD, Scottsdale, AZ (*Presenter* Nothing to Disclose
Steven S. Raman, MD, Santa Monica, CA (*Presenter* Nothing to Disclose
Marcelo Guimaraes, Charleston, SC (*Presenter* Consultant, Cook Group Incorporated; Consultant, Baylis Medical Company; Consultant, Terumo Corporation; Patent holder, Cook Group Incorporated

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**LEARNING OBJECTIVES**

1) Discuss the role of the interventional radiologist in the treatment and management of patients with primary and metastatic liver cancer as part of the multidisciplinary team. 2) Learn best practice techniques in the treatment of liver cancers, with emphasis on both locoregional and focal therapeutic approaches, and indications for treatment. 3) Explore various tips and tricks for each treatment modality and learn how to avoid complications through good patient selection, choosing the appropriate techniques, and knowing what common mistakes to avoid. 4) Learn about newer and developing techniques and devices, their potential roles and indications, and potential pitfalls. 5) Explore advanced imaging modalities in the detection of tumors and for monitoring treatment response.

**ABSTRACT**
Abdominal Dual Energy CT in Practice

Tuesday, Dec. 1 4:30PM - 6:00PM Location: E351

GI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Desiree E. Morgan, MD, Birmingham, AL (Presenter) Research support, General Electric Company
Alec J. Megibow, MD, MPH, New York, NY (Presenter) Consultant, Bracco Group
Eric P. Tamm, MD, Houston, TX (Presenter) Nothing to Disclose
Daniel T. Boll, MD, Durham, NC (Presenter) Research Grant, Siemens AG; Research Grant, Koninklijke Philips NV; Research Grant, Bracco Group

LEARNING OBJECTIVES
1) Understand the principles of image acquisition and post processing of dual energy CT technologies currently commercially available in the US. 2) Assess the technological innovations made possible with dual energy CT and the potential advances to enhance clinical practice and problem-solving in abdominal imaging. 3) Contrast the workflow issues and limitations of the various dual energy approaches as applicable to imaging of patients with abdominal disease.

ABSTRACT
After a brief overview of basic physics principles that distinguish the currently available dual energy CT scanner technologies, a variety of topics regarding dual source dual energy CT, single source dual energy CT, and sandwich detector dual energy CT will be covered by three experts using the technology in clinical practice. This will include image acquisition and patient experience, development of specific abdominal imaging protocols, workflow considerations, such as automated generation of blended images, virtual monoenergetic energy images, iodine/water material density images or iodine maps at the scanner level versus radiologist image manipulation, and will focus on real experience approaches to image interpretation. Strengths and limitations of dual source, single source, and sandwich detector dual energy CT will be demonstrated and discussed.
Gastrointestinal Wednesday Case of the Day
Wednesday, Dec. 2 7:00AM - 11:59PM Location: Case of Day, Learning Center

Participants
Vincent M. Mellnick, MD, Saint Louis, MO (Presenter) Nothing to Disclose
Matthew C. McDermott, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Ryan W. Buss, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Aarti Sekhar, MD, Brookline, MA (Abstract Co-Author) Nothing to Disclose
Tarek N. Hanna, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Gayatri Joshi, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Meghan G. Lubner, MD, Madison, WI (Abstract Co-Author) Grant, General Electric Company; Grant, NeuWave Medical, Inc; Grant, Koninklijke Philips NV
Perry J. Pickhardt, MD, Madison, WI (Abstract Co-Author) Co-founder, VirtuoCTC, LLC; Stockholder, Cellectar Biosciences, Inc; Research Consultant, Bracco Group; Research Consultant, KIT; Research Grant, Koninklijke Philips NV
Matthew C. McDermott, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Ryan W. Buss, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Aarti Sekhar, MD, Brookline, MA (Abstract Co-Author) Nothing to Disclose
Tarek N. Hanna, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Gayatri Joshi, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Meghan G. Lubner, MD, Madison, WI (Abstract Co-Author) Grant, General Electric Company; Grant, NeuWave Medical, Inc; Grant, Koninklijke Philips NV
Perry J. Pickhardt, MD, Madison, WI (Abstract Co-Author) Co-founder, VirtuoCTC, LLC; Stockholder, Cellectar Biosciences, Inc; Research Consultant, Bracco Group; Research Consultant, KIT; Research Grant, Koninklijke Philips NV

TEACHING POINTS

1) Each GI case of the day will be taken from disorders of the luminal GI tract as well as the liver, spleen, pancreas, and biliary system. The findings may be uncommon manifestations of common diseases or common manifestations of uncommon diseases.

Honored Educators

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Meghan G. Lubner, MD - 2014 Honored Educator
Meghan G. Lubner, MD - 2015 Honored Educator
Perry J. Pickhardt, MD - 2014 Honored Educator
Douglas S. Katz, MD - 2013 Honored Educator
Douglas S. Katz, MD - 2015 Honored Educator
Case-based Review of Pediatric Radiology (An Interactive Session)

Wednesday, Dec. 2 8:30AM - 10:00AM Location: S406A

Participants
Sudha A. Anupindi, MD, Philadelphia, PA (Director) Nothing to Disclose

LEARNING OBJECTIVES
1) To apply a systematic approach in the evaluation of pediatric diseases. 2) To identify essential imaging features of various pediatric congenital, musculoskeletal, abdominal and neurological diseases using a multimodality approach. 3) To understand and develop best imaging practice for various pediatric diseases.

ABSTRACT
To apply a systematic approach in the evaluation of pediatric diseases To identify essential imaging features of various pediatric congenital, musculoskeletal, abdominal and neurological diseases using a multimodality approach To understand and develop best imaging practice for various pediatric diseases

Sub-Events

MSCP41A  Fetal Thoracic and Abdominal Anomalies

Participants
Christopher I. Cassady, MD, Houston, TX (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.

MSCP41B  Pediatric Abdominopelvic Tumors

Participants
M. Beth McCarville, MD, Memphis, TN (Presenter) Support, General Electric Company

LEARNING OBJECTIVES
View learning objectives under main course title.

MSCP41C  Congenital Disorders of the Genitourinary Tract

Participants
Tracy N. Kilborn, MBChB, Cape Town, South Africa (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.
Gastrointestinal Series: Advances in Abdominal CT

Wednesday, Dec. 2 8:30AM - 12:00PM Location: E350

RC509-01 Radiation Dose Reduction in CT

Participants
Amy K. Hara, MD, Scottsdale, AZ (Presenter) Royalties, General Electric Company;

LEARNING OBJECTIVES
1) Compare advantages and disadvantages of various techniques to reduce radiation dose for abdominal CT. 2) Describe how iterative reconstruction techniques work and how they can improve image quality of low dose exams. 3) Develop a strategy to implement low dose techniques in clinical practice.

Honored Educators

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Amy K. Hara, MD - 2015 Honored Educator

PURPOSE

METHOD AND MATERIALS
This study was IRB approved and HIPAA compliant. Abdominal MDCT scans of fifty patients who had been imaged with both standard protocol (120 kV and filtered-back-projection reconstruction algorithm) and new protocol (automated kV selection and iterative reconstruction) were compared. Data was also analyzed based on BMI-based kV selection (100 kV if BMI <25 kg/m2). Radiation dose, image noise (subcutaneous fat), SNR (aorta and liver) and CNR (aorta and liver) were recorded. P<0.05 was considered significant.

RESULTS
Patient mean BMI was comparable between the two studies (24.6 kg/m2 for first study and 24.7 kg/m2 for second study; P=0.77). With automated tube voltage selection protocol, 43/50 (86%) were scanned with 100 kV, 5/50 (10%) with 120kV and 2/50 (4%) with 140kV. BMI for 100kV group ranged between 17.8 and 29.925 kg/m2. Sixteen patients scanned with 100kV had BMI ≥25 kg/m2. If BMI <25 kg/m2 would have been utilized as cut-off point for 100kV scan, 30% fewer patients would have been scanned with 100kV (28 vs 43). Compared with standard protocol, CDTIvol, DLP, and effective dose decreased 17.2%, 20% and 20.4%, respectively, in 43 patients that were automatically selected for 100kV scan. Image noise decreased by 21.7% (P<0.001) while CNR and SNR of liver and aorta increased >24% (P<0.001).

CONCLUSION
Attenuation-based automated tube voltage selection results in lower tube voltage in significantly higher number of patients, compared with standard and BMI-based selections. Image quality parameters improve with combination of lower tube voltage selection and iterative reconstruction.

CLINICAL RELEVANCE/APPLICATION
Attenuation-based automated tube voltage selection results in significantly higher number of patients imaged with lower dose...
HONORED EDUCATORS

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Vahid Yaghmai, MD - 2012 Honored Educator
Vahid Yaghmai, MD - 2015 Honored Educator

RC509-03 Oral Contrast Media Concentration Selection for Low kvp/keV CT Scanning

Wednesday, Dec. 2 9:00AM - 9:10AM Location: E350

Participants
Manuel Patino, MD, Boston, MA (Presenter) Nothing to Disclose
Diana Murcia, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Andrea Prochowski Iamurri, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Yasir Andrabhi, MD, MPH, Boston, MA (Abstract Co-Author) Nothing to Disclose
Avinash R. Kamhadekone, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Dushyant V. Sahani, MD, Boston, MA (Abstract Co-Author) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc

PURPOSE

Oral contrast media is commonly used for abdominal CT. Clinical implementation of low-kVp/DECT imaging demands adjustments in OCM concentration. The purpose of our study is to evaluate the impact of low X-ray energy (kVp/keV) on OCM using phantom and clinical data, and to assess optimal OCM concentrations for low-energy diagnostic CT scans

METHOD AND MATERIALS

Anthropomorphic CT colo phantom study: Four OCM solutions were used as follows: Water, Gastrografin® (Bracco dx, 9mg/ml), Iohexol (GE healthcare, 12mg/ml), and Barium Sulfate (Readi-CAT® 2.0%). Each solution was diluted with water to obtain 75, 50, and 25% of the standard dose of OCM for adults. The phantom was filled up serially with 400 ml of each OCM solution, from the lowest to the standard OCM concentration, and scanned on ssDECT scanner (Discovery-CT 750 HD, GE Healthcare) on SECT (80, 100 and 120 kvp, and 250mA) and DECT modes (140/80 kvp and 375 mA). VMC (40, 50, 60, and 70keV) images were generated yielding a total of 91 image datasets (39 on SECT, and 52 on DECT). Three ROIs were placed at 3 locations in colonic lumen to measure HU, SD and CNR. Clinical study: GI tract attenuation was measured in 50 consecutive patients with standard-dose, positive (barium and iodine) OCM in both SECT and DECT. Multiple ROIs were placed in different locations of the GI tract on 120-SECT and DECT-low keV images to measure HU. Statistical analysis was conducted with pair student t-test

RESULTS

Colonic attenuation in 120kVp-scans with standard OCM dose ranges between 261 and 303 HU. There was an inverse correlation between OCM HU and kvp/keV, irrespective of OCM concentration, increasing HU 2X on low-kVp and 5X on low-keV images (p<0.05). There was 5% drop in CNR with low-kVp but 15% increase with low-keV for all OCM's. Clinical abdomen CT exams mirrored phantom results. Optimal OCM dilutions for 100/80kVp scans were: Gastrografin® 75/75%, Iohexol 75/75% and Barium 75/50%. OCM dilutions of 25-50% were optimal on 40-70keV scans

CONCLUSION

Low kvp/keV scans increase GI tract attenuation, enabling OCM dose concentration reduction for diagnostic exams

LEARNING OBJECTIVES

1) To understand the risks of intravenous administration of iodinated CT contrast media. 2) To be familiar with the latest information on the use of iodinated CT contrast media in the setting of renal impairment. 3) To be familiar with potential future developments in intravenous CT contrast agents.
RESULTS

The body mass index between 2 groups showed no difference (p>0.05). For the 60keV spectral CT images, CT number and CNR were (359.00±45.21HU, 51.52±12.56) for abdominal aorta and (185.32±42.90HU, 20.63±46.19) for portal vein. These values were higher than the respective values of (306.03±46.36HU, 44.52±13.43) and (149.25±19.66HU, 15.11±3.65) for the 120kVp images. The SD values in erector spinae of the spectral CT images were 5.88±0.99HU in AP and 6.05±0.73HU in VP, statistically the same as those of the 120kVp images (5.90±1.43HU in AP and 5.85±0.73HU in VP) (P>0.05). The CTDI and effective dose were (14.28±2.61mGy, 6.63±1.21mSv) for spectral CT and (13.55±4.73mGy, 6.23±2.08mSv) for 120kVp CT with no difference (p>0.05). On the other hand, group A with spectral CT achieved 30% contrast dose reduction at 350mgI/kg compared with the conventional 120kVp group.

CONCLUSION

Compared with the conventional 120kVp CT, spectral CT can reduce the total contrast dosage by 30% and at the same time improves the vessel contrast enhancement and CNR without radiation dose increase.

CLINICAL RELEVANCE/APPLICATION

Spectral CT can reduce the total contrast dosage by 30% and improves vessel enhancement and CNR without radiation dose increase.

RC509-06     Dual-Energy CT and Virtual Monoenergetic Reconstructions: Utility of Novel and Basic Algorithms in Assessment of Intestinal Wall Enhancement and Applications for Acute Intestinal Ischemia

Wednesday, Dec. 2 9:40AM - 9:50AM Location: E350

Participants

Pedro Lourenco, MD, Vancouver, BC (Presenter) Nothing to Disclose
Ryan Rawski, BSc, MSc, Vancouver, BC (Abstract Co-Author) Nothing to Disclose
Patrick D. McLaughlin, FFRRCSI, Cork, Ireland (Abstract Co-Author) Speaker, Siemens AG
Tim O'Connell, MD, Meng, Vancouver, BC (Abstract Co-Author) President, Resolve Radiologic Ltd; Speake, Siemens AG
Savvas Nicolaou, MD, Vancouver, BC (Abstract Co-Author) Institutional research agreement, Siemens AG

PURPOSE

Acute bowel ischemia and infarction are devastating abdominal emergencies, with reported mortality rates up to 93%. CT sensitivity for detection of acute bowel ischemia is poor, in particular in the diagnosis of early bowel ischemia, and CT findings are often non-specific. Virtual monoenergetic reconstructions allow for optimized enhancement and evaluation of bowel wall for signs of ischemia and infarction. The basic algorithm has limited utility given high noise and signal to noise ratio. Here, we evaluate the utility of a novel (VMI+) and the basic (VMI) virtual monoenergetic algorithms in acute bowel ischemia.

METHOD AND MATERIALS

18 patients with pathologically confirmed bowel ischemia or infarction presented to a quaternary hospital. Abdominal DECT (100 and 140 keV) were obtained at the time of presentation. Axial series were reconstructed with VMI+ and VMI software application (Monoenergetic Basic and Plus, Dual Energy, Siemens) and evaluated for improved noise reduction, and the reconstructions were compared with virtual 120-keV series that blended spectral information from high and low keV datasets. Images were considered to lie within the sweet spot if noise level was < 40 HU.

RESULTS

Utilizing the novel algorithm broadened the sweet spot of diagnostically acceptable monoenergetic keV levels by 416%. With VMI+, the mean diagnostic range was 57-190 keV (SD 9.3 and 0.0, respectively), whereas using VMI, mean diagnostic range was 69.101 keV (SD 3.9 and 13.0, respectively). SNR and CNR were also significantly improved utilizing the VMI+ technique, by 107 and 76%, respectively. CNR utilizing the VMI+ algorithm at 50, 100 and 150 keV was 4.90 (SD 1.44) 3.18 (SD 1.44) 1.26 (SD 0.71), respectively, while VMI algorithm CNR was significantly inferior, at 2.39 (SD 0.92), 1.54 (SD 0.61) and 0.35 (SD 0.18). Intestinal wall enhancement was maximized at 40 keV, given the maximal CNR (5.18 SD 1.42), which allows for optimal assessment of bowel wall at this level, albeit tolerating lower SNR.
CONCLUSION
The "sweet spot" for virtual monoenergetic reconstructions was significantly increased when utilizing the VMI+ algorithm, with a diagnostic keV range increased by approximately 400%. SNR and CNR also demonstrate marked improvement by 107% and 76%, respectively, with VMI+ over VMI.

CLINICAL RELEVANCE/APPLICATION
The VMI+ reconstructions are markedly superior to the basic VMI algorithm, and are useful in assessing bowel wall enhancement.

RCS09-07  Patient Size-independent Monoenergetic Imaging for Detection Hypervascular Liver Tumors: Impact of a Second-generation Monoenergetic Algorithm

Wednesday, Dec. 2 9:50AM - 10:00AM Location: E350

Participants
Daniele Marin, MD, Cary, NC (Presenter) Nothing to Disclose
Juan Carlos Ramirez-Giraldo, PhD, Malvern, PA (Abstract Co-Author) Employee, Siemens AG
Sonia Gupta, MD, Newark, DE (Abstract Co-Author) Nothing to Disclose
Sandra Stinnett, MS, MPH, Durham, NC (Abstract Co-Author) Nothing to Disclose
Ehsan Samei, PhD, Durham, NC (Abstract Co-Author) Nothing to Disclose
Achille Mileto, MD, Durham, NC (Abstract Co-Author) Nothing to Disclose
Wanyi Fu, BEng, Durham, NC (Abstract Co-Author) Nothing to Disclose

PURPOSE
To investigate the impact of a novel monoenergetic reconstruction algorithm on the conspicuity of hypervascular liver tumors during dual-energy CT (DECT) of the liver.

METHOD AND MATERIALS
This retrospective, single-center HIPAA-compliant study was IRB-approved and informed patient consent was waived. Fifty-nine patients (35 men, 24 women) with 47 hypervascular liver tumors underwent DECT (80/Sn140 kVp) in the late hepatic arterial phase, with a dual-source CT system (Siemen Definition Flash). Datasets at energy levels ranging from 40 to 100 keV were reconstructed using first and second-generation monoenergetic algorithms (Syngo DE Monoenergetic and Monoenergetic Plus, respectively). Noise and tumor-to-liver contrast-to-noise ratio (CNR) were calculated and compared among different reconstructed datasets. The effect of patient's effective diameter on lesion CNR was also assessed. P-values were obtained for paired difference using generalized estimating equations (GEE) to account for multiple lesions per patient.

RESULTS
Noise was significantly lower and tumor-to-liver CNR significantly higher between 40 and 60 keV energies using a second-generation monoenergetic algorithm (P <.001 for all comparisons). The highest tumor-to-liver CNR was achieved using the second-generation monoenergetic algorithm at 40 keV, with an approximately 25% improvement in CNR compared to a first-generation algorithm at the optimal energy of 70 keV (Mean [SD] = 4.99 [1.70] vs. 3.80 [2.40]; P <.001). Our data showed that patient body size did not significantly affect the selection of the optimal monoenergetic level using the second-generation monoenergetic algorithm. This is in contrast with the significant impact of body size in the selection of the optimal energy level with the first-generation algorithm.

CONCLUSION
The second-generation monoenergetic algorithm significantly improves the conspicuity of hypervascular liver tumors compared to a first-generation algorithm, while simultaneously decreasing the variability introduced by patient's body weight in selecting the optimal monoenergetic level.

CLINICAL RELEVANCE/APPLICATION
A second-generation monoenergetic algorithm improves the conspicuity of hypervascular liver tumors and may streamline the workflow of DECT by decreasing the variability related to patient's body size.

RCS09-08  Dual Energy CT

Wednesday, Dec. 2 10:10AM - 10:30AM Location: E350

Participants
Alvin C. Silva, MD, Scottsdale, AZ (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Discuss the basic principles and different approaches for Dual-Energy CT. 2) Review common Dual-Energy CT post-processing displays. 3) Describe strategies for implementing Dual-Energy CT in clinical practice.

ABSTRACT

RCS09-09  Variability and Effect of Degree of Enhancement on CT Attenuation Measurements in Virtual Unenhanced Images Generated from Fast Kilovoltage Switching Dual-energy CT Using Iodine Material Suppression Algorithm

Wednesday, Dec. 2 10:30AM - 10:40AM Location: E350

Participants
Evan A. Raff, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Ravi K. Kaza, MD, Ann Arbor, MI (Presenter) Nothing to Disclose
To determine the rate and magnitude of CT number discrepancies between true unenhanced images (TUE) and virtual unenhanced images (VUE) generated from a fast kilovoltage switching dual-energy CT scanner using iodine material suppression algorithm.

METHOD AND MATERIALS

In this IRB-approved HIPAA-compliant retrospective cohort study, 21 multi-phasic abdominal CT examinations (unenhanced, corticomedullary [CM], nephrographic [NG]) obtained on a fast kilovoltage switching dual-energy CT scanner (GE, Milwaukee, WI) were reviewed. VUE images were generated from both dual-energy post-contrast phases using Material Suppressed Iodine (MSI) algorithm. CT numbers were measured on the matched TUE, VUE, and post-contrast images at predefined locations in the liver, pancreas, spleen, left kidney, main portal vein, aorta, and erector spinae muscle. 725 regions of interest were placed at 145 locations. The correlation between VUE and TUE CT numbers was assessed with Pearson’s correlation coefficient. Absolute CT number discrepancies and 95% confidence intervals (CI) were calculated for each VUE and TUE comparison. The effect of phase of enhancement on CT number discrepancies was assessed with ANOVA.

RESULTS

Overall, VUE and TUE measurements were not significantly different (p=0.29), and there was a very strong correlation between VUE and TUE CT numbers in both post-contrast phases (CM: r=0.91, NG: r=0.93, p<0.001). The mean difference between TUE and VUE images was 1 HU (95% CI: -7 to +9 HU) for CM phase imaging and 2 HU (95% CI: -6 to +10 HU) for NG phase imaging. Discrepancies ≥5 HU occurred 36 times (25%, 36/145) in the CM phase and 33 times (23%, 33/145) in the NG phase. Discrepancies ≥10 HU were rare in both phases (n=4 [CM], n=2 [NG]). Inter-phase VUE imaging differed by a mean of 0.7 HU (95% CI: -7 to +8 HU) between the CM and NG phases in the same subject, with 26 discrepancies ≥5 HU (18%, 26/145) and 3 discrepancies ≥10 HU (2%, 3/145). There was no significant correlation between the degree of enhancement and the magnitude of VUE-TUE discrepancies (r = 0.23).

CONCLUSION

CT numbers on VUE images generated from fast kilovoltage switching dual-energy CT scans have a very strong positive correlation to TUE CT numbers and are similar on a population level, but vary on a per-patient level.

CLINICAL RELEVANCE/APPLICATION

Discrepancies in TUE and VUE measurements of 5-9 HU are common and may affect enhancement calculations that rely on VUE data.

Honored Educators

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Katherine E. Maturen, MD - 2014 Honored Educator


Wednesday, Dec. 2 10:40AM - 10:50AM Location: E350

Participants

Amir Borhani, MD, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Alessandro Furlan, MD, Pittsburgh, PA (Abstract Co-Author) Author, Reed Elsevier; Research Grant, General Electric Company
Mark A. Sparrow, MD, Pittsburgh, PA (Presenter) Nothing to Disclose
Matthew H. Kulzer, MD, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Mitchell E. Tublin, MD, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Negar Iranpour, MD, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose

PURPOSE

GSI Assist (GE®) is an automated software which helps with selection of optimal dual-energy CT (DECT) scan parameters based on patient’s size and desired level of noise. This software uses scout-based attenuation characteristics to select an appropriate preset that will match (within 20%) the dose of a single-kvp CT scan (SECT). The purpose of this study is to evaluate the radiation dose when using GSI Assist for abdominal CT protocols and to compare the radiation dose of DECT with matched SECT.

METHOD AND MATERIALS

113 consecutive patients who underwent dual-energy CT of the abdomen, using a single source rapid kvp-switching DECT scanner (HD750 GE), were retrospectively reviewed. 43 patients (56 CT examinations) had matched SECT examinations (with comparable noise index, similar collimation, similar body part, and similar phase of contrast) within 2 years. The body part scanned, phase of study, absorbed dose (CTDIvol), dose-length product (DLP), effective dose (ED; using conversion factor of 0.015), body mass index (BMI), and weight were recorded for each scan. CTDIvol, DLP, and ED were compared between matched SECT and DECT examinations using paired t-test. Effect of weight, BMI, and phase of imaging on DECT radiation dose was also evaluated using linear regression analysis and Bland-Altman plot.

RESULTS

Mean CTDIvol and ED were 10.98 mGy (4.26-26.4; SD=5.95) and 7.68 mSv (2.1-21.2; SD=4.2) for DECT as compared to 11.6 mGy
(3.3-25.2; SD=7) and 7.9 mSv (1.7-20.6; SD=4.9) for matched SECT studies, respectively. These values were not statistically different (p=0.4 and 0.7, respectively). DECT radiation dose had significant correlation with patient's weight (R²=0.55; p<0.001) and BMI (R²=0.72; p<0.001), similar to SECT. Although DECT dose to patients with extreme weights (<65kg or >130kg) and extreme BMI (<18 or >30) was slightly higher, the correlation was not statistically significant (R² of 0.15 and 0.07, respectively).

CONCLUSION
There was no statistical difference between radiation dose of DECT and single-kvp CT when an automated software (GSI Assist) was used for optimal protocol selection. The average radiation dose from DECT was well below ACR reference level.

CLINICAL RELEVANCE/APPLICATION
Automated protocol selection software (GSI Assist) allows choosing the optimal abdominal CT technique on single-source dual-energy CT while maintaining the dose at the level of single-kvp CT dose.

RCS09-11 Advances in Oncologic Imaging
Wednesday, Dec. 2 10:50AM - 11:10AM Location: E350

Participants
Meghan G. Lubner, MD, Madison, WI (Presenter) Grant, General Electric Company; Grant, NeuWave Medical, Inc; Grant, Koninklijke Philips NV

LEARNING OBJECTIVES
1) Briefly define established size-related oncologic response criteria used in CT. 2) Discuss application of volumetric assessment of tumor burden at diagnosis and in assessing response to therapy. 3) Briefly describe selected examples of response assessment criteria looking at other tumor imaging characteristics such as tumor attenuation or enhancement in addition to size. 4) Examine CT tumor texture analysis as an additional tool to evaluate tumor heterogeneity at baseline and during therapy.

ABSTRACT

To determine whether there is an association between texture energy of primary lesions of colorectal cancer and their mutational status.

METHOD AND MATERIALS
A total of 24 cases were included. The most frequent mutations [single nucleotide polymorphisms (SNP)] found in a previous study with a cohort of 713 subjects of our institution, were analyzed. Five wild type (WT) tumors, 5 BRAF, 5 KRAS, 4 TP53 and 4 NRAS mutant (M) primary tumors were delineated and extracted from the pretreatment portal-venous phase 5mm slice thickness contrast enhanced CTs, creating a mask. For each phenotype we concatenated acquired texture energy measurements (TEV) for each slice of tumor to form a matrix (N by 9), where N is the number of slices. We computed more than 2000 pixels for each slice and, pixel spacing was normalized to 0.5 mm. Matrixes were used for statistical analysis. Texture analysis was performed using software developed by the laboratory of medical imaging and computation from our institution which includes normalization, filtering, and calculation of texture energy in the primary tumors. Nine different texture energies were compared between genotypes using student T tests, Fisher’s Exact Test was used to assess for statistical significance.

RESULTS
Significant differences were found on WT: M texture energy values (TEV)-3,4,5,8 and 9 at 59: 65, 41:47, 30: 37 and 31: 39 (p = 0.005, 0.002 and <0.001 for the latter); on WT: KRAS on TEV-4,5,8 and 9 at 41: 46(p<0.001), 30: 39 (p<0.001), 63: 71 (p=0.003) and 31: 38 (p<0.001). WT: NRAS was significantly different for all TEV-1 through 9(p<0.001), at 724: 838 (16%), 268: 315(17%), 58: 7733(3%), 40: 54(35%), 30: 40 (31%), 303: 381(26%), 189: 236(25%), 63:78 (24%) and 31:44 (39%). NRAS was most significantly associated with TEVs greater than 16% of WT tumors (p<0.001).

CONCLUSION
Wild type tumors, KRAS and NRAS mutants were found to have distinct texture energy patterns compared with other tumors. WT showed significantly lower texture energy values than mutant tumors. NRAS was most significantly associated to high energy values relative to WT.

CLINICAL RELEVANCE/APPLICATION

RCS09-12 Texture Characteristics and Mutational Status of Primary Colorectal Cancer
Wednesday, Dec. 2 11:10AM - 11:20AM Location: E350

Participants
Cinthia Cruz, MD, Boston, MA (Presenter) Nothing to Disclose
Synho Do, PhD, Boston, MA (Abstract Co-Author) Nothing to Disclose
James H. Thrall, MD, Boston, MA (Abstract Co-Author) Board Member, Mobile Aspects, Inc; Board Member, WorldCare International Inc; Consultant, WorldCare International Inc; Shareholder, Antares Pharma, Inc; Shareholder, iBio, Inc ; Shareholder, Peregrine Pharmaceuticals, Inc
Debra A. Gervais, MD, Chestnut Hill, MA (Abstract Co-Author) Nothing to Disclose

PURPOSE
To determine whether there is an association between texture energy of primary lesions of colorectal cancer and their mutational status.

METHOD AND MATERIALS
A total of 23 cases were included. The most frequent mutations [single nucleotide polymorphisms (SNP)] found in a previous study with a cohort of 713 subjects of our institution, were analyzed. Five wild type (WT) tumors, 5 BRAF, 5 KRAS, 4 TP53 and 4 NRAS mutant (M) primary tumors were delineated and extracted from the pretreatment portal-venous phase 5mm slice thickness contrast enhanced CTs, creating a mask. For each phenotype we concatenated acquired texture energy measurements (TEV) for each slice of tumor to form a matrix (N by 9), where N is the number of slices. We computed more than 2000 pixels for each slice and, pixel spacing was normalized to 0.5 mm. Matrixes were used for statistical analysis. Texture analysis was performed using software developed by the laboratory of medical imaging and computation from our institution which includes normalization, filtering, and calculation of texture energy in the primary tumors. Nine different texture energies were compared between genotypes using student T tests, Fisher’s Exact Test was used to assess for statistical significance.

RESULTS
Significant differences were found on WT: M texture energy values (TEV)-3,4,5,8 and 9 at 59: 65, 41:47, 30: 37, 63: 72 and 31: 39 (p = 0.005, 0.002 and <0.001 for the latter); on WT: KRAS on TEV-4,5,8 and 9 at 41: 46(p<0.001), 30: 39 (p<0.001), 63: 71 (p=0.003) and 31: 38 (p<0.001). WT: NRAS was significantly different for all TEV-1 through 9(p<0.001), at 724: 838 (16%), 268: 315(17%), 58: 7733(3%), 40: 54(35%), 30: 40 (31%), 303: 381(26%), 189: 236(25%), 63:78 (24%) and 31:44 (39%). NRAS was most significantly associated with TEVs greater than 16% of WT tumors (p<0.001).

CONCLUSION
Wild type tumors, KRAS and NRAS mutants were found to have distinct texture energy patterns compared with other tumors. WT showed significantly lower texture energy values than mutant tumors. NRAS was most significantly associated to high energy values relative to WT.

CLINICAL RELEVANCE/APPLICATION
Known associations of single nucleotide polymorphisms and clinical and imaging features play a pivotal role in treatment of colorectal cancer. Texture energy analysis is another tool for characterizing tumors using imaging data that can help us to guide genetic-driven biopsies and possibly treatments.

**Honored Educators**

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Debra A. Gervais, MD - 2012 Honored Educator

**RCT09-13 N-Staging in Primary Rectal Cancer: Can CT-Perfusion Differentiate between Malignant and Non-Malignant Pelvic Lymph Nodes? Preliminary Results from a Prospective, Blinded Feasibility Study Comparing CT-Perfusion Findings to Histopathology.**

Wednesday, Dec. 2 11:20AM - 11:30AM Location: E350

Participants
Zahra Kassam, MD, London, ON (Presenter) Nothing to Disclose
Kyle Burgers, London, ON (Abstract Co-Author) Nothing to Disclose
Joanna Walsh, London, ON (Abstract Co-Author) Nothing to Disclose
Errol E. Stewart, PhD, London, ON (Abstract Co-Author) Nothing to Disclose
Pavlo Ohorodnyk, MD, London, ON (Abstract Co-Author) Nothing to Disclose
Barbara J. Fisher, MD, London, ON (Abstract Co-Author) Nothing to Disclose
Ting-Yim Lee, MSc, PhD, London, ON (Abstract Co-Author) Research Grant, General Electric Company Royalties, General Electric Company

**PURPOSE**

To determine whether CT-Perfusion has the potential to distinguish between malignant and non-malignant lymph nodes in patients with primary rectal cancer.

**METHOD AND MATERIALS**

18 patients with rectal cancer were evaluated preoperatively with CT-perfusion (CT-P). Dynamic CT-P of the pelvis was performed following IV contrast injection. All visible pelvic lymph nodes were categorized qualitatively by the radiologist as being positive or negative for malignancy. Wherever possible, the inguinal lymph nodes of each patient were used as internal negative controls. Analysis of the lymph nodes included: (1) Visual CT interpretation by the radiologist, (2) CT-Perfusion, and (3) Histopathology (standard of reference). The visual and CT-Perfusion analysis were done independently, by different reviewers. The lymph nodes were assessed for blood flow, blood volume, mean transit time and capillary permeability. Patients with T2 disease were treated surgically with total mesorectal excision (TME); while those with T3/4 or node-positive disease underwent neoadjuvant therapy, followed by repeat CT-P. The nodes within the TME specimen were organized into perirectal zones according to a pre-established regional lymph node map. Ultrastaging of the lymph nodes was performed at 2 mm sections. The pathologist was blinded to the imaging and perfusion results.

**RESULTS**

Visual interpretation yielded 100 abnormal and 68 normal nodes; sensitivity was 1.0 and specificity was 0.33. CT-P demonstrated a pattern of peripheral perfusion in malignant nodes, while reactive nodes demonstrated homogeneous perfusion. Overall blood flow in non-malignant nodes was significantly higher than in malignant nodes (p<0.000). Analysis revealed 31 abnormal and 104 normal nodes (some nodes could not be evaluated due to motion artifact). Sensitivity was 1.0 and specificity increased to 0.87. The lower size limit for technical lymph node evaluation by CT-P was 3.2 mm.

**CONCLUSION**

CT-Perfusion shows early promise in N-staging of primary rectal cancer, even in nodes <5 mm. Qualitative N-staging by conventional CT could potentially overstage disease.

**CLINICAL RELEVANCE/APPLICATION**

Accurate N-staging of small nodes by conventional imaging methods can be challenging. Early results suggest that N-staging by CT-Perfusion has the potential to positively impact patient management, in the settings of (1) Initial diagnosis, (2) Response to therapy, and (3) Assessment of recurrence.

**RCT09-14 Dual Energy CT Utilization in Clinical Practice: Impact on Workflow and Radiation Doses**

Wednesday, Dec. 2 11:30AM - 11:40AM Location: E350

Participants
Yasir Andrabi, MD, MPH, Boston, MA (Abstract Co-Author) Nothing to Disclose
Manuel Patino, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Rani S. Sewatkar, MBBS, Edison, NJ (Abstract Co-Author) Nothing to Disclose
Andrea Prochowski Jamur, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Farhad Mehrkhani, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Avinash R. Kambadakone, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Dushyant V. Sahani, MD, Boston, MA (Presenter) Research Grant, General Electric Company; Research Consultant, Alena Pharmaceuticals, Inc

**PURPOSE**

The growing demand for dual energy (DE) CT has introduced workflow challenges and radiation dose concerns. Therefore we studied the impact of increased DE CT utilization on the CT workflow and radiation doses of cancer FU exams performed in last 2 years.
METHOD AND MATERIALS

In this IRB approved retrospective analysis, 20,325 cancer FU CT exams (age=61.6 years, weight=76.8 kg) performed between Dec 2012 - Mar 2015 on 5 of our scanners (GE Healthcare=3, Siemens=2) were included. Two GE scanners (Discovery CT750 HD) have DE capability and iterative reconstruction algorithms (IRT; ASiR) and remaining 1 is a single energy (SE) scanner (Light Speed Pro) with FBP algorithm. Both Siemens scanners have IRTs (SAFIRE); DE is present on one scanner (Flash). Exams were stratified into 3 groups: Group1: DE exams (DE-GE, DE-Siemens), Group2: SE-FBP and Group3: SE-IRT (ASiR,SAFIRE). Radiation doses were retrieved and compared between different groups and National Averages.

RESULTS

The DE CT constituted 41% of all cancer FU exams (DE-GE=8089, DE-Siemens=208) compared to 59% SE exams (SE-FBP=2075; SE-ASiR=6647; SE-SAFIRE=3306). Three fold increases in DE CT utilization was noted (21% in 2012 and 67% in 2015) with an overall slight increase in the total number of CT exams performed on these scanners. The radiation doses for DE CT exams were substantially (47%) lower than National averages (DIR). Doses were comparable to SE-FBP exams (CTDI(mGy); Group1=10.6 (DE-GE=12.1, DE-Siemens=9.2); Group2=12.4; p>0.05) and nearly 13% higher than SE-IRT scans (Group3=9.3mGy(SE-ASiR=9.6, SE-SAFIRE=8.9); p<0.05). A16% reduction in DE-CT doses were noted in 2015 compared to 2012.

CONCLUSION

There is a threefold increase in the utilization of DE-CT exams for cancer FU exams from last 2 years. DE-CT radiation doses are substantially (47%) lower than national averages, comparable to our institutional SE-FBP cancer FU exams and 13% higher than our SE-IRT scans. There is also a 16% reduction in DE-CT doses from 2012.

CLINICAL RELEVANCE/APPLICATION

There is an increase in DE-CT utilization due to its growing clinical applications. These exams have different acquisition and postprocessing demands, thus, raising work flow and radiation dose concerns. Our study indicates that DE CT exams do not interfere with the work flow and the radiation doses are also in the acceptable range for diagnostic CT exams.

Honored Educators

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Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator

RC509-15 CT Workflow Issues

Wednesday, Dec. 2 11:40AM - 12:00PM Location: E350

Participants

Dushyant V. Sahani, MD, Boston, MA (Presenter) Research Grant, General Electric Company; Research Consultant, Alena Pharmaceuticals, Inc

Honored Educators

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Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator
**SSK06**

**ISP: Gastrointestinal (Colon Cancer Screening and Staging)**

Wednesday, Dec. 2 10:30AM - 12:00PM Location: E351

**GI**  **CT**  **MR**  **OI**

**AMA PRA Category 1 Credits ™**: 1.50
**ARRT Category A+ Credits**: 1.50

**FDA** Discussions may include off-label uses.

**Participants**

David H. Kim, MD, Madison, WI (Moderator) Consultant, Viatronix, Inc; Co-founder, VirtuoCTC, LLC; Medical Advisory Board, Digital ArtForms, Inc; Stockholder, Cellecare Biosciences, Inc

Christine O. Menias, MD, Scottsdale, AZ (Moderator) Nothing to Disclose

**Sub-Events**

**SSK06-01**  **Gastrointestinal Keynote Speaker: Update on Colon Cancer Screening and CTC**

Wednesday, Dec. 2 10:30AM - 10:40AM Location: E351

**Participants**

David H. Kim, MD, Madison, WI (Presenter) Consultant, Viatronix, Inc; Co-founder, VirtuoCTC, LLC; Medical Advisory Board, Digital ArtForms, Inc; Stockholder, Cellecare Biosciences, Inc

**SSK06-02**  **CT Colonography versus Flexible Sigmoidoscopy for Colorectal Cancer Screening. Outcomes of a Randomized Controlled Trial (RCT)**

Wednesday, Dec. 2 10:40AM - 10:50AM Location: E351

**Participants**

Daniele Regge, MD, Candiolo, Italy (Presenter) Speakers Bureau, General Electric Company

Loredana Correale, PhD, Turin, Italy (Abstract Co-Author) Researcher, im3D SpA

Carlo Senore, MD, Torino, Italy (Abstract Co-Author) Nothing to Disclose

Cesare Hassan, Rome, Italy (Abstract Co-Author) Nothing to Disclose

Gabriella Iussich, MD, Locarno, Switzerland (Abstract Co-Author) Consultant, im3D SpA

Nereo Segnan, Torino, Italy (Abstract Co-Author) Nothing to Disclose

Stefania Montemezzi, MD, Verona, Italy (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To compare detection rate (DR) of CT colonography (CTC) and flexible sigmoidoscopy (FS) for CRC screening.

**METHOD AND MATERIALS**

An invitation letter to participate in a multicenter randomized screening trial was mailed to people aged 58-60 years, living in the Piedmont Region, Italy and in Verona, Italy. Individuals with a history of CRC/adenomas, inflammatory bowel disease, recent colonoscopy, or two first-degree relatives with CRC were excluded from invitation by their general practitioners. Responders to the invitation were randomized to either CTC or FS and scheduled for screening procedure. CTC interpretations were remotely performed via telediagnosis, and were assisted by a Computer-aided detection software. Participants with polyps≥6-mm at CTC and those with “high-risk” distal lesions (i.e., adenomas>10-mm, or high-grade dysplasia, or villous component >20%, or >2 adenomas of any type) at FS were referred for colonoscopy (CC). The primary outcome was DR of advanced neoplasia (AN), namely, the number of participants with CRC or advanced adenomas relative to the total number of participants. Differences were expressed as relative risk (RR) with 95% CIs.

**RESULTS**

5412 people agreed to take part in the trial: 2738 randomly assigned to FS and 2674 to CTC. After excluding participants with inadequate bowel preparation, analysis included 2673 (1298 females) adequate FS examinations and 2595 (1266 females) diagnostic CTC exams. Of FS participants, 271 (10.1%) were referred to CC; compliance to CC was 86.7% (235). Of CTC participants, 264 (10.2%) were offered CC, of whom 260 (98.5%) performed the exam. DR of AN was 4.7% (127 including 9 CRCs) for FS vs. 5.1% (133 including 10 CRCs) for CTC [RR: 1.1; 95% CI: 0.9-1.4; P=0.524]. DR of distal AN was 4.1% (109) for FS and 2.9% (76) for CTC [RR: 0.72; 95% CI: 0.54-0.96; P=0.025]. DR of proximal AN was 1.3% (34) for FS and 2.7% (69) for CTC [RR: 2.06; 95% CI: 1.37-3.19; P<0.001]. Isolated proximal AN were present in 2.3% and 0.67% of CTC and FS participants, respectively.

**CONCLUSION**

No significant differences were seen in AN detection for the two screening groups. However, DR of distal AN was 30% lower in CTC than in FS screening, while DR of proximal AN was two times higher following screening with CTC than with FS.

**CLINICAL RELEVANCE/APPLICATION**

Our study supports the hypothesis that CTC screening may have a larger impact on reduction of proximal CRC incidence than FS.

**SSK06-03**  **Natural Course of Medium-sized Polyps during a 3-year Surveillance Interval: Linear and Volumetric Assessment with CT Colonography in Correlation with Histology**

Wednesday, Dec. 2 10:50AM - 11:00AM Location: E351

**Participants**

Charlotte J. Tutein Nolthenius, Amsterdam, Netherlands (Presenter) Nothing to Disclose

Thierry N. Boellaard, MD, PhD, Amsterdam, Netherlands (Abstract Co-Author) Nothing to Disclose
Volumetric growth assessment in medium-sized polyps has shown to be more reliable than linear measurements and it seems a promising biomarker for determination of clinical importance. This is however not standard practice in reporting on polyps with CT colonography (CTC) and more experience and research is needed.

**METHOD AND MATERIALS**

Ethics approval and written informed consent were obtained. After participating in an invitational population-based CTC screening trial 101 participants harbored one or two 6-9 mm polyps as the largest lesion(s) for which surveillance CTC was advised after 3 years. Participants with lesion(s) of ≥6 mm at surveillance CTC were offered colonoscopy and polypectomy. Volumetric and linear measurements were performed on index and surveillance CTC and polyps were classified into baseline growth categories according to ≤30% volumetric change over the entire surveillance interval (>30% growth as progression, 30% growth to ~30% decrease as stable and >~30% decrease as regression). Polyp growth was correlated to histopathological findings and other polyp characteristics.

**RESULTS**

Between July 2012 and May 2014, 78 of 101 patients underwent surveillance CTC (mean age 65.6 (SD 6.7); 51% male). After a mean surveillance interval of 3.3 years (SD 0.3; range 3.0-4.6 years) of 95 polyps 33 (35%) progressed, 36 (38%) remained stable and 26 (27%) regressed, including an apparent resolution in 13 (14%) polyps. Of 20 proven advanced adenomas, 14 (70%) progressed and 6 (30%) remained stable, compared to 13 (37%) and 16 (46%) of 35 non-advanced adenomas. No associations were found between growth categories and polyp morphology, location and size at index CTC. Other linear or volumetric thresholds used did not identify more advanced adenomas.

**CONCLUSION**

Volumetric assessment showed one-third of medium-sized polyps to progress over time emphasizing the importance of these polyps. However, growth assessment was not able to identify all advanced adenomas as one-third remained stable in size over a 3-year surveillance interval. These findings must be taken into account when deciding on proper colonoscopy referral guidelines.

**CLINICAL RELEVANCE/APPLICATION**

Volumetric assessment showed one-third of medium-sized polyps to progress over time emphasizing the importance of these polyps.
Our study confirms that CT colonography is an important tool in the diagnosis of colorectal malignancy and is an example to other institutions in monitoring CT colonography outcomes and maintaining quality standards. During this presentation we will explore the common reasons for missed malignancy on CT colonography.

SSK06-05  
**CT Findings of Postpolypectomy Coagulation Syndrome in Patients Who Underwent Colonoscopic Polypectomy: Comparison with Those of Perforation**

**Wednesday, Dec. 2 11:10AM - 11:20AM Location: E351**

**Participants**
Yoon Joo Shin, MD, Seongnam, Korea, Republic Of (Presenter) Nothing to Disclose
Young Hoon Kim, MD, PhD, Seongnam-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Yoon Jin Lee, MD, Seongnam-si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Ji Hoon Park, MD, Seongnam-Si, Korea, Republic Of (Abstract Co-Author) Research Grant, Bracco Group
Kyoung Ho Lee, MD, Seongnam-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Ji Ye Sim, MD, MS, Seongnam-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
To describe CT findings of postpolypectomy coagulation syndrome (PPCS) and to identify the features that can distinguish it from colonic perforation after colonoscopic polypectomy.

**METHOD AND MATERIALS**
From January 2011 to November 2014, a total of 5542 adult (age>40yr) patient who underwent colonoscopic polypectomy were found according to search through hospital database. After reviewing the patient’s medical and imaging records, eight patients (0.14%) with PPCS and six patients (0.11%) with perforation were identified. Because five patients were excluded due to absence of CT examination, four (1 male; age range, 52-75 years with mean age, 69 years) with PPCS and five patients (5 male; age range, 46-67 years with mean age, 54 years) with perforation were finally included. Two abdominal radiologists reviewed the abdominal CT images in a consensus manner. The following CT findings were assessed: presence of pneumoperitoneum or pneumoretroperitoneum, presence of fluid collection, presence of colonic wall thickening, if present, patterns, thickness and length of an involved segment, enhancement pattern of an involved segment, presence of mural defect in an involved segment, and presence of surrounding infiltration around an involved segment. Clinical findings including patient’s symptom and sign were also assessed.

**RESULTS**
Although three patients with perforation eventually underwent surgery, all patients with PPCS were completely recovered only with conservative management. The clinical presentation including presence of abdominal pain or leukocytosis was not different between two groups. On CT, an involved colonic wall was more longer and thicker in PPCS group (mean length and width: 124 ± 81.3 mm, 16 ± 4.9 mm) than perforation group (41.4 ± 11.8mm, 7.4 ± 1.5mm). In all four patients with PPCS, CT images showed a marked low attenuation wall thickening with severe pericolic infiltration around an involved segment. None of the patients with PPCS showed free air on CT.

**CONCLUSION**
PPCS, a very rare complication after colonoscopic polypectomy (prevalence of 0.14%), shows severe low attenuating mural thickening. In comparison with perforation, PPCS does not demonstrate free air in peritoneal or retroperitoneal space

**CLINICAL RELEVANCE/APPLICATION**
The imaging features on CT can be useful to promptly distinguish PPCS from colonic perforation.

SSK06-06  
**Extracolonic Findings at Screening CT Colonography: Analysis of Incompletely Characterized and Likely Insignificant (C-RADS E3) Findings**

**Wednesday, Dec. 2 11:20AM - 11:30AM Location: E351**

**Participants**
Bryan D. Pooler, MD, Madison, WI (Presenter) Nothing to Disclose
David H. Kim, MD, Madison, WI (Abstract Co-Author) Consultant, Viatronix, Inc; Co-founder, VirtuoCTC, LLC; Medical Advisory Board, Digital ArtForms, Inc; Stockholder, CollecTi Biosciences, Inc
Perry J. Pickhardt, MD, Madison, WI (Abstract Co-Author) Co-founder, VirtuoCTC, LLC; Stockholder, CollecTi Biosciences, Inc; Research Consultant, Bracco Group; Research Consultant, KIT ; Research Grant, Koninklijke Philips NV

**PURPOSE**
To assess the incidence and outcomes of unexpected extracolonic findings at screening CTC which are likely insignificant and/or incompletely characterized (C-RADS E3), but may require further evaluation.

**METHOD AND MATERIALS**
7,952 consecutive patients (mean age 56.7±7.3 years, M:F 3,675:4,277) underwent first-time CTC screening over a 98-month interval. Persons with unsuspected C-RADS E3 findings were extracted and outcomes determined.

**RESULTS**
Previously unknown C-RADS E3 findings were identified in 9.2% (731/7,952; mean age 57.24±7.7 years; M:F 268:463) of the screening CTC population; 25 patients had multiple findings for a total of 757 E3 findings. Consideration for further imaging, if clinically appropriate, was suggested for 84% (634/757) of these findings, with clinical correlation suggested in the remainder. Dedicated follow-up imaging was obtained in 4.4% (353/7,952) of patients. Conditions requiring treatment or ongoing surveillance were diagnosed in 0.9% (72/7,952) of patients. Common extracolonic finding categories included: adnexal/uterine (24%, 185/757), lung (20%, 155/757), kidney/GU (20%, 149/757), and liver (11%, 85/757). Malignant or potentially malignant lesions were found in 0.2% (18/7,952) of patients, including renal cell carcinoma, lymphoma, breast cancer, and malignant/borderline ovarian cancer.

**CONCLUSION**
Likely insignificant/incompletely characterized (C-RADS E3) findings were found in 9.2% of patients undergoing screening CTC with consideration for additional imaging suggested in the majority. Follow-up imaging was actually obtained in 4.4%, with conditions ultimately requiring treatment or ongoing surveillance diagnosed in 0.9%. Malignant or potentially malignant lesions were found in 0.2% of the total cohort.

**CLINICAL RELEVANCE/APPLICATION**

Incompletely characterized and likely insignificant extracolonic (C-RADS E3) findings are uncommon, occurring in less than 10% of patients. Fewer than 1% of patients were diagnosed with conditions requiring treatment or continued surveillance. Extracolonic malignancies are rare in this group.

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Perry J. Pickhardt, MD - 2014 Honored Educator

**SSK06-07 Effect of Reducing Abdominal Compression during Prone CT Colonography on Ascending Colonic Rotation Occurring with Supine-to-prone Positional Change**

*Wednesday, Dec. 2 11:30AM - 11:40AM Location: E351*

Participants

Jong Keon Jang, MD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Seong Ho Park, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jong Seok Lee, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Hyun Jin Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Ah Young Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Hyun Kwon Ha, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

Colonic rotation that mimics lesion mobility on CT colonography (CTC) can be particularly deceptive when it happens in unexpected locations such as the ascending colon. This study was to evaluate the effect of reducing abdominal compression during prone CTC on ascending colonic rotation that occurs with supine-to-prone positional change.

**METHOD AND MATERIALS**

Consecutive patients fulfilling following criteria were found from 1218 CTC cases (January 2013 to July 2014): a) prone CTC obtained with cushion blocks placed under the chest and pelvis to reduce abdominal compression, b) air-distended ascending colon on both supine and prone CTC, and c) colonoscopy-proven sessile polyps >=6mm in straight mid-ascending colon. Radial locations along the luminal circumference (°) of 24 polyps and 54 colonic teniae (3 teniae in each patient) in mid-ascending colon of 18 patients (M:F, 16:2; 65±12 years) were measured on supine and prone CTC images and supine-to-prone difference was determined. A coordinate system designed to offset effects of torso rotation was used. The supine-to-prone difference was given a value between -180° (for internal rotation) and +180° (for external rotation). Degrees of abdominal compression (Abd comp ) and posterior displacement of the ascending colon still occurred in prone position due to gravitational anterior displacement of other mobile abdominal contents despite the lack of abdominal compression.

**RESULTS**

The radial location change was -22° to 61° (median, 10.4°) for the polyps and was similar for colonic teniae, which was smaller than the reported ascending colonic rotation. However, 50-56% of the polyps and teniae still showed external rotation >>10°. The radial location change was not significantly correlated with Abd comp (P =.131 to .287) but was correlated with Asc disp (r =.562 to .702; P =.001 to .015). Posterior displacement of the ascending colon still occurred in prone position due to gravitational anterior displacement of other mobile abdominal contents despite the lack of abdominal compression.

**CONCLUSION**

Ascending colonic rotation on CTC occurring with supine-to-prone positional change was incompletely prevented by reducing abdominal compression during prone CTC.

**CLINICAL RELEVANCE/APPLICATION**

Careful confirmation of lesion mobility or lack of it is fundamental for accurate CTC interpretation although reducing abdominal compression during prone CTC may decrease the related pitfall in the ascending colon.

**SSK06-08 Computer-aided Supine-only Reading in Full-cathartic CT Colonography: Observer Performance Study**

*Wednesday, Dec. 2 11:40AM - 11:50AM Location: E351*

Participants

Yasuji Ryu, MD, Boston, MA (Presenter) Nothing to Disclose
Janne J. Nappi, PhD, Boston, MA (Abstract Co-Author) Royalties, Hologic, Inc; Royalties, MEDIAN Technologies;
Hiroyuki Yoshida, PhD, Boston, MA (Abstract Co-Author) Patent holder, Hologic, Inc; Patent holder, MEDIAN Technologies;

**PURPOSE**

To assess the performance of an advanced computer-aided "supine-only reading" of full-cathartic CTC in the detection of polyps in patients with average or high risk of colorectal cancer.

**METHOD AND MATERIALS**
A total of 266 CTC cases were sampled from a multi-center CTC trial for patients with average or high risk of colorectal cancer, in which patients underwent cathartic bowel preparation with 2L polyethylene glycol solution and 20mL sodium diatrizoate for tagging of residual fluid, followed by automated CO2 insufflation. A computer-aided detection (CADe) system that had been trained with cases independent from this study was used to review the CTC cases. One expert reader (2600 cases reading experience) reviewed the cases in “supine-only reading” mode, in which only the supine scans of these cases were interpreted using CADe as a second reader, and recorded all detected lesions ≥6 mm. The per-patient sensitivities and the areas under the receiver operating curve (AUC) in the detection of adenomas and carcinomas were compared between unaided and CADe-aided readings, as well as between the supine-only reading and “conventional reading” result from the trial, in which both supine and prone scans were used for interpretation of the CTC cases.

RESULTS

There were 53 and 28 patients with adenomas and/or carcinomas ≥6 mm and ≥10 mm, respectively. Corresponding per-patient sensitivities (AUCs) for CADe-aided supine-only reading were 91% (.92) and 93% (.96), respectively, whereas those of conventional reading were 90% (.91) and 93% (.96), respectively. The differences in sensitivities and AUCs were not statistically significant (Fisher’s exact test, P>5). For 6-9 mm lesions, the per-patient sensitivity (AUCs) of CADe-aided supine-only reading was 83% (.88), which was higher (McNemar’s test, P<.05) than those of unaided, supine-only reading of 69% (.81).

CONCLUSION

In full-cathartic CTC, CADe-aided supine-only reading may yield an equally high performance in the detection of adenomas and carcinomas as that of the conventional, supine-prone reading. CADe may also significantly improves the detection performance of polyps 6-9 mm in size in the supine-only reading.

CLINICAL RELEVANCE/APPLICATION

Computer-aided supine-only reading has the potential to allow one-position scanning in CTC, thereby effectively reducing the radiation dose and reading time into a half of those of conventional reading.

SSK06-09 Observer Study for Detection of Lesions in Viewing CT Colonography Using a New Eye Gaze Tracking System

Participants
Mitsuru Sato, Maebashi, Japan (Presenter) Nothing to Disclose
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Mika Okajima, Gunma, Japan (Abstract Co-Author) Nothing to Disclose
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Kunio Doh, PhD, Chicago, IL (Abstract Co-Author) Shareholder, Hologic, Inc; License agreement, Hologic, Inc; License agreement, Deus Technologies, LLC; License agreement, Riverain Technologies, LLC; License agreement, Mitsubishi Corporation; License agreement, MEDIAN Technologies; License agreement, General Electric Company; License agreement, Toshiba Corporation; Research support, Deus Technologies, LLC; Research support, E. I. du Pont de Nemours & Company; Research support, Elcint Medical Imaging Ltd; Research support, FUJIFILM Holdings Corporation; Research support, General Electric Company; Research support, Hitachi, Ltd; Research support, Eastman Kodak Company; Research support, Konica Minolta Group; Research support, Mitaya Manufacturing Co, Ltd; Research support, Mitsubishi Corporation; Research support, Koninklijke Philips NV; Research support, Hologic, Inc; Research support, Riverain Technologies, LLC; Research support, Seiko Corporation; Research support, Siemens AG; Research support, 3M Company; Research support, Toshiba Corporation; Shoko Tsutsuki, Maebashi, Japan (Abstract Co-Author) Nothing to Disclose
Kiyoshi Isebe, Tokyo, Japan (Abstract Co-Author) Nothing to Disclose
Atsuko Torimoto, Otaru, Japan (Abstract Co-Author) Nothing to Disclose

PURPOSE

Monitoring the eye tracking of the observer in the detection of lesions is important in order to understand image interpretation process for CT colonography. Head-mount eye tracker system has been used to track observers’ viewing points on radiological images. However, it is difficult to use this system casually due to a problem of an obtrusive device for observation. We investigated gaze points for image interpretation of CTC images by experts and non-experienced observers, and analyze the time and the gaze point for detection of lesions using a new eye gaze tracking system, which was designed to detect the pupil point and corneal reflection point in the dark pupil eye tracking by using two infrared cameras.

METHOD AND MATERIALS

Observers for CTC image reading commonly use virtual gross pathology (VGP) images which were obtained as a stretched views of the inner colonic surface. We used an eye gaze point sensing system (JVCKenwood Co.,Yokohama,Japan) which consisted of an eye tracking sensor with two infrared light emitting diode (LED) laser emitters combined with two infrared cameras. Observer studies were performed by two expert observers (over 13 years experience) and two non-experienced observers on nineteen VGP images including tumors, polyps and other abnormalities.

RESULTS

Eye gaze tracking data of the observers can be obtained without a device put on the head such as a headgear, with proper training of about 20 minutes. The average reading time (32.6sec) by expert observers was significantly shorter (p<0.001) than that (46.2sec) by non-experienced observers. The detection rates of target areas such as tumors by expert observers (84.18%) was higher than that of non-experienced observers (68.35%). Non-experienced observers in CTC reading were prolonged with low detection rates. On other hand, experienced observers provided shortened viewer’s gaze dwells time on the target areas.

CONCLUSION

A new eye gaze tracking system for CTC images can be performed without a head-mount eye tracker. Although the reading time of expert observers was short, the target areas on VGP images were observed with a high detection rate.

CLINICAL RELEVANCE/APPLICATION

We investigated
An eye gaze tracking analysis using infrared cameras can be set-up easily. Gaze points on CTC images by experts and non-experienced observers can be determined for understanding of image readings for detection of lesions.
**SSK07**

**ISP: Gastrointestinal (Pancreas Benign Diseases)**

Wednesday, Dec. 2 10:30AM - 12:00PM Location: E353B

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<th>GI</th>
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AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

**Participants**

Elizabeth M. Hecht, MD, New York, NY (Moderator) Nothing to Disclose
Koenraad J. Mortele, MD, Boston, MA (Moderator) Nothing to Disclose
Atif Zaheer, MD, Baltimore, MD (Moderator) Nothing to Disclose

**Sub-Events**

**SSK07-01 Gastrointestinal Keynote Speaker: Update on Imaging Benign Pancreatic Diseases**

Wednesday, Dec. 2 10:30AM - 10:40AM Location: E353B

**Participants**

Koenraad J. Mortele, MD, Boston, MA (Presenter) Nothing to Disclose

**SSK07-02 Using T1 Mapping for the Diagnosis of Mild Chronic Pancreatitis**

Wednesday, Dec. 2 10:40AM - 10:50AM Location: E353B

**Participants**

Temel Tirkes, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Jordan K. Swenson, MD, Indianapolis, IN (Presenter) Nothing to Disclose
Chen Lin, PhD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Qun Zhong, MD, PhD, Fuzhou, China (Abstract Co-Author) Nothing to Disclose
Qushi Wang, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Evan Fogel, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Fatih Akisik, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Kumaresan Sandrasegaran, MD, Carmel, IN (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To determine if the pancreatic signal intensity on T1 mapping can be used to diagnose mild chronic pancreatitis.

**METHOD AND MATERIALS**

This retrospective study analyzed patients with suspected chronic pancreatitis who underwent MRI between March 2014 and December 2014. All MRI studies were performed on 3.0 T Magnetom Verio (Siemens Medical Solutions, Malvern, PA) scanner. T1 mapping was acquired with gradient echo sequence using TR 3.87 ms, TE 1.32, flip angles of 2° and 13°, NEX of 1 and matrix of 320x168. Of 127 patients scanned, patients < 18 years age, and those with acute pancreatitis, pancreatic neoplasm, iron overload, or cystic fibrosis were excluded from the analysis. Patients were grouped as normal or mild chronic pancreatitis based on secretin-enhanced MR pancreatography using the Cambridge classification. There were 55 normal and 21 patients with mild chronic pancreatitis. Region of interest (ROI) measurements (~1cm2) were drawn in the homogenous regions of the head, body and tail of the pancreas by two independent and blinded reviewers. The two-tailed t-test was used to determine differences of T1 relaxation times between the normal and mild CP patients. Receiver operating characteristic (ROC) curve analysis was performed to determine the accuracy of the T1 relaxation time as a differentiating criterion.

**RESULTS**

There was a significant difference (p<0.0001) in the T1 relaxation times of the pancreas between the normal (mean 819 ms, 95%CI: 739-898) and mild chronic pancreatitis (mean: 1141 ms, 95%CI: 1027-1255) groups. T1 relaxation time cut off value of 1000 ms was 72% sensitive (95%CI: 48-89) and 75% specific (95%CI: 61-85) for the diagnosis of mild chronic pancreatitis (AUC=0.80, p<0.0001). There was substantial inter-observer agreement (kappa=0.74) of measured T1 relaxation times.

**CONCLUSION**

There is significant difference in the T1 relaxation times of the pancreas between the normal and mild chronic pancreatitis patients.

**CLINICAL RELEVANCE/APPLICATION**

T1-mapping may be a practical imaging technique for diagnosis of mild chronic pancreatitis.

**Honored Educators**

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Temel Tirkes, MD - 2013 Honored Educator
Temel Tirkes, MD - 2014 Honored Educator
Kumaresan Sandrasegaran, MD - 2013 Honored Educator
Kumaresan Sandrasegaran, MD - 2014 Honored Educator
Fatih Akisik, MD - 2014 Honored Educator

**SSK07-03 Quantitative MRI Evaluation of the Pancreatic Parenchyma in Diabetes Mellitus**
Participants
Fabio A. Uyeno, MD, Sao Carlos, Brazil (Presenter) Nothing to Disclose
Jorge Elias JR, MD, PhD, Ribeirao Preto, Brazil (Abstract Co-Author) Nothing to Disclose
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Iana M. Araujo, Ribeirao Preto, Brazil (Abstract Co-Author) Nothing to Disclose
Adriana L. Carvalho, Ribeirao Preto, Brazil (Abstract Co-Author) Nothing to Disclose
Francisco A. Paula, Ribeirao Preto, Brazil (Abstract Co-Author) Nothing to Disclose
Valdair F. Muglia, MD, PhD, Ribeirao Preto, Brazil (Abstract Co-Author) Nothing to Disclose

PURPOSE
To assess the pancreatic fat fraction and ADC in healthy, obese and diabetic (type 1 and 2) subjects

METHOD AND MATERIALS
A retrospective study of abdominal MR images of 89 subjects (56 controls including obese subgroup; 33 diabetics) was carried out. Two radiologists reviewed all images independently and proceeded the calculation of pancreatic fat fraction through in and out-of-phase GRE T1-weighted sequences, and the ADC through diffusion with maximum b=1000. Pancreatic fat fractions and average values of ADC were obtained and compared.

RESULTS
We observed significant differences between pancreatic fat fractions of diabetics type 2 (DM2) and healthy and diabetic type 1 (DM1) individuals, with p values of 0.01 and 0.02 for men and 0.02 and 0.01 for women, with good interobserver reliability (intraclass correlation coefficients > 0.8). Obese non-diabetic subjects showed high pancreatic fat fraction similar to DM2. There was also a significant difference in ADC values between DM2 and DM1 and healthy individuals (p: 0.02 and 0.03 in males; p: 0.002 and 0.001 in females), lower in DM2.

CONCLUSION
We observed significantly higher pancreatic fat fractions in DM2, when compared to healthy and DM1 subjects. This finding favors the hypothesis of fatty infiltration of the organ as a possible associated causal factor to the pancreatic beta cells failure, although obese subjects had pancreatic fat fractions similar to DM2.

CLINICAL RELEVANCE/APPLICATION
Pancreatic fatty infiltration occurring can be evaluated by MRI and its role in Diabetes Mellitus need further assessment.

SSK07-04   Co-existing Liver and Pancreas Steatosis Related to Chronic Non-alcoholic Liver Diseases (NALD) but not to Viral Infection

Participants
Manuela Franca, MD, Porto, Portugal (Presenter) Nothing to Disclose
Angel Alberich-Bayarri, MD, Valencia, Spain (Abstract Co-Author) Nothing to Disclose
Luis Marti-Bonmati, MD, PhD, Godella, Spain (Abstract Co-Author) Nothing to Disclose
Joao A. Oliveira, Porto, Portugal (Abstract Co-Author) Nothing to Disclose
Francisa E. Costa, MD, Porto, Portugal (Abstract Co-Author) Nothing to Disclose
Jose Ramon Vizcaino Vazquez, Porto, Portugal (Abstract Co-Author) Nothing to Disclose
Helena Pessegueiro Miranda, Porto, Portugal (Abstract Co-Author) Nothing to Disclose

PURPOSE
Liver steatosis is related to metabolic syndrome but is also present in other diffuse liver diseases. Pancreas steatosis may be also present in association with steatohepatitis and metabolic syndrome. However, little is known about pancreas fat deposition in other diffuse liver diseases such as viral hepatitis. Our purpose was to assess the Proton Density Fat Fraction (PDFF) of the liver and pancreas, with a multiecho GRE MR sequence, in patients with diffuse liver diseases, and to evaluate the relationship between fat infiltration of both organs and the influence of the underlying liver disease.

METHOD AND MATERIALS
The study population included consecutive patients with diffuse liver disorders and clinically indicated liver biopsy, who underwent a 3T MR examination using a single breath-hold multiecho chemical shift GRE sequence with 12 echoes. PDFF quantification was performed with magnitude and phase reconstruction, T1 and T2* biases corrected, selecting a ROI in the biopsied liver segment and also in 3 pancreatic regions (head, body, tail). Differences of liver and pancreas PDFF between histologic grades were assessed with Spearman correlation analysis. Furthermore, the study population was categorized by clinical diagnosis (chronic viral hepatitis vs. chronic NALD).

CONCLUSION
We found a significant correlation between liver and pancreas PDFF quantification, in patients with NALD but not in patients with viral hepatitis.

CLINICAL RELEVANCE/APPLICATION
Fat deposition in liver and pancreas appears to be related in patients with chronic non-alcoholic disease but not in chronic viral hepatitis.

SSK07-05   Intravoxel Incoherent Motion Diffusion-weighted MR Imaging in Characterizing Tumorous and Inflammatory Pancreatic Diseases
To evaluate the feasibility of intravoxel incoherent motion (IVIM) parameters in differentiating acute pancreatitis, autoimmune pancreatitis (AIP), neuroendocrine tumor (NET), solid pseudopapillary tumor (SPT), pancreatic ductal adenocarcinoma (PAC), and normal pancreas.

**METHOD AND MATERIALS**

The institutional board approved this retrospective study, and informed consent was waived. We evaluated IVIM diffusion-weighted images (10 b values for 0 to 300 sec/mm²) of 104 consecutive patients (mean age, 53.7 years; M:F=58:46) with pathologically confirmed pancreatic neoplasms (n =54), 15 NETs, 9 SPTs, and 30 PACs) > 2 cm, acute pancreatitis (n =13), AIP (n =7), and normal pancreas (n =30). The slow diffusion coefficient (Dslow), fast diffusion coefficient (Dfast), and perfusion fraction (f) were measured on two consecutive sections covering the largest part of the lesions. The differences in IVIM parameters among the diagnoses of pancreatic lesions were compared using the ANOVA test and the post-hoc Bonferroni multiple comparisons test.

**RESULTS**

PAC had significantly lower f values (0.13 ± 0.06) than normal pancreas (0.24 ± 0.05), NET (0.21 ± 0.06), and acute pancreatitis (0.25 ± 0.01) and significantly lower Dfast values (20.0 ± 12.6 x 10^-3 mm²/sec) than normal pancreas (48.2 ± 23.3 x 10^-3 mm²/sec) (P<.05). For AIP, f value (0.14 ± 0.06) was significantly lower than that of normal pancreas (P<.05). Dfast values of acute pancreatitis (25.4 ± 14.6 x 10^-3 mm²/sec), NET (26.5 ± 9.9 x 10^-3 mm²/sec), and SPT (17.8 ± 9.5 x 10^-3 mm²/sec) were lower than that of normal pancreas. Although the Dslow of AIP (1.06 ± 0.19 x 10^-3 mm²/sec) were lower than normal pancreas (1.14 ± 0.15 x 10^-3 mm²/sec) and the other pancreatic diseases, the difference was not statistically significant.

**CONCLUSION**

Perfusion related parameters (f and Dfast) are more helpful in characterizing pancreatic diseases than Dslow. PAC and AIP are characterized by decreased perfusion fraction (f) compared with normal pancreas.

**CLINICAL RELEVANCE/APPLICATION**

IVIM is feasible for assessing the different perfusion and diffusion characteristics of pancreatic diseases.

**SSK07-06 Evaluation of Pancreatic Exocrine Insufficiency by Cine-Dynamic MRCP Using Spatially Selective IR Pulse: Correlation with Severity of Chronic Pancreatitis based on Morphological Changes of Pancreatic Duct**

**PURPOSE**

Recent study showed a significantly positive correlation between secretion grades of pancreatic juice at cine dynamic MRCP with a selective inversion recovery (IR) pulse and pancreatic exocrine function test. This study evaluated pancreatic exocrine insufficiency by cine-dynamic MRCP using spatially selective IR pulse in patients with chronic pancreatitis in correlation with the severity of morphological changes of pancreatic duct.

**METHOD AND MATERIALS**

41 patients with suspected chronic pancreatitis underwent cine-dynamic MRCP with a spatially selective IR pulse. Mean secretion grading score (5-point scale) based on the moving distance of pancreatic juice inflow on cine-dynamic MRCP was assessed. Based on the previous report, cutoff value of secretion grade less than 0.70 in cine-dynamic MRCP was used for the criterion of pancreatic exocrine insufficiency. Mean secretion grades were compared with Cambridge grade which defined the severity of chronic pancreatitis based on morphological changes of pancreatic duct.

**RESULTS**

In comparisons among patient groups with Cambridge grade1 (normal; n=6), 2 (equivocal; n=3), 3 (mild; n=6), 4 (moderate; n=9) and 5 (severe; n=17), median secretion grading score of Cambridge5 (score=0) was significantly lower than Cambridge1-4 (1.13, 0.55, 0.50, 0.15; P<0.001, P<0.015, P<0.002, P<0.028, respectively). In all 17 patients in Cambridge5, secretion grading score was less than 0.70. Median secretion grading score of Cambridge1 was significantly higher than Cambridge3-5 (P<0.030, P<0.011, P<0.001, respectively). In Cambridge2-4, there were no significant differences in secretion grading score between any groups. In Cambridge2, secretion grading score was less than 0.70 in 2 (67%) of 3 patients showing pancreatic exocrine insufficiency. Conversely, in Cambridge3 and 4, secretion grading score was more than 0.70 in 3 (20%) of 15 patients showing normal pancreatic exocrine function.
CONCLUSION
It should be noted that the degree of morphological changes of pancreatic duct does not necessarily reflect the severity of pancreatic exocrine insufficiency at cine-dynamic MRCP in Cambridge grade 2-4 (equivocal to moderate) chronic pancreatitis.

CLINICAL RELEVANCE/APPLICATION
Cine-dynamic MRCP with selective IR pulse may have a potential to evaluate pancreatic exocrine insufficiency in patients with Cambridge grade 2-4 (equivocal to moderate) chronic pancreatitis.

SSK07-07 Imaging Evaluation of Ablative Margin and Index Tumor Immediately after Combined Treatment of TACE and RF Ablation for Hepatocellular Carcinoma: Comparison between Multi-detector CT and MR Imaging

Participants
Jin Woong Kim, MD, Jeollanam-do, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Sang Soo Shin, MD, Gwangju, Korea, Republic Of (Presenter) Nothing to Disclose
Su Hee Heo, MD, Hwasun-Gun, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Hyo Soon Lim, MD, Jeollanam-Do, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jun Hyung Hong, Gwang-Ju, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Young Hoe Hur, Jeollanam-Do, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Yong-Yeon Jeong, MD, Chonnam, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

PURPOSE
To prospectively compare multi-detector CT and MR imaging in assessment of ablative margin (AM) and index tumor within ablation zones immediately after combined treatment of transcatheter arterial chemoembolization (TACE) and radiofrequency (RF) ablation for hepatocellular carcinoma (HCC)

METHOD AND MATERIALS
Based on our preliminary data, necessary number of patients was estimated to be at least 30 when an α error of 0.05 and a β error of 0.2 were applied. A total of 33 consecutive patients with 45 HCCs, who had successfully undergone contrast-enhanced CT and MR imaging after RF ablation combined with TACE, was enrolled in this study. CT and MR imaging were performed within 3 and 7 hours after completion of combined therapy of TACE and RF ablation, respectively. Both CT and MR images were reviewed in consensus by two radiologists in two separate sessions regarding visual discrimination between AM and index tumor and status of AM within ablation zones. The status of AM was classified as AM plus (AM completely surrounded tumor), AM zero (AM was partly discontinuous, without protrusion of tumor beyond postulated border of ablated area) and AM minus (AM was partly discontinuous, with protrusion of tumor). Any ablation zone with AM plus or AM zero was considered as imaging evidence to predict technical effectiveness, which was based on one-month follow-up CT, as well as to represent technical success.

RESULTS
With CT and MR imaging, visual discrimination between AM and index tumor was possible in 34 (75.6%) and 40 (88.9%) of 45 ablation zones, respectively (P = .1094). Among 34 and 40 ablation zones in which status of AM could be evaluated on CT and MR imaging, AM status was categorized into AM plus (n=25 and 31, respectively), AM zero (n=9 and 8, respectively) and AM minus (n=0 and 1, respectively). The technical effectiveness was noted in all of ablation zones on one-month follow-up CT. Based on CT and MR imaging, technical success and effectiveness were determined to be achieved in 34 (75.6%) and 39 (86.7%), respectively (P=.1797).

CONCLUSION
There was no significant difference in assessment of ablative margin and index tumor within ablation zones immediately after combined treatment of TACE and RF ablation between CT and MR imaging.

CLINICAL RELEVANCE/APPLICATION
CT and MR imaging have equivalent ability to evaluate technical success immediately after combined treatment of TACE and RFA. Thus, MR imaging may not be necessary.

SSK07-08 Methodology for True Dynamic Contrast-Enhanced MRI of Pancreatic Lesions

Participants
Eric Paulson, Milwaukee, WI (Presenter) Nothing to Disclose
Paul M. Knechtges, MD, Milwaukee, WI (Abstract Co-Author) Nothing to Disclose
Beth A. Erickson, MD, Milwaukee, WI (Abstract Co-Author) Nothing to Disclose

PURPOSE
Dynamic contrast-enhanced (DCE) MR imaging offers promise to improve the diagnosis, therapy planning, and response assessment of pancreatic lesions. However, organ motion arising from respiration and peristalsis can challenge voxel-wise estimation of pharmacokinetic (PK) parameters in abdominal DCE-MRI. We introduce here a novel methodology to correct DCE-MRI datasets for inter-scan motion, facilitating true voxel-wise DCE-MRI in the abdomen.

METHOD AND MATERIALS
Five patients with pancreatic cancer were imaged at 3T. An anti-peristaltic agent (glucagon, 1mg IV) was administered to suppress bowel motion. Multi-flip angle breath hold images (2/5/15/25 deg) were acquired using a 3D Dixon VIBE sequence. A time series of 16 breath hold 3D Dixon VIBE images was then acquired before (3), during (1), and after (12) bolus administration of contrast (0.1 mmol/kg, Multihance). Deformable image registration (DIR) software was used to construct deformation vector fields (DVFs) required to align the fat-only Dixon (FD) images at each time point to one pre-contrast FD reference image. The DVFs were then applied to the corresponding water-only Dixon (WD) images at each time point to motion-correct the DCE-MRI time series. Baseline
T1 maps were estimated using a linearized Ernst model fit to the multi-flip angle WD images. PK parameters (Ktrans, kep, ve, vp) were estimated on a voxel-wise basis by fitting of the linearized Extended Tofts model to concentration-time curves constructed using the motion-corrected WD images.

**RESULTS**

FD images were robust against spatial and temporal variations in signal intensity arising from wash-in and wash-out of contrast, facilitating construction of DVFs. Applying the FD-derived DVFs to WD successfully corrected the WD images for inter-scan motion arising from inconsistent breath holds, facilitating voxel-wise PK parameter estimation for all patients studied. The methodology facilitated extraction of late-arterial phase images for conventional radiologic interrogation.

**CONCLUSION**

The novel use of Dixon and DIR facilitates voxel-wise estimation of PK parameters from abdominal DCE-MRI datasets. Future work will incorporate Dixon with radial k-space sampling to improve intra-scan motion robustness during breath hold acquisitions.

**CLINICAL RELEVANCE/APPLICATION**

Potential to improve disease diagnosis, therapy selection and planning, and response assessment of abdominal organs (e.g., pancreas, liver, kidneys, etc).

**SSK07-09  Test-retest Reliability of 3D-EPI MR Elastography in Pancreas**

**METHOD AND MATERIALS**

A repeatability study using 3D-EPI MRE was conducted in 5 healthy volunteers and 8 patients confirmed by histopathologic examinations (5 with PDAC and 3 with chronic pancreatitis). Subjects were scanned by using a GE 3.0 T MR scanner to assess the mean stiffness of the tumors in PDAC cases, the parenchyma of pancreas in chronic pancreatitis cases and healthy volunteers with a multi-slice EPI pulse sequence (timepoint 1). Direct inversion algorithm with 3D post-processing was used to estimate shear stiffness and generate stiffness maps. Subjects were re-evaluated one day later (timepoint 2). Stiffness was measured by 2 independent analysts (one with three and another with one year experience of MRE measurement).

**RESULTS**

For the 2 analysts, the mean stiffness in all subjects was highly reproducible with intraclass correlation coefficient (ICC) of 0.975 (95% confidence interval [CI]: 0.944-0.989) across timepoints (r=0.973, P<0.001). Bland-Altman analysis showed mean stiffness difference was 0.01kPa (95% agreement limits: -0.54-0.55kPa). For the 2 timepoints, the ICC was 0.973 (95% CI: 0.940-0.988) across the 2 analysts (r=0.975, P<0.001). Bland-Altman analysis showed the stiffness difference was 0.05kPa (95% agreement limits: -0.51-0.62kPa). The averaging stiffness value was 1.46±0.21kPa for chronic pancreatitis and 3.28±1.09kPa for PDAC, in contrast with 1.11±0.08kPa for normal pancreas.

**CONCLUSION**

3D MRE is a highly reproducible modality for assessing stiffness of pancreas.

**CLINICAL RELEVANCE/APPLICATION**

It is suggested to incorporate MRE into a standard MRI study, which offers stable and accurate stiffness of pancreas and pancreatic masses relatively.
SSK18

**Vascular/Interventional (Advances in Hepatic Tumor Ablation)**

**Wednesday, Dec. 2 10:30AM - 12:00PM Location: N227**

**GI** **IR** **MR**

**AMA PRA Category 1 Credits ™: 1.50**
**ARRT Category A+ Credits: 1.50**

**FDA** Discussions may include off-label uses.

**Participants**
Nael E. Saad, MBBCh, Saint Louis, MO (Moderator) Research Consultant, Veran Medical Technologies, Inc; Proctor, Sirtex Medical Ltd.
Charles Y. Kim, MD, Durham, NC (Moderator) Research Grant, Galil Medical Ltd; Consultant, Kimberly-Clark Corporation; Consultant, Cryolife, Inc

**Sub-Events**

**SSK18-01 Long-Term Therapeutic Outcomes of Radiofrequency Ablation For Subcapsular versus Non-Subcapsular Hepatocellular Carcinoma**

**Wednesday, Dec. 2 10:30AM - 10:40AM Location: N227**

**Participants**
Tae Wook Kang, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Hyo Keun Lim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Mimi Kim, MD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose

**PURPOSE**
Recent clinical guidelines for management of hepatocellular carcinoma (HCC) have not recommended the radiofrequency (RF) ablation for subcapsular tumor due to a higher risk of incomplete ablation or major complications. However, these guidelines were mainly based on retrospective studies with insufficient sample size and follow-up. We retrospectively compared the long-term therapeutic outcomes of RF ablation for HCC in a subcapsular versus non-subcapsular location using propensity score matching.

**METHOD AND MATERIALS**
508 patients (396 men, 112 women; age range, 30-80 years) with a single HCC (<5 cm) were treated with ultrasonography-guided percutaneous RF ablation as a first-line treatment. We divided the patients into two groups, subcapsular (n = 227) or non-subcapsular group (n = 281). We evaluated the association of subcapsular location and the long-term therapeutic outcomes of RF ablation including local tumor progression (LTP) and overall survival (OS) using the matched data and assessed the major complication rate in overall data.

**RESULTS**
After matching, there were 163 matched pairs of patients in both groups. In the matched groups, the 3- and 5-years cumulative LTP rates were estimated as 18.8% and 20.9%, respectively, for the subcapsular group, and 13.2% and 16.0% for the non-subcapsular group. The corresponding OS rates were 90.7% and 83.2% in the subcapsular group, and 91.4% and 79.1% in the non-subcapsular group, respectively. The hazard rates for LTP (HR [hazard ratio] = 1.37, P = 0.244) and OS (HR = 0.86, P = 0.604) were not significantly different between two matched groups. In addition, there was no significant difference in both groups in terms of major complications rates (P > 0.05).

**CONCLUSION**
The difference in long-term therapeutic outcomes of RF ablation for HCC was not significant between the subcapsular and non-subcapsular groups.

**CLINICAL RELEVANCE/APPLICATION**
The consideration of overall technical difficulty of RF ablation for HCC under various clinical settings is more reasonable than the dichotomous view of recommendation for RF ablation judged by anatomical location including subcapsular HCCs.

**SSK18-02 Ablation Margin Size and Not Modality Predicts Local Tumor Progression after Ablation of Colorectal Liver Metastases: A Case-control Study of RF and Microwave Ablation**

**Wednesday, Dec. 2 10:40AM - 10:50AM Location: N227**

**Participants**
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**PURPOSE**
To compare the local tumor progression rates of colorectal liver metastases ablated percutaneously using either microwave (MW) or radiofrequency (RF).
METHOD AND MATERIALS

We performed an IRB-approved retrospective review of a prospectively created HIPAA-compliant ablation database. We included patients with CLM ablated using RF between November 2009 and December 2012. These were matched to a group of patients with CLM ablated using MW between November 2009 and July 2014. Patients were excluded if the percutaneous ablation was used to treat a local recurrence of a previous ablation. The ablation margin was measured on the 1st portal venous phase CT obtained post-ablation (4-8 weeks), and classified as either ≤5 mm or >5 mm. Patients/tumors were excluded if the ablation margin could not be measured due to either: (a) lack of a CT scan at baseline or at 4-8 weeks post-ablation, or (b) fused ablation defects. Clinical characteristics were compared between both groups. Kaplan-Meier methodology was used to calculate LTP-free survival. Stratified log-rank tests were used to analyze predictors of LTP.

RESULTS

The study enrolled 53 patients with 77 tumors ablated with RF in 64 sessions, and 36 patients with 43 tumors ablated with MW in 39 sessions. No differences existed between both groups in baseline clinical characteristics or mean tumor size (1.9 cm MW versus 1.9 cm RF) (P=0.9). The LTP-free survival rate at 2 years was 67% in the RF group and 71% in the MW group (P=0.9). The percentage of ablation margins >5 mm achieved with RF was 58% (45/77) and 42% with MW (18/43) (P=0.08). An ablation margin ≤5 mm was a predictor of LTP in both the RF group (P=0.001) and the MW group (P=0.005). The median LTP-free survival in tumors with a margin ≤5 mm was longer in the MW group than in the RF group (21 months versus 8 months), approaching statistical significance (P=0.09). The LTP rate for tumor with an ablation margin >5 mm was 4% in the RF group (2/45) and 6% (1/18) in the MW group (P=0.3). Minor complications rate for MW and RF were 26% (10/39) versus 13% (8/64) (P=0.09), and major complications rates were 15% (6/39) versus 13% (8/64) (P=0.7).

CONCLUSION

Local control after ablation of CLM is dependent on an adequate ablation margin and not the modality used.

CLINICAL RELEVANCE/APPLICATION

Sufficient ablation margins remain the most important factor to achieve prolonged LPFS regardless of thermal energy.

SSK18-03 Role of Microwave Ablation (MWA) Therapy of Liver Metastases from Colorectal Carcinoma Post systemic Chemotherapy: Tumor Control and Survival Rates

Wednesday, Dec. 2 10:50AM - 11:00AM Location: N227

Participants
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Thomas J. Vogl, MD, PhD, Frankfurt, Germany (Abstract Co-Author) Nothing to Disclose

PURPOSE

to evaluate the safety, efficiency, effectiveness, and overall outcome in patients treated with microwave thermal ablation of colorectal metastases post systemic chemotherapy.

METHOD AND MATERIALS

An institutional review board-approval was obtained with informed consent of all patients. Retrospective analysis of prospective intention to treat study was performed from January 2008 to January 2013, and included 92 patients (mean age 56 years SD: 2.6) with 132 liver metastases measuring 0.7-5.0cm, who were treated with microwave ablation (MWA). Local tumor control, complications, and long-term survival were analyzed.

RESULTS

The mean follow-up period was 32.5 months. Complete ablation was achieved in 117 of 132 (88.6%) nodules. Seventeen of the 117 (14.5%) successfully treated nodules developed local recurrence. Univariate analysis showed that tumor size of < 3 cm is a significant risk factor (P = 0.04). Multivariate analysis showed that number of cycles of chemotherapy (FOLFOX) was a significant prognostic factor for overall recurrence (P=0.03), whereas disease-free interval was the significant prognostic factor for distant recurrence (P=0.03). Major complications occurred in 1.1% of patients. No procedure-related mortalities were observed. The 1, 2, 3, and 5-year overall survival rates after the initial ablation were 82, 61.2, 51.2, and 38.3%, respectively. The main cause of death was systemic tumor progression in 65.3% of the patients.

CONCLUSION

MWA is a safe and effective treatment therapeutic option for patients with liver metastases from Colorectal Carcinoma post systemic chemotherapy.

CLINICAL RELEVANCE/APPLICATION

MWA could be safely used as a part of the therapeutic armamentarium in the management of patients with hepatic colorectal metastasis post systemic chemotherapy.

SSK18-04 Local Response Assessment after Percutaneous CT-guided IRE of Hepatic Malignancies: How Useful is Diffusion-weighted MRI (DWI)?

Wednesday, Dec. 2 11:00AM - 11:10AM Location: N227

Participants
Alexandra Barabasch, MD, Aachen, Germany (Presenter) Nothing to Disclose
Philipp Heil, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
Martina Dietelmaier, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
Nils A. Kraemer, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
Assessment of response to hepatic IRE using standard MR-sequences is difficult due to complex signal intensity (SI) changes of the ablation zones that occur during follow-up. DWI offers a high sensitivity for detection of liver metastases. Therefore, aim of this study was to evaluate if DWI is useful to help distinguish normal post-therapeutic SI changes after IRE from local recurrence.

**METHOD AND MATERIALS**

27 Patient (mean age 62y) with 37 malignant liver tumors (4 HCC, 33 metastases) underwent CT-guided percutaneous IRE. Pre- and post-interventional hepatic MRI (T2w TSE, dynamic CE T1w GE, T1w GE in late phase) with DWI (b=800) was performed before treatment, within 2 hours after IRE, at 24 hours after IRE, and at 1, 2, 4, 6, 8, 12 weeks after IRE, and every 3 months thereafter. MR-images were systematically analyzed by two readers in consent. The ablation volume was carefully manually rendered on each b=800 DW image of the ablation zone to create a volume of interest. Minimal ADC-values (ADCmin) were measured in the target lesion before treatment and in the ablation zone volume after treatment.

**RESULTS**

Within the first two days after IRE, ADCmin-values decreased significantly compared to pre-treatment ADCmin in 26 of 37 patients. Thereafter, ADCmin values increased continuously in all of these patients and, within 1-3 months after IRE, were back to normal, i.e. reached the level of the ADCmin values of normal liver parenchyma. In 8/37 patients, this normalization of ADCmin-values was not observed, but instead, exhibited a further decrease of ADCmin at follow up (6 weeks - 12 months) that were then lower than the baseline ADCmin of the tumor before IRE treatment. At the time when the ADCmin decrease was found, remaining hepatic MRI pulse sequences, including visual analysis of DWI, were not suspicious of local recurrence. Only at later follow-up MRI, presence of local tumor recurrence was confirmed in 7 out of these 8 cases.

**CONCLUSION**

These initial results suggest that quantitation of ADCmin is useful to identify local recurrences after hepatic IRE, because changes of ADCmin (specifically, a new decrease of ADCmin after post-treatment ADC normalization) precede visually perceptible SI changes.

**CLINICAL RELEVANCE/APPLICATION**

DWI, with ADC-min quantitation, may allow early diagnosis of local tumor recurrence after IRE.

**SSK18-05** MR Imaging Findings after Hepatic Irreversible Electroporation (IRE) - How to Depict Local Recurrence

Wednesday, Dec. 2 11:10AM - 11:20AM Location: N227

**Participants**

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Christiane K. Kuhl, MD, Bonn, Germany (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

We systematically followed patients after percutaneous IRE for primary or secondary liver malignancies according to a standardized follow-up MRI protocol. Our aim was to describe the normal changes of MR signal pattern over time that can be expected after IRE; this knowledge is important in order to allow the sensitive detection of signal intensity (SI) changes that are not within normal limits, i.e. likely represent local recurrence.

**METHOD AND MATERIALS**

27 patients (13 male, mean age 62y) with 37 malignant liver tumors (33 secondary, 4 HCC) underwent percutaneous CT-guided IRE. Patients underwent pre- and post-interventional hepatic MRI with Gd-EOB-DTPA according to a standardized protocol (including T2 TSE sequences, dynamic contrast-enhanced T1w GE sequence, T1w GE in late phase) before treatment, within 2 hours after IRE, at 24 hours after IRE, and then at 1, 2, 4, 6, 8, 12 weeks after IRE, and every 3 months thereafter. MR images were systematically evaluated by two readers in consent.

**RESULTS**

Even after successful IRE, in 23/37 (62%) cases, the ablated tumor was still visible, with unchanged SI and internal architecture as before IRE, for 1-8 weeks after IRE in 8/23 cases, for 3-9 months in 12/23 cases, and for more than 12 months in 3/23 cases. The ablation zone itself appeared as an immediately hyperintense area on T2w images until 1 week after IRE in all cases. Thereafter, the ablation zone inverted its SI and appeared on T2w images immediately hypointense in the center, with a hyperintense rim, the latter exhibited strong contrast enhancement in 34/37 cases. This appearance persisted for 1-4 weeks in 17/34 cases, for 6-8 weeks in 10/34 and for 3-6 months in 7/34 cases. The ablation zones showed a steady decrease in size and disappeared completely in 21/37 cases (within 3 months in 16 cases). Local recurrences were observed in 7/37 (19%) cases and were visible as immediately hyperintense masses on the edge of the immediately low SI ablation zone on T2w images.

**CONCLUSION**

IRE induces complex signal intensity changes that vary over time. In the majority of cases, the treated target lesions were visible within the ablation zone over a longer period of time. This makes diagnoses of local recurrence difficult.

**CLINICAL RELEVANCE/APPLICATION**

Knowledge of the typical MR-imaging appearance of the IRE ablation zone and its changes over time is important to avoid diagnostic errors in the follow up of patients after IRE.
PROCEDURAL SEDATION AND ANALGESIA VERSUS GENERAL ANESTHESIA FOR RESPIRATORY-GATED MR-HIFU ABLATION IN THE LIVER

Wednesday, Dec. 2 11:20AM - 11:30AM Location: N227

Participants
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Mario G Reis, PhD, Utrecht, Netherlands (Abstract Co-Author) Nothing to Disclose

PURPOSE
Investigate the feasibility of respiratory-gated MR-HIFU ablation in the liver under PSA with spontaneous breathing in an animal experiment. Validate the introduced respiratory depression by PSA in sedated human patients.

METHOD AND MATERIALS
Five pigs were placed on a Philips Sonalleve MR-HIFU system (1.5T, Philips Healthcare). PSA was induced using propofol (4.5-6mg/kg/h) and remifentanil (4.8-5.8μg/kg/h). Volumetric sonications were performed under PSA (4x4x10mm3, 450W acoustic power, 15-25s). MRI and acoustic energy delivery were respiratory gated with a pencil beam navigator. Then, GA was induced using midazolam (1mg/kg/h), nimex (0.09mg/kg/h), and sufentanil (11.3μg/kg/h). Mechanical ventilation was set to 13/min and the ablation protocol was repeated. For both protocols the nonperfused volumes (NPVs) were measured and the duty cycles (DC) of the therapeutic sonications were compared. PSA was induced in two patients prior to HIFU treatment using propofol (1.4 and 1.6 mg/kg/h) and remifentanil (2.5 and 0.3 μg/kg/h). Vital functions were monitored.

RESULTS
Under GA a median DC of 64.0% (IQR 62-67, n=42) was achieved and of 79.5% (IQR 73-85, n=42) under PSA. The mean NPV per sonication was 0.09ml during GA and 0.16ml during PSA. Breathing frequency (BF) under PSA varied between 9-15 breaths/min. Vital functions remained stable. During both patient treatments under PSA the BF could be depressed to values as low as 5/min while the ETCO2 level stayed <6.5%, and blood pressure and heart rate values remained normal.

CONCLUSION
The animal experiments confirmed the feasibility of volumetric HIFU ablations using respiratory gating under PSA. The results were comparable or superior to those achieved under GA. The subsequent PSA procedures on human patients evidenced the similarity in respiratory depression of the PSA protocol while vital functions and patient safety were not impaired. Future work anticipates translation of these findings in a clinical liver ablation study.

CLINICAL RELEVANCE/APPLICATION
Magnetic Resonance-guided High Intensity Focused Ultrasound (MR-HIFU) ablation in the liver is complicated by the continuous target movement due to respiration. Respiratory gating represents a simple and robust solution, which usually requires general anesthesia (GA) to obtain a long resting phase. From a patient’s perspective however, procedural sedation and analgesia (PSA) has advantages over GA: a lower risk of complications and shorter recovery.

PRECLINICAL EVALUATION OF AN MR-COMPATIBLE MICROWAVE ABLATION SYSTEM AND COMPARISON WITH A STANDARD MICROWAVE ABLATION SYSTEM IN AN EX Vivo BOVINE LIVER MODEL

Wednesday, Dec. 2 11:40AM - 11:50AM Location: N227

Participants
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PURPOSE
To evaluate a newly developed MR-compatible microwave ablation system with focus on ablation performance and compare it with a corresponding standard microwave ablation system in an ex-vivo setting.

METHOD AND MATERIALS
Overall, 52 ablation procedures were performed in an ex vivo bovine liver phantom, with various non-perfusion cooled microwave ablation devices and varying ablation durations, using the following settings: [A] 16G standard antenna, 2cm active tip, 2.4m cable; [B] MR-compatible 16G-antenna, 2cm active tip, 2.4m cable; [C] MR-compatible 16G-antenna, 2cm active tip, extended 6m cable; [D] MR-compatible 16G-antenna, 4cm active tip, extended 6m cable. Ablation durations were 3min, 5min and 10min for settings [A]-[C], performing an additional 15min ablation for setting [D]. Settings [A]-[C] were compared regarding the size of the ablation, i.e., short axis diameter (SA), Volume (V), as well as the generator energy output (E), with analysis of variance and Tukey post
hoc test. Ablation performance of the MR-compatible settings [C] and [D] were compared regarding SA, V, E and sphericity index (SA/LA) with unpaired t-test.

RESULTS

No statistically significant differences were found between [A], [B] and [C] regarding SA and V (10min; [A]: SA=25.8±2.4mm, V=17.8±4.4cm³, [B]: SA=25.3±1.9mm, V=16.6±3.0 cm³, [C]: SA=25.0±2.0mm, V=17.8±2.7 cm³); however, the highest generator energy output was measured for setting [C] ([A]: 9.9±0.5kJ, [B]: 10.1±0.5kJ, [C]: 13.1±0.3kJ, p<0.001). SA, V and E were significantly larger with setting [D] than [C] with 10min ablations ([D]: SA=34.0±2.9mm, V=39.4±7.5 cm³, E=16.7±0.8kJ) without significant difference in sphericity index ([C]: SA/LA=0.46±0.02, [D]: SA/LA=0.52±0.04, p=0.08). Largest ablation zone was achieved with setting [D] after 15 min ablation time (SA=41±1.4mm, V=60.9±5.2 cm³, SA/LA=0.59±0.01).

CONCLUSION

The MR-compatible microwave antenna and a standard, comparable, non-MR-compatible microwave ablation device create similar ablation zones. Use of an extension cable for generator positioning outside the MR scanner room is possible without loss of ablation performance.

CLINICAL RELEVANCE/APPLICATION

The tested MR-compatible system can be used without loss of ablation performance compared to the standard system.

SSK18-09 Percutaneous of Microwave Ablation of Hepatic Dome: Assessment of Efficacy and Safety

Wednesday, Dec. 2 11:50AM - 12:00PM Location: N227

Participants
Nazanin H. Asvadi, MD, Boston, MA (Presenter) Nothing to Disclose
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Ashraf Thabet, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Ronald S. Arellano, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

PURPOSE

To evaluate the efficacy and safety of computed tomography (CT) guided microwave ablation of tumors in hepatic dome.

METHOD AND MATERIALS

An Interventional Radiology database was used to retrospectively identify patients who underwent CT-guided percutaneous microwave ablation for liver tumors located in the hepatic dome between June 2011 and December 2014. Creation of artificial ascites was attempted as an adjunctive maneuver to displace the liver away from the right hemidiaphragm to minimize the potential risks of phrenic nerve injury, pneumothorax or peritoneal burn. Treatment response was assessed by either contrast material enhanced CT or magnetic resonance imaging (MRI) at 1, 3, 6, 9, 12 months and every 3 months thereafter. Primary clinical success was defined as absence residual tumor on one month post-ablation CT or magnetic resonance imaging. Secondary clinical success defined as no residual lesion after repeat microwave ablation.

RESULTS

Between June 2011 and December 2014, 46 patients (M: F = 31:15, mean age = 64.4 years, range = 25-89 years) underwent CT-guided percutaneous microwave ablation for 48 tumors in the hepatic dome. Creation of artificial ascites with 0.9% normal saline solution (0.9% NS) as an adjunctive maneuver to displace the dome from the right hemidiaphragm was performed in 34/48 (70%) of ablations with mean volume of 1237.5 ml of fluid (range=300-3000 ml). Primary success was achieved in 41/48 (85%). Four tumors required retreatment to achieve complete necrosis for a secondary success rate of 94%. There were no major complications. Two patients experienced small, asymptomatic pneumothoraces that were aspirated at the time of the procedure and did not result in thoracostomy or unexpected hospitalization.

CONCLUSION

Computed tomography guided microwave ablation of hepatic dome lesions is associated with high success rate and low complication rate. Creation of artificial ascites may have a protective effect on minimizing the risk of thermal injury to the diaphragm and/or risk of significant pneumothorax.

CLINICAL RELEVANCE/APPLICATION

Computed tomography guided microwave ablation of hepatic dome lesions is associated with high success and low complication rates.
PURPOSE

To identify demographic and imaging features that predict upgrade of LI-RADS category 4 (LR4) nodules to LI-RADS category 5 (LR5), and to assess their effects on progression rate and time to progression.

METHOD AND MATERIALS

For this HIPAA-compliant retrospective dual-center study, dynamic contrast-enhanced MRIs performed at two institutions between January 2010 and December 2013 were reviewed. Patients were included who had cirrhosis and at least one LR4 liver nodule, including 139 patients with 181 LR4 nodules. LI-RADS major and ancillary imaging features on the index MR examination were recorded for each LR4 nodule. Stepwise multivariate Cox proportional hazards model analysis for the clustered data was fitted to identify predictive risk factors for upgrade to LR5, including patient demographic and LI-RADS imaging features. Overall cumulative rate of upgrade was calculated by using the Kaplan-Meier method. The cumulative risks of upgrade were also compared in the presence and absence of significant predictive risk factors using the log-rank test.

RESULTS

31% (56/181) of the LR4 nodules upgraded to LR5. The independent significant predictive risk factors for upgrade were T2 hyperintensity (P<0.001; hazard ratio=1.83; 95%CI: 1.29-2.59), growth from prior to index MRI (P<0.005; hazard ratio=4.32; 95% CI, 1.57-11.26), and hepatitis C infection (P<0.05; hazard ratio=1.52; 95% CI, 1.03-2.27). The overall 3- and 6-month cumulative risk rate of upgrade was 10.2% and 32.7%. The 3- and 6-month cumulative risk rates were significantly higher in the presence of T2 hyperintensity (P=0.03; 11.1% and 48.1% vs 9.6% and 25.4%), although the presence of hepatitis C (P=0.71) or growth between prior and index examinations (P=0.98) did not show significant differences.

CONCLUSION

For LR4 nodules, T2 hyperintensity, growth, and hepatitis C infection are associated with significantly higher risk of upgrade to LR5. Although T2 hyperintensity was the greatest risk factor of upgrade, actual risk level was only mildly elevated and the risk of upgrade associated with LR4 nodules is similar across nodule subtypes.

CLINICAL RELEVANCE/APPLICATION

For LI-RADS category 4 nodules, T2 hyperintensity, growth, and hepatitis C infection are associated with significantly higher risk of upgrade to LR5, but actual risk levels are only mildly elevated in the presence of these risk factors.

PURPOSE

To identify demographic and imaging features that predict upgrade of LI-RADS category 4 (LR4) nodules to LI-RADS category 5 (LR5), and to assess their effects on progression rate and time to progression.

METHOD AND MATERIALS

For this HIPAA-compliant retrospective dual-center study, dynamic contrast-enhanced MRIs performed at two institutions between January 2010 and December 2013 were reviewed. Patients were included who had cirrhosis and at least one LR4 liver nodule, including 139 patients with 181 LR4 nodules. LI-RADS major and ancillary imaging features on the index MR examination were recorded for each LR4 nodule. Stepwise multivariate Cox proportional hazards model analysis for the clustered data was fitted to identify predictive risk factors for upgrade to LR5, including patient demographic and LI-RADS imaging features. Overall cumulative rate of upgrade was calculated by using the Kaplan-Meier method. The cumulative risks of upgrade were also compared in the presence and absence of significant predictive risk factors using the log-rank test.

RESULTS

31% (56/181) of the LR4 nodules upgraded to LR5. The independent significant predictive risk factors for upgrade were T2 hyperintensity (P<0.001; hazard ratio=1.83; 95%CI: 1.29-2.59), growth from prior to index MRI (P<0.005; hazard ratio=4.32; 95% CI, 1.57-11.26), and hepatitis C infection (P<0.05; hazard ratio=1.52; 95% CI, 1.03-2.27). The overall 3- and 6-month cumulative risk rate of upgrade was 10.2% and 32.7%. The 3- and 6-month cumulative risk rates were significantly higher in the presence of T2 hyperintensity (P=0.03; 11.1% and 48.1% vs 9.6% and 25.4%), although the presence of hepatitis C (P=0.71) or growth between prior and index examinations (P=0.98) did not show significant differences.

CONCLUSION

For LR4 nodules, T2 hyperintensity, growth, and hepatitis C infection are associated with significantly higher risk of upgrade to LR5. Although T2 hyperintensity was the greatest risk factor of upgrade, actual risk level was only mildly elevated and the risk of upgrade associated with LR4 nodules is similar across nodule subtypes.

CLINICAL RELEVANCE/APPLICATION

For LI-RADS category 4 nodules, T2 hyperintensity, growth, and hepatitis C infection are associated with greater risk of upgrade to LR5, but actual risk levels are only mildly elevated in the presence of these risk factors.

PurposE

Our aim was to measure the arterial (ALP), portal venous (PVP) supply of the liver parenchyma and their relationship called hepatic perfusion index (HPI = ALP/(ALP+PVP)* 100%) with help of volume perfusion-CT (VPCT) in patients with liver cirrhosis and to look for correlation with the invasively (transjugular) measured portal venous pressure and porto-systemic pressure gradient.

METHOD AND MATERIALS

VPCT was performed in 33 (22 male; 11 female; mean age: 63 years) patients with advanced liver cirrhosis and clinical signs of portal hypertension.
VPCT was performed in 52 (44 male, 8 female, mean age: 60 years) patients with advanced liver cirrhosis and clinical signs of portal hypertension. Images were post-processed using a software package based on a separate calculation of the dual blood supply based on a maximum-slope approach. We calculated additionally the HPI using volume-of-interest (VOI) analysis of three large areas of the left, right, and caudate lobes. Following CT-examinational protocol: 80kV, 100/120mA, 64x0.6mm collimation, 26 consecutive volume measurements, IV injection of 50 mL of iodinated contrast at a flow rate of 5 mL/s, was used. A transjugular approach was used for pressure measurements in the hepatic and the portal vein calculating subsequently the pressure gradient between the two.

RESULTS
The mean hepatic vein pressure was 12mmHg; the mean portal vein pressure was 31mmHg whereas the gradient between the two was 19mmHg. Mean diameter of the portal vein was 14.9mm. The mean ALP, PVP and HPI were 17.1, 33.7 and 41.8 mL/min per 100 mL, respectively. We found no correlation between the portal-venous pressure and the porto-systemic pressure gradient and the magnitude of ALP, PVP and HPI, although the latter yielded all abnormal values.

CONCLUSION
Perfusion parameters measured by VPCT in the cirrhotic liver in patients with portal hypertension are generally abnormal. However, the magnitude of ALP, PVP and HPI does not significantly correlate with that of the porto-systemic pressure gradient and therefore it should not be reciprocally used as surrogate parameters. The degree of collateralization might be a possible confounder in this setting.

CLINICAL RELEVANCE/APPLICATION
VPCT measures separately the contributions of hepatic arterial and portal venous blood supply, but in portal hypertension arterial buffer response is complex and cannot be simply assessed by VPCT.

GI373-SD-WEA3 Value of MRI for Diagnosis and Local Staging of Recurrent Rectal Cancer: Correlation with Surgery and Histopathology of Resected Specimen

Station #3

Participants
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PURPOSE
To assess the value of MRI for predicting surgical outcome of local recurrent rectal cancer (LRRC). In addition, patterns for diagnosis of LRRC on MRI using T2- weighted sequences (T2W) and contrast enhanced series (CEMRI) were evaluated.

METHOD AND MATERIALS
Surgically resected LRRC with curative intent were included. MRI was performed on 1.5 T using a pelvic coil (8- or 16-channel). MRI protocol included T2W FSE in axial, sagittal, and coronal planes and contrast- enhanced series in arterial, venous, parenchymal and late dominant phases after i.v. Gadolinium. MR image analysis was done through visual interpretation by an experienced observer (reader 1) and compared with post processing image evaluation by an inexperienced observer (reader 2). MRI findings of LRRC were correlated with surgery and histopathology (PA) of the resected specimen. Bland and Altman plots were used to determine the limits of agreement for measurements between two readers and between T2W and CEMRI with PA. To determine actual tumor size, only R0 resected lesions were included for comparison between MRI and PA. Categorical variables were compared using Chi-square test. A Two-sided significance level of 0.05 was used.

RESULTS
A total of 51 lesions (47 patient) were included. MRI was performed after completion of neo- adjuvant (chemo) radiotherapy within a mean time interval of 3 weeks (range 3-5 weeks) and prior to surgery (mean 6 weeks, range 4-7 weeks).Thirty (59%) tumors were radically resected (R0), 21 (41%) tumors were incompletely resected (R1). Lesions fixed to the pelvic side walls or presacral fascia (n=28) had 36% R0; non-fixed lesions (n=23) had 87% R0 (P=0.001).Tumor measurements on CEMRI had better agreement with PA than T2W.Imaging characteristics of LRRC on CEMRI include: arterial enhancement (100 %), persistent enhancement (100 %), dominant peripheral rim enhancement (59%), heterogeneous mosaic enhancement (21%).

CONCLUSION
LRRC fixed to the pelvic side walls or presacral fascia yield incomplete resection margins in 64%, whereas non- fixed tumors were completely resected in 87%. CEMRI has typical imaging characteristics for LRRC and is more consistent for tumor dimension than T2W.

CLINICAL RELEVANCE/APPLICATION
CEMRI is highly accurate for delineation of LRRC and should be included in the MRI protocol. Surgery alone is inadequate for fixed LRRC and should be followed by additional treatment methods (eg radiation therapy on resected surfaces)

GI374-SD-WEA4 Patient Size-independent Monoenergetic Imaging for Detection Hypervascular Liver Tumors: Impact of a Second-generation Monoenergetic Algorithm

Station #4

Participants
Daniele Marin, MD, Cary, NC (Presenter) Nothing to Disclose
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VPCT was performed in 52 (44 male, 8 female, mean age: 60 years) patients with advanced liver cirrhosis and clinical signs of portal hypertension. Images were post-processed using a software package based on a separate calculation of the dual blood supply based on a maximum-slope approach. We calculated additionally the HPI using volume-of-interest (VOI) analysis of three large areas of the left, right, and caudate lobes. Following CT-examinational protocol: 80kV, 100/120mA, 64x0.6mm collimation, 26 consecutive volume measurements, IV injection of 50 mL of iodinated contrast at a flow rate of 5 mL/s, was used. A transjugular approach was used for pressure measurements in the hepatic and the portal vein calculating subsequently the pressure gradient between the two.

RESULTS
The mean hepatic vein pressure was 12mmHg; the mean portal vein pressure was 31mmHg whereas the gradient between the two was 19mmHg. Mean diameter of the portal vein was 14.9mm. The mean ALP, PVP and HPI were 17.1, 33.7 and 41.8 mL/min per 100 mL, respectively. We found no correlation between the portal-venous pressure and the porto-systemic pressure gradient and the magnitude of ALP, PVP and HPI, although the latter yielded all abnormal values.

CONCLUSION
Perfusion parameters measured by VPCT in the cirrhotic liver in patients with portal hypertension are generally abnormal. However, the magnitude of ALP, PVP and HPI does not significantly correlate with that of the porto-systemic pressure gradient and therefore it should not be reciprocally used as surrogate parameters. The degree of collateralization might be a possible confounder in this setting.

CLINICAL RELEVANCE/APPLICATION
VPCT measures separately the contributions of hepatic arterial and portal venous blood supply, but in portal hypertension arterial buffer response is complex and cannot be simply assessed by VPCT.

GI373-SD-WEA3 Value of MRI for Diagnosis and Local Staging of Recurrent Rectal Cancer: Correlation with Surgery and Histopathology of Resected Specimen

Station #3

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PURPOSE
To assess the value of MRI for predicting surgical outcome of local recurrent rectal cancer (LRRC). In addition, patterns for diagnosis of LRRC on MRI using T2- weighted sequences (T2W) and contrast enhanced series (CEMRI) were evaluated.

METHOD AND MATERIALS
Surgically resected LRRC with curative intent were included. MRI was performed on 1.5 T using a pelvic coil (8- or 16-channel). MRI protocol included T2W FSE in axial, sagittal, and coronal planes and contrast- enhanced series in arterial, venous, parenchymal and late dominant phases after i.v. Gadolinium. MR image analysis was done through visual interpretation by an experienced observer (reader 1) and compared with post processing image evaluation by an inexperienced observer (reader 2). MRI findings of LRRC were correlated with surgery and histopathology (PA) of the resected specimen. Bland and Altman plots were used to determine the limits of agreement for measurements between two readers and between T2W and CEMRI with PA. To determine actual tumor size, only R0 resected lesions were included for comparison between MRI and PA. Categorical variables were compared using Chi-square test. A Two-sided significance level of 0.05 was used.

RESULTS
A total of 51 lesions (47 patient) were included. MRI was performed after completion of neo- adjuvant (chemo) radiotherapy within a mean time interval of 3 weeks (range 3-5 weeks) and prior to surgery (mean 6 weeks, range 4-7 weeks).Thirty (59%) tumors were radically resected (R0), 21 (41%) tumors were incompletely resected (R1). Lesions fixed to the pelvic side walls or presacral fascia (n=28) had 36% R0; non-fixed lesions (n=23) had 87% R0 (P=0.001).Tumor measurements on CEMRI had better agreement with PA than T2W.Imaging characteristics of LRRC on CEMRI include: arterial enhancement (100 %), persistent enhancement (100 %), dominant peripheral rim enhancement (59%), heterogeneous mosaic enhancement (21%).

CONCLUSION
LRRC fixed to the pelvic side walls or presacral fascia yield incomplete resection margins in 64%, whereas non- fixed tumors were completely resected in 87%. CEMRI has typical imaging characteristics for LRRC and is more consistent for tumor dimension than T2W.

CLINICAL RELEVANCE/APPLICATION
CEMRI is highly accurate for delineation of LRRC and should be included in the MRI protocol. Surgery alone is inadequate for fixed LRRC and should be followed by additional treatment methods (eg radiation therapy on resected surfaces)

GI374-SD-WEA4 Patient Size-independent Monoenergetic Imaging for Detection Hypervascular Liver Tumors: Impact of a Second-generation Monoenergetic Algorithm

Station #4

Participants
Daniele Marin, MD, Cary, NC (Presenter) Nothing to Disclose
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To investigate the impact of a novel monoenergetic reconstruction algorithm on the conspicuity of hypervascular liver tumors during dual-energy CT (DECT) of the liver.

METHOD AND MATERIALS

This retrospective, single-center HIPAA-compliant study was IRB-approved and informed patient consent was waived. Fifty-nine patients (35 men, 24 women) with 47 hypervascular liver tumors underwent DECT (80/340 kVp) in the late hepatic arterial phase, with a dual-source CT system (Siemant Definition Flash). Datasets at energy levels ranging from 40 to 100 keV were reconstructed using first and second-generation monoenergetic algorithms (Syn gu DE Monoenergetic and Monoenergetic Plus, respectively). Noise and tumor-to-liver contrast-to-noise ratio (CNR) were calculated and compared among different reconstructed datasets. The effect of patient’s effective diameter on lesion CNR was also assessed. P-values were obtained for paired difference using generalized estimating equations (GEE) to account for multiple lesions per patient.

RESULTS

Noise was significantly lower and tumor-to-liver CNR significantly higher between 40 and 60 keV energies using a second-generation monoenergetic algorithm at 40 keV, with an approximately 25% improvement in CNR compared to a first-generation algorithm at the optimal energy of 70 keV (Mean [SD] = 4.99 [1.70] vs. 3.80 [2.40]; P <.001). Our data showed that patient body size did not significantly affect the selection of the optimal monoenergetic level using the second-generation monoenergetic algorithm. This is in contrast with the significant impact of body size in the selection of the optimal energy level with the first-generation algorithm.

CONCLUSION

The second-generation monoenergetic algorithm significantly improves the conspicuity of hypervascular liver tumors compared to a first-generation algorithm, while simultaneously decreasing the variability introduced by patient’s body weight in selecting the optimal monoenergetic level.

CLINICAL RELEVANCE/APPLICATION

A second-generation monoenergetic algorithm improves the conspicuity of hypervascular liver tumors and may streamline the workflow of DECT by decreasing the variability related to patient’s body size.
Towards the diagnosis of underlying malignancy particularly HCC in appropriate clinical settings.

**GI376-SD-WEA6 CT Signs Can Predict Treatment Response and Long-Term Survival: A Study in Locally Advanced Esophageal Cancer with Preoperative Chemotherapy**

Station #6

Participants
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**PURPOSE**

Accurate prediction of treatment response and prognosis before surgery will allow prompt therapy adjustment. This study proposed to evaluate the efficacy of CT signs on treatment response and survival for advanced esophageal squamous cell carcinoma patients with preoperative chemotherapy.

**METHOD AND MATERIALS**

This study retrospectively enrolled 135 consecutive patients with preoperative chemotherapy from September 2005 to December 2011. Logistic regression model was conducted to evaluate the association between pathological response and CT signs. Overall survival (OS) and disease-free survival (DFS) were estimated using Kaplan-Meier method and Cox proportional hazards model was constructed to determine associations between CT signs after neoadjuvant chemotherapy and survival outcomes.

**RESULTS**

The logistic regression showed the total LN number (>6) at baseline and the CT value change rate (≤17%) were significant for poor response; OR were 5.07 (95% CI, 1.86 to 13.81, P=0.002) and 2.35 (95% CI, 1.05 to 5.23, P=0.037), respectively. In Cox analyses, preoperative tumor thickness (>10 mm), total LN number (>6), and short diameter of the largest LN (>10 mm) were significant for OS, HR were 2.33 (95% CI, 1.36 to 4, P=0.002), 1.88 (95% CI, 1.12 to 3.17, P=0.017) and 1.87 (95% CI, 1.07 to 3.28, P=0.028), respectively; whereas only the short diameter of the largest LN was significant for DFS, HR was 2.36 (95% CI, 1.23 to 4.54, P=0.01).

**CONCLUSION**

CT signs can predict therapeutic efficacy and survival outcomes and provide an opportunity to offer additional treatment options before surgery.

**CLINICAL RELEVANCE/APPLICATION**

This study provided the first evidence that CT signs can predict survival outcomes and therapeutic efficacy of patients with esophageal cancer who received preoperative chemotherapy. Therefore, it is of great clinical significance to perform CT examinations before and after neo-adjuvant therapies in esophageal cancer patients. The CT images interpreted before surgery could provide important information about survival and response, which would improve individualized treatment programs.

**GI377-SD-WEA7 The Diagnostic Performance of Transabdominal Ultrasonography for Incidental Pancreatic Cysts: Focus on the Effect of Prior Images, Size, and Location**

Station #7

Participants
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**PURPOSE**

To assess diagnostic performance of transabdominal ultrasonography (TAUS) for incidental pancreatic cysts with a focus on the effect of prior images, size, and location.

**METHOD AND MATERIALS**

1064 pancreatic cysts which were radiologically confirmed by contrast enhanced CT (n=795), MRI (n=21), CT and MRI (n=202), or endoscopic ultrasonography (EUS, n=46), were included in 938 patients who underwent TAUS. TAUS finding was analyzed based on the formal reports. One radiologist also retrospectively reviewed TAUS, CT, MR, and EUS images to determine the size, location, and detection rate of the pancreatic cyst before and after CT, MRI, or EUS. For statistical analysis, independent samples T-test and Chi-square test were applied.

**RESULTS**

Among 1064 pancreatic cysts, 107 cysts underwent TAUS before CT, MR, or EUS and 477 cysts underwent TAUS after prior study. 480 cysts underwent TAUS both before and after CT, MRI, or EUS. Overall 940 pancreatic cysts (88.3%) were delineated on TAUS. The detection rate of pancreatic cyst on TAUS before CT, MRI, or EUS was 49.2% (289/587), and the detection rate of pancreatic cyst on TAUS after CT, MRI, or EUS was 86.7% (830/957). In a group of patients who underwent TAUS both before and after CT, MRI, or EUS, the detection rate of pancreatic cyst on TAUS was increased after CT, MRI, or EUS (before: 40.0%, after: 85.2%, p<0.0001). The size of detected cysts (mean±SD, 15.5±9.2 mm) was larger than undetected cysts (mean±SD, 11.8±7.5 mm, p<0.0001) with significant difference. Undetected cysts on US were almost smaller than 2cm. The detection rate of TAUS after CT, MRI, and EUS in neck, head, body, uncinated process, and tail was 95.6%, 91.4%, 91%, 87.6%, and 67.8%.

**CONCLUSION**

Transabdominal US is useful for detection of pancreatic cyst. The detection rate of TAUS was improved after CT, MRI, and EUS.
Transabdominal US is useful image modality for incidental pancreatic cysts; especially follow up after CT, MRI, and EUS.

**TEACHING POINTS**

1. Colon EMR is a safe effective treatment for non-invasive polyps. CT is the modality of choice for imaging complications.
2. The general radiologist must be aware of the ‘expected’ findings post colon EMR, which include circumferential transmural oedema of the colon, mesenteric fat stranding, intramural gas and occasionally local locules of extraluminal gas.
3. The key feature that may require surgical intervention is extra-luminal gas distant from the affected colon and potentially signs of ischaemia.
4. On staging CT for polyps found to contain adenocarcinoma, caution should be applied if reporting locoregional spread, as extramural changes and lymphadenopathy often resolve.

**TABLE OF CONTENTS/OUTLINE**

**AIM:** To share our high volume centre experience of ‘expected’ post EMR appearances to avoid the pitfall of over interpretation and distinguish from acute perforation.

1. A brief description of colon EMR and its increasing role in the management of colon polyps and the role of imaging post EMR.
2. Pictorial review of common ‘expected’ imaging findings post colon EMR with an emphasis on CT.
3. Pictorial review of abnormal post EMR findings, which require urgent intervention.
4. Discussion of pitfalls in interpretation of CT findings particularly over interpretation of findings in the acute and cancer staging settings.


**TEACHING POINTS**

To demonstrate the importance of preoperative evaluation of biliary anatomy, especially in potential live liver transplant donors. To describe state-of-the-art Magnetic Resonance (MR) pulse sequences directed to biliary visualization: T2-weighted and hepatobiliary phase after administration of Gd-EOB-DTPA. To extensively illustrate common and uncommon biliary anatomic variants.

**TABLE OF CONTENTS/OUTLINE**

Introduction: Significance of preoperative identification of biliary anatomy. Description of common and uncommon anatomic variants. MR technique description: MR cholangiopancreatography: Thick-slab and high resolution 3D T2-weighted images. Hepatobiliary phase: T1-weighted fat saturated VIBE images, associated or not with controlled aliasing in parallel imaging results in higher acceleration (CAIPIRINHA) technique. Illustration, with correlation with intraoperative cholangiograms: Conventional anatomy. Most common variants (trifurcation/short right hepatic duct, right posterior duct joining left hepatic duct, etc.). Rare variants (accessory ducts, abnormal insertion of segmental ducts, low insertion of right anterior or cystic ducts, complex anomalies, etc.)
Suboptimal MR cases and discussion of causes/solutions. Examples of advantages of Gd-EOB-DTPA enhanced images over T2w images and vice versa.

Post-operative Bowel: Part I, Foregut (Esophagus to Duodenum) - A Guide for the Radiologist

Hardcopy Backboard

Participants
Nishant Patel, MD, Ann Arbor, MI (Presenter) Nothing to Disclose
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TEACHING POINTS
To demonstrate normal postsurgical radiological anatomy from esophagus to duodenum with illustrations. To demonstrate normal postoperative anatomy and complications on fluoroscopy, CT and MRI. To provide a guide for radiologists to interpret these studies.

TABLE OF CONTENTS/OUTLINE
Discussion of the performance, indication, expected postoperative anatomy of the following: Esophagus: Esophagectomy with gastric pull-through Fundoplication Stomach and Duodenum: Gastrectomy with esophago-jejunal anastomosis Roux-en-Y gastric bypass Sleeve gastrectomy Partial gastric resection Whipple procedure Biliroth I and II Peustow procedure Choledochojejunostomy in liver transplant Demonstration of complications related to these procedures including: Anastomotic leak Stricture - edema vs true narrowing Wound dehiscence Mimics of common complications

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Katherine E. Maturen, MD - 2014 Honored Educator
Diagnostic Performance and Imaging Features of Gadoxetic Acid-enhanced MR for Hypervascular Hepatocellular Carcinoma and Concordance Rate of Liver Imaging Reporting and Data System

PURPOSE
To assess diagnostic performance and imaging features of gadoxetic acid-enhanced MR for hypervascular hepatocellular carcinoma (HCC) detected by C-arm CT and concordance rate of Liver Imaging Reporting and Data System (LI-RADS).

METHOD AND MATERIALS
One hundred and sixty seven patients (M:F = 131:36, 63.8 years) with HCC (n = 379; 257 > 1 cm, 122 ≤ 1 cm) underwent gadoxetic acid-enhanced MR imaging. HCC was confirmed by showing typical enhancement patterns on MR (n = 347; 253 > 1 cm, 94 ≤ 1 cm), by showing hypervascularity on C-arm CT and continuous compact lipiodol uptake after TACE (n = 6; all 6 ≤ 1 cm), or by showing growth at follow-up C-arm CT with typical enhancement patterns on CT or MRI (n = 26; 4 > 1 cm, 22 ≤ 1 cm). Two radiologists graded likelihood of HCC with a five-point confidence scale and assessed MR imaging features. All HCCs were evaluated the concordance rate of LI-RADS. Jackknife alternative free-response receiver operating characteristic (JAFROC) method was used.

RESULTS
Mean JAFROC figure of merit for large (>1-cm) HCC was 0.948, while that for small HCC was 0.787 with fair agreement (κ = 0.409). Mean sensitivity and positive predictive value (PPV) were 91% (466 of 514) and 90% (466 of 517) for large HCC versus 63.0% (153 of 244) and 79% (153 of 194) for small HCC, respectively. Seventeen of 122 small HCCs (13.9%) were not seen on MR images, even after careful investigation. Among 379 HCC, 99 (26%) met LR 5, 259(66%) met LR 4, and 4(1%) met LR 3. Mean sensitivity of two radiologists according to LI-RADS were 92% (91 of 99) for LR 5, 85% (220 of 259) for LR 4, and 12.5% (0 of 4 by reader 1, 1 of 4 by reader 2) for LR 3. Although, all four major features were more prevalent in large HCCs (p < 0.01), common features for small HCC included arterial enhancement (81.9%), hepatobiliary phase hypointensity (80.3%), and delayed washout (72.9%).

CONCLUSION
Diagnostic performance of gadoxetic acid-enhanced MR imaging for small hypervascular HCC detection is still low, with mean sensitivity of 63.0% (153 of 244) and mean PPV of 79% (153 of 194), compared with large HCC. The concordance rate of LI-RADS was 26% in LR 5 and 66% in LR 4.

CLINICAL RELEVANCE/APPLICATION
Although, diagnostic performance of MRI for small HCC is still low, arterial enhancement (81.9%), hepatobiliary phase hypointensity (80.3%), and delayed washout (72.9%) were common in small hypervascular HCC.
Approval of this prospective single-center study was obtained by the IRB and the German Federal Office for Radiation Protection. A total of 40 thorax-abdomen-pelvis CT examinations acquired from 20 patients in a tumor follow-up were included into the evaluations. All patients were imaged on a 256-slice CT scanner using the departmental standard-dose and, immediately afterwards, a specific low-dose tumor-staging CT protocol. Reconstructed slices were generated by using three different reconstruction algorithms: a classical filtered backprojection (FBP), a first generation IR algorithm (IDose4, Philips Healthcare, Cleveland, OH, United States) and a next generation model-based IR algorithm (IMR, Philips Healthcare, Cleveland, OH, United States).

RESULTS
The overall detection of liver lesions tended to be higher with the IMR algorithm than with FBP or iDose4. The IMR data set at standard dose yielded the highest overall detectability, while the low-dose FBP data set showed the lowest detectability. For the low-dose protocols a significantly improved detectability of the liver lesion can be reported compared to FBP or iDose4 (P= .01). The radiation dose decreased by an approx. factor of five between the standard-dose (average effective dose: 12.2 ± 1.4 mSv) and the low-dose protocol (average effective dose: 2.7 ± 0.3 mSv). For the scan range of the liver the effective dose could be reduced to sub mSv.

CONCLUSION
The latest generation of IR algorithms significantly improved the diagnostic image quality and provided virtually noise-free images for ultra-low dose CT imaging of the liver.

CLINICAL RELEVANCE/APPLICATION
Advanced IR algorithms are leading CT towards sub mSv whole body imaging thereby limiting radiation exposure to a minimum.

G1381-SD-WEB4 Imaging Evaluation of Ablative Margin and Index Tumor Immediately after Combined Treatment of TACE and RF Ablation for Hepatocellular Carcinoma: Comparison between Multi-Detector CT and MR Imaging

Station #4

Participants
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PURPOSE
To prospectively compare multi-detector CT and MR imaging in assessment of ablative margin (AM) and index tumor within ablation zones immediately after combined treatment of transcatheter arterial chemoembolization (TACE) and radiofrequency (RF) ablation for hepatocellular carcinoma (HCC)

METHOD AND MATERIALS
Based on our preliminary data, necessary number of patients was estimated to be at least 30 when an α error of 0.05 and a β error of 0.2 were applied. A total of 33 consecutive patients with 45 HCCs, who had successfully undergone contrast-enhanced CT and MR imaging after RF ablation combined with TACE, was enrolled in this study. CT and MR imaging were performed within 3 and 7 hours after completion of combined therapy of TACE and RF ablation, respectively. Both CT and MR images were reviewed in consensus by two radiologists in two separate sessions regarding visual discrimination between AM and index tumor and status of AM within ablation zones. The status of AM was classified as AM plus (AM completely surrounded tumor), AM zero (AM was partly discontinuous, without protrusion of tumor beyond postulated border of ablated area) and AM minus (AM was partly discontinuous, with protrusion of tumor). Any ablation zone with AM plus or AM zero was considered as imaging evidence to predict technical effectiveness, which was based on one-month follow-up CT, as well as to represent technical success.

RESULTS
With CT and MR imaging, visual discrimination between AM and index tumor was possible in 34 (75.6%) and 40 (88.9%) of 45 ablation zones, respectively (P = .1094). Among 34 and 40 ablation zones in which status of AM could be evaluated on CT and MR imaging, AM status was categorized into AM plus (n=25 and 31, respectively), AM zero (n=9 and 8, respectively) and AM minus (n=0 and 1, respectively). The technical effectiveness was noted in all of ablation zones on one-month follow-up CT. Based on CT and MR imaging, technical success and effectiveness were determined to be achieved in 34 (75.6%) and 39 (86.7%), respectively (P=.1797).

CONCLUSION
There was no significant difference in assessment of ablative margin and index tumor within ablation zones immediately after combined treatment of TACE and RF ablation between CT and MR imaging.

CLINICAL RELEVANCE/APPLICATION
CT and MR imaging have equivalent ability to evaluate technical success immediately after combined treatment of TACE and RFA. Thus, MR imaging may not be necessary.

G1382-SD-WEB5 Color Coded Perfusion Imaging with Contrast Enhanced Ultrasound (CEUS) for Evaluation of the Post-interventional Success Following Trans-arterial Chemoembolization (TACE) and Ablative Techniques of Liver Lesions, First Results

Station #5

Participants
To evaluate the success of interventional treatments of liver tumors using a new color coded perfusion quantification software with CEUS.

**METHOD AND MATERIALS**

In 80 malignant liver lesions (49 Patients, 47 HCC, 32 metastases, 1 CCC, age 21 - 84 years, mean 60.3 years) CEUS was performed using a multifrequency probe (1-5 MHz, LOGIQ E9, GE, USA) within 24 hours following interventional treatment (16 TACE, 30 IRE, 32 Microwave ablation, 2 RFA). For each patient 1-2.4 mL of SonoVue® (BRACCO, Italy) was used. The digitally stored cine loops of the tumor microvascularization (up to 120 sec.) were evaluated retrospectively using a perfusion software (VueBox, BRACCO, Italy) regarding time to peak (TTP), mean transit time (mTT), peak enhancement (pE) and Wash-in Area Under the Curve (WIAUC). Each parameter was analyzed in the center and border area of the lesion. In 72 lesions, each parameter was additionally evaluated in the tumor periphery. Statistical evaluation was performed using the Wilcoxon-test.

**RESULTS**

The pre-interventional tumor size ranged from 11 mm to 55 mm, mean 26 mm in diameter. The post-interventional defect size ranged from 11 mm to 73 mm, mean 38 mm. In all patients, a post-interventional reduction of the tumor microvascularization was observed. Regarding the WIAUC (p<0.01) and pE (p<0.01) the differences between center of the lesion vs. border area and border area vs. periphery were found to be statistically significant. Evaluation of mTT showed no significant difference between center, border area or periphery whereas for TTP the differences between center and border area were also found to be statistically significant (p< 0.05).

**CONCLUSION**

CEUS with perfusion imaging offers new possibilities for the measurement of results following interventional treatment of liver lesions.

**CLINICAL RELEVANCE/APPLICATION**

Evaluation of the post-interventional success of ablation or embolization treatments of liver tumors using a new color coded perfusion quantification software with CEUS.

**GI383-SD-WEB6 Intraductal Papillary Mucinous Neoplasms (IPMN) of the Pancreas: Diagnostic Accuracy of Low-dose Abdominal MDCT Scan**

Station #6

Participants

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Sandro Sironi, MD, Monza, Italy (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To evaluate the diagnostic accuracy of low-dose MDCT combined with iterative reconstruction algorithm (iDose4) in the assessment of intraductal papillary mucinous neoplasms (IPMN) of the pancreas, to determining the correct surgical approach.

**METHOD AND MATERIALS**

We retrospectively evaluated nineteen patients (13 men; mean age 70.7±13.1 years) with pancreatic IPMN and who underwent from January 2013 to March 2015 an abdominal MDCT examination on a 256-slice scanner (iCT; Philips), with low-dose scanning protocol (120 kV, mAs determined by x-, y- and z-axis dose modulation) and iDose4 reconstruction modulation. Standard Magnetic Resonance (MR) imaging examination was used as reference standard for diagnosis of IPMN. For every IPMN the following data and protocol (120 kV, mAs determined by x-, y- and z-axis dose modulation) and iDose4 reconstruction modulation. Standard Magnetic

**RESULTS**

Multiplanar CT reconstructions were performed and the imaging data were reviewed as axial and as MPR images: coronal, sagittal and curved in order to evaluate the surgical criteria of malignancies and therefore the surgical approach. A total of 44 IPMN (26 in the tail, 8 in the body, 6 in the head, 2 in the neck) in 19 patients were evaluated (single in 8 cases, multiple in 11). The main lesion diameter was 14.4±6.8 mm; 22/44 (50%) demonstrated a distinct communication with MPD and MPD mean diameter was 2.7±0.7 mm. 5/44 (11%) lesions demonstrated inner septa and 10/44 (23%) wall thickening and 2/44 (4%) mural enhancing nodules. 8/44 (18%) of IPMN demonstrated close proximity to the portal vein.

**CONCLUSION**

Low-dose abdominal MDCT scans with iDose4 reconstruction algorithm are able to properly depict morphologic features of pancreatic IPMNs that may allow their proper characterization according to surgical guidelines.

**CLINICAL RELEVANCE/APPLICATION**

MDCT scans combined with iDose4 might represents a useful imaging technique, rapid and widely available, for the proper surgical assessment of pancreatic IPMN.
TEACHING POINTS

The root of small-bowel mesentery is an important peritoneal reflection. Usually it is involved by the spread of disease from surrounding structures, some disease processes can occur primarily within it. The purpose of this exhibit is: -To familiarize the viewer with the anatomy of the root of the small-bowel mesentery and various primary lesions arising within the root with emphasis on CT imaging findings. -To help the viewer learn an imaging pattern-based approach to develop a reasonable differential diagnosis of abnormalities arising in the root of mesentery, suggest additional work-up, if needed and in many cases help making the specific diagnosis.

TABLE OF CONTENTS/OUTLINE

The contents will be organized as follows with short discussions, illustrated examples and few cases as quiz towards the end of presentation: -Small-bowel mesenteric root anatomy -Lesions: 1. Vascular lesions such as Superior mesenteric artery and venous thrombosis, Superior mesenteric artery dissection/pseudo-aneurysm 2. Inflammatory and infectious entities such as Mesenteric panniculitis, Retractile mesenteritis, Abscess, Adenitis 3. Benign masses such as Cyst, Lipoma, Desmoid tumor, pseudotumor 4. Malignant masses such as Carcinoid, Lymphoma, Gastrointestinal stromal tumor, Mesothelioma 5. Miscellaneous such as Rosai-Dorfman disease 6. Short quiz cases.

TEACHING POINTS

High Resolution (HR) MRI is now widely used for treatment decisions and surgical planning in primary rectal cancer Inter observer variability in assessment of key parameters is a significant challenge in the successful implementation of this technique We review inter-observer variability and solutions to improve consistency in the interpretation of HR MR scans for primary rectal cancer

TABLE OF CONTENTS/OUTLINE

Review key imaging parameters in the preoperative staging of rectal cancerReview the incidence of interobserver variability in the assessment of T stage, N stage, depth of invasion and vascular invasion Review techniques and steps to improve consistency in assessment of key parameters

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Raghunandan Vikram, MBBS, FRCR - 2012 Honored Educator

TEACHING POINTS

Understand surgical options for metastatic liver cancer Illustrate the radiologist's role in preoperative planning for extended hepatectomy Illustrate decision making factors through a case based approach
TABLE OF CONTENTS/OUTLINE

Background
Surgical Options and Anatomy
Radiologist’s Role
CT Volumetry
Discuss and illustrate different methods
Define non-standardized and standardized liver volumetry measurements
Describe target volumes and kinetic growth rate pertaining to future liver remnant
Cases to illustrate decision making process

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David J. DiSantis, MD - 2014 Honored Educator

G106-EBWEB

Post-operative Bowel: Part II- Mid and Hind Gut (Jejunum to Anus) - A Guide for the Radiologist

Hardcopy Backboard

Participants

Ashish P. Wasnik, MD, Ann Arbor, MI (Presenter) Nothing to Disclose
Nishant Patel, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Ravi K. Kaza, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Katherine E. Maturen, MD, Ann Arbor, MI (Abstract Co-Author) Consultant, GlaxoSmithKline plc; Medical Advisory Board, GlaxoSmithKline plc
Mahmoud M. Al-Hawary, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

- Post-operative bowel is frequently imaged to evaluate for complications, and knowledge of expected normal postoperative anatomy remains crucial in identifying complications. Review common operative procedures related to small and large bowel with graphic illustrations and imaging examples.
- The learner should be able to identify the surgical procedure and post-op anatomy of small and large bowel, along with commonly seen complications.

TABLE OF CONTENTS/OUTLINE

- Description of various operative procedure and their indication involving the small and large bowel with illustrations, and representative examples on fluoroscopy and CT
- Following procedures that will be discussed include:
  - Small Bowel: Small bowel resection with primary or secondary anastomosis, procedure from urinary diversion (ileal conduit, Indiana pouch, Mitrofanoff appendicovesicostomy, neobladder)
  - Colon: Hemicolectomy/ileoceleic anastomosis, abdominoperineal resection (Miles procedure), low anterior resection, colectomy with ileal J-pouch-anal anastomosis, segmental colectomy with diverting/ end loop colostomy, Hartman's pouch.
- Complications related to these procedures will be presented with examples (anastomotic leak, fistula, stricture, bowel obstruction, inflammation, wound dehiscence and mimics like outpouching/capacious segment from side-side anastomosis).

HonoRed Educators

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Katherine E. Maturen, MD - 2014 Honored Educator
LEARNING OBJECTIVES

1) To explain the significance of injury mechanism and its role in the formation of consequent abdominal lesions and their complications. 2) To outline the role of proper imaging technique and diagnostic algorithm in the sufficiently fast diagnosis of abdominal injuries. 3) To learn more about the typical and unusual findings of various abdominal traumatic conditions.

ABSTRACT

Abdominal injuries require a timely and reliable diagnosis in order to prevent the potentially lethal outcome. The armory of clinical tools (physical examination, lab tests) does not fulfill these criteria, since they are either not fast, or not reliable. Imaging diagnostic modalities help the clinician to acquire the necessary amount of information to initiate focused and effective treatment. However, the selection of the appropriate imaging algorithm, modality and technique, as well as the precise detection and interpretation of essential imaging findings are frequently challenging, especially because the circumstances, under which these examinations are performed (open wounds, bandages, non-removable life-supporting equipment, lack of patient cooperation, etc.), are frequently less than optimal. Knowledge of critical imaging signs, symptoms and the role they play in the evaluation of the patient’s condition, but also fast decision-making and ability to closely cooperate with the clinicians are skills of key importance for radiologist members of the trauma team.

LEARNING OBJECTIVES

1) Attendees will be able to better analyze CT scans for non-traumatic causes of abdominal pain. 2) Attendees will learn the CT signs and causes of bowel ischemia. 3) Attendees will learn the CT findings of common causes of an “acute” abdomen. 4) Attendees will learn the imaging findings of acute, nontraumatic urinary tract and GI tract emergencies.

ABSTRACT

This segment of the course will go over the optimal imaging approach for patients presenting with acute abdominal pain. CT findings will be emphasized. Key imaging findings of nontraumatic causes of acute abdominal pain including gastrointestinal tract and urinary tract pathology will be explained. A systematic approach for the imaging evaluation of patients with abdominal emergencies will be illustrated and explained including proper scan protocols and analysis of imaging findings. Imaging diagnosis of urinary tract obstruction, infection, bowel obstruction, and ischemia will be emphasized.

LEARNING OBJECTIVES

1) Attendees will be able to better analyze CT scans for traumatic and non-traumatic causes of abdominal pain. 2) Attendees will learn the CT signs and causes of bowel ischemia and injuries. 3) Attendees will learn the CT findings of common causes of a traumatic and non-traumatic ‘acute’ abdomen. 4) Attendees will learn the imaging findings of acute, traumatic and nontraumatic urinary tract and GI tract emergencies.

ABSTRACT

Using cases and an audience response system, this segment of the course will go over the optimal imaging approach for patients presenting with acute abdominal pain and abdominal trauma injuries. CT findings will be emphasized. Key imaging findings of traumatic and nontraumatic causes of acute abdominal pain including gastrointestinal tract and urinary tract pathology will be explained. A systematic approach for the imaging evaluation of patients with abdominal emergencies will be illustrated and explained including proper scan protocols and analysis of imaging findings. Imaging diagnosis of blunt and penetrating abdominal injuries, urinary tract obstruction, infection, bowel obstruction, and ischemia will be emphasized.
LEARNING OBJECTIVES

1) Gain an appreciation of the basic scientific underpinnings of interventional oncology. 2) Understand how and why these mechanistic studies can have an impact on both daily clinical practice and future therapeutic paradigms. 3) Characterize the most important advances of tumor ablation over the last two decades. 4) Gain a better understanding of the cutting edge imaging techniques that facilitate successful state of the art interventional oncologic practice.

ABSTRACT

The first half of the session has been organized into a thematic unit entitled: "Mechanisms Matter: Basic science every IO should know" and will be dedicated to gaining an appreciation of the basic scientific underpinnings of interventional oncology and understanding how and why such studies can have an impact on both daily clinical practice and future therapeutic paradigms. This will include an initial lecture outlining the many insights and lessons that can be directly applied from radiation therapy and hyperthermia, followed by lectures that center upon key mechanistic pathways that are being used to improve transcather abdomen and tumor ablation. Two presentations will outline our current understanding of the potential systemic effects of post-procedure, cytokine-mediated inflammation - the negative effects leading to tumorigenesis and the potential beneficial immune (abscopisc) effects of IO therapies. A highlight of the session will be a keynote address "20 years of thermal ablation: Progress, Challenges and Opportunities". Dr. Solomon, a noted thought leader in the field will not only characterize the most important advances of tumor ablation over the last two decades and place them in their proper historical and developmental context, but will also identify key areas of research in device and technique development that hold the potential to propel the field forward in the upcoming decade. The second half of the session “Advancing IO with cutting-edge imaging techniques” will be dedicated to the cutting edge imaging modules that facilitate successful state of the art IO practice. Leading authorities will provide an in depth look at advances and adoption of 5 of the main technologies as they relate to enhancing interventional oncology including: advanced ultrasound and fusion techniques; state-of-the-art angiographic imaging (including Cone beam CT and subtraction reconstruction); tailoring MR for IO; the the role of PET/CT; and molecular imaging.

Sub-Events

VSIO41-01 Ischemia-The Prime Mover: Apoptosis, Hif-1a, and VEGF Pathways

VSIO41-02 Exploiting Tumor Hypoxia with Transarterial Chemoembolization to Treat Liver Cancer: Selective Hypoxia-Activated Intra-arterial Therapy in a Rabbit Model
Lessons Learned from XRT/Hyperthermia

Wednesday, Dec. 2 1:55PM - 2:10PM Location: S405AB

Participants
Mark W. Dewhirst, DVM, PhD, Durham, NC (Presenter) Stockholder, Celsion Corporation; Research Grant, Biomimetix Corporation; Research Grant, Johnson & Johnson; Consultant, Nevro Corp; Consultant, Merck KGaA; Consultant, Siva Corporation

LEARNING OBJECTIVES

1) Understand the complimentary interactions between hyperthermia and radiotherapy that increase cell killing. 2) Understand importance of measuring temperature during heating and methods for how this is accomplished. 3) Be able to articulate how hyperthermia affects tumor physiology and how these effects influence treatment responses.

ABSTRACT

There are more than a dozen positive phase III trials showing that hyperthermia can increase local tumor control when it is combined with radiotherapy. Such trials include head and neck cancer, cervix cancer, GBM, esophageal al cancer and chest wall recurrences of breast cancer. It has been known for more than two decades that hyperthermia augments the cytotoxicity of radiotherapy. Basic tenants underlying this interaction include proof that hyperthermia inhibits DNA damage-repair. Hyperthermia has complimentary cytotoxicity with radiotherapy in different parts of the cell cycle. Further, hyperthermia can increase tumor perfusion, thereby increasing oxygen delivery; lack of oxygen is a source of relative resistance to radiotherapy. In recent years, however, new insights have been made into how these two treatment modalities interact. These insights come from: 1) innovative clinical trials involving functional imaging and genomics and 2) examination of how hyperthermia affects the process of DNA damage repair. These developments point the way toward new methods to further therapeutic gain by taking advantage of cellular responses to these therapies.
**PURPOSE**

Hepatocellular carcinoma (HCC) is becoming an increasing cause of morbidity and mortality in patients co-infected with HIV and HCV. TACE is an important treatment option for unresectable HCC, but to date, there is paucity of data on the safety and efficacy profile of TACE in this specific cohort. The purpose of this study is to compare HCC patients with HIV/HCV co-infection treated with TACE against HCC patients with HCV mono-infection treated with TACE through survival analysis and recording of major complications.

**METHOD AND MATERIALS**

This single institution and retrospective study included 456 patients. 35 HIV/HCV co-infected HCC patients with CD4 > 100 (group EXP) and 421 HCV-only HCC patients (group CTRL) who received TACE from 2001 - 2014 were included. Propensity score matching (PSM) with the nearest-neighbor method was performed, adjusting for sex, ethnicity, and BCLC/HKLC, which take into account Child-Pugh Class, ECOG performance score, and tumor characteristics. Covariate balance was confirmed. Kaplan-Meier (KM) estimates with median overall survival (MOS) and log-rank statistic were calculated. Cox regression was performed on EXP group to identify infectious disease parameters of potential significance on survival, such as detectable HIV viral load, CD4 count, and anti-retroviral therapy (ART). Significant complications were recorded.

**RESULTS**

Of the 456 patients, 35 patients in EXP group were successfully matched to 75 patients in CTRL group. 15 (42.9%) patients had detectable HIV viral load. Median CD4 count was 406 x 106 cells/mm3 (range 121 to 1086). 31 (88.5%) patients were on ART. The cohort spanned all BCLC/HKLC stages. KM revealed MOS of 20.0 months for the EXP group and MOS of 21.3 months for the CTRL group (p = 0.907). Cox model on EXP group did not identify any infectious disease variables of significance on survival. No significant complication, such as death, ICU stay, or fulminant liver failure within 30 days of TACE, was observed in the EXP group.

**CONCLUSION**

In HCC patients with HIV/HCV co-infection and CD4 > 100, TACE demonstrated comparable safety and efficacy profile as in HCC patients with HCV only.

**CLINICAL RELEVANCE/APPLICATION**

Interventional oncologists should feel comfortable offering TACE as a treatment option to HCC patients with HIV/HCV co-infection.

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**VSIO41-05 Tailoring Nanodrugs for IO: Free Radicals, Heat Shock Proteins, and beyond**

**PURPOSE**

To evaluate the potential utility of circulating tumor cells (CTCs) measurements in predicting prognosis of hepatocellular carcinoma (HCC) patients treated with transarterial chemoembolization (TACE) treatments, including their differences in different vein sites and the immediate and delayed impact of TACE on CTCs.

**METHOD AND MATERIALS**

CTCs from consecutive patients with HCC were quantified before and immediately and 6-8 weeks after TACE. CTCs were examined in both samples derived from the peripheral vein (PV) and the hepatic vein (HV).

**RESULTS**

A total of 46 consecutive patients with HCC were recruited into the prospective study and 38 were analysed at last. CTCs counts in HV were significantly higher than in PV (P<0.001). TACE led to a statistically significant immediate fall in CTCs numbers, especially in HV (P<0.001). Patients with CTCs levels ≥ 2 in PV or ≥ 8 in HV at baseline per 7.5 ml blood samples, compared with the group with fewer CTCs in PV or HV, had a shorter median progression-free survival (PFS, 5.2 months vs. 12.0 months, P=0.01; 5.2 months versus 9.5 months, P=0.003, respectively). At the 6-8 weeks after TACE, patients with CTCs ≥ 2 in PV or ≥ 3 in HV had a similarly shorter PFS (5.0 months vs. 12.0 months, P<0.001; 5.1 months versus 11.2 months, P<0.001, respectively). Further analysis showed that patients with higher CTC levels also had a higher intrahepatic metastasis rate. The multivariate Cox regression analyses and ROC curves showed that the levels of CTCs at baseline and 6-8 weeks after TACE were significant independent prognostic factors of PFS.

**CONCLUSION**

The number of CTCs in peripheral and hepatic vein before and 6-8 weeks after TACE are independent predictors of PFS in HCC patients received TACE treatments. TACE immediately reduces the number of CTCs get into the blood circulation.

**CLINICAL RELEVANCE/APPLICATION**
CTCs detection is a promising method to predict prognosis in HCC patients underwent TACE. TACE immediately reduce the number of CTCs get into the blood and may reduce the rate of metastasis.

**VSIO41-07  Understanding Post-procedure Inflammation: AKT and c-met Pathways**  
Wednesday, Dec. 2 2:45PM - 3:00PM  Location: S405AB

**Participants**  
David A. Woodrum, MD, PhD, Rochester, MN (Presenter)  Nothing to Disclose

**LEARNING OBJECTIVES**  
View learning objectives under main course title.

**VSIO41-08  Microwave Hepatic Ablation Induces Dose Dependent Local Inflammation and Distant Pro-oncogenic Effects**  
Wednesday, Dec. 2 3:00PM - 3:10PM  Location: S405AB

**Participants**  
Erik Velez, BS, San Francisco, CA (Presenter)  Nothing to Disclose  
Nahum Goldberg, Jerusalem, Israel (Abstract Co-Author)  Nothing to Disclose  
Gaurav Kumar, PhD, Boston, MA (Abstract Co-Author)  Nothing to Disclose  
Yuanguo Wang, Boston, MA (Abstract Co-Author)  Nothing to Disclose  
Christopher L. Brumm, PhD, Madison, WI (Abstract Co-Author)  Shareholder, NeuWave Medical Inc; Consultant, NeuWave Medical Inc; Shareholder, Sympyle Surgical Inc; Consultant, Sympyle Surgical Inc  
Muneeb Ahmed, MD, Wellesley, MA (Abstract Co-Author)  Nothing to Disclose

**PURPOSE**  
To determine how different doses of microwave ablation (MWA) induce local inflammation and distant pro-oncogenic effects compared to radiofrequency ablation (RFA) in a small animal model.

**METHOD AND MATERIALS**  
F344 rats (n=24) were implanted with single subcutaneous R3230 tumors. Average tumor diameter and tumor growth rates were assessed daily. At mean tumor diameter of 10 mm, animals were divided into four groups (n=6/arm), and assigned to one of four treatments: sham (needle x 5 minutes), RFA (70°C x 5 minutes), rapid high-dose MWA (20W x 15 seconds), or slower low-dose MWA (5W x 2 minutes). Settings were selected to produce 11.4±0.8 mm coagulation zones for all ablation settings. Tumors were measured daily for 7 days post-treatment to determine growth rates. Thickness of periablational liver inflammation (heat shock protein 70; Hsp70), local liver IL-6 levels, and distant tumor proliferative indices (Ki-67) were also compared.

**RESULTS**  
Hepatic MWA-5W and RFA increased distant tumor growth rates compared to the MWA-20W and sham arms, such that the 7 day mean tumor diameter was greater (MWA-5W 16.3±1.1 mm, RFA 16.3±0.9 mm vs. sham 13.6±1.3 mm, p<0.01, and MWA-20W 14.6±0.9 mm, p<0.05). Although less than MWA-5 or RFA, MWA-20W also resulted in a significantly greater change in tumor diameter compared to the sham arm (p=0.04). Similarly, higher distant tumor proliferation was observed after hepatic MWA-5W and RFA, followed by MWA-20W, compared to sham (proliferative indices: MWA-5W 0.82±0.05, RFA 0.79±0.05, MWA-20W 0.65±0.02 vs. sham 0.49±0.05, p<0.01). Finally, lower-energy hepatic MWA and RFA resulted in greater periablational inflammation (Hsp70: RFA 141.5 μm (mean), MWA-5W 134.1 μm, vs. MWA-20W 67.5 μm, p<0.01) with a trend for elevation in IL-6 levels for RFA (542±61 pg/ml) and MWA-5W (486±101 pg/ml), vs. MWA-20W (349±22 pg/mL, p<0.08).

**CONCLUSION**  
Hepatic MW ablation can incite periablational inflammation and increased distant tumor growth similar to what has been recently reported for RFA. Yet, such undesired effects may be dependent on heating paradigms, and less pronounced with more rapid, higher power heating.

**CLINICAL RELEVANCE/APPLICATION**  
MWA and RFA can have 'off-target' tumor stimulatory effects, which may be decreased using higher MW energy to reduce secondary inflammation in the tissue surrounding the ablation zone.

**VSIO41-09  Systemic Implications of IO Therapies: Increased Tumorigenesis?**  
Wednesday, Dec. 2 3:10PM - 3:25PM  Location: S405AB

**Participants**  
Muneeb Ahmed, MD, Wellesley, MA, (mahmed@bidmc.harvard.edu) (Presenter)  Nothing to Disclose

**LEARNING OBJECTIVES**  
View learning objectives under main course title.

**VSIO41-10  Systemic Implications of IO Therapies: Beneficial Immune Effects?**  
Wednesday, Dec. 2 3:25PM - 3:40PM  Location: S405AB

**Participants**  
Joseph P. Erinjeri, MD, PhD, New York, NY, (erinjerj@mskcc.org) (Presenter)  Nothing to Disclose

**LEARNING OBJECTIVES**  
View learning objectives under main course title.
Panel Discussion: So What Does This All Mean?
Wednesday, Dec. 2 3:40PM - 3:55PM Location: S405AB

Participants

Participants

20 Years of Thermal Ablation: Progress, Challenges and Opportunities
Wednesday, Dec. 2 4:00PM - 4:25PM Location: S405AB

Participants
Stephen B. Solomon, MD, New York, NY (Presenter) Research Grant, General Electric Company

Participants

Advancing IO with Cutting-edge Imaging Techniques
Wednesday, Dec. 2 4:25PM - 4:40PM Location: S405AB

Participants

Advanced Ultrasound and Fusion Techniques
Wednesday, Dec. 2 4:40PM - 4:55PM Location: S405AB

Participants

State-of-the-Art Angiographic Imaging: Cone Beam CT and beyond
Wednesday, Dec. 2 4:55PM - 5:05PM Location: S405AB

Participants
Ming De Lin, PhD, Cambridge, MA (Presenter) Employee, Koninklijke Philips NV

Learning Objectives

1) Discuss the role of cone-beam computed tomography (CBCT) for intraprocedural imaging during transcatheter arterial chemoembolization (TACE). 2) Explain the advantages of CBCT over standard 2D angiography in the detection of hepatocellular carcinoma lesions and their feeding arteries. 3) Describe how CBCT during TACE can be used to assess the technical endpoint of embolization. 4) Demonstrate how to choose a CBCT technique using a decision-making algorithm to optimize the use of CBCT at each step of TACE for the identification of the lesion, guidance to reach the lesion, and assessment of embolization end points.

Abstract

Cone-beam computed tomography (CBCT) is an imaging technique that provides 3D imaging intraprocedurally from a rotational scan acquired with a C-arm equipped with a flat panel detector. Utilizing CBCT images during interventional procedures bridges the gap between the world of diagnostic imaging, where the image acquisition is typically performed separately from the procedure, and that of interventional radiology, which traditionally has been 2-dimensional (fluoroscopy and angiography). In the scope of transcatheter arterial chemoembolization (TACE), CBCT is capable of providing more information than standard two-dimensional imaging alone in localizing and/or visualizing liver tumors ("seeing" the tumor) and targeting tumors though precise microcatheter placement in close proximity to the tumors ("reaching" the tumor). It can also be useful in evaluating treatment success at the time of procedure ("assessing" treatment success).

Contrast Patterns on Intra-procedural Cone-beam CT Can Predict Early Tumor Response to DEB-TACE in Patients with Hepatocellular Carcinoma
Wednesday, Dec. 2 4:55PM - 5:05PM Location: S405AB

Participants

Sonia P. Sahu, New Haven, CT (Presenter) Nothing to Disclose
Ruediger E. Schernthaner, MD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Yan Zhao, MS, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Jae Ho Sohn, MD,MS, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Florian N. Fleckenstein, MS, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Alessandro G. Radaelli, PhD, MS, Best, Netherlands (Abstract Co-Author) Employee, Koninklijke Philips NV
Martijn Van Der Bom, MSC, Andover, MA (Abstract Co-Author) Employee, Koninklijke Philips NV
Rafael Duran, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Ming De Lin, PhD, Cambridge, MA (Abstract Co-Author) Employee, Koninklijke Philips NV
Jean-Francois H. Geschwind, MD, Westport, CT (Abstract Co-Author) Researcher, BTG International Ltd; Consultant, BTG International Ltd; Researcher, Koninklijke Philips NV; Consultant, Koninklijke Philips NV; Researcher, Guerbet SA; Consultant, Guerbet SA; Consultant, Terumo Corporation; Consultant, Threshold Pharmaceuticals, Inc.; Consultant, PreScience Labs, LLC; Researcher, Boston Scientific Corporation; Consultant, Boston Scientific Corporation
PURPOSE
Cone-beam CT (CBCT) is routinely utilized to determine the optimal location for drug delivery and technical success of embolization during drug-eluting beads transarterial chemoembolization (DEB-TACE). As such, the relationship between intraprocedural CBCT findings and therapy response should be investigated. This study examined whether quantified contrast patterns on intraprocedural CBCT could predict tumor response on 1 month follow-up magnetic resonance (MR) imaging in hepatocellular carcinoma (HCC) patients treated with DEB-TACE.

METHOD AND MATERIALS
This retrospective study included 53 lesions in 49 patients (38 men, median age 62.7 years) who underwent DEB-TACE. All patients had a contrast-enhanced CBCT image taken immediately before and an unenhanced CBCT image taken immediately after drug delivery. However, enhancement was seen on the post-TACE CBCT due to retained contrast medium from drug delivery. MR imaging was performed at baseline and 1 month follow-up. On the CBCT images, enhancement of the target lesions was measured in 1 dimension (D), 2D, and 3D. On follow-up CBCT, patients were classified as responders or non-responders using mRECIST, EASL, and quantitative EASL (qEASL). qEASL defines response as a ≥ 65% decrease in 3D enhancement. To assess whether contrast patterns on CBCT could predict 1 month MR response, uni- and multivariate logistic regressions. Baseline characteristics significant in univariate analysis were included in the multivariate model.

RESULTS
On pre- and post-TACE CBCT, median 1D, 2D, and 3D tumor enhancement was 3.4 vs 3.6 cm (p=0.5), 9.9 vs 10.4 cm (p=0.7), and 60.7 vs 73.0% (p=0.4). Response was seen in 34% (mRECIST) and 38% (EASL and qEASL) of lesions. Neither 1D nor 2D enhancement on CBCT could predict mRECIST or EASL response, respectively. However, 3D enhancement was predictive of qEASL response in univariate (pre-TACE CBCT: OR 1.07, 95% CI 1.03-1.11; post-TACE CBCT: OR 1.10, 95% CI 1.5-1.16) and multivariate analysis adjusted for age, hepatitis C, and tumor size (pre-TACE CBCT: OR 1.06, 95% CI 1.02-1.10; post-TACE CBCT: OR 1.09, 95% CI 1.03-1.15).

CONCLUSION
3D enhancement on intraprocedural CBCT can predict 3D tumor response on MR in HCC patients treated with DEB-TACE.

CLINICAL RELEVANCE/APPLICATION
CBCT contrast patterns during DEB-TACE are associated with future tumor response and therefore should guide intraprocedural decisions.

VSIO41-17 Tailoring MR for IO

Wednesday, Dec. 2 5:05PM - 5:20PM Location: S405AB

Participants
Philippe L. Pereira, MD, Heilbronn, Germany (Presenter) Research Consultant, Terumo Corporation; Speaker, AngioDynamics, Inc; Speaker, BSD Medical Corporation; Speaker, Terumo Corporation; Speaker, CeloNova BioSciences, Inc; Speaker, Medtronic, Inc; Speaker, BTG International Ltd; Speaker, Biocompatibles International plc; CeloNova BioSciences, Inc; Medtronic, Inc; Support, Siemens AG; Support, Novartis AG; Support, CeloNova BioSciences, Inc; Research Grant, Biocompatibles International plc; Research Grant, Siemens AG; Research Grant, Terumo Corporation; Research Grant, BTG International Ltd

LEARNING OBJECTIVES
View learning objectives under main course title.

ABSTRACT
Image guided tumor ablation is a minimally invasive therapy option in the treatment of primary and secondary hepatic malignancies. Magnetic resonance (MR) imaging offers an accurate pre-interventional imaging having important impact on patient selection and planning in the ablation procedure. Peri-interventional imaging is used for targeting, monitoring, and controlling of the ablation procedure. Due to a high soft-tissue contrast offering delineation of tumor tissue and the surrounding anatomy, coupled with multiplanar capabilities, MR imaging is an advantageous targeting technique compared with ultrasonography (US) or computed tomography (CT). Furthermore, a near-online imaging is feasible at interventional MR units facilitating a fast and precise placement of the probe inside the target tissue. MR imaging is sensitive to thermal effects enabling a monitoring of ablation therapy. At low-field, MR scanner T2 weighted sequences are accurate to near-online monitor acute effects of thermally induced coagulation subsequently being supportive to control the ablation procedure. Therefore, MR imaging can fulfill the conditions for overlapping ablations by enabling a precise repositioning of the MR compatible thermal applicator if required. MR imaging can be utilized to define the end point of thermal ablation after complete coverage of the target tissue is verified. Thus, the probability of achieving complete coagulation in larger tumors within a single therapy session is supposedly increased. A monitoring of thermal effects is moreover essential in order to prevent unintended tissue damage from critical structures in the surroundings of the target tissue. Subsequently, the possibility to monitor and control thermal ablation by MR imaging has an important impact on the safety and effectiveness of the ablation procedure. At least, first use of MR compatible microwave antennas will be presented in this refresher.

VSIO41-18 3D Quantitative Tumor Burden Analysis in Patients with Hepatocellular Carcinoma before TACE: Comparing Multi-lesion vs. Single-lesion Imaging Biomarkers as Predictors of Patient Survival

Wednesday, Dec. 2 5:20PM - 5:30PM Location: S405AB

Participants
Florian N. Fleckenstein, MD, New Haven, CT (Presenter) Nothing to Disclose
Rafael Duran, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Ruediger E. Schernthaner, MD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Jae Ho Sohn, MD,MS, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Sonia P. Sahu, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Yan Zhao, MS, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Berndhard Gebauer, MD, Berlin, Germany (Abstract Co-Author) Research Consultant, C. R. Bard, Inc; Research Consultant, Sirtex
**LEARNING OBJECTIVES**

1. Compare advantages of PET/CT with other imaging modalities in guiding interventional radiology procedures.
2. Describe strategies to improve lesion targeting during PET/CT interventional procedures.
3. Apply various PET/CT imaging techniques for the intraprocedural assessment of tumor ablation margins.

**ABSTRACT**

Positron Emission Tomography/Computed Tomography (PET/CT) enhances our capabilities in image-guided interventions in multiple ways. PET/CT enables targeting of disease foci not visible using other imaging modalities, provides uninterrupted visibility of targets despite intraprocedural changes in surrounding tissues or thermal effects of ablation, and facilitates unique intraprocedural strategies for assessing tumor ablation results. Many case examples will be shown that highlight rationales, strategies and emerging techniques for successful PET/CT-guided interventions.

**METHOD AND MATERIALS**

122 patients with HCC treated with TACE were retrospectively included. Baseline arterial-phase, contrast-enhanced MRI was used to measure overall and enhancing diameters in a total of 296 HCC lesions. A 3D segmentation analysis was performed to assess total liver volumes and to quantify enhancing tumor volume (ETV) for each lesion. Enhancing tumor burden (ETB) was defined as the ratio between total ETV and total liver volume. Patients were stratified into high and low tumor burden groups following the BCLC staging (5cm for unifocal HCC and 3cm for 3 lesions for multifocal HCC; accordingly 65cm³ and 45cm³ were used for 3D cutoffs). A threshold of 4%, based on the ROC curve, was used for ETB. Survival was assessed using Kaplan-Meier analysis as well as uni- and multivariate cox proportional hazard ratios (HR). Concordances of each assessment technique were calculated and the method with the highest correlation was further evaluated in order to identify the ideal number of lesions needed for an accurate prediction of OS.

**RESULTS**

A significant separation of the survival curves was achieved for all methods (log rank, p<0.05). Multivariate analysis, according to 3D methods showed the highest predictivity of OS as compared to 1D techniques (HR 5.2 [95%CI, 3.1-8.8, p<0.001] for ETV and HR 6.6 [95%CI, 3.7-11.5, p<0.001] for ETB vs. HR 2.6 [95%CI, 1.2-5.6, p=0.012] for overall diameter and HR 3.0 [95%CI, 1.5-6.3, p=0.003] for enhancing diameter). Concordances were found to be the highest for ETB. The difference between ETB concordances of all (0.782) and single largest lesion (0.759) was below two-times the standard error (0.038).

**CONCLUSION**

3D quantitative assessment of enhancing tumor burden as represented by the largest HCC lesion is a stronger predictor of OS as compared to diameter-based measurements. Assessing multiple lesions on baseline imaging provides no added accuracy in predicting patient OS.

**CLINICAL RELEVANCE/APPLICATION**

3D volumetric analysis of the largest lesion is a strong predictor of OS and superior to 1D diameter-based methods used in current staging systems. Hence, 3D methods should be considered for future staging systems.

**VSIO41-19 Interventional PET/CT**

**Wednesday, Dec. 2 5:30PM - 5:45PM Location: S405AB**

**Participants**

Paul B. Shyn, MD, Boston, MA, (pshyn@bwh.harvard.edu) *(Presenter)*

Nothing to Disclose

**LEARNING OBJECTIVES**

1) Compare advantages of PET/CT with other imaging modalities in guiding interventional radiology procedures. 2) Describe strategies to improve lesion targeting during PET/CT interventional procedures. 3) Apply various PET/CT imaging techniques for the intraprocedural assessment of tumor ablation margins.

**VSIO41-20 Molecular Imaging**

**Wednesday, Dec. 2 5:45PM - 6:00PM Location: S405AB**

**Participants**

Bradford J. Wood, MD, Bethesda, MD *(Presenter)*


**LEARNING OBJECTIVES**

View learning objectives under main course title.
Irreversible Electroporation in Patients with Hepatocellular Carcinoma: Immediate Versus Delayed Findings on MR Imaging

Participants
Debra A. Gervais, MD, Chestnut Hill, MA (Moderator) Nothing to Disclose
Steven S. Raman, MD, Santa Monica, CA (Moderator) Nothing to Disclose

Sub-Events

SSM08-01 Irreversible Electroporation in Patients with Hepatocellular Carcinoma: Immediate Versus Delayed Findings on MR Imaging

Participants
Guy E. Johnson, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
Matthew J. Kogut, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
James Q. Park, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
Raymond S. Yeung, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
Daniel S. Hippe, MS, Seattle, WA (Abstract Co-Author) Research Grant, Koninklijke Philips NV; Research Grant, General Electric Company
Siddharth A. Padia, MD, Seattle, WA (Presenter) Nothing to Disclose

Purpose
Irreversible electroporation (IRE) is a non-thermal technique used to ablate soft tissue tumors. Our study assessed MR imaging appearance after IRE for the treatment of hepatocellular carcinoma (HCC).

Method and Materials
In this institutional review board-approved retrospective study with waiver of informed consent, twenty patients with HCC were treated with IRE over a 2.5 year period. Median patient age was 62, and 75% of patients had Child-Pugh A cirrhosis. Median tumor diameter was 2.0 cm (range 1.0-3.3 cm). Contrast-enhanced multiphase MR was performed on post-procedure day 1, 30, and every 90 days thereafter. Ablation zone sizes and signal intensities were compared between each time point for both T1- and T2-weighted images. Trends in MR signal intensity and tumor dimensions over time were quantified using generalized linear models.

Results
MR appearance of a treated tumor includes a zone of peripheral enhancement with centripetal filling on delayed post-contrast images. Compared to post-procedure day one, there is a decrease in enhancing ablation zone size of 28.9% (mean) every 90 days. There is a trend towards decreasing signal intensity of the peripheral ablation zone over time on both T1- and T2-weighted images. Trends in MR signal intensity and tumor dimensions over time were quantified using generalized linear models.

Conclusion
IRE of HCC results in a large region of enhancement on immediate post-procedure MR, which involutes on follow-up imaging. This is associated with decreasing signal intensity of the peripheral ablation zone over time. This phenomenon may represent resolution of the reversible penumbra.

Clinical Relevance/Application
1. Understanding of the standard MR imaging appearance after IRE can help guide future therapy and assess prognosis with respect to tumor response.
2. The large area of enhancement seen after IRE may represent regions of reversible electroporation, which may be used to optimize treatment protocols or target localized drug delivery in future studies.

SSM08-02 Local Hepatic Tumor Control in Patients with HCC Undergoing Transarterial Lipiodol Embolisation Followed by Microwave Ablation

Participants
Roland M. Seidel, MD, Homburg, Germany (Presenter) Nothing to Disclose
Alexander Massmann, MD, Homburg/Saar, Germany (Abstract Co-Author) Nothing to Disclose
Peter Fries, MD, Homburg, Germany (Abstract Co-Author) Nothing to Disclose
Guenter K. Schneider, MD, PhD, Homburg, Germany (Abstract Co-Author) Research Grant, Siemens AG; Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Research Grant, Bracco Group; Amo Buecker, MD, Homburg, Germany (Abstract Co-Author) Consultant, Medtronic, Inc Speaker, Medtronic, Inc Co-founder, Aachen Resonance GmbH Research Grant, Siemens AG

Purpose
To investigate local tumor control in patients with HCC undergoing lipiodol embolization and subsequent microwave ablation.

Method and Materials
25 patients with 35 HCC (mean size 23mm, SD 9mm) underwent superselective transarterial embolization with lipiodol. Subsequently...
percutaneous CT guided microwave ablation of the tumors was performed using a 2.45 GHz generator (power output 80 to 120W) with cooled tip probes (Acculis, Angiodynamics, USA). All patients were investigated before therapy by unenhanced and dynamic contrast enhanced MR or CT; follow up was performed within 1, 3, 6 and more months after treatment. Treatment was rated as successful in case of a complete rim of necrosis surrounding the lesion and no further tumor growth. Patient data were evaluated retrospectively on a PACS workstation by two readers in consensus.

**RESULTS**

In 24 of 25 (96%) patients a complete ablation was diagnosed on the early follow up imaging. The patient rated with incomplete ablation presented tumor progression on follow up imaging. 1 patient initially rated as complete ablation presented lesion progression and underwent chemoembolization with no residual tumor up to 510 d after microwave ablation. Overall complete ablation rate per patient was 92% (23 of 25 patients) and 94% per lesion (33 of 35 lesions).

**CONCLUSION**

Microwave ablation in combination with lipiodol embolization for patients with HCC is a valuable therapeutic procedure for smaller hepatic tumors. Especially the targeting and embolizing potential of the retained lipiodol is likely to contribute to a more reliable tumor access and ablation effect.

**CLINICAL RELEVANCE/APPLICATION**

The treatment of smaller local HCC tumors becomes more and more an issue in the bridging to transplant situation and therefore minimal invasive percutaneous ablation techniques become attractive, since local tumor control is in the range of surgical treatments. This study demonstrates a reliable minimal invasive targeting and embolization technique in combination with microwave ablation for the enhancement of local tumor control.

**SSM08-03 Analysis of a Series of Microwave Ablated Native HCCs: Which Parameters do Affect Outcome after Treatment?**

*Wednesday, Dec. 2 3:20PM - 3:30PM Location: E353A*

**Participants**
Valentina Battaglia JR, MD, Pisa, Italy (Presenter) Nothing to Disclose
Salvatore Mazzeo, MD, Pisa, Italy (Abstract Co-Author) Nothing to Disclose
Carla Cappelli, MD,PhD, Pisa, Italy (Abstract Co-Author) Nothing to Disclose
Rosa Cervelli, Pisa, Italy (Abstract Co-Author) Nothing to Disclose
Piercarlo Rossi, MD, Pisa, Italy (Abstract Co-Author) Nothing to Disclose
Carlo Bartolozzi, MD, Pisa, Italy (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To investigate the efficacy at 1 month after treatment of ultrasound-guided percutaneous microwave ablation (MWA) of series of native HCCs.

**METHOD AND MATERIALS**

From January 2013 to February 2015, 221 patients with a single HCC lesion were candidate for ultrasound-guided percutaneous MWA. Of them, 113 were excluded because of patients' habitus or limited US visibility of the lesion (42 and 71 patients respectively). Finally, our study included 108 patients who were treated with MWA for a single hepatic lesion. All lesions were classified on the basis of dimensions, location and venous vessel contiguity. A cooled shaft antenna of 16 or 14 Gauge was respectively. Finally, our study included 108 patients who were treated with MWA for a single hepatic lesion. All lesions were divided into subdiaphragmatic (23: yes; 86: no) and on the basis of proximity (<5mm) to vascular structures (59: yes; 49: no). In all cases, a CT evaluation performed 1 month after procedure was done. Tumor response after treatment was evaluated by means of mRECIST. Statistical analysis was performed by means of Chi-square test and bivariate correlation.

**RESULTS**

All neoplasm were ablated in a single session and no major complication occurred. At CT evaluation, 84 lesions showed a Complete Response, 23 Partial response and 1 lesion Stable Disease. Statistical analysis showed no significant relationship between complete response and tumor size, time of ablation or power applied. At bivariate analysis, tumor location and subdiaphragmatic position did correlate (p<0.0001) with lesions' response to treatment, independently from dimensions and technical parameters of power emission.

**CONCLUSION**

In our series, tumor size did not appear to impact complete ablation rates, whereas lesion localization represents the most important factor influencing tumor response.

**CLINICAL RELEVANCE/APPLICATION**

Lesions' characteristics might lead to formulate a grading on the basis of whom to predict tumor response after treatment.

**SSM08-04 Local Treatment for Colorectal Cancer Liver Metastases, Comparison of Radiofrequency Ablation and Surgical Metastasectomy**

*Wednesday, Dec. 2 3:30PM - 3:40PM Location: E353A*

**Participants**
Naik Vietti Violi, Lausanne, Switzerland (Presenter) Nothing to Disclose
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Pierre E. Bize, MD, Lausanne, Switzerland (Abstract Co-Author) Nothing to Disclose
Rafael Duran, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Nicolas Demartines, MD, Lausanne, Switzerland (Abstract Co-Author) Nothing to Disclose
Nermin Halkic, Lausanne, Switzerland (Abstract Co-Author) Nothing to Disclose
**PURPOSE**
To compare local recurrence rate of radiofrequency ablation (RFA) and surgical metastasectomy for colorectal cancer liver metastases from a surgical and radiological database of consecutive patients and to define the best candidates for each treatment.

**METHOD AND MATERIALS**
In this retrospective study, 26 patients (17 M, 9 F, mean age 69 years) with RCC treated with percutaneous ablation were included. The patients underwent contrast enhanced nephrographic phase dual energy CT scan with a single-source dual energy CT (750HD GE Healthcare, Milwaukee WI) as part of post ablation surveillance. In this cohort, 13 patients had single energy unenhanced scans. All the patients in this cohort had renal mass protocol single energy CT (SECT) at different time-points. Post processed subtraction, material density iodine (MD-I) and virtual unenhanced images were generated. Two blinded radiologists reviewed the SECT and DECT images in two separate sessions for ablation zone margin, presence of residual/recurrent tumor, image quality, and presence of artifacts with a 5 point confidence score. The CTDI and DLP were recorded and compared between DECT series and SECT series.

**RESULTS**
A total of 28 RCC underwent percutaneous ablation. DECT with MD-I iodine images demonstrated higher specificity for detection of abnormal enhancement in the ablation zone suggesting residual tumor/recurrence compared to SECT (30% vs 91%). The image quality score for DECT (with MD-I) was higher compared to standard SECT images (5 vs 4.1 of SECT with p<0.05) with higher number of artifacts recorded in the subtraction images generated from standard non-contrast and contrast enhanced CT images (25% of cases). A single phase DECT had significant radiation dose reduction in comparison to dual phase SECT scans (736.11±231.6 mGy-cm vs 1596.5±450.2 mGy-cm; p<0.001) and the radiation dose considerations of nephrographic phase DECT and SECT were comparable (736.11±231.6 mGy-cm vs 609.5±169.1 mGy-cm; p=0.179) and SECT were comparable (736.11±231.6 mGy-cm vs 609.5±169.1 mGy-cm; p=0.179). The radiation dose comparison was done by Chi square and logistic regression in univariate and multivariate analysis.

**CONCLUSION**
Pending proper selection (small lesions visible under imaging guidance), RFA tends to have a lower recurrence rate than metastasectomy. Lesions localized in depth in the liver parenchyma, close to large veins are at risk of local recurrence after metastasectomy.

**CLINICAL RELEVANCE/APPLICATION**
Metastasectomy and radiofrequency ablation are currently used for treatment of colorectal cancer liver metastasis aiming for total tumor ablation and sparing liver parenchyma. There is no study comparing results and risk of local recurrence between metastasectomy and RFA.
scans and subtraction images which increase the cumulative radiation dose and are affected by artifacts.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator

SSM08-06 CT and MR Imaging Features to Predict Residual or Recurrent Hepatocellular Carcinoma after Transarterial or Percutaneous Treatment

Wednesday, Dec. 2 3:50PM - 4:00PM Location: E353A

Participants
Eric C. Ehman, MD, San Francisco, CA (Presenter) Nothing to Disclose
Sarah Umetsu, MD, PhD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Nicholas Fidelman, MD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Linda Ferrell, MD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Michael A. Ohliger, MD, PhD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Benjamin M. Yeh, MD, San Francisco, CA (Abstract Co-Author) Research Grant, General Electric Company; Author with royalties, Oxford University Press; Shareholder, Nextest, Inc;
Judy Yee, MD, San Francisco, CA (Abstract Co-Author) Research Grant, EchoPixel, Inc
Thomas A. Hope, MD, San Francisco, CA (Abstract Co-Author) Advisory Committee, Guerbet SA; Research Grant, General Electric Company

PURPOSE
To determine which CT and MR features are most predictive of viable hepatocellular carcinoma (HCC) following percutaneous or transarterial treatment.

METHOD AND MATERIALS
Pathology reports for liver explants from 12/2012-7/2014 with CT or MR imaging performed within 90 days of transplant (45±28 days) were reviewed. Patients with a history of hepatocellular carcinoma and preoperative treatment including transarterial chemoembolization (TACE) or percutaneous ablation (radiofrequency, microwave, cryo, ethanol) were included. Each lesion was reviewed on the most recent pre-transplant imaging study and size, location and enhancement features recorded. Pathology slides were reviewed and the size of viable tumor nodule recorded (if present).

RESULTS
91 patients with 135 treated lesions were included. 88(65%) lesions were imaged with CT and 47(35%) with MR, including 89(66%) post-TACE, 24(18%) post-ablation, and 22(16%) post both TACE and ablation. At explant, 69(51%) of lesions showed viable tumor. 11/42(26%) of viable lesions at CT and 15/27(56%) at MR demonstrated nodular arterial enhancement (p=0.02). Washout was seen in 13/42(31%) of viable HCCs at CT and in 6/27(22%) at MR (p=0.05). Capsule appearance was seen in 2/42(5%) of viable lesions at CT and in 1/27(4%) at MR (p=0.05). Using each criteria to diagnose a study positive for recurrence, sensitivity and specificity were 38% and 92% for nodular enhancement, 28% and 94% for washout and 4% and 100% for capsule. Using any of the three criteria, overall sensitivity and specificity were 45% and 91%. Detection rate for nodular recurrence was 33% for lesions <1cm, 55% for lesions 1-2cm and 71% for lesions >2cm. Lesion detection by size was similar at CT and MR.

CONCLUSION
No single imaging finding was sensitive for viable HCC following treatment. Nodular arterial enhancement was the most frequently seen, and seen significantly more at MR than at CT. Washout was less frequently seen and seen equally at MR and CT. Capsule was rarely seen but when present always predicted recurrence. There is limited detection of lesions <1cm both at MR and CT and only marginal detection between 1-2cm.

CLINICAL RELEVANCE/APPLICATION
Post-treatment imaging is difficult to interpret and imaging features predictive of recurrent or residual disease are not well understood. Accurate diagnosis of viable tumor at post-treatment imaging is important to guide future therapy such as repeat TACE or ablation.
**SSM09**

**Gastrointestinal (Esophagus Imaging)**

Wednesday, Dec. 2 3:00PM - 4:00PM Location: E353B

**Participants**

David J. Lomas, MD, Cambridge, United Kingdom (Moderator) Nothing to Disclose  
Lisa M. Ho, MD, Durham, NC (Moderator) Nothing to Disclose

**Sub-Events**

**SSM09-01 Changes in Esophageal Dimensions during Continuous Swallowing in Healthy Adults as Detected by Magnetic Resonance Imaging**

Wednesday, Dec. 2 3:00PM - 3:10PM Location: E353B

**Participants**

Sabarish Narayanasamy, MBBS, MD, Aligarh, India (Presenter) Nothing to Disclose  
Mehatab Ahmad, MBBS, Aligarh, India (Abstract Co-Author) Nothing to Disclose  
Mudit Arora, DMRD, Aligarh Ho, India (Abstract Co-Author) Nothing to Disclose  
Faisal Janal, MBBS, Aligarh, India (Abstract Co-Author) Nothing to Disclose  
Breethaa J. Selvaranani, Aligarh, India (Abstract Co-Author) Nothing to Disclose  
Anusha Sundararajan, Loma Linda, CA (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

This study was designed to quantify the degree of fluctuation in esophageal dimensions during continuous swallowing on Magnetic Resonance (MR) Imaging.

**METHOD AND MATERIALS**

30 healthy volunteers (25 males and 5 females, age range: 15-45 years) were chosen for the study. MR examination was done using a 1.5 tesla magnet. Initially, the esophagus was imaged in the resting state (Resting MR). Then, the volunteer was asked to drink water continuously and another set of MR images were obtained (Swallowing MR). The thoracic esophagus was divided into three segments (upper, middle and lower) based on anatomical landmarks. Diameter and the wall thickness of the esophagus were measured in each segment and the cross sectional area (CSA) was calculated.

**RESULTS**

The esophageal CSA increased by twofold on swallowing MR scans as compared to the resting scans [Median (interquartile range) increase in CSA in upper segment - 117.3% (61-162.2), in middle segment - 87.7% (54.3-162.9) and in the lower segment - 122.1% (78.9 - 188.1)]. The anteroposterior and transverse diameters of the thoracic esophagus increased by about 60% as compared to the resting MR scans. The mean wall thickness of the thoracic esophagus was reduced by about 25% on swallowing MR as compared to resting scan.

**CONCLUSION**

Our study helps to define normal changes in esophageal dimensions during continuous swallowing. The lower third of the thoracic esophagus appears to be the most distensible segment.

**CLINICAL RELEVANCE/APPLICATION**

Swallowing MRI has been proposed as an experimental investigative modality for motility disorders of the esophagus and knowledge of the fluctuation in esophageal dimensions during swallowing might be of clinical utility.

**SSM09-02 Differentiate Esophageal Cancer Stages with Spectral CT Imaging**

Wednesday, Dec. 2 3:10PM - 3:20PM Location: E353B

**Participants**

Yang Chuango, MMed, Xianyang City, China (Presenter) Nothing to Disclose  
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Xirong Zhang, Xianyang, China (Abstract Co-Author) Nothing to Disclose  
Chenglong Ren, Shanxi, China (Abstract Co-Author) Nothing to Disclose  
Haifeng Duan, Xianyang City, China (Abstract Co-Author) Nothing to Disclose  
Taiping He, Xianyang, China (Abstract Co-Author) Nothing to Disclose  
Xiaoxia Chen, MMed, Xianyang City, China (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To explore the value of spectral CT imaging to differentiate esophageal cancer stages.

**METHOD AND MATERIALS**

67 patients with esophageal cancer diagnosed by esophagoscopy underwent plain and double-phase enhanced CT scan with spectral CT mode. Patients were divided into well-to-moderately differentiated and poorly differentiated squamous carcinoma groups. The iodine-based material decomposition (MD) images were generated and analyzed with GSI Viewer software to measure the iodine concentration (IC) in tumors. Normalized iodine concentration (NIC) was obtained by dividing tumor IC to that of aorta. Data from the two cancer groups were analyzed statistically by independent-samples t test and were correlated with pathological
RESULTS
There were 32 well-to-moderately differentiated (Picture 1) and 35 poorly differentiated (Picture 2) squamous carcinoma verified by pathology. IC values of the well-to-moderately differentiated squamous carcinoma in both the arterial phase (AP) (2.66±1.07mg/ml) and venous phase (VP) (2.12±0.94mg/ml) were lower than that of the poorly differentiated squamous carcinoma (2.85±1.25mg/ml and 2.57±1.06mg/ml, respectively). The NIC value of the well-to-moderately differentiated squamous carcinoma was also lower than that of the poorly differentiated squamous carcinoma: 0.12±0.05 vs. 0.13±0.06 in AP and 0.42±0.13 vs. 0.61±0.18 in VP, respectively. Statistical differences of IC and NIC were found between the two groups in VP (both p<0.05) but not in AP (p>0.05).

CONCLUSION
There are correlation between the iodine concentration and normalized iodine concentration of esophageal cancers and their histological differentiation stages. IC and NIC parameters obtained in spectral CT for the esophageal cancer in the venous phase can be used as new indexes to differentiate esophageal cancer stages.

CLINICAL RELEVANCE/APPLICATION
Parameters such as normalized iodine concentration in esophageal cancer determined in spectral CT may be used to differentiate esophageal cancer stages.

PURPOSE
This pilot study was intended to prospectively compare the diagnostic performance of Diffusion-Weighted Magnetic Resonance Imaging (DW-MRI), Multidetector Computed Tomography (MDCT) and Endoscopic Ultrasonography (EUS) in the preoperative loco-regional staging of esophageal cancer.

METHOD AND MATERIALS
This study was institutional review board-approved. Eighteen patients with biopsy proved esophageal or gastro-esophageal (Siewert I) tumor (9 directly treated with surgery and 9 addressed to chemo/radiotherapy before) underwent 1.5 T DW-MRI, 64-channels MDCT and EUS before and after neoadjuvant treatment. All images were analyzed and staged blindly by dedicated operators according to the 7th TNM edition and two radiologists calculated independently the Apparent Diffusion Coefficient (ADC) from the initial scan. The results were then compared with histopathological findings. Statistical analysis included Spearman and intraclass correlation coefficients, Mann-Whitney U test and receiver operator characteristic curve analysis. After the population had been divided according to local invasion (T1-2 vs T3-4) and nodal involvement (N0 vs N+), sensitivity, specificity, accuracy, positive and negative predictive value were calculated and compared for each technique. Quantitative measurements from DWI were also analyzed.

RESULTS
For T staging, EUS showed the best sensitivity (100%) while MR showed the highest specificity (92%) and accuracy (83%). For N staging, MR and EUS showed the highest sensitivity (100%) but none of the three techniques showed adequate results for specificity. Overall, MR showed the highest accuracy (66%) for N stage. Mean pathological ADC was different between surgery-only and chemo/radiotherapy groups (1.90 vs 1.30 x 10-3 mm²/s, respectively; p= 0.005), with an optimal cut off for local invasion of 1.33 x 10-3 mm²/s (p=0.05).

CONCLUSION
DW-MRI could improve the current preoperative staging workup for esophageal cancer, showing characteristic advantages for both staging and initial treatment decision-making.

CLINICAL RELEVANCE/APPLICATION
DW-MRI can be useful in the preoperative workup for esophageal cancer and could help to select appropriate treatments after initial staging.

PURPOSE
To evaluate diagnostic feasibility of MP-MRI for the preoperative staging of EC and to assess its efficacy in discrimination between
responder and non-responders in those who underwent neoadjuvant treatment (NT).

**METHOD AND MATERIALS**

Between 2011 and January 2015, 36 patients with biopsy-proven EC underwent 3T MRI with the same approach: T2 weighted images, DWI and DCE sequences, with cardiac and respiratory gating. According to local invasion (T1-2 vs T3-4) and nodal involvement (N- vs N+), we identified 11 patients with organ confined lesion who underwent surgery: MR staging results were compared with histopathological findings directly. 25 patients were addressed to NT and restaging MRI after treatment was compared with histological findings after surgery. Sensitivity (SE), specificity (SP), positive (PPV) and negative (NPV) predictive value and accuracy were calculated for the both groups. For NT group, changes in ACD and changes in DCE time intensity curve at MRI before and after treatment were calculated. 2 readers independently determined: pre-NT and post-NT ADC, percentage changes in ADC (ΔADC), DCE time intensity curves and interobserver variability.

**RESULTS**

Surgery group: for T staging, SE was 98 %, SP 78 %, accuracy 90%; for N staging SE was 67 %, SP 60 %, accuracy 64%. NT group after NT: for T staging SE was 80 %, SP 85 %, PPV 67%, NPV 92%, accuracy 89% and 76%, 78%, 50%, 91% and 91% respectively for N staging. Responders showed lower pre-NT ADC (1.30 vs 1.80Å~10-3mm2/s; P=0.002) and higher post-NT ADC (2.50 vs 1.64Å~10-3mm2/s; P=0.001) than non-responders and ADC increased in responders (ΔADC, 90.28 versus 11 %, respectively). A slight difference was observed in DCE curves but without a significant difference (p>0.05). Interobserver reproducibility was good both for surgery (k 0.68) and post-NT (k 0.86).

**CONCLUSION**

MR can correctly stage organ-confined lesions according to the high specificity (for the T stage) and to rightly assess pathological nodal involvement (for the N stage) thanks to the good SE. The ADC can be used to assess esophageal tumour response to NT treatment as a reliable expression of tumour regression.

**CLINICAL RELEVANCE/APPLICATION**

Preoperative staging in esophageal cancer is critical in order to prompt a surgical (T1-T2 stages without nodal involvement) or neoadjuvant therapy (T3-T4 stages with nodal involvement).

**SSM09-05 Textural Analysis of Baseline 18F-FDG PET for Predicting Treatment Response and Prognosis in Patients with Locally Advanced Esophageal Cancer**

Wednesday, Dec. 2 3:40PM - 3:50PM Location: E353B

**Participants**

Xiaorong Sun, Jinan, China (Presenter) Nothing to Disclose

Lu Sun, Jinan, China (Abstract Co-Author) Nothing to Disclose

Ligang Xing, Jinan, China (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

Textural features on baseline 18F-FDG PET have shown the potential role in predicting treatment response in mixed stage esophageal cancer. This study is aim to investigate the value of this new technique for locally advanced esophageal squamous cell cancer (ESCC) receiving chemoradiotherapy.

**METHOD AND MATERIALS**

Under a waiver from IRB, 48 patients with newly diagnosed locally advanced ESCC who treated with concurrent chemoradiotherapy were retrospectively reviewed. Thirty-nine patients with early stage ESCC were included as control. All patients underwent pretreatment whole-body 18F-FDG PET/CT. Fifty-four texture indices describing global, local, and regional features were measured in addition to 5 conventional indices as standardized uptake values (SUVs, including maximum, peak, and mean SUV), metabolic volume (MV), and total lesion glycolysis (TLG). Patients were classified as responders (R, complete or partial response) and non-responders (NR, stable or progressive disease) according to RECIST1.1. Progression-free survival (PFS) and overall survival (OS) were recorded. The prognostic significance of parameters was examined using receiver-operating-characteristic curves, Kaplan-Meier analysis, and Cox regression analysis.

**RESULTS**

Both intratumor heterogeneity and mean/peak intensity of FDG uptake were significantly higher in locally advanced ESCC than those in early stage. Thirty-four texture indices, MV, and TLG showed the ability to differentiate R from NR. Nine texture indices showed higher sensitivity (76.7%~86.7%) and specificity (77.8%~94.4%) than MV (76.7% and 83.3%) and TLG (73.3% and 83.3%). Ten texture indices and MV were hazard factors of PFS and OS. Large-zone emphasis, one of the regional texture indices, was the only independent predictor of survival, with hazard ratio of 4.22 (95%CI:1.83~9.72) for PFS and 3.90 (1.74~8.79) for OS. None of the SUVs could predict treatment response and survival.

**CONCLUSION**

FDG PET textural indices provide better predictive information than conventional parameters for locally advanced ESCC.

**SSM09-06 CT Signs Can Predict Treatment Response and Long-Term Survival: A Study in Locally Advanced Esophageal Cancer with Preoperative Chemotherapy**

Wednesday, Dec. 2 3:50PM - 4:00PM Location: E353B

**Participants**

Xiao-Yan Zhang, Beijing, China (Presenter) Nothing to Disclose

Xiaoting Li, Beijing, China (Abstract Co-Author) Nothing to Disclose

Zhilong Wang, MD, Beijing, China (Abstract Co-Author) Nothing to Disclose
Ying-Shi Sun, MD, PhD, Beijing, China (Abstract Co-Author) Nothing to Disclose

PURPOSE

Accurate prediction of treatment response and prognosis before surgery will allow prompt therapy adjustment. This study proposed to evaluate the efficacy of CT signs on treatment response and survival for advanced esophageal squamous cell carcinoma patients with preoperative chemotherapy.

METHOD AND MATERIALS

This study retrospectively enrolled 135 consecutive patients with preoperative chemotherapy from September 2005 to December 2011. Logistic regression model was conducted to evaluate the association between pathological response and CT signs. Overall survival (OS) and disease-free survival (DFS) were estimated using Kaplan-Meier method and Cox proportional hazards model was constructed to determine associations between CT signs after neoadjuvant chemotherapy and survival outcomes.

RESULTS

The logistic regression showed the total LN number (> 6) at baseline and the CT value change rate (≤ 17%) were significant for poor response; OR were 5.07 (95% CI, 1.86 to 13.81, P = 0.002) and 2.35 (95% CI, 1.05 to 5.23, P = 0.037), respectively. In Cox analyses, preoperative tumor thickness (> 10 mm), total LN number (>6), and short diameter of the largest LN (> 10 mm) were significant for OS, HR were 2.33(95% CI, 1.36 to 4, P = 0.002), 1.88(95% CI, 1.12 to 3.17, P = 0.017) and 1.87(95% CI, 1.07 to 3.28, P = 0.028), respectively; whereas only the short diameter of the largest LN was significant for DFS, HR was 2.36(95% CI, 1.23 to 4.54, P = 0.01).

CONCLUSION

CT signs can predict therapeutic efficacy and survival outcomes and provide an opportunity to offer additional treatment options before surgery.

CLINICAL RELEVANCE/APPLICATION

This study provided the first evidence that CT signs can predict survival outcomes and therapeutic efficacy of patients with esophageal cancer who received preoperative chemotherapy. Therefore, it is of great clinical significance to perform CT examinations before and after neo-adjuvant therapies in esophageal cancer patients. The CT images interpreted before surgery could provide important information about survival and response, which would improve individualized treatment programs.
PURPOSE
Pancreatic cysts detection has increased due to the widespread use of advanced cross-sectional imaging. Pancreatic cysts represent a wide spectrum of lesions varying from those with extremely low malignant potential, to those associated with cancer. Mucin-producing cysts have a malignant potential, whereas serous cysts are generally benign. An overlap between imaging features can be misleading, and in the indeterminate cases additional evaluations such as follow up, FNA and/or surgery are required. The aim of this study was to evaluate the feasibility and the reproducibility of diffusion-weighted imaging (DWI) in characterizing pancreatic cysts when standard imaging is not diagnostic.

METHOD AND MATERIALS
Forty-four pancreatic cysts (43 patients; 27 females; 16 males; mean age 47 years) underwent histological or cyst fluid analysis after MRI including DWI were retrospectively analyzed. Three blinded readers independently evaluated signal intensity (SI) and ADC. Intra-observer and inter-observer agreement were calculated. Fisher’s exact test and Welch’s t test were used to compare SI and ADC values respectively, to pathological results. Diagnostic accuracy of thresholds ADC was assessed by ROC analysis. A p value of less than 0.05 was considered statistically significant.

RESULTS
The mean ADC value of the mucin-producing cysts was 3.26 x10-3 mm²/sec, 3.27 x10-3 mm²/sec and 3.35 x10-3 mm²/sec for the three readers, respectively. The mean ADC value of the serous cysts was 2.86 x10-3 mm²/sec, 2.85 x10-3 mm²/sec and 2.85 x10-3 mm²/sec for the three readers, respectively. Difference in ADC values between the two cyst groups was 12.4%, 12.9% and 14.8% for the three readers, respectively (p<0.001). Intra-observer and inter-observer agreement were excellent. ROC analysis showed an area under the curve of 0.82 (CI, 0.69-0.94), 0.81 (CI, 0.67-0.94) and 0.85 (CI, 0.69-0.95) for the three readers, respectively. A threshold ADC of 3x10-3 mm²/sec resulted in correct identification of cysts in 77-81% of cases, with sensitivity and specificity ranging between 84-88% and 66-72%, respectively.

CONCLUSION
DWI may be a helpful tool in distinguishing between mucin-producing and serous pancreatic cysts.

CLINICAL RELEVANCE/APPLICATION
ADC values may be used to differentiate between mucin-producing and serous cysts of the pancreas and could potentially reduce unnecessary invasive approaches to diagnosis or the need for follow up studies.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying activities.
Among 95 patients with 150 cysts, 12 patients with 16 cysts underwent operations. Out of 134 cysts in 83 non-surgical patients, preliminary radiologic diagnosis with the pathologic results.

RESULTS

To describe the natural history of small, incidental pancreatic cysts after long-term follow-up, with an emphasis on identifying indicators of indolent lesions.

METHOD AND MATERIALS

In an IRB-approved, HIPAA-compliant study, patients with known PCL scheduled for MRI follow up underwent prospective transabdominal ultrasound of the pancreas on the same date as the MRI examination. PCL were measured in transverse (TR), anteroposterior (AP), and craniocaudad (CC) dimensions and the longest dimension obtainable in any plane. US was performed in blinded fashion to same date MR results. Detection rate of US was correlated with patient factors including weight, AP abdominal diameter, thickness of subcutaneous abdominal fat, location of cyst within pancreas, and size of cyst, using chi-squared and Wilcoxon rank sum tests. Size measurements of pancreatic cysts at US were compared with MR measurements. MR measurements were taken as gold standard for cyst size.

RESULTS

252 PCL were evaluated in 57 patients (39 females, 18 males, mean age 67 yrs (range, 39-86 yrs)). Mean maximum cyst diameter was 8.5 mm (range, 2-92 mm). PCL were identified at ultrasound in 100% (5/5) of cysts ≥3 cm; 92% (12/13) of cysts ≥2 and <3 cm; 78% (43/55) of cysts ≥1 and <2 cm; 35% (27/78) of cysts ≥5mm and <1 cm; and 16% (16/101) of cysts <5 mm. Measured max diameter at US differed from max diameter at MRI by a mean 0.7 mm (range, -6 to +16 mm); cysts were under measured by US in 46% and over measured in 31% of maximum diameter measurements, respectively. US identified 47% (14/30) of cysts located in uncinate process, 53% (27/51) in head; 83% (10/12) in neck, 52% (35/67) in body, and 18% (17/93) in tail. There were statistically significant correlations between PCL visualization at US and maximum cyst size (p<0.001), patient weight (p=0.012), and AP abdominal diameter (p=0.0059); no significant correlation (p=0.43) between thickness of subcutaneous abdominal fat and cyst visualization at ultrasound was identified.

CONCLUSION

The vast majority of PCL can be visualized at follow up with transabdominal ultrasound. Frequency of detection varies strongly with lesion size, location, patient weight and abdominal diameter.

CLINICAL RELEVANCE/APPLICATION

Many pancreatic cystic lesions known to exist from prior imaging can be visualized and accurately measured at follow up with transabdominal ultrasound. Body habitus and cyst size and location correlate with success of ultrasound.

SSM10-05 Fate of Small Pancreatic Cysts (<3cm) after Long-term Follow-up: Analysis of Significant Radiologic Characteristics and Proposal of Follow-up Strategy

Wednesday, Dec. 2 3:40PM - 3:50PM Location: E353C

To describe the natural history of small, incidental pancreatic cysts after long-term follow-up, with an emphasis on identifying indicators of indolent lesions.

METHOD AND MATERIALS

We retrospectively selected 95 patients with 150 cysts from our hospital database. Selection criteria included patients with pancreatic cysts <3cm in CT from 2003-2004, followed with CT or MR for greater than 5 years (mean 117.1±19.6 months), or received pancreatic surgery during the follow-up period. Two radiologists reviewed the initial CT and recorded size, location, shape, ductal communication, p-duct dilatation, calcification and presumptive radiologic diagnosis of each cyst. We then recorded the size change after the conclusion of follow-up period. For patients who underwent an operation, we compared the cysts' radiologic features with those of the patients who did not undergo an operation. Furthermore, for surgical patients, we compared the preliminary radiologic diagnosis with the pathologic results.

RESULTS

Among 95 patients with 150 cysts, 17 patients with 16 cysts underwent operations. Out of 134 cysts in 83 non-surgical patients, indicators of indolent lesions.
Among 95 patients with 150 cysts, 14 patients with 16 cysts underwent operations. Out of 154 cysts in 85 non-surgical patients, 49(36.6%) cysts didn't change in size, while 57(42.5%) increased, and 27(20.9%) decreased or vanished. Among increased 57 cysts, only 5 were larger than 3cm at the end of the follow-up period. The initial size of the cyst was significantly larger in the surgical group compared to the nonsurgical group(17.2±7.3mm vs 11.3±5.5 mm, p<0.000). Reasons for surgery included malignancy(4/95, 4.21%), borderline IPMN(6/95, 6.31%) with 5 moderate and 1 low grade, and SCN with increasing size(2/95, 2.11%). Pleomorphic and clubbed shape were significant features for borderline and malignant cysts. No cysts<15 mm and without p-duct change showed a significant change in size in 3 years.

CONCLUSION

The incidence of malignancy was 4.21% in our group. However, the majority of small cysts remained less than 3cm after long-term follow-up. The initial size of cysts as well as the shape are important features for predicting the progress and potential for malignant transformation. Patients with initial cysts<15mm, without P-duct change, and non-pleomorphic or clubbed shape may be assessed at long term intervals without significant risk of malignancy.

CLINICAL RELEVANCE/APPLICATION

It is a feasible strategy to extend follow-up interval for cysts<15mm, without P-duct change, non-pleomorphic or clubbed shape, which could lead to reduce medical expenditure.

PURPOSE

To assess diagnostic performance of transabdominal ultrasonography (TAUS) for incidental pancreatic cysts with a focus on the effect of prior images, size, and location.

METHOD AND MATERIALS

1064 pancreatic cysts which were radiologically confirmed by contrast enhanced CT (n=795), MRI (n=21), CT and MRI (n=202), or endoscopic ultrasonography (EUS, n=46), were included in 938 patients who underwent TAUS. TAUS finding was analyzed based on the formal reports. One radiologist also retrospectively reviewed TAUS, CT, MR, and EUS images to determine the size, location, and detection rate of the pancreatic cyst before and after CT, MRI, or EUS. For statistical analysis, independent samples T-test and Chi-square test were applied.

RESULTS

Among 1064 pancreatic cysts, 107 cysts underwent TAUS before CT, MR, or EUS and 477 cysts underwent TAUS after prior study. 480 cysts underwent TAUS both before and after CT, MRI, or EUS. Overall 940 pancreatic cysts (88.3%) were delineated on TAUS. The detection rate of pancreatic cyst on TAUS before CT, MRI, or EUS was 49.2% (289/587), and the detection rate of pancreatic cyst on TAUS after CT, MRI, or EUS was 86.7% (830/957). In a group of patients who underwent TAUS both before and after CT, MRI, or EUS, the detection rate of pancreatic cyst on TAUS was increased after CT, MRI, or EUS (before; 40.0%, after; 85.2%, p=0.0001). The size of detected cysts (mean±SD, 15.5±9.2 mm) was larger than undetected cysts (mean±SD, 11.8±7.5 mm, p<0.0001) with significant difference. Undetected cysts on US were almost smaller than 2cm. The detection rate of TAUS before CT, MRI, and EUS in neck, body, head, tail, and uncinated process was 60.7%, 55.7%, 54.6%, 37.9%, and 27.5%. The detection rate of TAUS after CT, MRI, and EUS in neck, head, body, uncinated process, and tail was 95.6%, 91.4%, 91%, 87.6%, and 67.8%.

CONCLUSION

Transabdominal US is useful for detection of pancreatic cyst. The detection rate of TAUS was improved after CT, MRI, and EUS regardless the location.

CLINICAL RELEVANCE/APPLICATION

Transabdominal US is useful image modality for incidental pancreatic cysts; especially follow up after CT, MRI, and EUS.
**SSM23**

**Vascular/Interventional (Advances in Transarterial Chemoembolization)**

Wednesday, Dec. 2 3:00PM - 4:00PM Location: E351

*GI CT IR*

AMA PRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: 1.00

**Participants**

Sarah B. White, MD, MS, Milwaukee, WI (Moderator) Nothing to Disclose
Hyun S. Kim, MD, Atlanta, GA (Moderator) Nothing to Disclose

**Sub-Events**

**SSM23-01** **Transpulmonary Chemoembolization (TPCE) in Pulmonary Malignant Tumors: Evaluation of Treatment Response Using Parenchymal Blood Volume (PBV)**

Wednesday, Dec. 2 3:00PM - 3:10PM Location: E351

Participants

Thomas J. Vogl, MD, PhD, Frankfurt, Germany (Presenter) Nothing to Disclose
Thomas Lehnert, MD, Frankfurt Am Main, Germany (Abstract Co-Author) Nothing to Disclose
Hanns Ackermann, Frankfurt On Main, Germany (Abstract Co-Author) Nothing to Disclose
Marcus Hezel, BS, Frankfurt, Germany (Abstract Co-Author) Nothing to Disclose
Nagy N. Naguib, MD, MSc, Frankfurt Am Main, Germany (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To evaluate initial experiences with the assessment of parenchymal blood volume (PBV) of pulmonary malignant tumors by using C-arm CT for detecting early response to transpulmonary chemoembolization (TPCE) and clinical practicability.

**METHOD AND MATERIALS**

The study was approved by the institutional ethics committee. 21 patients (females: 15, males: 6; range: 41-77 years; mean: 56.77 years) were palliatively treated with TPCE. PBV and tumor diameter were analyzed and PBV maps were calculated from 3D-CTA data sets. Imaging was performed on a flat detector C-arm CT. Response groups were classified according to the RECIST criteria. Statistically significant differences were determined and PBV and diameter were correlated as parameters of response to treatment using the Pearson's regression analysis.

**RESULTS**

In a mean of 4.91 sessions the median diameter increased by 18.18% (p>0.05) and PBV was reduced by 39.62% (p>0.05). Functional and anatomical response per tumor was statistically significant (p≤0.05). Correlation coefficient was r=0.058. 2/41 tumors showed partial response, 31/41 tumors stable disease and 8/41 tumors progressive disease. Highest pre-treatment PBV values were measured in decreasing tumors (206.93 mL/L), lowest values in increasing tumors (60.17 mL/L; p>0.05). Lowest values also were measured in lung cancer (53.02 mL/L) vs. uterine leiomyosarcoma (103.31 mL/L) and renal cell cancer (113.14 mL/L; p≤0.05).

**CONCLUSION**

The assessment of PBV maps by using 3D-CTA image data should be easy to integrate into the clinical routine. PBV shows a stronger response to TPCE treatment than the measurement in diameter and should be considered as a response parameter for early detection.

**CLINICAL RELEVANCE/APPLICATION**

Parenchymal blood measurements allow optimization of TPCE treatment in pulmonary malignant tumors

**SSM23-02** **Chemosaturation with Percutaneous Hepatic Perfusion of Melphalan for Hepatic Metastases from Uveal Melanoma: Multiinstitutional Evaluation**

Wednesday, Dec. 2 3:10PM - 3:20PM Location: E351

Participants

Thomas J. Vogl, MD, PhD, Frankfurt, Germany (Presenter) Nothing to Disclose
Silvia Koch, Frankfurt, Germany (Abstract Co-Author) Nothing to Disclose
Bernhard Gebauer, MD, Berlin, Germany (Abstract Co-Author) Research Consultant, C. R. Bard, Inc; Research Consultant, Sirtex Medical Ltd; Research Grant, C. R. Bard, Inc; Research Consultant, PAREXEL International Corporation;
Winfried A. Willinek, MD, Bonn, Germany (Abstract Co-Author) Speakers Bureau, Bayer AG Speakers Bureau, Bracco Group Speakers Bureau, General Electric Company Speakers Bureau, Koninklijke Philips NV Speakers Bureau, Lantheus Medical Imaging, Inc Advisory Board, General Electric Company Advisory Board, Lantheus Medical Imaging, Inc Advisory Board, Bayer AG Roland D. Bruening, MD, Hamburg, Germany (Abstract Co-Author) Speakers Bureau, Bracco Group; Speakers Bureau, General Electric Company; Speakers Bureau, Koninklijke Philips NV; Speakers Bureau, Delcath Systems, Inc; Shareholder Delcath Systems, Inc;
Alexander Enk, Heidelberg, Germany (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

This multiinstitutional evaluation intends to retrospectively evaluate the results of the treatment of non-resectable hepatic metastases of uveal melanoma using percutaneous hepatic perfusion (PHP; Hepatic CHEMOSAT® Delivery System; Delcath Systems Inc., USA).

**METHOD AND MATERIALS**

This multiinstitutional evaluation intends to retrospectively evaluate the results of the treatment of non-resectable hepatic metastases of uveal melanoma using percutaneous hepatic perfusion (PHP; Hepatic CHEMOSAT® Delivery System; Delcath Systems Inc., USA).
Between 2012 and 2014 fourteen patients with hepatic metastases of uveal melanoma received one to three sessions of Chemosaturation-PHP. Eleven patients were evaluated by means of RECIST criteria. Survival time analysis was performed. Adverse events and complications were registered.

RESULTS
Chemosaturation is well tolerated by the majority of all fourteen patients. After therapy seven patients developed leukopenia, six patients had thrombopenia and two patients showed neutropenia, infection and fever each. Out of the eleven patients evaluated by means of RECIST criteria, four patients (36%) showed PR, SD was observed in five patients (46%) and two patients (18%) had PD. Two patients underwent two further sessions. After the first session tumour response of one patient turned from SD to PR and returned to SD. The other patient’s treatment response showed PR in all three sessions. Survival time of all patients ranged from 1.5 to 23 months (median OS 6.5 months) following first Chemosaturation. Time to progression of the two patients with PD was 6.2 months in one patient. The other patient died 1.6 months after evaluation.

CONCLUSION
Chemosaturation-PHP has been manifested as a potential treatment for patients with non-resectable hepatic metastases of uveal melanoma.

CLINICAL RELEVANCE/APPLICATION
Chemosaturation-PHP provides a good treatment option in patients with unresectable liver metastases from uveal melanoma.

SSM23-03 Quantitative Real-time Fluoroscopy Analysis on Measurement of the Hepatic Arterial Flow During Transcatheter Arterial Chemoembolization of Hepatocellular Carcinoma: Comparison with Quantitative Digital Subtraction Angiography Analysis

Wednesday, Dec. 2 3:20PM - 3:30PM Location: E351

Participants
Yi-Yang Lin, MD, Taipei City, Taiwan (Presenter) Research grant, Taipei Veterans General Hospital and Siemens, Grant No. T1100200.
Rheun-Chuan Lee, MD, Taipei, Taiwan (Abstract Co-Author) Nothing to Disclose
Wan-Yuo Guo, MD, PhD, Taipei, Taiwan (Abstract Co-Author) Nothing to Disclose
Cheng-Yen Chang, MD, Taipei, Taiwan (Abstract Co-Author) Nothing to Disclose

PURPOSE
To quantitatively measure the hemodynamic change of hepatic artery during transcatheter arterial chemoembolization (TACE) of hepatocellular carcinoma (HCC) by subtracted fluoroscopy quantitative color-coding analysis (f-QCA) and digital subtraction angiography quantitative color-coding analysis (d-QCA).

METHOD AND MATERIALS
This is a prospective study performed in a single medical institution from February 2014 to March 2015. Seventeen consecutive patients (mean 70.5 years old; male 12, female 5) underwent TACE with doxorubicin and Lipiodol emulsion or with microspheres for HCC. Patients were enrolled if superselective segmental TACE was technically feasible. The endpoint of TACE was sluggish antegrade arterial flow. Real-time subtracted fluoroscopic image and digital subtraction angiography image with a bolus injection were quantitatively analyzed. The f-QCA and d-QCA (syngo iFlow; Siemens) were used to determine the maximal density time (Tmax) of selected vessels. Relative Tmax (rTmax) was defined as the Tmax at the selected vessel minus the time of contrast medium spurting from the catheter tip. Imaging acquisition and injection protocols remained the same before and after TACE.

RESULTS
The pre- and post-TACE rTmax of the embolized segmental artery in f-QCA and d-QCA were 1.39 ± .52s, 2.28 ± 1.09s, p < .001 and 1.60 ± .87, 3.14 ± 1.89s, p < .001, respectively. The Pearson correlation of pre- and post-TACE rTmax of the embolized segmental artery between f-QCA and d-QCA were .65, p < .01 and .73, p < .001. The rTmax of the proximal lobar hepatic arteries and proper hepatic artery had no significant change before and after TACE in f-QCA and d-QCA.

CONCLUSION
The f-QCA is a fast and convenient method with lower radiation dose to quantify arterial flow change of embolized segmental artery during TACE. Flow quantification of embolized segmental artery by f-QCA has high correlation with that by d-QCA.

CLINICAL RELEVANCE/APPLICATION
The f-QCA is a fast and convenient method to evaluate arterial flow change during TACE. The f-QCA can potentially replace the d-QCA with lower radiation dose.

SSM23-04 Transarterial Chemoembolization for the Treatment of Advanced Hepatocellular Carcinoma: A Retrospective Cohort Study with 508 Patients

Wednesday, Dec. 2 3:30PM - 3:40PM Location: E351

Participants
Yan Zhao, MS, Baltimore, MD (Presenter) Nothing to Disclose
Jae Ho Sohn, MD,MS, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Florian N. Fleckenstein, MS, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Sonia P. Sahu, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Rafael Duran, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Ruediger E. Schernthaner, MD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Howard Lee, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Li Zhao, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Susanne Smolka, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Ming De Lin, PhD, Cambridge, MA (Abstract Co-Author) Employee, Koninklijke Philips NV
The efficacy and safety of transarterial chemoembolization (TACE) for Barcelona Clinic Liver Cancer (BCLC) class C remains controversial. We conducted a large retrospective study to summarize our available data about the treatment of TACE in advanced HCC patients over the last 15 years.

**METHOD AND MATERIALS**
Between November 1998 and December 2013, all advanced stage (BCLC C) HCC patients with Child-Pugh (A/B) and Eastern Cooperative Oncology Group score of 0-2 were consecutively enrolled. Cox proportional hazards model was used to examine risk factor association with survival. Risk scores for individual patients were calculated by combing the prognostic values with the corresponding regression coefficients. The concordance (c)-statistic (equivalent to the receiver operating characteristic (ROC) curve) was used to assess the validity of categorizing patients treated with TACE into two subgroups. Cut-off values were determined according to ROC curves.

**RESULTS**
Of the 508 patients, 79.3% were male and median patient age was 63 (range, 19-90). By multivariate analysis, extrahepatic metastasis (HR=2.19, 95%CI 1.44-2.46), AFP>400ng/ml (HR=1.73, 95%CI 1.38-2.17), portal vein invasion (HR=1.62, 95%CI 1.33-2.02), Child-Pugh class B (HR=1.37, 95%CI 1.09-1.73) and number of tumor nodules >2 (HR=1.39, 95%CI 1.11-1.74) were significantly associated with survival. Risk scores (R) for individual patients were calculated by combining these five prognostic values with the corresponding regression coefficients. The c-statistic associate with the model in the prediction of 1 year, 2 year and 3 year survival was 0.74 (95%CI 0.69-0.78), 0.73 (95%CI 0.68-0.78) and 0.72 (95%CI 0.66-0.79), respectively. To achieve both the best sensitivity and specificity, we selected 5.5 as the cut-off value for R score. The Kaplan-Meier analysis showed that the median survival in the patients <5.5 was significantly longer than those >5.5 (21.6 vs. 6.9 months, P<0.001).

**CONCLUSION**
TACE should be considered an effective therapy for select advanced HCC patients. We suggest modification of the BCLC stage C classification to improve staging of these patients.

**CLINICAL RELEVANCE/APPLICATION**
Select advanced stage (BCLC stage C) HCC patients with well-preserved liver function could benefit from TACE treatment.

**SSM23-05 Feasibility of Flat-detector CT Perfusion Imaging in TACE for HCC: Implications for Treatment Planning and Response**

Participants
- Rory O'Donohoe, MBChB, Dublin, Ireland (Presenter) Nothing to Disclose
- Alexis M. Cahalane, MBChB, Dublin 4, Ireland (Abstract Co-Author) Nothing to Disclose
- Aoife Hayes, Dublin, Ireland (Abstract Co-Author) Nothing to Disclose
- Olivia Connolly, Dublin, Ireland (Abstract Co-Author) Nothing to Disclose
- Jeffrey W. McCann, MBChB, Dublin, Ireland (Abstract Co-Author) Nothing to Disclose
- Edmund Ronan Ryan, MBChB, Dublin, Ireland (Abstract Co-Author) Nothing to Disclose

**METHOD AND MATERIALS**
Intra-procedural flat-detector CT perfusion imaging performed in the angiography suite at the time of TACE now allows assessment of tumor perfusion immediately before and after chemoembolization. This study examines the significance of areas of residual increased blood volume (indicating persistent tumor perfusion) immediately following TACE through comparison with the follow-up CT or MRI.

**RESULTS**
In five treatments, residual abnormally increased perfusion was visible on the post treatment DynaPBV images and in all cases this correlated well with residual tumor on the follow-up CT or MRI. In two treatments, there was no residual abnormally increased perfusion which was confirmed as a complete treatment response on follow-up imaging studies. In two patients, both with lesions adjacent to the liver capsule, no abnormally increased perfusion was visible on DynaPBV, but hyperenhancing tumor was visible on follow-up imaging likely due to extra-hepatic supply via the inferior phrenic artery.

**CONCLUSION**
Our results show flat-detector CT perfusion imaging to be accurate in detecting residual disease at the end of the TACE procedure. Challenges exist with anomalous anatomy and lesions with extra-hepatic supply.

**CLINICAL RELEVANCE/APPLICATION**
Flat-detector CT perfusion imaging is accurate for detecting residual viable tumor at the end of the TACE procedure and may be useful in planning further treatments without the need for intervening imaging.
Four-dimensional CT Navigation for Precise Chemoembolization of Hepatocellular Carcinoma

Wednesday, Dec. 2 3:50PM - 4:00PM Location: E351

Participants
Tianhao Su, MD, Beijing, China (Presenter) Nothing to Disclose
Long Jin, Beijing, China (Abstract Co-Author) Nothing to Disclose
Wen He, Beijing, China (Abstract Co-Author) Nothing to Disclose

PURPOSE
To describe and explore four-dimensional (4D) CT navigation prior to transarterial chemoembolization (TACE) for hepatocellular carcinoma (HCC).

METHOD AND MATERIALS
Contrast-enhanced computed tomographic imaging with volume helical shuttle (VHS) technique were prospective performed at a 64-row multidetector scanner before TACE in HCC patients. The whole liver region was selected for dynamic study of the tumor. A series of 16 phases images from pre-arterial to portal venous phase were collected and 4D CT images were reconstructed with 1.25-mm thickness on a commercial workstation. Radiologists analyzed the volumetric data, being free to use axial slices as well as postprocessing reconstruction algorithms (e.g., MIP and MPR). All 4D CT angiography (CTA) images in cine mode were compared with DSA in TACE, including anatomy of hepatic artery, tumor supplying arteries, tumor vessels, tumor staining. Embolization effect was also evaluated on DSA and follow-up CT.

RESULTS
The study included 46 independent HCC lesions in 38 patients. Normal hepatic artery anatomy was found in 24 cases (63.2%, according to Michels' classification) and variations in 14 cases (36.8%), which presented good hints for DSA selective hepatic arterial work. The diagnosis consistent rate was 100% between 4D CTA and DSA in showing the anatomy and variation of hepatic artery. 4D CTA noninvasively showed tumor supplying arteries (n = 41), tumor vessels (n = 36), and tumor staining (n = 42). DSA showed better tumor staining result and the visible rate of tumor staining in 4D CTA was 91.3% (42/46). However, 4D CTA had advantage in reproducibly delineating the three-dimension relationship between tumor and blood vessels while detecting tumor supplying arteries, especially for medium sized lesions (diameter range from 3 to 7 cm). Since 4D CTA could dynamically show 3-5 levels of intrahepatic arterial branches, it provided a good navigation for effective superselective microcatheter placement. Upon 4D CT results, chemoembolization therapies were effectively performed. Successful lipiodol accumulations were achieved in specific region of liver.

CONCLUSION
Four-dimensional CT using VHS technique could be easy and helpful in evaluating hepatic artery anatomy and locating tumor supplying artery for interventional chemoembolization planning.

CLINICAL RELEVANCE/APPLICATION
Four-dimensional CT can be used as a planning and navigation tool for TACE in HCC.
**MSCU42**

**Case-based Review of US (An Interactive Session)**

Wednesday, Dec. 2 3:30PM - 5:00PM Location: S406A

- **GI**
- **GU**
- **US**

**AMA PRA Category 1 Credits™:** 1.50

**ARRT Category A+ Credits:** 1.50

**Participants**
Deborah J. Rubens, MD, Rochester, NY *(Moderator) Nothing to Disclose*

**LEARNING OBJECTIVES**

1) Recognize the diverse applications of ultrasound throughout the body and when it provides the optimal diagnostic imaging choice. 2) Understand the fundamental interpretive parameters of ultrasound contrast enhancement and its applications in the abdomen. 3) Know the important factors to consider when choosing ultrasound vs CT for image guided procedures and how to optimize ultrasound for technical success.

**ABSTRACT**
Ultrasound is a rapidly evolving imaging modality which has achieved widespread application throughout the body. In this course we will address the major anatomic areas of ultrasound use, including the abdominal and pelvic organs, superficial structures and the vascular system. Challenging imaging and clinical scenarios will be emphasized to include the participant in the decision-making process. Advanced cases and evolving technology will be highlighted, including the use of ultrasound contrast media as a problem solving tool, and the appropriate selection of procedures for US-guided intervention.

**Active Handout:** Deborah J. Rubens

http://abstract.rsna.org/uploads/2015/15002752/Active MSCU42.pdf

**Sub-Events**

**MSCU42A  Challenging Abdominal Cases**

**Participants**
Oksana H. Baltarowich, MD, Philadelphia, PA *(Presenter) Nothing to Disclose*

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**ABSTRACT**

View abstract under main course title.

**MSCU42B  Acute Pelvic Pain**

**Participants**
Leslie M. Scoutt, MD, New Haven, CT, (leslie.scoutt@yale.edu) *(Presenter) Consultant, Koninklijke Philips NV*

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**Honored Educators**

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Leslie M. Scoutt, MD - 2014 Honored Educator

**MSCU42C  Superficial Ultrasound Imaging: Head to Toe**

**Participants**
Deborah J. Rubens, MD, Rochester, NY *(Presenter) Nothing to Disclose*

**LEARNING OBJECTIVES**

View learning objectives under main course title.
RSNA/ESR Emergency Symposium: General Principles, Pediatric and ENT Emergencies (An Interactive Session)

Wednesday, Dec. 2 3:30PM - 5:00PM Location: S402AB

AMAPRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Ronald J. Zagoria, MD, San Francisco, CA, (ron.zagoria@ucsf.edu) (Moderator) Nothing to Disclose
Andras Palko, MD, PhD, Szeged, Hungary (Moderator) Medical Advisory Board, Affidea Group;

Sub-Events

MSSR44A  Polytrauma

Participants
Ulrich Linsenmaler, MD, Munich, Germany (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Demonstrate general principles of diagnostic imaging in Emergency Radiology in traumatic and non-traumatic emergencies. 2) Analyze ethiology, background and management of common radiological emergencies. 3) Identify the role, indications and protocols for US, CR, MDCT in modern emergency radiology.

ABSTRACT
Multiple trauma / polytrauma remains the leading cause of death in a patient population below the age of 45 years. Modern Emergency Radiology plays today a key role in an interdisciplinary team guiding diagnosis and treatment in the initial clinical workup. This lecture will cover the following topics: To describe background, incidence and regional differences in patients with polytrauma / multiple trauma. To appreciate the clinical significance and to analyze critical triage criteria to undergo ER / shock room admission and concepts of initial clinical management (ATLS). To review imaging techniques and radiological management and logistic concepts for patients with polytrauma / multiple trauma within a clinical algorithm. To review the use of whole body computed tomography (WBCT), CTA as well as conventional radiography (CR) and ultrasound (US) in the initial work-up. To describe common and uncommon imaging findings. Image reading and data management, individualized CT protocols and outcome control.

MSSR44B  Challenges of Imaging Pediatric Abdominal Emergencies

Participants
Susan D. John, MD, Houston, TX (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Understand the variations of pathology that cause abdominal pain and vomiting in infants and children. 2) Plan safe and effective imaging protocols using US, CT, and MRI. 3) Recognize pitfalls in the diagnosis of pediatric abdominal emergencies with imaging.

ABSTRACT

MSSR44C  Imaging in ENT Emergencies

Participants
Diego B. Nunez JR, MD, MPH, New Haven, CT, (diego.nunez@yale.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Analyze imaging findings in patients presenting with acute head and neck conditions using a systematic spatial approach. 2) Demonstrate understanding of the role and indications of CT and MR in acute non-traumatic ENT case management. 3) Identify the extent of disease and recognize specific complications of cervicofacial infections.

ABSTRACT
Controversy Session: US, CT, or MR Imaging in Possible Appendicitis in Children: Three Pegs and Often Only One Hole

Wednesday, Dec. 2 4:30PM - 6:00PM Location: E451A

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

Participants
Nancy R. Fefferman, MD, New York, NY, (nancy.fefferman@nyumc.org) (Moderator) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the advantages, disadvantages and limitations of US as an effective imaging modality in the diagnosis of appendicitis in children. 2) Review the current literature addressing the diagnostic performance of US for pediatric appendicitis. 3) Discuss the role of US in the imaging evaluation of suspected appendicitis in children.

ABSTRACT

Participants
Michael J. Callahan, MD, Boston, MA, (michael.callahan@childrens.harvard.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Highlight the advantages, disadvantages and versatility of computed tomography for the diagnosis of suspected acute appendicitis in children. 2) Describe published sensitivity and specificity values for computed tomography in the setting of suspected acute appendicitis in the pediatric population. 3) Explain the challenges and potential barriers for standardization of pediatric appendicitis clinical practice guidelines at academic and non-academic centers.

Participants
R. Paul Guillerman, MD, Houston, TX, (rpguille@texaschildrens.org) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Develop an MRI protocol for suspected pediatric appendicitis. 2) Estimate the diagnostic efficacy of MRI for suspected pediatric appendicitis. 3) Appraise how radiation-induced cancer risks and diagnostic performance characteristics influence the optimal selection of US, CT and MRI for suspected pediatric appendicitis.
Gastrointestinal Thursday Case of the Day

Thursday, Dec. 3 7:00AM - 11:59PM Location: Case of Day, Learning Center

Participants

Vincent M. Mellnick, MD, Saint Louis, MO (Presenter) Nothing to Disclose
Matthew C. McDermott, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Ryan W. Buss, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Aarti Sekhar, MD, Brookline, MA (Abstract Co-Author) Nothing to Disclose
Tarek N. Hanna, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose
Gayatri Joshi, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Meghan G. Lubner, MD, Madison, WI (Abstract Co-Author) Grant, General Electric Company; Grant, NeuWave Medical, Inc; Grant, Koninklijke Philips NV
Perry J. Pickhardt, MD, Madison, WI (Abstract Co-Author) Co-founder, VirtuoCTC, LLC; Stockholder, Cellectar Biosciences, Inc; Research Consultant, Bracco Group; Research Consultant, KIT; Research Grant, Koninklijke Philips NV
Lauren Saling, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Simon Onderi, MD, Mineola, NY (Abstract Co-Author) Nothing to Disclose
Natalie Chen, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Rex A. Parker III, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
John J. Hines JR, MD, New Hyde Park, NY (Abstract Co-Author) Nothing to Disclose
Melanie Wegener, Garden City, NY (Abstract Co-Author) Nothing to Disclose
Douglas S. Katz, MD, Mineola, NY (Abstract Co-Author) Nothing to Disclose
Lori M. Gettle, MD, MBA, Hummelstown, PA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

1) Each GI case of the day will be taken from disorders of the luminal GI tract as well as the liver, spleen, pancreas, and biliary system. The findings may be uncommon manifestations of common diseases or common manifestations of uncommon diseases.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Meghan G. Lubner, MD - 2014 Honored Educator
Meghan G. Lubner, MD - 2015 Honored Educator
Perry J. Pickhardt, MD - 2014 Honored Educator
Douglas S. Katz, MD - 2013 Honored Educator
Douglas S. Katz, MD - 2015 Honored Educator
Participants

Sub-Events

**RC609A**  Hypervascular Liver Lesions in non-Cirrhotic Patients

Participants
David J. Grand, MD, Providence, RI (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Confidently diagnose liver lesions that meet imaging criteria as definitively benign.
2) Describe the use of hepatocyte-specific contrast agents and their role in evaluation of hypervascular liver lesions.
3) Provide a differential diagnosis for hypervascular lesions which are not definitively benign and recommend further imaging or biopsy as appropriate.

**RC609B**  Dealing with Liver Incidentalomas

Participants
Rajan T. Gupta, MD, Durham, NC, (rajan.gupta@duke.edu) (Presenter) Consultant, Bayer AG; Speakers Bureau, Bayer AG; Consultant, Invivo Corporation

**LEARNING OBJECTIVES**

1) The goal of this course is to familiarize the audience with recent work on dealing with liver incidentalomas including recommendations from the ACR white paper on the topic. Case examples with management guidelines will be shown to demonstrate the key elements of these papers.

**RC609C**  HCC - Typical and Atypical

Participants
Choon H. Thng, MBBS, Singapore, Singapore, (thng.choon.hua@singhealth.com.sg) (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Identify typical appearances of HCC on CT and MRI.
2) Describe and apply criteria from AASLD consensus conference for imaging-based diagnosis of HCC.
3) Identify atypical appearances of HCC and recommend appropriate additional diagnostic procedures for these lesions.

**ABSTRACT**

Hepatocellular carcinoma (HCC) commonly occurs in cirrhotic liver and has typical appearances of arterial enhancement and wash-out in the delayed phase. Consensus conferences such as the American Association for Study of Liver Diseases (AASLD) have set up diagnostic criteria based on these typical appearances, for which an imaging-based diagnosis of HCC can be made. However, the appearances of HCC can be atypical when the above findings are less obvious. Arterial hypervascularity can be inferred when a lesion enhances from hypointensity in the pre contrast phase to isointensity in the arterial phase. Subtle arterial hypervascularity and wash-out can also be inferred by comparing changes in signal intensity and Hounsfield readings of the lesion as well as the background liver. The presence of fibrous septa, mosaic pattern, and nodule-in-nodule architecture are suggestive of HCC. Organic anionic transporting polypeptide (OATP) expression declines during the carcinogenesis process and hepatocyte specific contrast allows early detection of HCC nodules which have yet to show the typical patterns. Moderate T2 hyperintensity and restricted diffusion favor the diagnosis of malignancy but are not specific for HCC. They are useful in suggesting the possibility of HCC when observed in the appropriate context of gadolinium enhanced or hepatocyte specific contrast enhanced MR studies. HCC can rarely present in atypical forms for which a diagnosis cannot be made without histology. Understanding the typical and atypical appearances of HCC allow the radiologist to actively participate in the management of the patient.

**RC609D**  Imaging after Liver-directed Therapy

Participants
Steven S. Raman, MD, Santa Monica, CA (Presenter) Nothing to Disclose
**Participants**

Edward G. Grant, MD, Los Angeles, CA (Presenter) Research Grant, General Electric Company; Medical Advisory Board, Nuance Communications, Inc

**LEARNING OBJECTIVES**

1) Understand the indications for the use of contrast enhanced ultrasound in renal masses. 2) Be familiar with the advantages and disadvantages of contrast enhanced ultrasound in comparison to other forms of cross sectional imaging with regard to its application to renal masses. 3) Be able to analyze contrast enhanced ultrasound images of the kidney. 4) Understand the basics of quantitative contrast imaging of renal masses.

**ABSTRACT**

Contrast enhanced ultrasound (CEUS) has numerous applications in the imaging of renal masses. It has the particular advantage in this population of being able to be used in patients with renal failure which is not the case with either CT or MRI. Obviously CEUS does not use ionizing radiation and is less expensive than other techniques. A further advantage is the fact that ultrasound is a real time technique and vascular characteristics of lesions can be evaluated throughout the examination. Applications of CEUS in the kidney include imaging of complex cysts (flow in wall, septae etc.) and evaluation of pseudolesions (column of Bertin, infarct, scars). It can also be used to further characterize indeterminate masses on CT/MR and may be able to classify some lesions as benign versus malignant, or suggest their actual histology. The diagnostic capability of CEUS is facilitated by its ability to provide quantitative information. Given the lack of ionizing radiation and absence of nephrotoxicity CEUS is ideal for patients undergoing active surveillance of a renal mass or post resection/RFA. The evaluation of complex renal cysts is one of the most common indications for CEUS. Observed features at CEUS are typically similar to those of the Bosniak classification and this has now been adapted for use with ultrasound contrast. In solid renal masses CEUS may provide information that can help determine the nature of the mass and its anatomy as well as the number of individual lesions. This is particularly valuable in patients in whom other contrast agents are contraindicated. One notable example is the characteristic enhancement pattern of papillary versus clear cell renal cell carcinoma. The former typically enhances less than the surrounding parenchyma throughout the examination while the latter dramatically hyperenhances in the arterial phase. Again, quantitative imaging can further add to the confidence of the diagnosis in such cases.

**Participants**

Hans-Peter Weskott, MD, Hannover, Germany, (weskotthp@t-online.de) (Presenter) Luminary, General Electric Company; Speaker, Bracco Group

**LEARNING OBJECTIVES**

1) Understanding the indications of contrast enhanced ultrasound (CEUS) in focal liver and gallbladder diseases. 2) Learning about the importance of the three contrast phases and how CEUS performs in detecting and characterizing focal liver lesions and to characterize inflammatory and tumorous changes of the gallbladder wall. 3) Learning about the potential value as well as the limitations of CEUS in liver and gallbladder diseases. 4) Learning how CEUS performs when compared to B-mode and Color Doppler ultrasound, CT and MRI imaging.

**ABSTRACT**

Liver: In patients with favorable scanning conditions CEUS is at least as sensitive as contrast enhanced CT (CECT) in detecting malignant liver lesions. Due to its high temporal resolution, even a hyper-enhancement of a few seconds can reliably be detected, thus improving the characterization of focal liver lesions. A majority of malignant lesions can therefore be characterized as hypo-, iso- or hyper-enhancing. During the arterial phase the tumor's vessel architecture and direction of contrast filling is important for characterizing a lesions character. Due to a high spatial resolution, novel contrast imaging techniques allow detection of washed out lesions down to 3mm in size. CEUS characterizes focal liver lesions with a much higher diagnostic confidence than conventional US and is comparable to CT and MRI. CEUS also improves intraoperative tumor detection and characterization. Using time intensity analysis a change in contrast enhancement and kinetics helps in estimating tumor response to chemotherapy. CEUS is also used to monitor local ablation therapy and is a useful imaging tool to detect early tumor recurrence. Gallbladder: CEUS can be used to better visualize ulceration, perforation, and tumors of its wall. It thus helps in optimizing clinical management, including timing for surgery. CEUS does not affect renal or thyroid function and is therefore helpful in older patients and the preferred imaging technique in young patients and those with impaired renal function.
LEARNING OBJECTIVES

1) Attendees will recognize the association of hypervascularity with inflammatory processes in the bowel on the basis of neoangiogenesis. 2) They will appreciate the value of CEUS of the bowel, with provision of both subjective and objective blood flow determinations, useful in determining disease activity and in assessing response to therapy. 3) They will apply the common interpretations of time intensity curves to obtain peak enhancement and area under the curve information, recognizing their direct relationship to inflammatory disease with increasing parameters.

ABSTRACT
PURPOSE
Liver steatosis is the most common liver disease in Western Countries and it may progress to steatohepatitis and cirrhosis. Magnetic Resonance Spectroscopy (MRS) has been shown to strongly correlate with histology in fat quantification. However, MRS has some limitations such as breathing artifact and difficulties in avoiding vessels or bile ducts within the voxel. 3D VIBE-Dixon is a MR sequence which can quantify fat content. The aim of this study was to compare fat quantification of liver using 3D VIBE-DIXON to that using MRS.

METHOD AND MATERIALS
IRB approved this prospective, HIPAA compliant study. Thirty potential liver donors (14 males, 12 females; mean age 38 yo) underwent liver MR, including single voxel MRS, within the right (RL) and left lobe (LL) and axial 3D VIBE-Dixon. Liver biopsy was performed in 8 patients. Fat percentage (FP) was generated by MRS. Two readers blinded to MRS results independently quantified the FP on 3D VIBE-Dixon by drawing a ROI in both lobes in the same locations of the MRS voxels. Lin's concordance correlation was used to assess concordance between MRS and 3D VIBE-Dixon, for the two readers. Intraclass correlation coefficient was used to compare 3D VIBE-Dixon to histology. Inter-observer agreement was calculated. A p ≤0.05 was considered statistically significant.

RESULTS
In the RL, mean FP was 5.8% by MRS, and 4.8% and 4.8% by 3D VIBE-Dixon for readers 1 and 2, respectively, with a strong concordance between the two technique (rho= 0.78 and 0.76 for reader 1 and 2, respectively, p<0.001). In the LL, mean FP was 5.2% by MRS, and 4.2% and 4% by 3D VIBE DIXON for readers 1 and 2, respectively, with medium concordance between the two sequences (rho=0.44 and 0.38 for readers 1 and 2, respectively). Inter-observer agreement was excellent in both RL and LL (rho=0.96 and 0.92, respectively, p<0.001). In the 8 patients who underwent biopsy FP by 3D VIBE-DIXON highly correlated to histological results (ICC=0.85).

CONCLUSION
In this prospective study, fat quantification using 3D VIBE-DIXON was highly reproducible, with strong correlation to MRS in the RL. Correlation was moderate in the LL, probably due to artifacts on MRS.

CLINICAL RELEVANCE/APPLICATION
3D VIBE-DIXON is a highly reproducible MR sequence, which may allow non-invasive fat quantification in the liver. Further studies with larger cohort and pathology comparison are required.
To assess the inter-site reproducibility of 2D magnetic resonance elastography (MRE) analysis for hepatic stiffness in obese adults

METHOD AND MATERIALS

In this HIPAA compliant, IRB approved study, obese (BMI ≥ 30 kg/m²) adults underwent 2D MRE on a 1.5T or 3.0T GE scanner at one of two sites. A passive driver produced 60 Hz acoustic shear waves through the liver, and MRE-generated wave images, magnitude images, and stiffness maps (elastograms) were transferred offline for manual analysis. Analysts at each of the two separate sites evaluated all exams from both sites. Analysts drew regions of interest (ROIs) on the elastograms in areas of the liver where parallel wave propagation was observed on the corresponding wave image. From these ROIs, stiffness values were recorded. Weighted average was applied to obtain a single per-liver stiffness value. Bland-Altman plot and intraclass correlation coefficient (ICC) were used to assess inter-site reproducibility. Paired t-test was used to examine systematic shifts.

RESULTS

87 adults (74 female, 13 male) underwent MRE. The mean (± standard deviation) age and BMI were 48.3 (± 12.5) years and 42.6 (± 5.8) kg/m² respectively. Fourier scans were considered unanalyzable by at least one of the two sites due to low signal-to-noise or poor wave propagation. Hence, data from 73 subjects were used in reproducibility analyses. ICC for the two sites was .833 (0.724, 0.898). Mean (± standard deviation) stiffness values for site A and site B were 2.90 (± 1.06 kPa) and 3.13 (±1.15 kPa) respectively. A small, clinically non-meaningful, but statistically significant bias was observed (mean difference .23 kPa, paired t-test p=0.0016).

CONCLUSION

MRE analysis for hepatic stiffness from independent analysts at two separate sites had high reproducibility. There was a small systematic bias observed between the two participating study sites, which was not clinically meaningful in the context of staging liver fibrosis.

CLINICAL RELEVANCE/APPLICATION

In order for 2D MRE to be clinically useful in the staging of hepatic fibrosis, liver stiffness results must be analyst and site independent. Studies such as this will help demonstrate the reproducibility of MRE stiffness values.

SSQ06-03 ¹H-Magnetic Resonance Spectroscopy is Superior to Controlled Attenuation Parameter (CAP) in Assessing Liver Fat Content in Human Non-alcoholic Fatty Liver Disease (NAFLD)

Awards

Trainee Research Prize - Resident

Participants

Jaap Stoker, MD, PhD, Amsterdam, Netherlands (Presenter) Nothing to Disclose
Joanne Verheij, PhD, Rotterdam, Netherlands (Abstract Co-Author) Nothing to Disclose
Jaap Stoker, MD, PhD, Amsterdam, Netherlands (Abstract Co-Author) Nothing to Disclose

PURPOSE

Non-alcoholic fatty liver disease (NAFLD) is an increasingly recognized health problem worldwide. Liver biopsy is the diagnostic standard, but liver fat content is preferably assessed noninvasively and quantitatively. Recently, the Controlled Attenuation Parameter (CAP) technique was introduced on the FibroScan®, a transient elastography device with FDA approval since 2013. Only limited data are available regarding CAP's accuracy compared to established quantitative measures. Therefore, we prospectively compared CAP and ¹H-Magnetic Resonance Spectroscopy (¹H-MRS) derived fat fractions (FF) against liver biopsy in a cohort of patients with NAFLD.

METHOD AND MATERIALS

Forty NAFLD patients (M/F: 29/11) with median (IQR) age of 52.6 (48.5-57.3) and BMI of 27.1 (25.4-33.1) were included in this IRB-approved study. Same-day 3T MRI and CAP measurement were performed by a single examiner within 27 (17-50) days of liver
biopsy, assessed by a single pathologist. ¹H-MRS derived FF and CAP values were compared between Brunt steatosis grades S0-3 using Kruskall-Wallis and Mann-Whitney-U tests. Correlations were assessed with Spearman’s. Diagnostic accuracies of CAP and FF to identify ≥S1 on biopsy were compared with ROC analyses.

RESULTS
Median FF differed (p<0.0001) between all histological steatosis grades at 1.0%(0.7-1.4), 6.1%(3.9-8.8), 17.4%(11.3-21.1) and 26.3%(25.0-30.1). Median CAP only differed between grades S0 and S2 (p=0.025) and S1 and S2 (p=0.006) at 260 dB/m (221-320), 281 dB/m (249-331), 330 dB/m (305-378) and 348 dB/m (321-353). FF (rs 0.90;95%-CI:0.81-0.95) correlated better (P=0.0002) with steatosis grades than CAP (rs 0.53;95%-CI:0.25-0.73). The area under the ROC curve (AUROC) to identify ≥S1 was higher (P=0.04) for ¹H-MRS at 0.88 (95%-CI:0.73-1.0) than for CAP at 0.76 (95%-CI:0.56-0.95). Optimal cut-off values of 4.1% and 261 dB/m resulted in sensitivity/specificity/positive/negative predictive values of 89%/100%/100%/56% for ¹H-MRS and 89%/60%/ 94%/43% for CAP.

CONCLUSION
¹H-MRS derived FF differed between all four steatosis grades on biopsy, while CAP did not. Better correlation with histological features and superior AUROC to identify steatosis stage ≥S1 reaffirm ¹H-MRS as preferred method for noninvasive liver fat content assessment.

CLINICAL RELEVANCE/APPLICATION
¹H-MRS derived liver fat fractions show better diagnostic accuracy than CAP values for accurate noninvasive liver fat content assessment.

SSQ06-04 Assessment of Liver and Pancreas Iron Overload with a 3T MRI Multiecho GRE Sequence in Diffuse Liver Disorders: Rorrelation with Serum Ferritin and Liver Biopsy

Thursday, Dec. 3 11:00AM - 11:10AM Location: E350

Participants
Maxxuentes, M. A. (Presenter) Nothing to Disclose
Niklas Verloge, Regensburg, Germany (Abstract Co-Author) Nothing to Disclose
Claudia Feller, MD, PhD, Regensburg, Germany (Abstract Co-Author) Nothing to Disclose
Marcel D. Nickel, Erlangen, Germany (Abstract Co-Author) Employee, Siemens AG
Christian R. Stroszczynski, MD, Regensburg, Germany (Abstract Co-Author) Nothing to Disclose
Philipp Waggenmann, Regensburg, Germany (Abstract Co-Author) Nothing to Disclose

PURPOSE
Iron overload is associated with hereditary hemochromatosis, chronic transfusions, hemolytic conditions and diffuse liver diseases such as chronic hepatitis C, alcoholic liver disease and NAFLD. Pancreatic iron can be also found in some of these conditions. Our objective was to assess R2* values of the liver and pancreas in patients with chronic diffuse liver diseases, comparing the R2* values with serum ferritin levels and liver biopsy.

METHOD AND MATERIALS
A total of 99 consecutive patients with chronic diffuse liver disorders who underwent liver biopsy and abdominal MR examination were included. The 3T MR examination included a single breath-hold multiecho GRE sequence with 12 echoes. Iron related-R2* quantification was performed with a dedicated software selecting a ROI within the biopsied liver segment and also in the pancreas (head, body and tail). Liver biopsy was used as gold standard for liver iron deposits grading (0-4).

CONCLUSION
There is an excellent relationship between liver R2*-iron quantification against liver biopsy and serum ferritin, in different chronic liver disorders. Pancreas R2* is significantly correlated with serum ferritin, liver R2* and histologic iron grading.

CLINICAL RELEVANCE/APPLICATION
In patients with diffuse chronic liver disorders, pancreas R2* correlate with liver R2* and biopsy-proved liver iron overload.

SSQ06-05 Liver Volume-assisted Estimation of Liver Function Based on Gd-EOB-DTPA-enhanced MR-Relaxometry

Thursday, Dec. 3 11:10AM - 11:20AM Location: E350

Participants
Michael Haimerl, Regensburg, Germany (Presenter) Nothing to Disclose
Niklas Verloge, Regensburg, Germany (Abstract Co-Author) Nothing to Disclose
Claudia Feller, MD, PhD, Regensburg, Germany (Abstract Co-Author) Nothing to Disclose
Marcel D. Nickel, Erlangen, Germany (Abstract Co-Author) Employee, Siemens AG
Christian R. Stroszczynski, MD, Regensburg, Germany (Abstract Co-Author) Nothing to Disclose
Philipp Waggenmann, Regensburg, Germany (Abstract Co-Author) Nothing to Disclose

PURPOSE
To determine whether liver function as determined by indocyanine green (ICG) clearance can be estimated quantitatively from gadoxetic acid (Gd-EOB-DTPA)-enhanced magnetic resonance (MR)-Relaxometry and to estimate the impact of liver liver volumes.

METHOD AND MATERIALS
132 patients underwent an ICG clearance test and Gd-EOB-DTPA-enhanced MRI, including MR-Relaxometry at 3 Tesla. A transverse...
3D VIBE sequence with an inline T1 calculation was acquired prior to and 20 minutes post-Gd-EOB-DTPA administration. Volumetric analysis of respective livers was performed on Aquarius iNtuition Viewer (TeraRecon Inc.). The reduction rate of T1 relaxation time (rrT1) between pre- and post-contrast images and the liver volume-assisted index of T1 reduction rate (LvrT1) were evaluated. The plasma disappearance rate of ICG (ICG-PDR) was correlated with the liver volume (LV), rrT1 and LvrT1, providing an MRI-based estimated ICG-PDR value (ICG-PDRest).

RESULTS

Regression model showed a significant log-linear correlation of ICG-PDR with LV (r = 0.31; p = 0.001), T1post (r = 0.62; p < 0.001) and rrT1 (r = 0.85; p < 0.001). Assessment of LV and consecutive evaluation of multiple linear regression model revealed a stronger log-linear correlation of ICG-PDR with LvrT1 (r = 0.91; p < 0.001), allowing for the calculation of ICG-PDRest.

CONCLUSION

Liver function as determined using ICG-PDR can be estimated quantitatively from Gd-EOB-DTPA-enhanced MR-Relaxometry. Volume-assisted MR-Relaxometry has a stronger correlation with liver function than does MR-Relaxometry.

CLINICAL RELEVANCE/APPLICATION

Global and regional liver function may be visualized by Gd-EOB-DTPA-enhanced MRI, which might be of importance for planning liver resections.

SSQ06-06  
Liver Volume Predicts the Clinical Outcome of Patients with Decompensated Alcoholic Steatohepatitis

Thursday, Dec. 3 11:20AM - 11:30AM Location: E350

Participants
Maxime Ronot, MD, Clichy, France (Abstract Co-Author) Nothing to Disclose
Romain Breguet, MD, Geneva, Switzerland (Abstract Co-Author) Nothing to Disclose
Catherine Hansen, Geneve, Switzerland (Abstract Co-Author) Nothing to Disclose
Christoph D. Becker, MD, Thonex, Switzerland (Abstract Co-Author) Nothing to Disclose
Sylvain Terraz, MD, Geneva, Switzerland (Abstract Co-Author) Nothing to Disclose
Matthieu Lagadec, MD, Clichy, France (Presenter) Nothing to Disclose

PURPOSE

To evaluate the prognostic value of abdominal multidetector computed tomography (MDCT) in patients with decompensated alcoholic steatohepatitis (ASH).

METHOD AND MATERIALS

This ancillary study was based on the analysis of data collected during a randomized trial on ASH treatment. Response to treatment was defined as the improvement of the baseline MELD score ≥3 points at 3 months. All patients underwent contrast-enhanced MDCT of the abdomen. The following parameters were measured: 1/ liver (DL) and spleen (DS) density on unenhanced images, and DL/DS ratio, 2/ liver volume-to-body weight ratio (VLBW), 3/ subcutaneous fat (FSC), visceral fat (FV) and muscular (M) surfaces at the level of L3-L4. Responders and non-responders were compared with uni-, multivariate and ROC analyses. Results were compared with a validation cohort of patients, clinically and biologically similar to the study cohort.

RESULTS

Fifty-eight patients (34 males; mean age, 56 years) were analyzed, including 34 (59%) responders. Baseline mean MELD and ABIC scores were 19 (13-28) and 8.3 (6.5-10.3). On multivariate analysis, VLBW ≥ 2.4% predicted response with 88% and 63% sensitivity and specificity. In the validation cohort (n=24, and 0.66±0.07 (p=0.043), respectively. BMI, baseline MELD and ABIC scores, gender, DL/DS, FV and M were not different between the two groups. VLBW ≥ 2.4% predicted response with 88% and 63% sensitivity and specificity. In the validation cohort (n=24, and 0.66±0.07 (p=0.043), respectively. BMI, baseline MELD and ABIC scores, gender, DL/DS, FV and M were not different between the two groups. VLBW ≥ 2.4% predicted response with 88% and 63% sensitivity and specificity. In the validation cohort (n=24, 75% responders), the same cut-off value predicted response with 83% and 67% sensitivity and specificity. 0.66±0.07 (p=0.043), respectively. BMI, baseline MELD and ABIC scores, gender, DL/DS, FV and M were not different between the two groups. VLBW ≥ 2.4% predicted response with 88% and 63% sensitivity and specificity. In the validation cohort (n=24, 75% responders), the same cut-off value predicted response with 83% and 67% sensitivity and specificity.

CONCLUSION

In patients suffering from decompensated ASH, the liver volume appears to be a major positive prognostic factor. This simple morphometric parameter may be added to the initial evaluation of the liver disease to improve patient management.

CLINICAL RELEVANCE/APPLICATION

The liver volume-to-body weight ratio appears to be a major prognostic factor in patients with ASH. This morphometric parameter could be added to the initial workup of patients, to better predict the response to treatment and improve the management.

SSQ06-07  
MRI Based Quantification of Hepatic Uptake and Excretion of Gadoxetic Acid: Preliminary Results

Thursday, Dec. 3 11:30AM - 11:40AM Location: E350

Participants
Daniel Truhn, MD, Cologne, Germany (Presenter) Nothing to Disclose
Alexander Ciritsis, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
Nienke L. Hansen, MD, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
Alexandra Barabasch, MD, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
Burkhard Maedler, Bonn, Germany (Abstract Co-Author) Researcher, Koninklijke Philips NV
Christiane K. Kuhl, MD, Bonn, Germany (Abstract Co-Author) Nothing to Disclose
Nils A. Kraemer, Aachen, Germany (Abstract Co-Author) Nothing to Disclose

PURPOSE

Recent research in liver MRI has shown that quantification of hepatic uptake of gadoxetic acid is a promising method for determination of local liver function and correlates well with established clinical measures of liver function. The aim of this study was to evaluate a method for combined measurement of hepatic uptake and excretion.
METHOD AND MATERIALS

After intravenous administration of gadoxetic acid, signal enhancement of liver tissue in 14 healthy patients was measured over the time course of 30 minutes. First, the data was assessed using previously published methods that do not consider excretion. Then, a dual inlet two compartment model was appended by a parameter describing the excretion of contrast medium into the bile. A least squares fit was performed to extract the following parameters: extra- and intracellular volume fraction, uptake and excretion rates, arterial and portal venous flow fractions. Results for the models without and with consideration of excretion were subsequently compared.

RESULTS

The dual inlet two compartment model provided the best agreement between modeled and measured signal values when compared to previously published methods that do not consider excretion of contrast agent. The mean value for the uptake rate in healthy liver tissue was 4.76±0.54 /100/min. Excretion half-time was 21.9±2.4 min.Inter-patient variance was significantly greater when conventional models (uptake only) models were applied. We found a significant deviation between modeled and measured signal values with an uptake rate of 3.56±1.34 /100/min. Excretion rates could only be obtained with the dual inlet two compartment model.

CONCLUSION

The model not considering the excretion was only valid in the first 5 minutes of hepatic signal enhancement and failed over the course of 30 minutes. Accurate modeling of gadoxetic acid induced hepatic enhancement over a longer time course requires a dual inlet two compartment model. Including this parameter into models of liver tissue might lead to a more precise correlation between hepatic function and MRI.

CLINICAL RELEVANCE/APPLICATION

When aiming to measure hepatic function using MRI not only the hepatic uptake, but also the excretion should be taken into account to get better correlations between MRI and liver function.

SSQ06-08  The Attenuation Distribution Across the Long Axis (ADLA): Evaluation of Predictive Performance in a Large Clinical Trial

Awards
Trainee Research Prize - Medical Student

Participants
Nikita Lakomkin, Nashville, TN (Presenter) Nothing to Disclose
Allison Hainline, Nashville, TN (Abstract Co-Author) Nothing to Disclose
Hakmook Kang, Nashville, TN (Abstract Co-Author) Nothing to Disclose
M. S. Hutson, Nashville, TN (Abstract Co-Author) Nothing to Disclose
Carlos L. Arteaga, Nashville, TN (Abstract Co-Author) Nothing to Disclose
Richard G. Abramson, MD, Nashville, TN (Abstract Co-Author) Consultant, ICON plc;

PURPOSE

Novel methods of image feature analysis may be a useful adjunct to standard methods of cancer treatment response assessment. The attenuation distribution across the long axis (ADLA) is a simple, easily extractable measure of lesion heterogeneity; in a recent preliminary study, ADLA measurements predicted overall survival (OS) better than RECIST 1.1. The purpose of this study was to evaluate the ability of the ADLA method to predict OS in a larger clinical trial.

METHOD AND MATERIALS

Under a data sharing agreement from Genentech (San Francisco, CA) and an IRB waiver from our institution, we obtained de-identified imaging and clinical data from RIBBON-1, a multi-site phase 3 trial of bevacizumab (Avastin) in metastatic breast cancer. We analyzed all RIBBON-1 patients treated with Avastin who had at least 1 liver metastasis measuring ≥ 15 mm on baseline contrast-enhanced CT. For each patient at every time point, up to 2 target liver lesions were evaluated using both RECIST 1.1 criteria and ADLA. The ADLA was obtained as the standard deviation of the post-contrast CT attenuation values in the portal venous phase across a long-axis diameter function. To define a treatment response using ADLA, Brier scores were computed to establish the optimal percent decrease for separating patients with longer OS. Using Kaplan-Meier survival analysis, the log-rank test was then used to evaluate the ability of a treatment response by ADLA measurements to predict OS. The ADLA method was then compared to RECIST 1.1 using a bootstrapping technique that generated 95% confidence intervals on the Brier scores for both approaches.

RESULTS

165 patients met inclusion criteria. Median OS was 461 days (range 60-916). The ADLA method discriminated patients with longer OS at an optimal threshold of a 21.5% decrease from baseline. At this threshold, a treatment response by the ADLA method successfully separated patients with longer OS (p<0.001). Furthermore, a treatment response by ADLA was superior to a response by RECIST 1.1 for discriminating patients with longer OS (95% confidence interval for the Brier score difference: [0.070-0.52]). Kaplan-Meier survival curves are shown below.

CONCLUSION

In retrospective data analysis from a large clinical trial, the ADLA method was superior to RECIST 1.1 for predicting overall survival.

CLINICAL RELEVANCE/APPLICATION

The ADLA measurement is an easily extractable parameter that may be useful for assessing cancer treatment response.

SSQ06-09 Differences of Target Lesion Selection Drives Variability of Response Assessment According to RECIST 1.1

Thursday, Dec. 3 11:50AM - 12:00PM Location: E350
Awards
RSNA Country Presents Travel Award

Participants
Yunus Alparslan, Aachen, Germany (Presenter) Nothing to Disclose
Jonas Schmoe, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
Hanna Witte, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
Annika Keulers, MD, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
Christiane K. Kuhl, MD, Bonn, Germany (Abstract Co-Author) Nothing to Disclose
Sebastian Keil, MD, Aachen, Germany (Abstract Co-Author) Nothing to Disclose

PURPOSE
To conduct a prospective systematic analysis of factors contributing to variability of response classification in RECIST1.1 beyond factors related to disease measurement, i.e. variability that persists even if dedicated software for response assessment is used.

METHOD AND MATERIALS
63 patients (60 ± 9 years) underwent a total 132 contrast-enhanced CT studies for initial staging or follow-up after systemic chemotherapy. A target or non-target lesion satisfying RECIST1.1 criteria could be identified in 52/63 patients (82.5%) and 113/132 (85.6%) of (re-)staging CT studies. Data were independently interpreted by three radiologists with > 4 years of experience who used specialized software (MintMedical) for standardized response assessment. Response was classified in complete or partial response (CR, PR), or stable or progressive disease (SD, PD), and stratified as progressive (PD) vs. non-progressive (CR, PR, SD).

RESULTS
Overall, readers agreed in terms of response classification in 58.4% of studies (66/113) and disagreed in 41.6% (47/113). In 50/113 studies, readers had chosen the same, and in 63/113 studies, readers had chosen different target lesions. Selection of the same target lesion was associated with an 88% rate (44/50) of agreement; selection of different target lesions was associated with a 74.6% rate (47/63) of disagreement. After dichotomizing response classes according to their therapeutic implication in PD vs. non-PD RECIST1.1 response classes, disagreement was observed in 17/113 staging examinations (15%). In 13 of these 17 patients (76.5%), readers had chosen different target lesions.

CONCLUSION
The basic assumption of standardized response assessment is that different readers should yield the same response classification for a given patient. In fact, however, different readers disagree in almost half of patient cases, and in 15%, they disagree even with regards to the basic distinction between PD vs. non-PD. Major source of variability appears to be the fact that different readers may choose different target lesions. The resulting variability between readers will not be compensated for by software tools for automated response assessment.

CLINICAL RELEVANCE/APPLICATION
Even with standardized RECIST readings and use of dedicated automated software, different radiologists will yield different results with regards to response classification, even with regards to broadly different categories (PD vs. non-PD).
**Gastrointestinal (Colon and Appendix)**

**SSQ07**

**Diffusion-weighted MRI for Evaluating Ileocolonic Inflammation in Crohn' Disease**

**Thursday, Dec. 3 10:30AM - 10:40AM Location: E353C**

**Participants**  
Andrea Laghi, MD, Rome, Italy (Moderator) Speaker, Bracco Group Speaker, Bayer AG Speaker, General Electric Company Speaker, Koninklijke Philips NV  
Rizwan Aslam, MBCh, San Francisco, CA (Moderator) Research support, Bayer AG

**Sub-Events**

**SSQ07-01** **Diffusion-weighted MRI for Evaluating Ileocolonic Inflammation in Crohn' Disease**

**Thursday, Dec. 3 10:30AM - 10:40AM Location: E353C**

**PURPOSE**  
To assess the efficacy of Diffusion-weighted MRI (DWI) for evaluating ileocolonic inflammation in patients with Crohn's disease (CD).

**METHOD AND MATERIALS**

25 CD patients underwent MR enterography (MRE) with DWI using three b values of 50, 400 and 800 s/mm² and ileocolonoscopy within one month. The conventional MRE findings (including mural thickness, T2 weighted signal intensity and contrast enhancement) and DWI signal intensity in bowel segments were qualitatively scored from 0 to 3. Apparent diffusion coefficient (ADC) map was generated by using monoeponential model. Disease activity was scored by simple endoscopic score for Crohn's disease (SES-CD) immediately after each endoscopy and was graded as inactive (0-2) and active CD (≥3). The relationship between SES-CD and MRI results was analyzed. All MRI results were interpreted by two radiologists who blinded to clinical data independently.

**RESULTS**

Of the 102 evaluated segments (terminal ileum=20, colon/rectum=82), 55 segments were active CD. The ADCs of active CD were significantly lower than those of inactive CD ($P <0.001$), while DWI scores were higher in active CD ($P <0.001$). The SES-CD correlated closely with ADCs ($r =-0.92$, $P <0.001$), followed by DWI scores ($r =-0.88$, $P <0.001$), MRE-DWI scores ($r =0.88$, $P <0.001$) and MRE scores ($r =0.85$, $P <0.001$). ADCs discriminated between active and inactive CD with an area under the ROC curves of 0.99, followed by DWI scores (AUC=0.98), MRE-DWI scores (AUC=0.98) and MRE scores (AUC=0.94). The threshold ADC of $1.59 \times 10^{-3}$ mm²/s yielded 95.70% sensitivity and 96.40% specificity. Inter-observer agreements were good with regard to DWI scores ($k =0.65$, $P<0.001$) and ADC measurement (intra-class correlation coefficient=0.97, $P <0.001$).

**CONCLUSION**

DWI and ADC correlate with disease activity in ileocolonic Crohn' disease with excellent diagnostic accuracy for differentiating active from inactive CD.

**CLINICAL RELEVANCE/APPLICATION**

DWI and ADC are conducive to assess disease activity of Crohn' disease.

**SSQ07-02** **Dual Energy Spectral CT for Assessing the Stages of Colon Cancer**

**Thursday, Dec. 3 10:40AM - 10:50AM Location: E353C**

**Participants**  
Yang Chuangbo, MMed, Xianyang City, China (Presenter) Nothing to Disclose  
Chenglong Ren, Shanxi, China (Abstract Co-Author) Nothing to Disclose  
Qi Yang, Xianyang, China (Abstract Co-Author) Nothing to Disclose  
Tian Xin, MMed, Xianyang City, China (Abstract Co-Author) Nothing to Disclose  
Zhanli Ren, Xianyang, China (Abstract Co-Author) Nothing to Disclose  
Tian Qian, MMed, Xianyang City, China (Abstract Co-Author) Nothing to Disclose  
Ma Guangming, MMed, Xianyang City, China (Abstract Co-Author) Nothing to Disclose  
Taiping He, Xianyang, China (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To evaluate the value of dual energy spectral CT in assessing the stages of colon cancer.

**METHOD AND MATERIALS**

This study was approved by our ethics committee. We retrospectively analyzed 47 colon cancer patients who underwent...
preoperative dual-phase contrast enhanced spectral CT scans. Patients were divided into the well-differentiated group (A) and the poorly and undifferentiated group (B) based on the pathological findings for analysis. Iodine concentration (IC) for tumors was measured in arterial phase (AP) and venous phase (VP) on the iodine-based material decomposition images and normalized to that of aorta to obtain normalized IC (NIC). Tumor CT attenuation number was measured on the monochromatic image sets to generate spectral HU curve and to calculate a slope (k) for the curve: \((\text{CT}(40\text{keV})-\text{CT}(90\text{keV}))/50\). Values of the 2 groups were compared and ROC study was performed to assess the differential diagnosis performance.

RESULTS

There were 18 well-differentiated cases (group A) and 20 poorly differentiated and 9 undifferentiated cases (group B). CT numbers on the 70keV images were statistically the same in both groups (48.6±9.03HU vs. 63.9±5.86HU, p>0.05). On the other hand, the IC, NIC and slope (k) values in AP for group A were significantly lower than those for group B (1.01±40.20mg/ml vs. 1.59±0.57mg/ml for IC; 0.12±0.03 vs. 0.19±0.09 for NIC; 1.41±0.29 vs. 2.03±0.85 for slope, all p<0.05). Using iodine concentration value of 1.13mg/ml in AP as a threshold, one could obtain an area-under-curve of 0.85 for ROC study with sensitivity of 81.8% and specificity of 71.4% for differentiating well-differentiated from poorly differentiated colon cancers. These values were significantly higher than the respective values of 72.7% and 64.3% with conventional CT numbers at 70keV.

CONCLUSION

Quantitative parameters obtained in spectral CT in the arterial phase improve accuracy for differentiating well-differentiated colon cancers from poorly differentiated and un-differentiated ones.

CLINICAL RELEVANCE/APPLICATION

Quantitative iodine concentration measurement in spectral CT may be used to improve accuracy for the differentiation of well-differentiated and poorly and un-differentiated colon cancers.

SSQ07-04 Extramural Venous Invasion Detected by Contrast-enhanced Multiple-row Detectors Computed Tomography (ceMDCT) as a Predictor of Synchronous Metastases in Patients with Colon Cancer

Participants
Suxing Yang, Beijing, China (Presenter) Nothing to Disclose
Xun Yao, PhD, Beijing, China (Abstract Co-Author) Nothing to Disclose
Xinghe Song, Beijing, China (Abstract Co-Author) Nothing to Disclose
Yancheng Cui, Beijing, China (Abstract Co-Author) Nothing to Disclose
Yingjiang Ye, Beijing, China (Abstract Co-Author) Nothing to Disclose
Nan Hong, MD, Beijing, China (Abstract Co-Author) Nothing to Disclose
Yi Wang, MD, Beijing, China (Abstract Co-Author) Nothing to Disclose

PURPOSE

To determine whether extramural venous invasion (EMVI), detected by contrast-enhanced multiple-row detectors computed tomography (ceMDCT), can be used as an adverse feature to predict synchronous metastases in patients with colon cancer.

METHOD AND MATERIALS

Patients with pathology-proven colon cancer from January 2009-December 2013 were included in this retrospective study. Patients with other malignancies and/or intussusception were excluded. Two radiologists reviewed patients' ceMDCT images and reached a consensus regarding EMVI status, extramural tumor depth, and tumor location. Tumor and lymph node categories, and AJCC stage and tumor differentiation were determined from patients' pathology (AJCC)-7th Edition. Furthermore, two radiologists reached a consensus regarding EMVI status, extramural tumor depth, and tumor location. Tumor and lymph node categories, and AJCC stage and tumor differentiation were determined from patients' pathology records. Synchronous metastases were confirmed by whole body ceMDCT within 3 months after initial diagnosis or by surgery, if available. Chi-squared and Fisher's exact tests were used to analyze the association between EMVI and tumor characteristics. Logistic regression analyses were performed to analyze whether EMVI status was a predictive factor of metastases in colon cancer.

RESULTS

250 patients were reviewed. EMVI was observed in 106 patients (106/250, 42.4%). In the EMVI-positive group, synchronous metastases were seen in 39 patients (39/106, 36.8%) while 10 (10/144, 6.9%) patients in the EMVI-negative group had confirmed metastases. EMVI was moderately associated with extramural tumor depth and AJCC stage (contingency coefficient 0.443 and 0.401 respectively, p<0.001), which were then excluded from all multivariable analyses. EMVI status and pathologic lymph node categories were demonstrated to be significant factors (Odds ratio 7.8 and 9.6, P<0.001) in predicting synchronous metastases.

CONCLUSION

EMVI may be used as a significant adverse feature to predict an increased risk of synchronous metastases in colon cancer patients.

CLINICAL RELEVANCE/APPLICATION

ceMDCT can demonstrate extramural venous invasion and is recommended for the initial evaluation of colon cancer before curative surgery and adjuvant chemotherapy.

SSQ07-05 Stercoral Perforation and Colorectal Cancer Perforation; Differentiating CT Features

Participants
Su-jin Ko, MD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Seong Sook Hong, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Ji-young Hwang, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Hyun-Joo Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Sung Hwan Bae, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

PURPOSE

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To determine the computed tomography (CT) signs associated with stercoral perforation and colorectal cancer perforation.

**METHOD AND MATERIALS**

From 8 years, all surgically and pathologically confirmed patients with stercoral perforation (n=8, mean age 68.3 years) or colon cancer perforation (n=11, mean age 66.3 years) were retrospectively reviewed by two board-certified radiologists blinded to the proven diagnosis. The following CT findings were evaluated and recorded for each patient: wall thickness of distal colon adjacent to perforation site, pattern of colon wall thickening and enhancement, length of thickened bowel wall, presence of fecaloma, degree of proximal colon dilatation, and pericolonic inflammation or presence of pericolonic abscess, and number of enlarged pericolonic lymph nodes. These findings were correlated with the pathologic diagnosis.

**RESULTS**

The mean thickness of the distal colonic wall adjacent to the perforation site was 13.6 mm in patients with colorectal cancer perforation and 5.1 mm with stercoral perforation, which was statistically different. There was a significant correlation between colorectal cancer perforation and eccentric wall thickening (p<0.01). CT findings of layered enhancing wall thickening (p<0.01) and presence of fecaloma in proximal colon (p<0.01) were significant findings for stercoral perforation. Patients with colorectal cancer displayed more pericolonic lymph nodes (mean 2.27, p<0.05).

**CONCLUSION**

Fecaloma in the proximal colon and layered enhancing wall thickening adjacent to perforation site are likely due to stercoral perforation. Eccentric bowel wall thickening at the distal portion of the perforation site with many enlarged pericolonic lymph nodes is most likely colorectal cancer perforation.

**CLINICAL RELEVANCE/APPLICATION**

Resection of the diseased segment of colon and exteriorization is sufficient for stercoral perforation, while extensive bowel resection with lymph node dissection is required for treatment of colorectal cancer perforation. Thus, distinguishing these two conditions and accurate preoperative diagnosis can facilitate early therapeutic management and improve survival.

**Comparison of Diagnostic Performance of US Re-evaluation and CT Reassessment for Patients with Equivocal CT Findings of Acute Appendicitis**

Thursday, Dec. 3 11:20AM - 11:30AM Location: E353C

**Participants**

Ji Ye Sim, MD, MS, Seongnam-Si, Korea, Republic Of (Presenter) Nothing to Disclose
Hyuk Jung Kim, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Suk Ki Jang, Sungnam-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jee Woo Yeon, Sungnam-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Il Dong Kim, Sungnam, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
June-Sik Cho, MD, Daejeon, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
So Ya Paik, Sungnam, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Young Rock Ha, Sungnam, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To compare diagnostic performance between US re-evaluation and CT reassessment for patients with equivocal CT findings of acute appendicitis, overall and coexistent inflammation group.

**METHOD AND MATERIALS**

Our Institutional Review Board approved this retrospective study and waived informed consent. 115 patients who had equivocal CT findings of acute appendicitis and underwent US re-evaluation were included. All CTs were reviewed independently by two abdominal radiologists. They analyzed four CT findings (appendiceal wall enhancement, appendiceal wall thickening, intraluminal air in appendix, and a coexistent inflammatory lesion) and made a diagnosis of acute appendicitis. In US analysis, patients were categorized into positive and negative appendicitis, based on previous structured US reports. The diagnostic performance of CT reassessment and US re-evaluation, interobserver agreement of CT findings and the likelihood of appendicitis were calculated.

**RESULTS**

The overall AUC, sensitivity and specificity of US re-evaluation (0.960, 100% and 92.1%) was higher than CT reassessment (reviewer 1: 0.697, 51.9% and 87.5%, reviewer 2: 0.759, 66.7% and 85.2%). In the coexistent inflammation group, the AUC, sensitivity and specificity of US re-evaluation (reviewer 1 and 2: 0.990, 100% and 98.0%) were also higher than CT reassessment (reviewer 1: 0.607, 27.3% and 94.1%, reviewer 2: 0.561, 14.3% and 98.0%). Interobserver agreement of diagnosing appendicitis and alternative diagnosis were moderate (κ=0.44 and 0.51).

**CONCLUSION**

For patients with equivocal CT findings of acute appendicitis, US re-evaluation shows better diagnostic performance than CT reassessment in both of overall and coexistent inflammation group.

**CLINICAL RELEVANCE/APPLICATION**

When patient have equivocal findings of appendicitis on CT, US re-evaluation can improve diagnostic accuracy.
PURPOSE
The purpose of this study was to evaluate the feasible CT findings for differentiating malignant from benign lesions in cases of non-mucocele type appendiceal neoplasms.

METHOD AND MATERIALS
All consecutively registered patients with pathologic confirmed appendiceal neoplasms and pre-operative CT scans (n=60) were obtained over a 14-year period from January 2000 through December 2014. Of these patients, borderline malignancy (n=28) and mucocele type appendiceal neoplasm (n=4) were eliminated by pathologic reports and the remaining 28 patients with non-mucocele type appendiceal neoplasm finally formed the study sample. The patients were classified into benign and malignant group depending on their pathologic reports. The colonic type adenoma (n=3), mucinous cystadenoma (n=10), benign appendiceal neuroendocrine tumor (n=4), and ganglioneuroma (n=1) were included in the benign group and the colonic type adenocarcinoma (n=4), malignant appendiceal neuroendocrine tumor (n=3), lymphoma (n=1) and metastasis (n=2) formed into the malignant group. Two experienced radiologists analyzed the presence of mass, irregular wall thickening, perforation, cecal wall thickening, appendicolith, peritoneal thickening, ascites, lymphadenopathy suggestive of malignancy, and periappendiceal fat infiltrations in consensus reading. The CT results were compared for malignant and benign groups.

RESULTS
CT showed statistically significant difference in irregular wall thickening, presence of mass and perforation between the benign and malignant groups (p < 0.05). Cecal wall thickening, appendicolith, peritoneal thickening, ascites, lymphadenopathy suggestive of malignancy, and periappendiceal fat infiltrations did not exhibit significant difference between the benign and malignant groups (p > 0.05).

CONCLUSION
It is difficult to distinguish underlying malignancy from benign condition, regarding non-mucocele type appendiceal neoplasm. However, irregular wall thickening, presence of mass and perforation can be useful CT features associated with malignancy.

CLINICAL RELEVANCE/APPLICATION
Irregular wall thickening, presence of mass, and perforation can be applicable CT features in the pre-operative diagnosis of underlying malignancy concerning non-mucocele type appendiceal neoplasm.

SSQ07-08 Preoperative CT Predictors Associated with 30-day Adverse Events in Patients with Appendiceal Inflammatory Masses that Underwent Immediate Appendectomies

Thursday, Dec. 3 11:00AM - 11:50AM Location: E353C

Participants
Myung Sub Kim, MD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Mi Sung Kim, MD, Koyang, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Dong Hyun Kim, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Hee Jin Park, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Hyun Pyo Hong, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Heon Ju Kwon, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

PURPOSE
To evaluate preoperative CT predictors that are associated with 30-day adverse events in patients that underwent an immediate appendectomy for appendiceal inflammatory masses.

METHOD AND MATERIALS
One hundred forty-four patients who underwent immediate appendectomy, and were diagnosed with an appendiceal inflammatory mass by the preoperative CT examination, were included. The main outcome was the 30-day adverse events. Patient demographics, preoperative CT and laboratory parameters were evaluated. Factors associated with 30-day adverse events were assessed using logistic regression analysis.

RESULTS
A total of 22 (15%) of the 144 patients had 30-day adverse events: 10 intra-abdominal abscesses, three wound infections, two cases of peritonitis, two small bowel obstructions, two intra-abdominal abscesses with peritonitis, one intra-abdominal abscess with wound infection, one intra-abdominal abscess with obstructed ileus, and one case of peritonitis with obstructed ileus. In univariate analysis, the presence of appendicolith (odds ratio [OR], 2.49; p = 0.048), and obstructed ileus (OR 3.79; p = 0.01) were associated with adverse events. Obstructed ileus (adjusted OR, 3.05; p = 0.04) was the only independent preoperative predictor associated with 30-day adverse events in patients with appendiceal inflammatory masses.

CONCLUSION
Obstructed ileus was an independent preoperative CT predictor associated with 30-day adverse events in patients that underwent immediate appendectomy for appendiceal inflammatory masses.

CLINICAL RELEVANCE/APPLICATION
Non-operative approach, such as percutaneous drainage or use of antibiotics might be considered if obstructive ileus was accompanied preoperatively in patients having appendiceal inflammatory mass.

SSQ07-09 Initial Performance of Radiologists and Radiology Residents in Interpreting Low-dose (2-mSv) Appendiceal CT

Participants
Hyun Kyung Yang, MD, Seongnam-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
PURPOSE
To prospectively evaluate the initial diagnostic performance and learning curve of a community of radiologists and residents in interpreting 2-mSv appendiceal CT.

METHOD AND MATERIALS
The institutional review boards approved the study. We included 46 attending radiologists and 153 radiology residents from 22 hospitals, who completed an online training course of 30 2-mSv CT cases. Appendicitis was confirmed in 14 cases. Most of the readers had limited (≤ 10 cases, n = 32) or no (n = 118) prior exposure to low-dose (LD) appendiceal CT. The order of cases was randomized for each reader. Multi-reader multi-case receiver operating characteristic (ROC) analysis was performed. Generalized estimating equations were used to model the learning curves in diagnostic performance.

RESULTS
Diagnostic performance gradually improved with years of training. Average area under the ROC curve was 0.94 (95% confidence interval, 0.90, 0.98) 0.92 (0.88, 0.96), 0.90 (0.85, 0.96), and 0.86 (0.80, 0.92), for the attending radiologists, senior residents, second-year residents, and first-year residents, respectively. We did not observe any notable intra-reader learning curves over the training course of the 30 cases, except for a decrease in reading time. Diagnostic accuracy and sensitivity were significantly affected by the reader training level and prior overall experience with appendiceal CT, but not by the prior specific exposure to LD appendiceal CT.

CONCLUSION
The learning curve is likely prolonged and forms gradually over years by overall radiology training and clinical experience in general rather than by the exposure to LD appendiceal CT specifically.

CLINICAL RELEVANCE/APPLICATION
The clinical implementation of 2-mSv CT may be feasible in many hospitals, assuming qualified site radiologists can carefully supervise the practice. The learning curve is likely prolonged and forms gradually over years by overall radiology training and clinical experience in general rather than by the exposure to LD appendiceal CT specifically. Performance improves with years of CT experience, with senior residents' performance nearly matching that of attending radiologists.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Perry J. Pickhardt, MD - 2014 Honored Educator
PURPOSE
Respiratory motion artifact is one of the major causes of image degradation in dynamic contrast-enhanced imaging of the abdomen. The parallel imaging (PI) technique can decrease the acquisition time but lead to PI artifacts and a loss of signal-to-noise ratio (SNR) at a high acceleration factor (AF). They depend heavily on the geometry of the coil array used and various vendor-specific PI reconstruction techniques. The purpose of this study was to examine whether the shortened breath-hold 3-dimensional volumetric interpolated breath-hold examination (3D-VIBE) sequence for high AF using the controlled aliasing in parallel imaging (CAIPIRINHA) technique could substitute for the conventional sequence using generalized autocalibrating partially parallel acquisition (GRAPPA) in patients undergoing routine gadoxetic acid-enhanced liver MRI.

METHOD AND MATERIALS
30 patients with clinically suspected focal liver lesions were scanned using 3D-VIBE sequences with GRAPPA with AF=2 and AF=4 and CAIPIRINHA with AF=4 (acquisition times: 21, 14, and 12 seconds, respectively) at the same spatial resolution during the hepatobiliary phase on a 3T MRI scanner. Visual evaluations using a 3- or 5-point scale and SNR analysis were performed for the 3 sequences.

RESULTS
For CAIPIRINHA with AF=4, there was significantly less image noise in both visual evaluation and SNR analysis and fewer PI artifacts than for GRAPPA with AF=4 (P<0.0005); it was equal to GRAPPA with AF=2, and had fewer motion artifacts than GRAPPA with AF=2 and 4 (P<0.012). The liver edge sharpness and hepatic vessel clarity, lesion conspicuity, and overall image quality were rated significantly higher with CAIPIRINHA with AF=4 than GRAPPA with AF=2 and AF=4 (P<0.009). For GRAPPA with AF=4, lesion conspicuity and overall image quality were rated significantly lower than for GRAPPA with AF=2 (P<0.012).

CONCLUSION
The shortened breath-hold 3D-VIBE sequence using the new CAIPIRINHA technique with a high AF of 4 was superior to the conventional GRAPPA sequence. The shortened breath-hold sequence using GRAPPA with a high AF of 4 worsened the image quality and lesion conspicuity.

CLINICAL RELEVANCE/APPLICATION
The shortened breath-hold 3D-VIBE sequence using the CAIPIRINHA with a high AF of 4 can reduce the acquisition time to almost half without significantly increasing image noises and artifacts.
**SSQ08-03** New Quiet MR Sequences in Clinical Routine: First Experience in Abdominal Imaging

**Participants**
Sebastian Fischer, MD, Frankfurt, Germany (Presenter) Nothing to Disclose
Markus Domschke, Frankfurt, Germany (Abstract Co-Author) Nothing to Disclose
Thomas J. Vogl, MD, PhD, Frankfurt, Germany (Abstract Co-Author) Nothing to Disclose
Claudia Frehse, Frankfurt, Germany (Abstract Co-Author) Nothing to Disclose
Patricia Dewes, MD, Frankfurt, Germany (Abstract Co-Author) Nothing to Disclose
Jan-Erik Scholtiz, Germany (Abstract Co-Author) Nothing to Disclose
Stefan Zangos, MD, Frankfurt, Germany (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
Purpose of our study was to demonstrate the feasibility and limitations of acoustic noise reduction in a standard clinical MRI protocol for abdominal imaging.

**METHOD AND MATERIALS**
The acoustic noise and image quality were assessed for a standard liver imaging protocol including TSE and GRE sequences and compared to a protocol with new quiet optimizations in 17 patients with suspected liver lesions (10 men, 7 women; 58.7±12.0 years). For each sequence the SI, SNR and CNR were measured. Two independent, blinded readers with a different level of training interpreted both examinations, while scoring artefacts, the overall image quality, the delineation of the abdominal organs and the level of confidence in visualization of the anatomy and pathologies. Afterwards a side-by-side comparison for readers’ image preference was performed. The means of the sound level measurements, the SI, SNR and CNR was compared in a paired comparative t-test using Holm-Sidak method. The Wilcoxon rank test determined differences in readers ratings and their level of agreement was derived from Spearman correlations.

**RESULTS**
Significant reduction of acoustic noise was measured for T2 TSE (-5.16 dBa) and T2 HASTE (-3.75 dBa) and less differences for T1 FLASH (-0.42 dBa) and T1 DIXON (-0.29 dBa). SI, SNR and CNR were significantly lower for quiet T2 TSE (-11.3%, -18.0%, -23.1%) and T2 HASTE (-25.4%, -46.2%, -37.7%) and higher for T1 DIXON (+4.6%, +32.0%, +24.4%). All sequences were independently rated with an comparable image quality and confidence in visualization of the anatomy and pathologies against the standard sequences, except from the quiet T1 FLASH sequences (structure identification -29.5%; diagnostic confidence -37.5%). Accordingly in the side-by-side comparison standard T1 FLASH sequences were strongly preferred against new quiet sequences, while less preference was observed for T2 TSE and T2 HASTE and no difference in T1 DIXON sequences. Inter-rater correlation was k=0.987 with p<0.001.

**CONCLUSION**
An acoustic noise reduction was achieved with the new quiet optimizations while maintaining diagnostic quality and confidence in T2 TSE, T2 HASTE and T1 DIXON sequences. The quiet T1 FLASH sequence seems not to be comparable with regard to image quality and diagnostic confidence.

**CLINICAL RELEVANCE/APPLICATION**
The results can be used to render MRI scans more patient-friendly in clinical practice, in particular for young, scared or elderly patients.

**SSQ08-04** Intravoxel Incoherent Motion Diffusion-weighted Imaging is a Better Indicator of High Grade Hepatocellular Carcinoma Than Conventional Apparent Diffusion Coefficient

**Participants**
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**PURPOSE**
To evaluate the utility of intravoxel incoherent motion (IVIM) derived parameters for discrimination of histological grade of hepatocellular carcinoma (HCC). Measurement reproducibility was also studied by assessing inter- and intra-reader variation.

**METHOD AND MATERIALS**
Fifty-eight patients with 60 pathologically confirmed HCCs underwent IVIM imaging with 11 b values (0-1000 s/mm²). The diffusion parameters, i.e., apparent diffusion coefficient (ADC), slow diffusion coefficient (D), fast diffusion coefficient (D*), and perfusion fraction (f) were calculated for all HCCs. All measurements were performed by two radiologists, and one of them repeated the measurements after a 4-week interval to minimize memory bias. These parameters were compared between lesions with high and low-to-moderate histologic grade using Wilcoxon test. Further, receiver operating characteristic (ROC) analysis was performed to evaluate the discrimination ability, and inter- and intra-reader agreements were analyzed with intraclass correlation coefficients (ICC).

**RESULTS**
The D and D* values (×10⁻³ mm²/s) were both significantly lower in high grade HCC than in low-to-moderate grade HCC for both observers (P < 0.0183) (D = 0.78 vs. 0.98 [reader 1-1st], 0.73 vs. 0.96 [reader 1-2nd], and 0.76 vs. 0.96 [reader 2]; and D* = 24.5 vs. 39.7 [reader 1-1st], 22.7 vs. 40.7 [reader 1-2nd], and 23.5 vs. 37.0 [reader 2]). The ADC values [×10⁻³ mm²/s] measured by reader 1-1st and f (%) measured by reader 1-2nd also showed a statistical difference (ADC = 0.99 vs. 1.14, and f = 27.1 vs. 21.8, P < 0.0129). The ROC analysis demonstrated that the D value had significantly greater Az values than the ADC for
CONCLUSION

The IVIM-derived D values showed a significantly better diagnostic performance than the ADC values in differentiating high grade HCC from low-to-moderate grade HCC. The results by the two readers and repeated measurements by one reader are reproducible, especially for the D value.

CLINICAL RELEVANCE/APPLICATION

D values derived from IVIM modeling may be helpful in the preoperative differentiation of the histologic grade of HCC,

SSQ08-05  
Quantification of Liver Fibrosis by T1rho MR - Phantom Validation and Pilot In-Vivo Imaging at 3T

Thursday, Dec. 3 11:10AM - 11:20AM Location: E353A

Participants

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Xiang He, PhD, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Alessandro Furlan, MD, Pittsburgh, PA (Abstract Co-Author) Author, Reed Elsevier; Research Grant, General Electric Company
Kyongtae T. Bae, MD, PhD, Pittsburgh, PA (Abstract Co-Author) Patent agreement, Medtronic, Inc; Consultant, Otsuka Holdings Co, Ltd

PURPOSE

To assess the performance of T1rho MR in noninvasive fibrosis quantification through protein phantom validation, healthy subject reproducibility testing, and liver disease patient imaging.

METHOD AND MATERIALS

This prospective study was HIPAA-compliant and IRB-approved. T1rho imaging was performed on a Siemens MAGNETOM Trio 3T scanner with a phased-array body coil. Single-slice measurements were obtained using spin-lock preparation ranging from 10-80 msec followed by a balanced steady state free precession readout. T1rho values were calculated by single exponential fitting of the signal decay profile. Phantoms containing various concentrations of polysaccharides and proteins (cross-linked bovine serum albumin) were imaged. 19 healthy subjects (12M, 7F, mean age 30) were recruited; 11 liver disease subjects (8M, 3F, mean age 50) were enrolled following liver biopsy (fibrosis stages F1=2; F2=5; F3=2; F4=2). Correlation (Pearson r) was calculated between T1rho value and fibrosis stage, inflammatory grade, and degree of steatosis, as well as time since last meal and days since last alcoholic beverage.

RESULTS

In phantoms, T1rho values correlated strongly with protein concentration (r=0.97), further validating T1rho quantification. Good inter- and intra-subject reproducibility was demonstrated in healthy volunteers. In liver disease subjects, good correlation was found between T1rho and fibrosis stage (r=0.74). No significant correlation between T1rho and inflammatory activity was found (r=-0.26). There was a moderate negative correlation with degree of steatosis (r = -0.66). There was no significant correlation with hours since last meal or days since last drink (r=-0.12 and 0.16, respectively).

CONCLUSION

T1rho quantification was validated using a protein solution phantom. T1rho hepatic imaging is feasible at 3T in human subjects and values appear unaffected by food or alcohol intake. A positive correlation with fibrosis stage in disease subjects was found.

CLINICAL RELEVANCE/APPLICATION

T1rho values appear to correlate with macromolecular concentration and may provide an additional tool for noninvasive quantification of fibrosis, an important indicator of chronic liver disease severity.

SSQ08-06  
Rectal Cancer: Short-Term Reproducibility of Intravoxel Incoherent Motion Parameters at 3.0T MR

Thursday, Dec. 3 11:20AM - 11:30AM Location: E353A

Participants

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Yanyan Xu, Beijing, China (Abstract Co-Author) Nothing to Disclose
Wu Wang, MD, PhD, Beijing, China (Abstract Co-Author) Nothing to Disclose

PURPOSE

To evaluate the short-term test-retest reproducibility of IVIM (intravoxel incoherent motion) parameters of rectal cancer at 3.0T MR.

METHOD AND MATERIALS

Twenty-six patients with rectal cancer who underwent pelvic magnetic resonance imaging including diffusion-weighted imaging using eight b values (0 to 1000s/mm2) 30 min apart. IVIM parameters (D, pure diffusion; f, perfusion fraction; D*, pseudo-diffusion coefficient) were calculated by bi-exponential analysis. The values of interobserver IVIM parameters and test-retest parameters were compared by paired t-test or Wilcoxon test. The short-term test-retest reproducibility of IVIM parameters and the interobserver IVIM parameters variation were assessed by measuring repeatability coefficient and Bland-Altman limits of agreements. The repeatability coefficient was calculated as the range of IVIM parameters of two identical measurements for 95% of subjects. P<0.05 was considered to indicate a statistically significant difference.

RESULTS

The mean IVIM parameters values (D, f, D*) were (1.17±0.39) mm2/ms, (13.56±6.74) %, (46.76±77.74) mm2/ms, respectively. There were no significant differences in D, f, or D* values within two different observers on the same DW-MR scan (p=0.256,
Results
Relatively good reproducibility of D value measurement were observed in rectal cancer between short-term test and retest IVIM imaging, compared to f and D* values. The IVIM parameters (f and D*) showed large repeatability coefficient and extent of 95% confidence interval. More efforts should be invested to improve the measurement reproducibility of IVIM parameters in rectal cancer.

Clinical Relevance/Application
The Intravoxel Incoherent Motion (IVIM)-derived parameters are increasingly used for clinical management decisions in rectal cancer. However intravoxel incoherent motion (IVIM) parameters (f and D*) showed worse measurement reproducibility compared to D. In serial DW-MRI for rectal cancer evaluation such as treatment response, measurement variations should be considered.

SSQ08-07 Semi-quantitative Assessment of Respiratory Motion Compensation Techniques in T2-weighted Abdominal MR Imaging Using A Novel MRI-compatible Motion Platform

Thursday, Dec. 3 11:30AM - 11:40AM Location: E353A

Participants
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Ivan Pedrosa, MD, Dallas, TX (Abstract Co-Author) Nothing to Disclose

Purpose
For T2-weighted (T2) fast spin echo imaging of the abdomen, multishot (MSFSE) may be preferred over faster single shot (SSFSE) because of superior contrast-to-noise, increased sharpness and spatial resolution. However, studies evaluating the effect of motion on T2W strategies are lacking. Our goal was to assess the effects of respiratory motion on various k-space sampling and motion compensation approaches, utilizing a novel motion-simulating platform.

Method and Materials
Respiratory waveforms were recorded in a healthy volunteer by tracking diaphragm excursion during breath-hold, diaphragmatic drift, cough, and free-breathing. Waveforms were used to drive a computer-controlled MRI-compatible motion platform. Using a 3T Philips Ingenia and a 32-element phased-array coil, T2 axial images of a torso phantom were acquired during simulated respiratory motion using SSFSE, interleaved (IMSFSE) and sequential (sMSFSE) MSFSE, and a new MultiVane XD (MVXD) acquisitions. These were repeated during simulated free breathing without and with respiratory trigger (RT) and navigator (NAV) motion compensation. Three fellowship-trained radiologists, blinded to acquisition used, independently assessed motion artifacts, clarity of edges, signal uniformity, slice registration, and overall quality using a 5-point scale. Scores for each radiologist were normalized and analyzed by one-way ANOVA for equality of mean scores between acquisitions.

Results
Imaging scores during breath-hold and cough showed no significant differences between acquisitions. During diaphragmatic drift and free breathing (without/with RT and NAV), SSFSE scores of motion artifacts, signal uniformity, and overall quality were superior to those of IMSFSE and sMSFSE, and statistically different (p<0.01). MVXD had better scores than IMSFSE and sMSFSE for all categories with RT and for motion artifact and signal uniformity with NAV, and these differences were significant (p<0.01).

Conclusion
Our novel MRI-compatible motion phantom allows detecting differences in the effects of respiratory motion in various k-space sampling and respiratory compensation techniques for T2W abdominal MRI. SSFSE and novel acquisitions such as MVXD resulted in better image quality scores.

Clinical Relevance/Application
Phantom motion simulation studies enable systematic quality assessment of MR acquisitions during motion and facilitate development and validation of new motion-compensated MR imaging techniques.

SSQ08-08 Is 3D Non-rigid Registration Necessary in Hepatic DCE-MRI: A Repeatability Study

Thursday, Dec. 3 11:40AM - 11:50AM Location: E353A

Participants
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Purpose
To investigate necessity of three-dimensional non-rigid registration application in hepatic dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) by the pharmacokinetic parameters’ repeatability.

Results
p=0.088, p=0.112), and the corresponding repeatability coefficient and Bland-Altman biases were 11.1%, 55.4%, 40.3%; 1.0%, 8.0%, 2.9%, respectively. The repeatability coefficient and Bland-Altman biases for D, f and D* were 47.3%, 126.3%, 197.4% and 10.9%, 21.6%, 20.1%, respectively with short-term test and retest DW-MR scan.
There is significant difference between means of discrepant pixels' value pre and post registration data in same slice (t=2.637, p<0.05). RPD box chart showed that mean of inter- and intra [Ktrans], [kep] and [Ve] of lesion, liver and sacrospinal muscle after registration was smaller than that before registration. Outliers and extreme value were reduced or disappeared for most pharmacokinetic parameters in pre and post registration comparison, with the exception of the [Ve] from liver in interobserver comparison (number of outliers pre/post- registration: 0/3) and [kep] from lesion in intraobserver comparison (number of outliers pre/post- registration: 2/3). Repeatability of [Ktrans] and [kep] measured from lesion, liver and sacrospinal muscle was improved after registration in both inter- and intra-measurements. Concordance correlation coefficient (CCC) of [Ktrans], [kep],[Ve] obtained from lesion, sacrospinal muscle was augmented in post -registration group than that of in pre group(for example, CCC of interobserver comparison pre/post- registration:0.5561/0.8510).

CONCLUSION

The 3D non-rigid registration is relatively useful to improve the repeatability of pharmacokinetic parameters and necessary in hepatic DCE-MRI.

METHODS

This prospective study was approved by the institutional review board. 18 patients with confirmed hepatocellular carcinoma underwent DCE-MRI examination. We applied a 3D non-rigid registration on the dynamic enhanced sequence and pharmacokinetic parameters such as transfer constant [Ktrans], rate constant [kep], and relative extravascular extracellular space [Ve] were obtained with a Reference Model. Firstly, we compared the value of each pixel in the same slice of pre and post-registration images and all the images in dynamic phases were studied. Paired t-test was used to evaluate the discrepant pixels in this two groups. [Ktrans], [kep] and [Ve] value of lesion, liver and sacrospinal muscle were obtained by the mean value of the fixed ROI in the same slice. Then, their values of pre and post registration groups were compared by using relative percent difference(RPD) and The Bland-Altman Plot method. Inter- and intra variations, repeatability and concordance correlation were performed for DCE-MRI quantitative parameters.

SSQ08-09 Limitations of Gd-EOB-DTPA-enhanced MRI: Can Clinical Parameters Predict Suboptimal Hepatobiliary Phase?

Thursday, Dec. 3 11:50AM - 12:00PM Location: E353A

Participants
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Ala M. Rozenblit, MD, Bronx, NY (Abstract Co-Author) Nothing to Disclose

PURPOSE

Hepatobiliary phase (HBP) of Gd-EOB-DTPA-enhanced MRI offers additional information not available with extracellular Gd agents. According to Liver Imaging Reporting and Data System (LI-RADS), adequate HBP is essential for reliable characterization of observations relative to the liver parenchyma. LI-RADS deems HBP to be adequate when liver parenchyma is unequivocally hyperintense relative to intrahepatic vessels. Suboptimal HBP would negate the advantage of Gd-EOB-DTPA. Thus, accurate prospective identification of patients who would have suboptimal HBP would be helpful in clinical practice. The goal of this study was to establish cut-off levels for clinical parameters which would predict suboptimal HBP.

METHOD AND MATERIALS

This retrospective study included patients with chronic liver disease who had hepatocellular carcinoma screening with Gd-EOB-DTPA-enhanced MRI between 1/1/11-3/1/13. For each case HBP was rated as adequate or suboptimal, based on LI-RADS criteria. The following laboratory data obtained within 3 months of MRI date was extracted: total bilirubin (TB), direct bilirubin (DB), serum glutamic oxaloacetic transaminase (SGOT), serum glutamic-pyruvic transaminase (SGPT) and alkaline phosphatase (ALP). Model For End-Stage Liver Disease (MELD) scores were calculated as 3.78×ln[TB] + 11.2×ln[INR] + 9.57×ln[creatinine] + 6.43. Receiver operating curve (ROC) analysis was used to establish cut-off values for predicting suboptimal HBP.

RESULTS

Of 179 patients, 158 (88.3%) patients (91 [57.6% male) had adequate HBP and 21 (11.7%) patients (13 [61.9%] male) had suboptimal HBP, mean ages 57.7 [±9.9] years and 52.7 [±14.4] years, respectively (p=0.140). Areas under the curve for predicting suboptimal HBP were 0.86 (95%CI 0.78-0.94) for MELD score, 0.87 (95%CI 0.80-0.95) for TB, 0.92 (95%CI 0.86-0.97) for DB, 0.58 (95%CI 0.46 - 0.69) for SGOT, 0.39 (95%CI 0.27 - 0.51) for SGPT. Accuracy, positive likelihood ratios and cut-off values for predicting suboptimal HBP were, respectively: 88.6% and 11.5 for MELD score ≥16.7, 90.0% and 35.5 for TB ≥4.3 mg/dL, 92.9% and 71.0 for DB ≥1.3 mg/dL.

CONCLUSION

Values above cut-off levels of MELD score, direct and total bilirubin can predict suboptimal hepatobiliary phase with high accuracy.

CLINICAL RELEVANCE/APPLICATION

Prospective identification of patients with high likelihood of suboptimal HBP can help avoid administering a more costly agent to patients who would not benefit from its unique properties.
A Simple Ultrasonographic Score for the Accurate Detection of Inflammatory Activity in Crohn’s Disease

PURPOSE

Cross-sectional imaging is central in the diagnosis and management of Crohn’s disease, an immune-mediated disease of the bowel often leading to transmural damage. Safe, non-radiation-based modalities are preferred, given young age of onset. Ultrasound is accurate in detection of disease activity; however, a simple validated score for inflammatory activity is not widely used. The aim of this study was to evaluate grey scale parameters that contribute most to disease activity and devise a clinically applicable score.

METHOD AND MATERIALS

This was an IRB approved, single center prospective study evaluating patients with established Crohn’s disease monitored with sonography, before and after treatment with adalimumab. Patients were evaluated with ileocolonoscopy (scored using validated indices) and ultrasound within 2 weeks of endoscopy at time zero and either at 6 or 12 months depending on clinical indication. A score was developed based on ordinal logistic regression using a proportional odds model. The final model included only variables with p values < 0.05. Disease severity was classified according to endoscopic score with the most significant grey scale variables weighted to classify individuals into different severity levels. ROC curves were plotted to demonstrate the discriminative and predictive capacity of the scoring system developed.

RESULTS

A total of 63 patients were included, 24 had 2 endoscopic examinations, while 39 had 1, giving a total of 87 US and endoscopic comparisons. The average age is 40.7 years, 28 females and 35 males. The most common disease distribution was ileocolonic 59% (37/63), with 30% (19/63) having terminal ileal and 8% (5/63) with colonic disease. Three grey scale parameters were significantly associated with inflammatory activity, including bowel wall thickness (p=0.046) mesenteric inflammatory fat (p=0.006) and lymph nodes (p=0.028). Based on the novel score, the ROC curve for distinguishing patients with inactive or mild disease from those with active disease was 0.89 while distinguishing normal from any activity was 0.81.

CONCLUSION

US is accurate in the detection of clinically significant disease activity compared to endoscopy and may be a surrogate to endoscopy to guide management.

CLINICAL RELEVANCE/APPLICATION

This simple score may provide a standardized approach to sonographic CD activity measurement across centers.
PURPOSE
To validate a protocol with reduced iodine load for hepatic dynamic CT using virtual monochromatic image (VMI) with adaptive statistical iterative reconstruction (ASiR) of dual-energy CT (DECT) data.

METHOD AND MATERIALS
The institutional review board approved this study. We firstly conducted a phantom experiment to determine an optimal iodine load and ASIR level for VMI at 60 keV, which is the least possible energy level for application of ASIR (protocol A). Then we conducted a clinical study in which 54 patients suspected of liver diseases underwent three-phase dynamic CT with protocol A; the other 54 patients were selected by propensity score matching out of 510 patients underwent full iodine load with single-energy CT (SECT at 120 kVp) (protocol B; 50% ASIR used). We measured CT attenuation values (mean and standard deviation) of the liver parenchyma and the erector spinae muscle in all phases, the aorta in hepatic arterial phase, and the portal vein in portal venous phase. The mean CT attenuation values and contrast-to-noise-ratio (CNR) of each structure, and image noise were compared between the two protocols, by using equivalence test at an A level of .05. We also performed visual analyses including image contrast, image noise, streak artifacts and overall image quality, each using a 4-point score, which were assessed by Mann-Whitney test.

RESULTS
In the phantom study, 420 mgI/kg iodine load and image reconstruction at 60 keV with 50% ASIR was considered adequate for protocol A. The clinical study showed equivalency in any of the CT attenuation values, image noise in all phases, and CNR for the liver parenchyma between the two protocols. CNR for the aorta and the portal vein were not equivalent; those in protocol A tended to be larger than those in protocol B. The significant difference between the two protocols was not detected in any of the visual analyses (P > .05).

CONCLUSION
VMIs at 60 keV with 50% ASIR allow 30% reduction of iodine load while maintaining comparable image quality to full iodine load with the SECT imaging.

CLINICAL RELEVANCE/APPLICATION
In DECT imaging, VMI reconstruction at lower keV can allow reduction in iodine dose, which can contribute the reduction of risk of contrast-induced nephropathy.

PURPOSE
Diffusion-weighted MR Enterography for Treatment Monitoring after Medical Therapy in Crohn’s Disease: A Prospective Intra-individual Longitudinal Study

Participants
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METHOD AND MATERIALS
Seventeen patients with ileocolic CD prospectively underwent MR enterography (MRE) and colonoscopy within 1 week’s time both before and after 1 to 2 years of medical therapy (with immunosuppressive agents in most patients). MRE included contrast-enhanced imaging (CEMRE) and DWI (b = 900 s/mm²). A total of 31 index lesions, defined as a continuous area with the most severe inflammation in each anatomical bowel segment visible on both DWI and CEMRE, including 10 terminal ileal, 10 right colic, 2 descending, 3 sigmoid, and 1 rectal lesions were followed. Changes in inflammation of the index lesions was visually assessed as worsened, stable, decreased, and complete remission (CR) independently using DWI and CEMRE. Apparent diffusion coefficient (ADC) values were measured. The data were analyzed with endoscopic findings as the reference standard.

RESULTS
Eighteen and 13 lesions achieved partial improvement and CR, respectively, at the endoscopic follow-up. DWI and CEMRE correctly identified improved (by any degree) inflammation in 81% (25/31) and 90% (28/31) lesions, respectively (P = .179 by GEE). The distinguished CR from partial improvement with the sensitivity of 85% (11/13) and 77% (10/13), respectively, and the specificity of 61% (11/18) and 67% (12/18), respectively, with no significant difference (P = .1 by GEE). DWI and CEMRE readings concurred for improved inflammation in 77% (24/31) lesions and for CR in 81% (25/31) lesions. ADC values significantly increased after treatment (1.56 ± 0.34 × 10⁻³ mm²/s) vs. 2.12 ± 0.64, P < .001 by GLMM; actual increase in 27/31 lesions). The ROC curve area for distinguishing CR from partial improvement was 0.812 for post-therapy ADC and 0.744 for ADC change.

CONCLUSION
DWI could demonstrate improved inflammation after medical therapy and distinguish CR from partial improvement fairly accurately in CD.

CLINICAL RELEVANCE/APPLICATION
DWI can be an option for treatment monitoring of CD, in particular, when a contrast-enhanced examination is difficult to perform.

Accuracy of MR-determined Hepatic Proton Density Fat Fraction (PDFF) and Histology-determined Fat Fraction for Estimation of Triglyceride Concentration in Twenty-one Ex-vivo Human Livers
Noninvasive Liver Iron Content Grading by MR R2* Relaxation: Initial Results in Patients Suspected of Liver Iron-overload

PURPOSE
To assess the feasibility of magnetic resonance (MR)-determined hepatic proton density fat fraction (PDFF) and histology-determined fat fraction (histology-FF) for estimation of triglyceride concentration ([TG]) in ex vivo human liver using biochemically-determined liver [TG] as a reference standard.

METHOD AND MATERIALS
Twenty-one postmortem whole livers were obtained from the National Disease Research Interchange and scanned at 3T using a cardiac coil within 48 hours of death. Donors (31 - 67 [mean 55 ± 11] yrs; 11 female) had or were at risk for hepatic steatosis based on medical history. Five 1.5-cm radius circular locations were selected in each specimen. Unenhanced two-dimensional axial spoiled gradient-recalled-echo images of the specimens were obtained. Using published MR techniques, MR spectroscopy (MRS), magnitude-based MRI (M-MRI), and complex-based MRI (C-MRI) hepatic PDFF estimations were computed at each location. Six biopsies were also obtained at each location (thirty biopsies per liver): three for histologic analysis to determine histology-FF and three for biochemical analysis to determine [TG]. The average of [TG] at each location was used as a reference standard for that location. Regression analyses were performed for [TG] versus MRS-PDFF, M-MRI-PDFF, C-MRI-PDFF, and histology-FF. R²'s with bootstrap-based bias-corrected, accelerated 95% confidence intervals were computed and served as metrics of accuracy. Pairwise comparisons of the R²'s were performed using bootstrap-based tests to adjust for within-liver dependence.

RESULTS
MRS-PDFF, M-MRI-PDFF, C-MRI-PDFF, histology-FF and [TG] of liver specimens ranged from 0.1 - 23.5%, -7.4 - 26.3%, 1.3 - 21.2%, 0 - 70 %, and 1.2 - 31.3 mg/100g respectively. The R²'s from the regression models between [TG] and MRS-PDFF, M-MRI-PDFF, C-MRI-PDFF, and histology-FF were 0.95 (0.86 - 0.98), 0.90 (0.62 - 0.97), 0.92 (0.55 - 0.99), and 0.92 (0.78 - 0.94) respectively. The differences between R²'s were not statistically significant (all p>0.05).

CONCLUSION
In this ex vivo study, using biochemically-determined liver [TG] as a reference standard, MR-determined hepatic PDFF and histology were accurate for estimation of hepatic [TG].

CLINICAL RELEVANCE/APPLICATION
This study helps to validate the MR-determined hepatic PDFF as an accurate biomarker of hepatic steatosis.

Participants
Xianfu Luo, Yangzhou, China (Presenter) Nothing to Disclose
Jingtao Wu, Yangzhou, China (Abstract Co-Author) Nothing to Disclose

PURPOSE
To prospectively assess the feasibility of magnetic resonance (MR)-determined hepatic iron content (LIC) in patients suspected of having liver iron-overload.

METHOD AND MATERIALS
Fifty-six subjects suspected of liver iron overload (serum ferritin concentrations > 500 μg/L) were enrolled in our study. All subjects examined with MR liver scanning. Thirty-four of 56 subjects underwent FerriScan scanning. Hepatic relaxation parameter including R2* and R2 were acquired with gradient-echo sequences and FerriScan, respectively. Correlations between MR measurements were analyzed. The liver iron content (LIC) determined from FerriScan was set as a reference standard. Based on LIC scale thresholds used in iron chelation therapy, receiver operating characteristic (ROC) analysis was used to calculate the cutoff values and corresponding sensitivity and specificity.

RESULTS
Hepatic R2* value was 346.90 Hz ± 382.89 and range from 26.47 Hz to 1,503.10 Hz. MR relaxation R2* was significantly correlated with FerriScan determined LIC. (with correlation coefficients 0.974, 95% confidence interval 0.947-0.987, P < 0.0001). To discriminate among different LIC thresholds of 1.8, 3.2, 7.0, and 15.0 mg Fe/g, the corresponding optimal cutoff values were 55.11, 86.25, 144.52, and 375.13 Hz, respectively. The area under the receiver operating characteristic curves (AUCs) for R2* kept above 0.99 for all LIC thresholds.
CONCLUSION
MR relaxation R2* value was highly correlated with liver iron content determined by FerriScan. It could accurately quantify and stratify liver iron accumulation in patients.

CLINICAL RELEVANCE/APPLICATION
MR relaxation R2* value might be useful for guiding iron chelation therapy and monitoring the effects of chelation therapy.

GI390-SD-THA7 Quantitative Evaluation of the Potential Replacement of Abdominal CT-perfusion Measurements by Single-acquisition Dual-energy Iodine Concentration Maps

Participants
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PURPOSE
Evaluation of the potential replacement of conventional abdominal CT-perfusion measurements in pancreatic carcinoma by quantitative single-acquisition dual-energy (DE) iodine concentration maps acquired at the peak of the tissue-enhancement curve (tmax), and assessment of an associated reduction in radiation dose.

METHOD AND MATERIALS
For 18 patients with histologically verified pancreatic carcinoma CT-perfusion sequences were dynamically acquired in DE mode at tube potentials of 80kVp and 140kVp with tin filtration over 51 seconds (34 acquisitions; 1 every 1.5s) using dual-source CT (Somatom Definition Flash; Siemens Healthcare, Forchheim, Germany). After deformable motion-correction perfusion maps were calculated from the 80kVp datasets using software developed in-house implementing the Maximum-slope model. For each patient, one quantitative iodine concentration map was calculated from the DECT acquisition at tmax by means of three-material decomposition. Regions of interest (ROIs) were placed at identical locations for both functional images inside both carcinoma and healthy pancreatic tissue, and correlation between perfusion values and iodine concentrations measured in the ROIs was calculated.

RESULTS
Tmax occurred on average 35.9±4.2s after starting contrast agent injection. Average perfusion values differed significantly between healthy tissue and carcinoma (89.7±28.6ml/100ml/min vs. 40.9±21.8ml/100ml/min; p<0.0001), as well as average iodine concentrations measured at tmax (2.3±0.8mg/ml vs. 1.3±0.6mg/ml, p<0.0001). Correlation between measured perfusion values and iodine concentrations was high (0.81) at tmax. Average reduction in effective radiation dose was 95% when comparing a single DECT acquisition at tmax to the 80kVp CT-perfusion sequence (0.18mSv vs. 3.87mSv).

CONCLUSION
Correlation between quantitative iodine concentration and conventional abdominal CT-perfusion measurements was high, and a statistically significant difference in measured iodine concentrations was found between healthy pancreatic tissue and carcinoma. These results indicate that iodine maps acquired at tmax might be suited for replacing abdominal CT-perfusion measurements, allowing for a large reduction in patient dose.

CLINICAL RELEVANCE/APPLICATION
Abdominal CT-perfusion measurements might be replaced by single-acquisition quantitative DECT iodine concentration maps that provide similar functional information at lower radiation exposure.

GI163-ED-THA8 Pancreatic Cysts: Pathological Classification, MRI Characteristics and Differential Diagnosis

Participants
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TEACHING POINTS
• To demonstrate MRI characteristics and pathological classification of pancreatic cysts.
• To educate participants about the classic MRI findings of cystic pancreatic lesions and their mimics.

TABLE OF CONTENTS/OUTLINE
• Review the pathophysiology of cystic pancreatic masses.
• Differential diagnosis of cystic lesions based on the pathological classification as well as typical patient profile and pertinent imaging patterns, such as location, calcification, mural nodularity, and
communication with the pancreatic ducts. Illustrate MRI features of various cystic pancreatic masses, including serous cystadenoma, mucinous cystic pancreatic tumor (adenoma and carcinoma), IPMN, adenocarcinoma, solid pseudopapillary neoplasm and cystic neuroendocrine tumor. Demonstrate lesions that can mimic primary pancreatic cystic masses, such as pseudocysts, lymphoepithelial cyst, squamous cyst and intraductal tubular carcinoma etc. SUMMARY Many cystic pancreatic masses are found incidentally on abdominal imaging. Distinguishing magnetic resonance imaging characteristics and the patient history enable radiologists to narrow the differential diagnosis of pancreatic cystic lesions without exposing patients to ionizing radiation.

**GI240-ED-***

**Pictorial Essay of Sacral and Presacral Lesions**

Station #9

Participants

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TEACHING POINTS

Describe the clinical spectrum of common and uncommon lesions arising from the presacral and sacral space. Identify imaging features (CT and primarily MR) to differentiate the described lesions. Develop a differential diagnosis for sacral and presacral lesions.

**TABLE OF CONTENTS/OUTLINE**

Outline of sacral and presacral lesions organized into categories by tissue of origin: developmental, osseous, hematologic, neurogenic, infectious/inflammatory, and miscellaneous. Dedicated focus on several important lesions from each of the above categories which will include: a brief overview of epidemiology, clinical relevance, anatomy; MRI and/or CT imaging characteristics; and differential considerations. A brief list of examples (one example from each category): chordoma (developmental), neurofibroma (neurogenic), osteoblastoma (osseous), sacroilitis (infectious/inflammatory), chloroma (hematologic), retroperitoneal fibromatosis (miscellaneous).

**GI320-ED-***

**Hepatic Steatosis: The Fickle Finger of Fat**

Station #10

Participants

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Jeffrey Olpin, MD, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

1. Recognize the patterns of fatty liver disease on CT and MRI, as well as the underlying pathophysiology of each. 2. Understand that focal fatty change can mimic, obscure or indicate metastatic disease. 3. Non-invasively differentiate focal fatty change from metastatic disease thereby avoiding unnecessary biopsies, incorrect cancer staging and undue anxiety due to inconclusive imaging studies.

**TABLE OF CONTENTS/OUTLINE**

1) Imaging diagnosis of hepatic steatosis: a) Ultrasound b) Computed tomography c) Magnetic resonance imaging 2) Patterns of fatty liver disease: a) Diffuse b) Lobar/segmental c) Nonsegmental d) Subcapsular e) Perivascular f) Peritumoral g) Nodular

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Maryam Rezvani, MD - 2015 Honored Educator
Akram M. Shaaban, MBBCh - 2015 Honored Educator

**GI026-EB-***

**Diffuse and Multifocal Pancreatic Diseases: Main Morphologic and Functional Imaging Features**

Hardcopy Backboard

Participants

Pietro A. Bonaffini, MD, Monza, Italy (Presenter) Nothing to Disclose
Manuel Patino, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Dushyant V. Sahani, MD, Boston, MA (Abstract Co-Author) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc

TEACHING POINTS

Pancreatic diseases present not only as focal lesions but also with a diffuse involvement or as multiple localizations widespread within the entire gland. They are often incidentally discovered in patients with no specific symptoms or without pancreatic dysfunction and tend to demonstrate imaging features that frequently overlap each other. The main teaching points of this exhibit are: The diagnosis and the management of pathologies with a diffuse involvement of the pancreas mostly rely on the combined evaluation of clinical history, laboratory data and imaging findings (both morphologic and functional techniques). The knowledge of role, contributions and limitations of available imaging techniques in this setting remains mandatory for radiologists and proper patient overview.

**TABLE OF CONTENTS/OUTLINE**
To discuss advantages and pitfalls of morphologic (ultrasound/US, endoscopic US/EUS, multidetector computed tomography/MDCT, magnetic resonance imaging/MRI) and functional (i.e. positron emission tomography/PET) imaging techniques. To briefly report incidence, risk factors, symptoms and laboratory parameters of diffuse pancreatic diseases. To present the main imaging features of diffuse/multifocal pancreatic involvement: inflammatory and autoimmune diseases, infections, neoplastic and infiltrative disorders.

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Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator
PURPOSE
We are developing a computer-aided diagnosis (CAD) scheme for estimating the malignancy grade of hepatocellular carcinoma (HCC) using contrast-enhanced ultrasound (CEUS). In this study, observers estimated the malignancy grade of HCC with and without the cues provided by CAD.

METHOD AND MATERIALS
Informed consent and institutional review board approval were obtained. A total of 232 histologically confirmed cases of HCC were studied; 76 well differentiated (w-HCC), 133 moderately differentiated (m-HCC), and 23 poorly differentiated (p-HCC). In this observer study, CEUS vascular images acquired using the maximum intensity projection technique were displayed together with static B-mode and Kupffer-phase (defined as 10 minutes after injection) images. Five hepatologists independently assigned confidence ratings for the malignancy grade of each HCC. Each hepatologist read each case first without CAD and then immediately afterwards with CAD. The observers' rating data were evaluated by multi-reader multi-case receiver operating characteristic (ROC) analysis.

RESULTS
The overall sensitivity of CAD for discrimination between three histological types of HCC was 87.5% (203/232). For discrimination between w-HCC and m/p-HCC, the mean area under the ROC curve (AUC) for the 5 observers was significantly improved from 0.779±0.074 to 0.872±0.090 with CAD (p=0.0069). For discrimination between w/m-HCC and p-HCC, the mean AUC was also significantly improved from 0.713±0.107 to 0.863±0.101 with CAD (p=0.0321).

CONCLUSION
The use of our CAD scheme can significantly improve the diagnostic performance of hepatologists in discrimination among three histological types of HCC using CEUS.

CLINICAL RELEVANCE/APPLICATION
The CAD improves the ability of hepatologists to make discrimination among three histological types of HCC using CEUS and would be useful for noninvasively assessing the malignancy grade of HCC in personalized medicine.
dose CT (RDCT), low dose CT and ultralow dose CT (ULDCT) were performed. From ULDCT and RDCT, images were reconstructed with MBIR3 and MBIR2 (UL-MBIR3 and UL-MBIR2) and FBP (R-FBP), respectively. Three regions of interest were placed on the liver. The mean CT attenuation of the liver (CT[L]) was calculated. For diagnosing hepatic steatosis, a criteria of CT[L]<48 Hounsfield Unit (HU) was applied to each image, and the result of R-FBP was used as a reference standard.

RESULTS
Dose-length products of RDCT and ULDCT were 422.1 ± 180.3 and 36.5 ± 13.3 mGy·cm, respectively. There was 91% reduction of DLP in ULDCT compared to RDCT. CT[L] of R-FBP, UL-MBIR3 and UL-MBIR2 were 55.7, 56.5 and 53.2 HU, respectively. There were significant differences between R-FBP vs UL-MBIR3 and R-FBP vs UL-MBIR2 (both p<0.01, paired t-test). Using Bland-Altman analyses, the bias (95% confidence interval) of UL-MBIR3 vs R-FBP and UL-MBIR2 vs R-FBP were 0.8 (0.30 to 1.30) and -2.5 (-3.0 to -2.1), respectively. And the limit of agreement (95% confidence interval) of UL-MBIR3 vs R-FBP and UL-MBIR2 vs R-FBP were 4.2 (3.3 to 5.1) and 4.6 (3.6 to 5.6), respectively. Applying diagnostic criteria to R-FBP, 13 patients were diagnosed as hepatic steatosis. The sensitivity, specificity and accuracy in UL-MBIR3/UL-MBIR2 (with p-value, Mc Nemar's test) were 1.00/1.00, 0.986/0.932 (p=0.046) and 0.988/0.942 (p=0.046), respectively, and significant improvements were seen in specificity and accuracy.

CONCLUSION
Diagnostic performance of hepatic steatosis in ultralow-dose CT improved with MBIR3 compared to MBIR2.

CLINICAL RELEVANCE/APPLICATION
Hepatic steatosis can be diagnosed with high specificity and accuracy in ultralow-dose CT reconstructed with MBIR3 compared to MBIR2.

Magnetic Resonance Enterography Score: New Proposal to Asses Crohn's Disease Activity

Participants
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PURPOSE
The aim of the current study is to determine the accuracy of Magnetic Resonance Enterography (MRE) in evaluating Crohn's disease activity identifying associations between clinical score (Harvey Bradshaw Index- HBI), laboratory test (C-reactive protein- CRP) and imaging parameters as well as to assess the potentiality of MR-E to differentiate active from inactive CD using a MRE score of disease activity, making a correlation with HBI and CRP.

METHOD AND MATERIALS
We performed a retrospective study of seventy-seven patients with Crohn Disease. All patients underwent MRE and the images were analyzed for the location and length of the pathological segment (in centimeters), bowel wall thickness (in millimeters), presence of submucosal edema (hyperintensity on T2-weighted sequences), degree and pattern of contrast enhancement of intestinal wall, hyperemia of mesenteric vessels, hypervascular and enlarged (>1 cm) mesenteric lymph nodes, fibro-fatty proliferation and extra-luminal complications. The primary analysis was to determine associations between Magnetic Resonance Enterography parameters, Harvey Bradshaw index and C-reactive protein. Associations were testing using Chi-Squared test. Additional analysis was to elaborate a new Magnetic Resonance Enterography score researching a correlation with clinical and laboratory data. The elaboration of this score was based on the results of associations between C-reactive protein and Magnetic Resonance features. It was considered pathological a Magnetic Resonance Enterography score ≥4.

RESULTS
Significant associations were found between degree of contrast enhancement and C-reactive protein (p=0.009); comb sign and C-reactive protein (p=0.003); fibro-fatty proliferation and Harvey Bradshaw Index (p=0.023). No significant associations were found between other Magnetic Resonance Enterography parameters and C-reactive protein and clinical data. Magnetic Resonance Enterography score for Crohn Disease significantly correlates with CRP (r =0.328; p= 0.005).

CONCLUSION
These results make Magnetic Resonance Enterography score for Crohn Disease a simple, important and useful instrument for evaluation of disease activity according to laboratory data.

CLINICAL RELEVANCE/APPLICATION
This study shows that MRE is not just useful in detecting Crohn's disease but also for the evaluation of disease activity, thus it could give an important contribution to the management of the patients.

Pharmacokinetic Quantification of the Liver Function using Gd-EOB-enhanced DCE-MRI in Patients with Portal Vein Embolization

Participants
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GI394-SD-

Hyperattenuating serosa sign has the potential to further improve the differentiation ability of T4a from T3.

**CLINICAL RELEVANCE/APPLICATION**

The possibility of misdiagnosis of T3 to T4a. Hyperattenuating serosa sign with traditional signs can improve the discrimination performance of T4a from T3, and reduce the negativity of non-embolized vessel blood in embolized and non-embolized materials.

**METHOD AND MATERIALS**

Thirty-three consecutive patients who underwent pre-operative CT scan and clinically diagnosed as cT4a gastric cancer, were enrolled in this retrospective study. Transverse and multiplanar reconstruction images were reviewed in consensus by two radiologists blinded. We hypothesized that the high density outer layer of the gastric wall may be associated with cancer involvement of the serosa, and refer to this sign as hyperattenuating serosa sign. The efficacy of the discrimination of T4a from T3 by traditional CT signs (ie, nodular or irregular outer layer of the gastric wall, or haziness of the perigastric fat) and the traditional parameters, X2=5.107, P=0.038; traditional signs, X2=4.251, P=0.057).

**RESULTS**

The negative predictive value (NPV) for the judgement of serosa invasion by traditional CT signs was 43.8%(7/16), which increased to 68.8% (11/16) after combining with the hyperattenuating serosa sign. The combined parameters outperformed traditional signs in determining the serosa invasion in patients with gastric cancers.

**CONCLUSION**

The hyperattenuating serosa sign of CT is associated with gastric cancer involvement of the serosa. The combination of hyperattenuating serosa sign with traditional signs can improve the discrimination performance of T4a from T3, and reduce the possibility of misdiagnosis of T3 to T4a.

**CLINICAL RELEVANCE/APPLICATION**

Hyperattenuating serosa sign has the potential to further improve the differentiation ability of T4a from T3.

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**PURPOSE**

To evaluate dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) with the liver-specific contrast agent Gd-EOB-DTPA using a mathematical model for noninvasive and spatially resolved determination of liver function parameters. Patients after intervention portal vein embolization (PVE) served as a model for intra-individual differences in liver function. We analyzed and compared the metabolism of arterial and portal venous blood in embolized and non-embolized materials.

**METHOD AND MATERIALS**

MRI-data of five patients 14 days after PVE were acquired at 1.5T (Siemens MAGNETOM Avanto) using a 6-channel body coil and a 6-channel table coil. To record contrast media behavior up to 30 min after bolus injection, a 3D gradient-echo keyhole sequence with a temporal resolution of 3.4s (Siemens, syngo TWIST) was used. Retrospective correction for liver motion was performed. Motion-corrected concentration maps were used to extract the concentration-time curves of ROIs placed in the aorta (CAIF), the portal vein (CPVIF), and the examined liver area (CT). The first compartment represents the sinuses, while the other compartment represents hepatocytes. The simplex optimization algorithm is used to fit the following parameters: overall sinusoidal flow (FG), sinusoidal mean transit time (MTT), hepatic uptake / extraction rate (KI / KE) as well as the compartment volumes (vS / vH).

**RESULTS**

For non-embolized liver areas, mean KI was 5.09 ± 1.18 %/s and mean KE was 0.82 ± 0.32 %/s, MTT was 6.79 ± 1.17 s. Figure 1 shows differences in embolized and non-embolized liver areas after PVE in one patient. In contrast to earlier work on the pharmacokinetic modeling of Gd-EOB, we used both liver inlets for calculations as well as an image acquisition over up to 30 minutes. Additionally, using a two-compartment approach was especially important for proper description of arterial and portal venous phases of contrast medium enhancement.

**CONCLUSION**

The applied mathematical model allows spatially resolved quantification of hepatocyte function via the metabolic rate of Gd-EOB in the liver using data from patients with portal vein embolization. This approach has the potential to enable noninvasive liver function analysis.

**CLINICAL RELEVANCE/APPLICATION**

Gd-EOB-enhanced DCE-MRI using a pharmacological model may be used as an imaging-based liver function test to enable spatially resolved quantification of hepatocyte function.

**GI397-SD-THB5**

Hyperattenuating Serosa Sign on CT in Determining the Serosa Invasion of Gastric Cancers

**Station #5**

**Participants**

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Ying-Shi Sun, MD, PhD, Beijing, China (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

The paragastric inflammatory strands may mimic the cancer infiltration out of the serosa and lead to the overstaging of T3 tumors during the preoperative staging of gastric cancers. The purpose of our study was to evaluate the additional value of hyperattenuating serosa sign on CT in determining the serosa invasion in patients with gastric cancers.

**METHOD AND MATERIALS**

Thirty-three consecutive patients who underwent pre-operative CT scan and clinically diagnosed as cT4a gastric cancer, were enrolled in this retrospective study. Transverse and multiplanar reconstruction images were reviewed in consensus by two radiologists blinded. We hypothesized that the high density outer layer of the gastric wall may be associated with cancer involvement of the serosa, and refer to this sign as hyperattenuating serosa sign. The efficacy of the discrimination of T4a from T3 by traditional CT signs (ie, nodular or irregular outer layer of the gastric wall, or haziness of the perigastric fat) and the traditional CT signs combined with hyperattenuating serosa sign were compared, by means of chi-square test.

**RESULTS**

The negative predictive value (NPV) for the judgement of serosa invasion by traditional CT signs was 43.8%(7/16), which increased to 68.8% (11/16) after combining with the hyperattenuating serosa sign. The combined parameters outperformed traditional signs in the judgment of the serosa invasion (combined parameters, X2=5.107, P=0.038; traditional signs, X2=4.251, P=0.057).

**CONCLUSION**

The hyperattenuating serosa sign of CT is associated with gastric cancer involvement of the serosa. The combination of hyperattenuating serosa sign with traditional signs can improve the discrimination performance of T4a from T3, and reduce the possibility of misdiagnosis of T3 to T4a.

**CLINICAL RELEVANCE/APPLICATION**

Hyperattenuating serosa sign has the potential to further improve the differentiation ability of T4a from T3.

**GI394-SD-**

The Prognostic Significance of Extramural Vascular Invasion Detected by Contrast-enhanced Multiple-
Comparison of CAIPIRINHA-VIBE, Radial-VIBE, and Conventional VIBE Sequences for Dynamic Contrast-enhanced (DCE) MRI at 3.0T: A Validation Study using a DCE-MRI Phantom

Participants
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In Seong Kim, PhD, SEOUL, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

METHOD AND MATERIALS
Using a DCE-MRI phantom containing 28 tubes filled with NiCl2 solutions of various concentrations, six minutes of dynamic series and T1-mapping with variable flip angle methods were acquired using conventional-VIBE, Radial-VIBE, and CAIPIRINHA-VIBE sequences on 3.0-T scanners. Signal stability and signal linearity were tested for dynamic series and the precision of R1 values were tested for T1-mapping series. The scans were repeatedly performed at two weeks and three months to test repeatability/reproducibility, assessed by within-subject coefficient of variation (WSCV).

RESULTS
Signal stability of dynamic series was excellent in all three sequences, in that sequential signal intensities were stable over six minutes. Regarding the signal linearity between the signal intensity and the R1 value in dynamic series, CAIPIRINHA-VIBE demonstrated the highest linear correlation (correlation coefficient r =0.963), followed by conventional-VIBE (r =0.959) and Radial-VIBE (r =0.953). Regarding the R1 precision assessed by correlation between known R1 values of phantom and measured R1 values on T1-mapping sequences, CAIPIRINHA-VIBE (r =0.985) was the most accurate method, followed by conventional-VIBE (r =0.861) and Radial-VIBE (r =0.442). CAIPIRINHA-VIBE showed excellent repeatability/reproducibility (WSCV, 1.79-6.71%) compared with Radial-VIBE (WSCV, 2.04-67.2%) and conventional-VIBE (WSCV, 3.4-31.9%).

CONCLUSION
Using a phantom, we intended to validate protocols of the radial acquisition of volumetric interpolated breath hold examination (Radial-VIBE) and the controlled aliasing in parallel imaging results in higher acceleration (CAIPIRINHA-VIBE) sequences for dynamic contrast-enhanced MRI (DCE-MRI) by comparing them to conventional-VIBE sequence.
CONCLUSION

In terms of signal stability, signal linearity, R1 precision, and their repeatability/reproducibility, CAIPIRINHA-VIBE demonstrated outstanding performance for DCE-MRI compared with Radial-VIBE and conventional-VIBE.

CLINICAL RELEVANCE/APPLICATION

CAIPIRINHA-VIBE is a robust sequence to be used in DCE-MRI in light of excellent signal stability, signal linearity, R1 precision, and repeatability/reproducibility in the phantom study.

Hepatobiliary Agent Technique: Maximizing Image Quality

Station #8

Awards

Certificate of Merit

Participants
Nicholas C. Monu, MD, Providence, RI (Presenter) Nothing to Disclose
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Claude B. Sirin, MD, San Diego, CA (Abstract Co-Author) Research Grant, General Electric Company; Speakers Bureau, Bayer AG; Consultant, Bayer AG; ;
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TEACHING POINTS

Hepatobiliary agents present many advantages over traditional extracellular contrast agents; however, specific technical challenges may hinder optimal acquisition in practice. Adjustments need to be made to existing liver MRI protocols to achieve best results.

TABLE OF CONTENTS/OUTLINE

- Available agents, dosing, injection rates, protocol design/efficiency
- Hepatobiliary phase imaging: Definition, contribution to image interpretation, pitfalls
- Adequacy Determinants Assessment Image optimization Flip angle Spatial resolution Breath-hold versus navigated techniques. Co-localization with other sequences.

Hepatic Arteriportal Shunts (APS): A Comprehensive Review of Mechanisms, Causes, Types, Imaging Features, and Differential Diagnosis

Station #9

Awards

Identified for RadioGraphics

Participants
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Mark Tann, MD, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose
Kumaresan Sandrasegaran, MD, Carmel, IN (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

1. Learn causes of hepatic arteriportal shunts and their various mechanisms.2. Learn the imaging appearance of various types of hepatic arteriportal shunts. 3. Learn how to differentiate hepatic arteriportal shunts from their mimics.

TABLE OF CONTENTS/OUTLINE

- Review the mechanism of hepatic arteriportal shunts: trans-vasal, trans-sinusoidal, trans-plexal, trans-tumoral, and post-injury.2. Review the various causes of hepatic arteriportal shunts.3. Discuss the various types of hepatic arteriportal shunts and the corresponding CT and MR imaging manifestations.4. Discuss the common mimics and differential diagnosis.5. Discuss the role of imaging management and follow-up.

Honored Educators

Participants
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Fatih Akisik, MD - 2014 Honored Educator
Temel Tirkes, MD - 2014 Honored Educator
Kumaresan Sandrasegaran, MD - 2014 Honored Educator

MRI of the Liver and Biliary System: Choosing the Appropriate Contrast Agent

Station #10

Participants
TEACHING POINTS

- Recognize that there are multiple different choices of intravenous contrast available when performing hepatobiliary MR imaging.
- Become familiar with the properties and MR imaging appearance of extracellular contrast agents and hepatobiliary agents, gadobenate dimeglumine (Gd-BOPTA) or gadoxetic acid (Gd-EOB-DTPA), when imaging the liver and biliary system.
- Know the appropriate usage of extracellular contrast agents in multiple different clinical scenarios, e.g. liver lesion detection, confirmation of a hemangioma identified at ultrasound or CT, routine metastatic workup, diagnosis and staging of primary liver cancers including HCC and cholangiocarcinoma, assessment of vessel patency, assessment of tumor response after loco-regional therapy.
- Know the appropriate usage of hepatobiliary agents in a myriad of different clinical scenarios, e.g. HCC surveillance in cirrhotic patients, evaluation of extent of hepatic metastatic disease, differentiation of FNH vs. hepatocellular adenoma, biliary anatomy and bile leak.

TABLE OF CONTENTS/OUTLINE

- Background of available MR contrast agents for imaging the liver
- Clinical indications for utilizing an extracellular contrast agent
- Clinical indications for utilizing a hepatobiliary contrast agent
- Case examples
- Decision tree for choosing the appropriate contrast agent

Awards
Certificate of Merit

Participants
Andrea Prochowski Iamurri, MD, Boston, MA (Presenter) Nothing to Disclose
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Dushyant V. Sahani, MD, Boston, MA (Abstract Co-Author) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc
Avinash R. Kambadakone, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is:
1. To discuss the technique and protocols for DECT of the liver
2. To review the clinical applications of DECT in the liver with illustrative examples
3. To discuss the potential pitfalls and challenges in successful incorporation of DECT liver into clinical practice

TABLE OF CONTENTS/OUTLINE

1. Technical features and principles of DECT with particular focus to liver imaging
2. Different vendor solutions for DECT
3. DECT Protocols for liver imaging tailored to indications
4. Current and emerging clinical applications of DECT in liver
5. Potential pitfalls and challenges in DECT liver imaging in clinical practice
6. Impact of DECT on clinical workflow and patient care

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator
Case-based Review of the Abdomen (An Interactive Session)

Thursday, Dec. 3 1:30PM - 3:00PM Location: S406A

**LEARNING OBJECTIVES**

1) To review a series of clinically relevant, abdominal imaging cases, with audience participation. 2) To review important concepts and potential pitfalls of: the liver on sonography; the acute abdomen on US, CT, and MR; liver transplants on multi-modality imaging; genitourinary imaging; and trauma imaging 3) To provide take home points for the audience based on specific actual case material which was instructional or problematic for the presenters.

**ABSTRACT**

**Sub-Events**

**MSCA51A**  Hepatic Tumor Imaging

Participants
Puneet Bhargava, MD, Shoreline, WA (Presenter) Editor, Reed Elsevier

**LEARNING OBJECTIVES**

1) Review imaging appearances of common hepatic tumors. 2) Review key imaging findings that aid in differential diagnosis.

**ABSTRACT**

**Honored Educators**

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Puneet Bhargava, MD - 2015 Honored Educator

**MSCA51B**  Abdominal Trauma Imaging

Participants
Savvas Nicolaou, MD, Vancouver, BC (Presenter) Institutional research agreement, Siemens AG

**LEARNING OBJECTIVES**

1) Review the technique and protocols, with an emphasis on MDCT, for imaging of blunt and penetrating abdominal and pelvic trauma. 2) Demonstrate examples of the spectrum of injuries and the accompanying management associated with abdominal trauma, including hepatic and hepatobiliary (gallbladder) injuries, bowel and mesenteric injuries, and pelvic injuries including bladder and vascular injuries. 3) Demonstrate significance of arterial and portal venous phase imaging in the setting blunt abdominal and pelvic trauma, and the utility of whole body imaging. 4) Review new imaging applications and techniques such as iterative reconstruction and dual-energy CT, which can help better image abdominal and pelvic injuries post-trauma.

**ABSTRACT**

**MSCA51C**  Acute Abdomen Imaging

Participants
Stephan W. Anderson, MD, Boston, MA (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) The participant will be exposed to the current literature related to imaging of acute abdominal pain using CT. 2) The participant will be able to apply an evidence-based approach to CT protocol development in the imaging of acute abdominal pain. 3) The participant will be able to independently evaluate the published literature in this area in a critical fashion and continue to apply recent developments to their own practice.
Interventional Oncology Series: Management of Hepatic Metastases from Colorectal Cancer and Neuroendocrine Tumors

Thursday, Dec. 3 1:30PM - 6:00PM Location: S405AB

AMA PRA Category 1 Credits™: 4.25
ARRT Category A+ Credits: 5.00

FDA Discussions may include off-label uses.

Participants
Sarah B. White, MD, MS, Philadelphia, PA (sbwhite@mcw.edu) (Moderator) Nothing to Disclose

ABSTRACT

Sub-Events

VSIO51-01 Setting the Stage: NCCN/ESMO Guidelines for mCRC

Thursday, Dec. 3 1:30PM - 1:45PM Location: S405AB

Participants
Mary F. Mulcahy, MD, Chicago, IL (Presenter) Nothing to Disclose

VSIO51-02 Advances in the Surgical Toolbox for Colorectal Liver Metastases

Thursday, Dec. 3 1:45PM - 2:00PM Location: S405AB

Participants
Kiran Turaga, Milwaukee, WI (Presenter) Speakers Bureau, Caris Life Sciences; Consultant, Johnson & Johnson

LEARNING OBJECTIVES

1) To identify the role and timing of surgical resection of metastatic colorectal cancer in improving survival of patients. 2) To identify potential pitfalls and risks in implementing surgical resection with regional therapies to the liver. 3) To understand the evolving role of hepatic arterial infusional therapy in the management of patients with unresectable CRLM.

VSIO51-03 Colorectal Liver Metastases: To Ablate or not to Ablate?

Thursday, Dec. 3 2:00PM - 2:15PM Location: S405AB

Participants
David A. Woodrum, MD, PhD, Rochester, MN (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the role of ablation for colorectal metastases. 2) To identify which patients may be the best candidates for ablation. 3) To review the advantages/disadvantages of the liver ablation technologies.

ABSTRACT

Colorectal cancer is ranked fourth in cancer occurrence and second in cancer death in the West. Somewhere between 50-70% of these patients will develop liver metastases throughout their course. Locoregional thermal ablative therapies are important treatment options for liver metastases, achieving good short-term outcomes with low morbidity. This review summarizes the current evidence for the using liver ablation techniques with colorectal metastases and summarizes which patient population may benefit the most.

VSIO51-04 K-ras Mutation is Associated with a Shorter Overall Survival after RF Ablation of Colorectal Liver Metastases

Thursday, Dec. 3 2:15PM - 2:25PM Location: S405AB

Participants
Waleed Shady, MBCh, New York, NY (Presenter) Nothing to Disclose
Vlassios S. Sotrichos, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Elena N. Petre, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Etay Ziv, MD, PhD, New York, NY (Abstract Co-Author) Nothing to Disclose
Jeremy C. Durack, MD, New York, NY (Abstract Co-Author) Scientific Advisory Board, Adient Medical Inc Investor, Adient Medical Inc
Constantinos T. Sofocleous, MD, PhD, New York, NY (Abstract Co-Author) Consultant, Sirtex Medical Ltd
Stephen B. Solomon, MD, NY (Abstract Co-Author) Research Grant, General Electric Company
Efsevia Vakiani, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Mithat Gonen, PhD, New York, NY (Abstract Co-Author) Nothing to Disclose
Rona D. Yaeger, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Nancy Kemeny, MD, New York, NY (Abstract Co-Author) Nothing to Disclose

PURPOSE

To describe the incidence and patterns of genetic marker mutations, and to evaluate their potential prognostic value on local tumor progression (LTP)-free and overall survival (OS) after RFA of colorectal cancer liver metastases (CLM).
METHOD AND MATERIALS

We performed an IRB approved retrospective review of a HIPPA compliant clinical ablation database for patients with CLM treated with RFA between December 2002 and December 2012. Only patients with available genetic testing profiles were included. Genetic profiles were obtained by mass-spectrometry based sequenom assay of surgical/biopsy specimens obtained from primary/metastatic sites. Genes analyzed for mutations included: (1) K-ras, (2) K-ras and BRAF, or (3) an 8 gene panel (K-ras, N-ras, BRAF, PIK3CA, Akt1, MEK1, ERBB2, and EGFR). Kaplan-Meier methodology was used to calculate LTP-free and OS rates. The log-rank test was used to evaluate the prognostic value of genetic marker mutations.

RESULTS

This study enrolled 90 patients with 139 CLM. Median tumor size was 1.7 cm (range: 0.6-5 cm). The median follow-up was 52 months. Results for the mutation status were available for K-ras in all patients, for BRAF in 58 patients, and for the 8 genes in 23 patients. K-ras was mutated in 40% of patients (36/90), BRAF in 7% (4/58), PIK3CA in 17% (4/23), N-ras in 9% (2/23), and no mutations were observed for the other genes. There was a trend towards shorter median OS in patients with mutated genes; K-ras (29 months versus 46 months), BRAF (22 months versus 53 months), PIK3CA (22 months versus 51 months), N-ras (8 months versus 51 months). Statistical significance was only reached for K-ras (P=0.037) and N-ras (P=0.001), but not for BRAF (P=0.18) and PIK3CA (P=0.8). There was no difference in the LTP-rates with mutations of K-ras 46% (22/48) versus 42% (38/90) (P=0.26), BRAF 33% (2/6) versus 39% (43/88) (P=0.69), PIK3CA 0% (0/5) versus 39% (15/38) (P=0.16), or N-ras 50% (1/2) versus 34% 14/41 (P=0.17). There was a trend towards shorter LTP-free survival with K-ras mutations; median of 26 months versus 37 months.

CONCLUSION

Mutations of K-ras and N-ras are associated with a shorter overall survival after RFA of CLM. Mutations of K-ras are associated with a shorter LTP-free survival, although LTP rate was not statistically different.

CLINICAL RELEVANCE/APPLICATION

K-ras mutant patients require more strict follow-up and could benefit from adjuvant chemotherapy after RFA of CLM.

VS1051-05 Palliative Embolotherapy: New Technology, New Promises?

Thursday, Dec. 3 2:25PM - 2:40PM Location: S405AB

Participants

Tobias F. Jakobs, MD, Munich, Germany, (tobias.jakobs@barmherzige-muenchen.de) (Presenter) Speaker, Sirtex Medical Ltd; Research Consultant, Sirtex Medical Ltd; Speaker, Siemens AG; Speaker, Terumo Corporation; Speaker, Surefire Medical, Inc; Speaker, BTG International Ltd

LEARNING OBJECTIVES

1) Indications for palliative embolotherapy.2) Results of palliative embolization in mCRC patients.3) Products and devices for embolotherapy.

ABSTRACT

Embolisation has become an accepted modality of cancer treatment in patients with a variety of clinical scenarios. It is commonly used in clinical practice in the treatment of hepatocellular carcinoma, hepatic metastases from colorectal and breast cancer and neuroendocrine tumors. This review summarizes the current evidence for the efficacy of embolotherapy in mCRC patients, together with the associated complications and future options.

VS1051-06 A Gene Signature to Predict Tumor Response to Hepatic Arterial Embolization

Thursday, Dec. 3 2:40PM - 2:50PM Location: S405AB

Participants

Etay Ziv, MD,PhD, New York, NY (Presenter) Nothing to Disclose
Elena N. Petre, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Stephen B. Solomon, MD, New York, NY (Abstract Co-Author) Research Grant, General Electric Company
Franz E. Boas, MD,PhD, New York, NY (Abstract Co-Author) Co-founder, ClarPACS
Karen T. Brown, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Joseph P. Erinjeri, MD, PhD, New York, NY (Abstract Co-Author) Nothing to Disclose

PURPOSE

To identify a gene mutation signature that may potentially be used to predict tumor response to hepatic arterial embolization.

METHOD AND MATERIALS

We performed a retrospective review to identify patients who have undergone bland hepatic arterial embolization for the treatment of primary liver cancer or liver metastases that also had available a panel of genetic testing results--specifically, an assay that identifies mutations in any of 341 'druggable' genes by sequencing tumor samples and comparing with germline mutations. A total of 10 patients were identified whose biopsy specimens were recovered either prior to or after embolization of the liver tumors. Of the ten patients identified, half demonstrated either complete response or partial response post-embolization (two of these were HCC patients). The rest were categorized as non-responders. A principal component analysis demonstrates that much of the variance in the data can be summarized by the two groups (responders and non-responders), and that the second principal component may predict tumor response to embolization (see Figure 1). The top genes contributing to this principal component are involved in cross-talk between the Wnt/B-catenin signaling pathway and hypoxia signaling pathway (see Table 1).
CONCLUSION

A gene mutation signature suggests that tumor response to embolization may be predicted by the underlying mutation profile of the tumor and moreover, suggests a central role for the involvement of hypoxia and Wnt/B-catenin signaling pathways.

CLINICAL RELEVANCE/APPLICATION

A gene signature that can predict tumor response to embolization may be used to better stratify patients as well as potentially broaden the scope of embolization to liver metastases not traditionally treated by this procedure.

VSIO51-07 Delayed-arterial Phase Cone-Beam CT Improves the Visibility of Liver Metastasis during Intra-arterial Therapy

Thursday, Dec. 3 2:50PM - 3:00PM Location: S405AB

Participants
Ruediger E. Schermenthaner, MD, Vienna, Austria (Presenter) Nothing to Disclose
Reham R. Haroun, Salt Lake City, UT (Abstract Co-Author) Nothing to Disclose
Rafael Duran, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Howard Lee, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Sonia P. Sahu, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Jae Ho Sohn, MD, MS, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Julius Chapiero, MD, Berlin, Germany (Abstract Co-Author) Nothing to Disclose
Yan Zhao, MS, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Boris Gorodetski, Baltimore, MD (Abstract Co-Author) Nothing to Disclose
Florian N. Fleckenstein, MS, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Susanne Smolka, New Haven, CT (Abstract Co-Author) Nothing to Disclose
Ming De Lin, PhD, Cambridge, MA (Abstract Co-Author) Employee, Koninklijke Philips NV
Alessandro G. Radaelli, PhD, MS, Best, Netherlands (Abstract Co-Author) Employee, Koninklijke Philips NV
Martijn Van Der Bom, MSC, Andover, MA (Abstract Co-Author) Employee, Koninklijke Philips NV
Jean-Francois H. Geschwind, MD, Westport, CT (Abstract Co-Author) Researcher, BTG International Ltd; Consultant, BTG International Ltd; Researcher, Koninklijke Philips NV; Consultant, Koninklijke Philips NV; Researcher, Guerbet SA; Consultant, Guerbet SA; Consultant, Terumo Corporation; Consultant, Threshold Pharmaceuticals, Inc; Consultant, PreScience Labs, LLC; Researcher, Boston Scientific Corporation; Consultant, Boston Scientific Corporation

PURPOSE

Improved visibility of liver metastasis during intra-arterial therapy (IAT) could improve tumor targeting. The purpose of this study was to compare the visibility of liver metastasis on dual-phase cone-beam CT (DP-CBCT) and digital subtraction angiography (DSA), with reference to pre-interventional contrast-enhanced magnetic resonance imaging (CE-MRI) of the liver.

METHOD AND MATERIALS

Of 416 patients with liver metastasis treated with IAT between January 2010 and October 2014 at our institution, 15, 10 and 3 patients with neuroendocrine, colorectal and sarcoma liver metastasis (NELM, CRCLM and SLM), respectively, had intra-procedural DP-CBCT and were included in this retrospective study. DP-CBCT was acquired after a single injection of contrast agent in the tumor-feeding arteries at an early and delayed arterial phases (EAP and DAP). The visibility of each lesion was graded by two radiologists in consensus on a three rank scale (complete, partial and none) on DP-CBCT and DSA images when compared to CE-MRI. McNemar's test was used.

RESULTS

47 NELM, 45 CRCLM and 16 SLM lesions were included. On DSA, 59.6%, 15.6% and 18.8% of NELM, CRCLM and SLM lesions were completely depicted, respectively. Complete depiction rate on EAP-CBCT was significantly higher for CRCLM (44.4%; p<0.001), but significantly lower for NELM (40.4%; p=0.049) and similar for SLM (25%, p=1.0). On DAP-CBCT however, the highest rates of complete depiction were found - NELM (97.1%), CRCLM (91.1%) and SLM (100%), all p<0.001. Complete or partial depiction was achieved on DSA for 85.1%, 42.2% and 37.5% of NELM, CRCLM and SLM, respectively. EAP-CBCT yielded significantly higher sensitivities of 84.4% and 87.5% for CRCLM and SLM, respectively (p<0.02), but not for NELM (89.4%; p=0.625). DAP-CBCT again demonstrated the highest sensitivity at 100%, 95.6% and 100% for NELM, CRCLM and SLM, respectively (p<0.002). In summary, out of 108 metastatic liver lesions, 106 (98.1%) were at least partially depicted and only 2 (1.9%) CRCLM could not be identified on DAP-CBCT. In contrast, 43 (39.8%) lesions could not be identified on DSA.

CONCLUSION

DAP-CBCT significantly improves the visibility of liver metastasis during IAT and should be used as standard intra-procedural imaging technique.

CLINICAL RELEVANCE/APPLICATION

Improved visibility of metastatic liver lesions facilitates a more selective treatment to reduce non-target embolization without missing some lesions occult on DSA.

VSIO51-08 mCRC Tumor Board

Thursday, Dec. 3 3:00PM - 3:30PM Location: S405AB

Participants
Michael C. Soulen, MD, Philadelphia, PA (Presenter) Royalties, Cambridge University Press; Consultant, Guerbet SA; Research support, Guerbet SA; Consultant, BTG International Ltd; Research support, BTG International Ltd; Consultant, Merit Medical Systems, Inc; Speaker, Sirtex Medical Ltd
Sarah B. White, MD, MS, Philadelphia, PA, (sbwhite@mcw.edu) (Presenter) Nothing to Disclose
Mary F. Mulcahy, MD, Chicago, IL (Presenter) Nothing to Disclose
Kiran Duragia, Milwaukee, WI (Presenter) Speakers Bureau, Caris Life Sciences; Consultant, Johnson & Johnson
David A. Woodrum, MD, PhD, Rochester, MN (Presenter) Nothing to Disclose
Tobias F. Jakobs, MD, Munich, Germany, (tobias.jakobs@barmherzige-muenchen.de) (Presenter) Speaker, Sirtex Medical Ltd;
**Learning Objectives**

**Abstract**

**VSIO51-09 Setting the Stage mNET**

Thursday, Dec. 3 3:40PM - 3:55PM Location: S405AB

Participants

Emily Bergsland, MD, San Francisco, CA (Presenter) Research funding, Novartis AG Research support, F. Hoffmann-La Roche Ltd Consultant, Pfizer Inc Consultant, Lexicon Pharmaceuticals, Inc Consultant, Novartis AG

**Learning Objectives**

1) Review the epidemiology and classification of gastroenteropancreatic neuroendocrine tumors (GEPNETs).
2) Discuss the role of somatostatin analogs for the treatment of GEPNETs.
3) Summarize the current systemic treatment options for metastatic GEPNETs.
4) Examine commonly applied treatment algorithms for advanced GEPNETs.

**Abstract**

**VSIO51-10 Aggressive Surgical Management in mNET**

Thursday, Dec. 3 3:55PM - 4:10PM Location: S405AB

Participants

Robert E. Roses, MD, Philadelphia, PA (Presenter) Nothing to Disclose

**Learning Objectives**

1) Discuss the role of liver resection or ablation in the multidisciplinary management of neuroendocrine tumors.

**Abstract**

The management of neuroendocrine tumors has evolved considerably in recent years with the introduction of new systemic and local therapies. Surgery remains an important component of therapy. Indications for surgery for primary tumors and metastases as well nuances of therapy sequencing and multidisciplinary decision making will be discussed.

**VSIO51-11 Imaging Biomarkers of Tumor Response in Neuroendocrine Liver Metastases Treated with Intraarterial Therapy: Can Whole Liver Response Patterns Predict Patient Survival?**

Thursday, Dec. 3 4:10PM - 4:20PM Location: S405AB

Participants

Sonia P. Sahu, New Haven, CT (Presenter) Nothing to Disclose

Ruediger E. Schernthaner, MD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose

Julius Chapiro, MD, Berlin, Germany (Abstract Co-Author) Nothing to Disclose

Jae Ho Sohn, MS, Baltimore, MD (Abstract Co-Author) Nothing to Disclose

Yan Zhao, MS, Baltimore, MD (Abstract Co-Author) Nothing to Disclose

Florian N. Fleckenstein, MS, New Haven, CT (Abstract Co-Author) Nothing to Disclose

Ming De Lin, PhD, Cambridge, MA (Abstract Co-Author) Employee, Koninklijke Philips NV

Jean-Francois H. Geschwind, MD, Westport, CT (Abstract Co-Author) Researcher, BTG International Ltd; Consultant, BTG International Ltd; Consultant, Koninklijke Philips NV; Consultant, Guerbet SA; Consultant, Terumo Corporation; Consultant, Threshold Pharmaceuticals, Inc; Consultant, PreScience Labs, LLC; Researcher, Boston Scientific Corporation; Consultant, Boston Scientific Corporation

Rafael Duran, MD, Baltimore, MD (Abstract Co-Author) Nothing to Disclose

**Purpose**

Neuroendocrine liver metastases (NELM) usually appear diffuse and bi-lobar. However, conventional therapy response assessments (WHO, RECIST, mRECIST, and EASL) are lesion-based and thus challenging to implement in NELM patients. We propose a new approach that uses 3D liver segmentation to assess the total enhancing tumor volume (ETV). The purpose of this study was to investigate whether changes in ETV on contrast-enhanced T1 weighted MRI could be an early biomarker for survival after the first transarterial chemoembolization (TACE).

**Method and Materials**

This retrospective study included 51 patients (men: 28; median age: 58.3 years) with diffuse bi-lobar NELM who underwent MRI 3-6 weeks before and after the first TACE. Using prototype semi-automatic 3D software, two independent readers segmented the whole liver, placed a 1 cm³ region of interest (ROI) in healthy liver parenchyma, and measured the ETV in the arterial phase. Enhancement was defined as >2 standard deviations the average intensity of the ROI. Intraclass correlation (ICC) assessed inter-reader agreement. Paired t-test compared the ETV before and after TACE. If ETV decreased by ≥ 50%, patients were classified as responders. Survival analysis included Kaplan-Meier curves with the log-rank test and Cox-proportional hazards modeling. Baseline characteristics that were statistically significant on univariate analysis were adjusted for in the multivariate model.

**Results**

Mean ETV decreased significantly after TACE from 1432.6 to 826.6 cm³ (p <0.01) and 20 (39.2%) patients were classified as responders. Responders had a significantly better prognosis than non-responders, with a median overall survival of 84.3 vs. 16.7 months, respectively (p<0.01). In univariate analysis, response was a significant predictor of survival (HR: 0.15, 95% CI: 0.06-0.39) and in the multivariate model adjusted for ECOG ≥1, portal vein thrombosis and extrahepatic disease, response was the only significant covariate (HR: 0.21, 95% CI: 0.08-0.60). Inter-reader agreement was high before and after TACE (ICC 0.999, 95% CI: 0.998-0.999 and ICC 0.998, 95% CI: 0.997-0.999, respectively).
**CONCLUSION**

Changes in the total enhancing tumor volume can identify NELM patients who will experience prolonged survival as early as 1 month after TACE.

**CLINICAL RELEVANCE/APPLICATION**

Total enhancing tumor volume in 3D is recommended as an early imaging biomarker for survival in NELM patients treated with TACE.

**VSI051-12 Intra-arterial Therapies of GEP-NET: Techniques and Indications**

Thursday, Dec. 3 4:20PM - 4:35PM Location: S405AB

Participants
Thierry J. De Baere, MD, Villejuif, France (Presenter) Consultant, Terumo Corporation; Speaker, Medtronic, Inc; Consultant, General Electric Company; Consultant, Guerbet SA;

**LEARNING OBJECTIVES**

1) To understand particular natural history of NET metastases and indication for local therapies. 2) To know intra-arterial therapies available for NET inclusion bland embolization, TACE and radioembolization. 3) To know published results on efficacy of intra-arterial therapies on NET liver metastases. 4) To know about possible complications of intra-arterial therapies on NET liver metastases.

**ABSTRACT**

gastro-entero pancreatic-neuroendocrine tumors (GEP-NET) from small intestine and pancreas are most common cause of NET liver metastases. Grade 1 (carcinoid / < 2 mitoses / 10 microscopic fields and Ki-67 < 2%) and grade 2 (well- differentiated / 2 to 20 mitoses and Ki-67 from 3 to 20%) (1) are potential candidate for liver directed therapies where G3 carcinoma are candidate for systemic treatment (2). For secretory syndrome, liver directed therapies are second line treatment after somatostatin analogs. For control of tumor growth, liver directed therapies are used upon progression or for large tumor burden. Intra-arterial therapies combine occlusion of the tumor feeders, with or without chemotherapy or radiation therapy including trans-arterial chemoembolization (TACE), trans-arterial embolization (TAE), and radioembolization (RE). GEP NET liver metastases are usually bilobar and two sessions of treatment will be delivered sequentially 4-8 weeks apart to each lobes. If the tumors are in small number, hyper-selective will be delivered. Patients with >75% of liver involvement must be treated a few segments of liver at once, and will require several sessions.Contraindications includes liver insufficiency, obstructive jaundice, biliaryenteric anastomoses, portal vein thrombosis and renal insufficiency (3). In biloenteric anastomoses or portal vein thrombosis RE could be an interesting alternative in early reports (4). TACE using Lipiodol used for more than 20 years provides 52-86 % response on the secretory syndrome for over 12 months (5, 6). OS has a median of 38.6 months (33-55 months for non-pancreatic-NET and 23-43 months for pancreatic-NET) (7-9). Our recent unpublished data highlight a median OS of 70 months, with no radiation-induced liver disease (10). Grade 3 or higher adverse events were fatigue (6.5%), nausea (3.2%), pain (2.7%), and ascites (0.5%).

**VSI051-13 Y-90-4mNET**

Thursday, Dec. 3 4:35PM - 4:50PM Location: S405AB

Participants
Steven C. Rose, MD, San Diego, CA (Presenter) Stockholder, Sirtex Medical Ltd; Proctor, Sirtex Medical Ltd; Scientific Advisory Board, Surefire Medical, Inc; Consultant, Surefire Medical, Inc; Consultant, Embolx, Inc

**VSI051-14 SW43-DOX Loaded DEB-TACE, a Potential New Drug Delivery Platform - An in Vitro Evaluation**

Thursday, Dec. 3 4:50PM - 5:00PM Location: S405AB

Participants
Johannes M. Ludwig, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Yongkang Gai, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Sun Lingyi, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Dexing Zeng, Pittsburgh, PA (Abstract Co-Author) Nothing to Disclose
Hyun S. Kim, MD, Atlanta, GA (Abstract Co-Author) Nothing to Disclose

**RESULTS**

Fluorescence Microscopy showed specific binding of SW43-DOX-Cy3 in Panc-1, HT-29 & HEPG2 cells. Panc-1 cells showed a specific uptake of SW43-DOX-Lu177 at 5h (0.83 nmol/mg prot.), which increased to 1.36 and 1.21 nmol/mg prot. at 5h and 3h (p<0.01) respectively. Compared to DOX, SW43-DOX demonstrated significantly superior viability reduction (at least p<.01 for all comparison) of PANc-1 of cells treated with DOX or SW43-DOX: 98.7% vs. 64% (25μM DOX) and 88.3% vs. 33.3% (50μM DOX) after 6h; 46.6% vs. 30.6% (25μM) and 39.5% vs. 5.3% (50μM) after 24 h and 15% vs. 2.9% (25μM) and 9.5% vs. 0.54% (50μM) after 48 h. Results from HEPG2, besides 25 μM (6h) & 50 μM (48h), and HT-29 cells also proved statistical superiority of SW43-DOX over DOX (p<0.01). Loading on DEB was 95% within 24h.

**VSI051-15 Theranostic Approaches to the Management of Neuroendocrine Tumors**

Thursday, Dec. 3 5:00PM - 5:15PM Location: S405AB

Participants
Chaitanya Dvigi, MD, New York, NY (Presenter) Nothing to Disclose

**VSI051-16 Intra-arterial Therapy in Liver Metastases: The 5 Best Papers of the Past Year?**
LEARNING OBJECTIVES

1) To comprehend 5 interesting papers of the last year on intrarterial therapies of liver metastasis. 2) To update the evidence on mCRC intrarterial therapies. 3) To discuss the best laboratory research paper on the topic. 4) To discuss the largest published series on Y90 radioembolization outcome in mCRC. 5) To update the intrarterial therapies in mNET.

mNET Tumor Board
Hot Topic Session: Cancer Screening: Breast Tomosynthesis, CT Colonography, Lung Cancer

Thursday, Dec. 3 3:00PM - 4:00PM Location: E451A

Participants
Paul P. Cronin, MD, MS, Ann Arbor, MI (Moderator) Nothing to Disclose

Sub-Events

SPSH55A Imaging in Breast Cancer Screening

Participants
Elizabeth S. Burnside, MD, MPH, Madison, WI (Presenter) Stockholder, NeuWave Medical Inc

LEARNING OBJECTIVES
1) To review the foundation and evolution of scientific investigation that supports evidence-based breast cancer screening.
2) To critically evaluate the methodologies currently being used to construct screening guidelines.
3) To understand the outcomes by which successful screening programs are measured.
4) To review and assess the current controversies of breast cancer screening.

ABSTRACT

URL

SPSH55B Imaging in Lung Cancer Screening

Participants
Ella A. Kazerooni, MD, Ann Arbor, MI (Presenter) Nothing to Disclose

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/

Ella A. Kazerooni, MD - 2014 Honored Educator

SPSH55C Imaging in Colon Cancer Screening

Participants
David H. Kim, MD, Madison, WI (Presenter) Consultant, Viatronix, Inc; Co-founder, VirtuoCTC, LLC; Medical Advisory Board, Digital ArtForms, Inc; Stockholder, Cellectar Biosciences, Inc

LEARNING OBJECTIVES
1) Be able to compare/contrast image-based screening by CT colonography (CTC) against the other screening options for colorectal cancer.
2) Be familiar with the major trials that establish the performance profile of CTC.
3) Understand the rationale for the selective polypectomy strategy at CT colonography.
Case-based Review of the Abdomen (An Interactive Session)

Thursday, Dec. 3 3:30PM - 5:00PM Location: S406A

LEARNING OBJECTIVES

1) To review a series of clinically relevant, abdominal imaging cases, with audience participation. 2) To review important concepts and potential pitfalls of: the liver on sonography; the acute abdomen on US, CT, and MR; liver transplants on multi-modality imaging; genitourinary imaging; and trauma imaging. 3) To provide take home points for the audience based on specific actual case material which was instructional or problematic for the presenters.

ABSTRACT

Sub-Events

MSCA52A  Abdominal Transplant Imaging

Participants
Matthew T. Heller, MD, Pittsburgh, PA, (hellermt@upmc.edu) (Presenter) Consultant, Reed Elsevier; Author, Reed Elsevier

LEARNING OBJECTIVES

1) Describe normal post-operative imaging of liver transplantation. 2) Categorize the complications of liver transplantation and summarize common imaging findings. 3) Integrate the role of imaging in the treatment plan of the transplant patient.

ABSTRACT

Active Handout: Matthew Thomas Heller


MSCA52B  Adrenal Imaging

Participants
Julie H. Song, MD, Providence, RI, (jsong2@lifespan.org) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the imaging appearances of common adrenal masses and review uncommon lesions. 2) Understand the principles of imaging characterization of adrenal masses and apply imaging tools appropriately. 3) Learn to avoid pitfalls and misdiagnoses of adrenal lesions.

MSCA52C  Hepatic Sonography: Pearls and Pitfalls

Participants
Terry S. Desser, MD, Stanford, CA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Correctly identify common and uncommon sonographic pathology in the liver. 2) Use your understanding of basic sonographic and physiologic principles to infer the correct diagnosis in unusual ultrasound cases.

Active Handout: Terry S. Desser

**Participants**

**Sub-Events**

**RC709A**  **Cholangiocarcinoma**

Participants
Kartik S. Jhaveri, MD, Toronto, ON (Presenter) Speaker, Bayer AG

**LEARNING OBJECTIVES**

1) Review Diagnosis and Mimics of Cholangiocarcinoma. 2) Discuss Classification and Imaging Appearances of Cholangiocarcinoma. 3) Highlight Role of Imaging in Staging and Resectability Evaluation of Cholangiocarcinoma.

**ABSTRACT**

**RC709B**  **Benign Biliary Disease**

Participants
Ivan Pedrosa, MD, Dallas, TX (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Demonstrate the MRI findings in common and uncommon benign biliary disease. 2) Convey available MRI techniques and protocols for evaluation of benign biliary disease. 3) Illustrate common pitfalls that can mimic benign biliary disease.

**Active Handout:** Ivan Pedrosa

**RC709C**  **Biliary Post-op Complications**

Participants
Chandana G. Lall, MD, Orange, CA (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Understand underlying mechanism of iatrogenic biliary injury. 2) Review of biliary anatomy: Anatomic variants which may predispose to injury. 3) MR Imaging features of iatrogenic biliary injury. 4) Classification of biliary injuries. 5) Role of hepatobiliary agents in workup of biliary injury.

**ABSTRACT**


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Chandana G. Lall, MD - 2013 Honored Educator

**RC709D**  **Biliary Cases I Missed**

Participants
John P. McGahan, MD, Sacramento, CA (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) To familiarize the audience with common imaging pitfalls when evaluating the biliary system. 2) To help the audience avoid common mistakes when evaluating the biliary tract with either MRI or CT. 3) To demonstrate to the audience what devastating consequences that may occur when suggesting a specific wrong diagnosis.
Participants

LEARNING OBJECTIVES

Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

Sub-Events

RC713A  Fetal Ear and Orbital Anomalies

Participants
Maria A. Calvo-Garcia, MD, Cincinnati, OH (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify major fetal external ear and orbital malformations. 2) Apply useful search patterns during US and fetal MRI evaluation of external ear and orbital anomalies.

ABSTRACT

Assessment of the fetal face is an important part of the sonographic structural survey. Craniofacial abnormalities occur as an isolated phenomenon or in the context of syndromes, chromosomal abnormalities or environmental insults. Along the course of this presentation we will review the standard facial anatomic survey with US and the main embryologic steps involved in the development of the face. Subsequently we will discuss major malformations involving the external ear and orbits and their expected association. The presentation will include clinical cases evaluated with US and fetal MRI and their postnatal correlations.

RC713B  Fetal Chest Anomalies

Participants
Teresa Victoria, MD, PhD, Philadelphia, PA, (victoria@email.chop.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To discuss the most common fetal lung masses. 2) To identify imaging algorithms and patterns that can be helpful in reaching a diagnosis.

ABSTRACT

Accurate diagnosis of fetal lung lesions is crucial for appropriate counseling and management of the abnormalities in hand. During the lecture, the normal appearance of the fetal chest will be briefly done, in order to approach a review of the most common pulmonary lesions encountered during the fetal period. Diagnostic clues that will guide accurate diagnosis will be discussed. Rare lung lesions and their imaging diagnostic approach will also be discussed.

RC713C  Fetal GI Anomalies

Participants
Erika Rubesova, MD, Stanford, CA (Presenter) Researcher, Siemens AG

LEARNING OBJECTIVES

1) After the presentation, the learners should be able to recognize the normal appearance of developing fetal bowel, as well as the most common and uncommon presentations of congenital bowel anomalies on ultrasound and MRI. They will become familiar with the specific information provided by each of the two modalities. The course will present a review of bowel anomalies of the fetus and will be illustrated by representative cases with the objective for the learners to understand the systematic approach of image analysis that can lead to the accurate diagnosis or limited list of differential diagnoses.

ABSTRACT

Diagnosis of fetal bowel anomalies usually presents on ultrasound as bowel dilatation or echogenic bowel. Echogenic bowel is associated with multiple other congenital conditions such as chromosomal anomalies, viral infections or cystic fibrosis. Dilatation of bowel may have various etiologies and systematic review of the findings including bowel wall thickening, number of distended bowel loops or the increased echogenicity of the content may help to localize bowel obstruction and narrow the list of differential diagnosis. Fetal MRI adds precious information to the ultrasound thanks the larger field of view, better tissue contrast but mainly thanks to high T1 signal intensity of meconium. Meconium is formed in the entire bowel and accumulates in the rectum that acts as a reservoir. While meconium is seen in the small bowel and colon in the second trimester, it is mainly seen in the fetal colon after 30 weeks of gestational age. Meconium acts as intraluminal contrast, similar to a barium enema. Systematic review of the distribution of meconium and analysis of the bowel caliber in comparison to normal values for gestational age helps to establish or narrow the list of differential diagnoses of fetal gastrointestinal abnormalities. In this presentation, we will review the advantages and limitations of ultrasound and MRI for diagnosis of fetal anomalies, we will discuss and illustrate, by representative cases, the approach to the most common and some more rare or atypical congenital bowel anomalies on ultrasound and MRI, in order to establish a single or short list of differential diagnoses.
Handout: Erika Rubesova

consider novel tracers of tumor biology (e.g. hypoxia, proliferation, apoptosis) beyond the commonly used radiotracers. In this
section, technical and clinical concepts will be described to design and deliver personalized radiotherapy in the abdomen. Technical concepts will include incorporation of multi-modality imaging for treatment planning, image guidance at treatment, and functional and anatomical adaptation. Clinical concepts will include functional targeting, clinical goals, and toxicity risks.

**ABSTRACT**

The use of imaging and other biomarkers to increase the efficacy of treatment and decrease the risk of toxicity increased in the abdomen. Functional imaging and serum-based biomarkers can enable a more detailed understanding of the tumor, its characteristics, and early indications of its response to therapy. In addition, they can also be utilized to assess an individual patient's risk for toxicity, enabling a personalized approach to radiotherapy. These advanced imaging techniques can be combined with anatomical information to generate high precision treatment plans which can be adapted over the course of treatment to account for identified uncertainties, changes, and deviations which may compromise the delivery of the intended treatment or identify the ability to re-optimize treatment to improve the therapeutic ratio. In this session, technical and clinical concepts will be described to design and deliver personalized radiotherapy in the abdomen. Technical concepts will include incorporation of multi-modality imaging for treatment planning, image guidance at treatment, and functional and anatomical adaptation. Clinical concepts will include functional targeting, clinical goals, and toxicity risks.

**LEARNING OBJECTIVES**

1) Describe the processes necessary for the safe and accurate integration of multi-modality imaging for treatment planning. 2) Understand the role of image guidance for abdominal radiotherapy. 3) Illustrate methods to perform functional and anatomical adaptation in the abdomen.

**ABSTRACT**

The use of imaging and other biomarkers to increase the efficacy of treatment and decrease the risk of toxicity increased in the abdomen. Functional imaging and serum-based biomarkers can enable a more detailed understanding of the tumor, its characteristics, and early indications of its response to therapy. In addition, they can also be utilized to assess an individual patient's risk for toxicity, enabling a personalized approach to radiotherapy. These advanced imaging techniques can be combined with anatomical information to generate high precision treatment plans which can be adapted over the course of treatment to account for identified uncertainties, changes, and deviations which may compromise the delivery of the intended treatment or identify the ability to re-optimize treatment to improve the therapeutic ratio. In this session, technical and clinical concepts will be described to design and deliver personalized radiotherapy in the abdomen. Technical concepts will include incorporation of multi-modality imaging for treatment planning, image guidance at treatment, and functional and anatomical adaptation. Clinical concepts will include functional targeting, clinical goals, and toxicity risks.

**LEARNING OBJECTIVES**

1) Review methods to obtain, process and analyze tissue and serum based biomarkers for abdominal tumors. 2) Describe current dose/fractionation regimens as well as normal tissue constraints utilized in treating abdominal tumors. 3) Explain potential advantages of assessing treatment response with MRI and quantitative PET/SPECT (PERCIST) imaging over CT based response (RECIST) in abdominal tumors.

**ABSTRACT**

In order to deliver personalized radiation therapy in abdominal tumors, it is important to understand the methods used to obtain, analyze, and interpret serum and tissue based biomarkers. Most research to date has focused on identifying specific biomarkers used to personalize systemic or targeted therapies. Radiation-specific biomarkers are emerging and may eventually be used to determine whether radiation is indicated or identify specific radiation sensitizers for use in abdominal tumors. Radiation therapy planning has historically used computed tomography (CT)-based imaging. Molecular imaging using hybrid positron emission tomography (PET)/CT scanning or single-photon emission computed tomography (SPECT) imaging and functional magnetic resonance imaging (MRI) has provided new insights into the precise identification of gross tumor volume (GTV) and clinical tumor volume (CTV) and has provided response information during and after therapy. The effective use of PET/SPECT and MRI in clinical practice, however, requires an appreciation of the unique challenges inherent to these modalities. Fundamental physical issues of limited spatial resolution relative to the biological process, partial volume effects, image misregistration, motion management, and edge delineation must be carefully considered and can differ by agent or the method applied. Integration of PET/SPECT and MRI imaging into multicenter clinical trials and clinical practice can be particularly challenging due to differences in imaging protocols, machines, and anatomy. Imaging protocols that clearly outline scan and fusion parameters are crucial. Further, interpretation of tumor response should be standardized, and scans should be obtained at consistent time intervals. In addition, it is important to consider novel tracers of tumor biology (e.g. hypoxia, proliferation, apoptosis) beyond the commonly used radiotracers. In this
session, we will discuss these applications and challenges as well as provide guidance on how to integrate PET/SPECT/MRI into radiation treatment planning and assessing treatment response. Finally, we will evaluate common dose and fractionation regimens as well as established dose constraints used in treating abdominal tumors with conventional and stereotactic body radiation therapy.
Participants

LEARNING OBJECTIVES

Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

Sub-Events

RC729A  **Systematic Approach to Pancreatic Cancer**

Participants
Elizabeth M. Hecht, MD, New York, NY, (eh2560@cumc.columbia.edu)  **(Presenter)** Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss a systematic approach to diagnosing and staging pancreatic cancer and discuss template reporting for preoperative planning. 2) Discuss potential mimics and pitfalls related to diagnosis and staging of solid pancreatic neoplasms

ABSTRACT

Treatment of pancreas cancer requires a multidisciplinary approach. Imaging interpretation and reports play a critical role in managing patients with pancreatic pathology. Accurate staging of pancreatic neoplasms is paramount to determining management and imaging plays a central role in stratifying patients for treatment. The goal of surgery is to achieve resection margins free of tumor to maximize survival benefit. Unnecessary surgery and accompanying morbidity need be minimized in patients with no added survival benefit from resection. Structured reporting and standardized terminology enhances communication with the clinic team and imparts key elements into a diagnostic report that will help determine appropriate management.

Active Handout: Elizabeth M. Hecht


RC729B  **Pancreatic Cyst: A Multidisciplinary Approach to Diagnosis and Management**

Participants
Ihab R. Kamel, MD, PhD, Baltimore, MD  **(Presenter)** Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the imaging features of pancreatic cysts and the impact of multidisciplinary approach to diagnosis and management.

ABSTRACT

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Ihab R. Kamel, MD, PhD - 2015 Honored Educator

RC729C  **The Inflamed Pancreas: Pearls and Perils**

Participants
Koenraad J. Mortele, MD, Boston, MA  **(Presenter)** Nothing to Disclose

LEARNING OBJECTIVES

1) To review the imaging features of a vast array of inflammatory conditions that may involve the pancreas.
Pitfalls in Liver Imaging

Thursday, Dec. 3 4:30PM - 6:00PM Location: E451B

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50

LEARNING OBJECTIVES
1) Describe most commonly encountered imaging pitfalls of the liver. 2) Describe relevant technical background, pathophysiology and hemodynamics of these pitfalls. 3) List tips to avoid erroneous diagnosis and clues to reach correct diagnosis.

ABSTRACT
There is a wide range of common pitfalls in liver imaging, which can lead to frequent incorrect diagnoses mainly because many radiologists are not completely familiar with anatomical, morphological, physiological, hemodynamic and biological principles as well as deficiency of modern clinical and radiological knowledge. This leads to common misinterpretations which would further result in wrong management with potentially negative outcome. In this course, we discuss a spectrum of these pitfalls according to the following organization:

1. Diagnostic pitfalls
   a. Mistaking benign lesions for malignant lesions
   b. Mistaking malignant lesions for benign lesions
2. Technical pitfalls
   a. CT, US, MR specific issues that create difficulties in diagnosis
   b. Technique pitfalls
3. Organizing pitfalls by liver status
   a. Pitfalls in imaging chronic liver disease (cirrhosis)
   b. Pitfalls in noncirrhotic liver
4. Atypical presentations of common benign lesions
5. Atypical presentations of common malignant lesions
6. Organization according to imaging findings

URL
Sub-Events

Participants
Khaled M. Elsayes, MD, Ann Arbor, MI (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.

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Khaled M. Elsayes, MD - 2014 Honored Educator
Participants

Sub-Events

**RC808A Pitfalls in Right Upper Quadrant Ultrasound**

Participants
Mindy M. Horrow, MD, Philadelphia, PA (horrowm@einstein.edu) (Presenter) Spouse, Director, Merck & Co, Inc

LEARNING OBJECTIVES

1) Describe technical factors that may improve visualization of cholelithiasis including appropriate frequency transducer and identification of gallbladder neck. 2) Identify non biliary causes of gallbladder wall thickening. 3) Recognize causes for non-visualization of a fluid filled gallbladder and how to differentiate the gallbladder from other fluid filled structures in the right upper quadrant. 4) Describe situations in which color Doppler is essential to detect renal causes of right upper quadrant pain.

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Mindy M. Horrow, MD - 2013 Honored Educator

**RC808B Pediatric Abdominal Ultrasound Pitfalls**

Participants
Susan D. John, MD, Houston, TX (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Use optimal protocols for performing abdominal US in infants and children. 2) Avoid diagnostic errors in pediatric gastrointestinal US caused by common artifacts and variables in exam performance. 3) Recognize variations in pathology and important secondary findings that are helpful for the diagnosis of acute or emergent conditions in the pediatric abdomen.

**ABSTRACT**

**RC808C Non-obstetrical Gynecologic Ultrasound Pitfalls**

Participants
Ana P. Lourenco, MD, Providence, RI (alourenco@lifespan.org) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize commonly encountered gynecological ultrasound pitfalls. 2) Describe strategies to avoid these pitfalls.

**ABSTRACT**

This session will review common pitfalls encountered in gynecologic ultrasound and highlight strategies for avoiding such pitfalls. Case-based presentations will illustrate the varied presentations of ovarian torsion, non-gynecologic etiologies for acute pelvic pain including ureteral calculi and acute appendicitis, and a variety of uterine, ovarian and adnexal abnormalities. The benefits and limitations of transabdominal and transvaginal imaging, as well as color Doppler, will be highlighted with examples to demonstrate the utility of each technique.

Active Handout: Ana P. Lourenco

**RC808D First Trimester Ultrasound Pitfalls**

Participants
Mariam Moshiri, MD, Seattle, WA (Presenter) Consultant, Reed Elsevier; Author, Reed Elsevier

LEARNING OBJECTIVES

1) To review the relatively recent report of the Society of Radiologists in Ultrasound, on new ultrasound criteria for evaluation of first trimester pregnancy. 2) To demonstrate potential pitfalls of sonographic performance and interpretation in the first trimester of pregnancy, and to discuss how to avoid them. 3) To review other relevant, very recent literature on first trimester pregnancy ultrasound performance and interpretation.
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Mariam Moshiri, MD - 2013 Honored Educator
Mariam Moshiri, MD - 2015 Honored Educator
Abdomen Radiographs and GI Fluoroscopy: Don't Bury 'em Yet!

Friday, Dec. 4 8:30AM - 10:00AM Location: N230

Participants
Sub-Events

**RC809A Abdomen Radiographs: Just an Annoyance Before the CT, Right?**

Participants
David J. DiSantis, MD, Lexington, KY, (djdisantis@gmail.com) (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**
1) List the innate 'contrast materials' present in abdomen radiographs. 2) Use those cues to identify pathology.

**ABSTRACT**
Millions of abdomen radiographs still are performed yearly in the United States. If viewed in a more than perfunctory manner, they can reveal a spectrum of abnormalities. This presentation offers a fresh approach to ferreting out the clues to pathology hidden in the lowly KUB.

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David J. DiSantis, MD - 2014 Honored Educator

**RC809B Esophagography 2015: What You Need to Know**

Participants
Laura R. Carucci, MD, Midlothian, VA, (lcarucci@vcu.edu) (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**
1) Discuss the continuing importance of fluoroscopic evaluation of the esophagus. 2) Describe examination techniques for the esophagus. 3) Review the radiologic diagnosis of pathologic conditions involving the esophagus including functional and structural abnormalities.

**ABSTRACT**
Despite an overall trend towards a decreasing number of fluoroscopic procedures performed, the number of esophagography studies has proportionally increased in recent years. Fluoroscopic evaluation remains the primary modality for evaluating the esophagus. Radiologists should be able to perform and interpret esophagography studies. A spectrum of functional and structural abnormalities that may affect the esophagus will be discussed.

**RC809C Fluoro Eyes Only: Role of Fluoroscopy in the Colon**

Participants
Christine O. Menias, MD, Scottsdale, AZ, (menias.christine@mayo.edu) (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**
1) Discuss the role of plain film, fluoroscopy and CT in the evaluation of colonic pathology. 2) Review the radiographic, fluoroscopic imaging features of a spectrum of colonic pathologies, with CT correlation. 3) Review the fluoroscopic appearance of complications in the post-operative colon.

**ABSTRACT**
Despite the overall trend of the decreasing number of fluoroscopic screening studies of the colon, fluoroscopic evaluation of the colon is often requested in the post-operative or obstructed patient. Understanding the common surgical appearance of the post-operative colon, becomes important for the radiologist who is asked to evaluate for complications. Common surgical procedures as well as their complications will be discussed. In addition, a spectrum of entities that result in distal colonic obstruction will be discussed.

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LEARNING OBJECTIVES

1) To discuss essentials in the performance of fluoroscopic examinations of the postoperative gastrointestinal tract to: a. prevent complications, b. insure a diagnostic examination, c. avoid technical and interpretive pitfalls.

ABSTRACT

Despite advances in endoscopy and cross sectional imaging, fluoroscopic examinations of the postoperative GI tract has remained essential. Rationale for its performance are: 1. to detect complications in the early (<4 weeks) or late (>4 weeks) post operative periods, 2. to assess the efficacy of the surgical procedure, and 3. to define anatomy and establish a baseline. A brief review of commonly performed surgical procedures will be given to insure understanding of the altered anatomy to insure complete anatomic coverage and enable performance of a 'tailored' diagnostic examination designed to answer clinical questions to guide management of the post surgical patient. Knowledge of the essentials on what contrast agents to use, how it should be administered and radiographic considerations (views/positioning) are emphasized to avoid procedure related complications and avoid pitfalls.
Acute Abdominal Vascular Diseases (An Interactive Session)

Friday, Dec. 4 8:30AM - 10:00AM Location: E353B

LEARNING OBJECTIVES

1) Review the epidemiology of symptomatic aortic branch dissections. 2) Explain the pathophysiology of side branch malperfusion syndromes in acute aortic dissection. 3) Present the spectrum of imaging findings in spontaneous aortic branch dissections, including the differential diagnosis (vasculitis, connective tissue diseases, fibromuscular dysplasia, segmental arterial mediolysis).

ABSTRACT

Dissections of aortic side branches is a common complication of Type A and Type B acute aortic dissection which substantially increases mortality. It is important to understand the pathophysiology and the two principle mechanisms of side branch malperfusion in aortic dissection: flow obstruction can be due to (A) local abnormalities, such as occlusive dissection flaps, blind ending false lumen with true lumen occlusion ('windsock'), or frank thrombosis. Side-branch malperfusion may also occur due to (B) limited inflow: The classic situation is complete true lumen collapse in the upstream aorta, resulting in underperfusion of all downstream branches supplied by the true lumen. While local obstructions are most commonly treated by stent placement into the diseased side branch, inflow-lesions typically require surgical or endovascular repair of the upstream aorta. Spontaneous dissections of the celiac, mesenteric, or renal arteries are relatively rare events, and typically present with acute abdominal or flank pain. Dissections of side branch arteries can lead to ischemic complications or to frank rupture with intra- or retroperitoneal hemorrhage. Patients presenting with mesenteric or renal artery dissection require a thorough workup to identify genetic disorders (notably Ehlers Danlos IV), inflammatory conditions (vasculitis), and other entities such as fibromuscular dysplasia and segmental arterial mediolysis (SAM). Imaging findings range from non-obstructive lesions such as intramural hematomas, double-barrel lumen, to partial or complete obstruction ('windsock'). Complications include rupture or ischemia. Spontaneous dissections may heal, or evolve into aortic branch aneurysms.

Symptomatic Aneurysms

Symptomatic aneurysms cover the spectrum of arterial aneurysms presenting with a) localized symptoms secondary to aneurysm expansion and possible rupture b) regional symptoms secondary to dissection and embolism and c) systemic cardiovascular dysfunction related to hypotension and organ dysfunction. Common clinical scenarios include aneurysm rupture - most commonly abdominal aortic, popliteal and abdominal visceral aneurysms as well as thoracoabdominal aortic dissection. Symptomatic aneurysms may also occur in patients with known arterial pathology including connective tissue disorders such as Marfan's and Ehlers-Danlos syndrome, and Takayasu aortitis/arteritis. Patients with suspected rupture of abdominal aortic or ileofemoropopliteal artery aneurysms may initially be evaluated by sonography. However, in all circumstances, CT angiography due to its robust implementation and high-resolution imaging of the vasculature and regional anatomy that allows for planning of endovascular and surgical intervention is the preferred technique. CT Angiographic protocols appropriate to the suspected anatomic location of the aneurysm that provide an adequate roadmap for endovascular or surgical intervention are employed. Extended coverage is particularly important in patients with suspected thoracoabdominal aortic dissection or aneurysms associated with peripheral embolism. Cardiac gating should be utilized in any patient with a suspected Type A aortic dissection or rupture of an ascending aortic aneurysm. Aortic, cardiac and coronary artery imaging are integral to the evaluation and management of these patients. A particular subset of the "symptomatic aneurysm" is post-trauma aortic disruption, usually thoracic in which diagnosis of traumatic aneurysm is critical and the aneurysm is associated with additional sites of soft tissue and skeletal trauma. Guidelines for endovascular or surgical intervention or non invasive management with serial CT Angiographic imaging will be discussed.

Mesenteric Ischemia

1) Discuss the various categories of mesenteric ischemia (arterial occlusive, embolic, venous thrombotic, and nonocclusive), and the pathophysiologic basis behind the imaging findings in each case. 2) Understand the basis behind modern CT protocols for mesenteric ischemia, particularly the biphasic examination with CT mesenteric angiography. 3) Demonstrate techniques to rapidly analyze a mesenteric CT angiographic dataset. 4) Review the CT signs of mesenteric ischemia and their sensitivity and specificity.
5) Evaluate the current literature on mesenteric ischemia and discuss optimal diagnostic criteria.

ABSTRACT

Acute mesenteric ischemia (AMI) is a life-threatening condition said to affect up to 1% of patients presenting with an acute abdomen, and it carries a mortality rate ranging between 59-93% in the published literature. Time to diagnosis and surgical treatment are the only factors which have been shown to improve mortality, and evidence shows that the clear test of choice for AMI is now biphasic CT. Water is preferably administered as a negative contrast agent, followed by CT mesenteric angiography and then a portal venous phase exam. Diagnostic accuracy is significantly improved by analysis of the CT angiogram for arterial stenoses or occlusions, evidence of emboli, or angiographic criteria of nonocclusive ischemia. It is the use of CT angiography in addition to routine portal phase imaging which has pushed the sensitivity and specificity of the test to >90% in recent published articles. Other nonangiographic CT findings that are relatively specific for AMI in the appropriate clinical setting include pneumatosis intestinals, portal or mesenteric venous gas or thrombosis, and decreased bowel wall enhancement. Bowel wall thickening, mesenteric stranding, ascites, and mucosal hyperenhancement are more nonspecific findings which may also be seen. Nonocclusive schema may be the most difficult form to diagnose, and findings of shock abdomen can aid in identification. Knowledge of the patient’s clinical history is critical not only for the selection of an appropriate study protocol but also for interpretation of the imaging findings in context.

RC812D Gastrointestinal Bleeding

Participants
Jorge A. Soto, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To review the appropriate implementation of CT angiography in the evaluation of patients presenting with acute lower intestinal bleeding. 2) To describe the technical details that are necessary for acquiring good quality CT angiography examinations. 3) Illustrate the characteristic CT angiographic findings of active or recent bleeding with specific examples of multiple etiologies.

ABSTRACT

Acute gastrointestinal bleeding is a serious condition that may threaten a patient’s life depending on the severity and duration of the event. Precise identification of the location, source and cause of bleeding are the primary objectives of the diagnostic evaluation. Implementation of colonoscopy in the emergency setting poses multiple challenges, especially the inability to adequately cleanse the colon and poor visualization owing to the presence of intraluminal blood clots. Scintigraphy with technetium 99m-labeled red blood cells is highly sensitive but also has some limitations, such as the inability to precisely localize the source of bleeding and determine its cause. Properly performed and interpreted CT angiography examinations offer logistical and diagnostic advantages in the detection of active hemorrhage. A three-phase examination (non-contrast, arterial and portal venous) is typically performed. Potential technical and interpretation pitfalls should be considered and will be explained. The information derived from CT angiography helps direct therapy and select the most appropriate hemostatic intervention (when necessary): endoscopic, angiographic, or surgical. Precise anatomic localization of the bleeding point also allows a targeted endovascular embolization. The high diagnostic performance of CT angiography makes this test a good alternative for the initial emergent evaluation of patients with acute lower intestinal bleeding.

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Jorge A. Soto, MD - 2013 Honored Educator
Jorge A. Soto, MD - 2014 Honored Educator
Jorge A. Soto, MD - 2015 Honored Educator
Interventional Series: Complications in Interventional Oncology-Avoidance and Damage Control

Participants
Charles E. Ray JR, MD, PhD, Chicago, IL, (chary@uic.edu) (Moderator) Advisory Board, Novate Medical Ltd; Editor, Thieme Medical Publishers, Inc.; Robert J. Lewandowski, MD, Chicago, IL (Moderator) Advisory Board, BTG International Ltd; Advisory Board, Boston Scientific Corporation; Consultant, Cook Group Incorporated; Consultant, ABK Medical Inc

LEARNING OBJECTIVES
1) List 2 important recent publications in interventional oncology. 2) Explain the mechanism of one complication related to thermal ablation. 3) Describe 1 pitfall of radioembolization. 4) Outline 3 complications in combination therapy for hepatocellular carcinoma. 5) List three complications of chemo-embolization.

ABSTRACT

ChemoFilter is a novel medical device that limits systemic toxicity of chemotherapeutics by filtering non-target drug from blood that could be described as intra-vascular dialysis. This method has a potential to prevent toxicity associated with treatment of head and neck cancer, such as renal failure associated with cisplatin. We report a novel method to bind chemotherapeutics in blood that uses immobilized DNA as a platform for binding chemotherapeutics with intrinsic DNA binding activity.

METHOD AND MATERIALS
DNA binding experiments were carried out in vitro with doxorubicin in PBS solution. Genomic DNA was used to determine the concentration of DNA that shows optimum binding kinetics. Binding kinetics in nylon mesh of different pore size was evaluated.

RESULTS
DNA binding kinetics by doxorubicin is dose dependent and is very rapid with 94% decrease in drug concentration from solution within 1 minute of reaction time. DNA demonstrates faster binding kinetics by doxorubicin as compared to previously published polystyrene resin that uses ion exchange to filter doxorubicin out of the solution. DNA sequestered within the Nylon mesh demonstrates approximately 70% decrease in doxorubicin concentration from solution within 5 minutes.

CONCLUSION
DNA ChemoFilter demonstrates rapid binding of doxorubicin and is a model for filtration of DNA binding chemotherapeutics from the bloodstream.

CLINICAL RELEVANCE/APPLICATION
DNA ChemoFilter is optimized for DNA intercalating chemotherapeutics and minimizes their systemic toxicity after intra-arterial administration for treatment of liver and head and neck malignancies.
RC814-03  Repeated Transarterial Chemoocclusion with Degradable Starch Microspheres (DSMs-TACO) of Unresectable Hepatocellular Carcinoma: A Single Center Experience

Participants
Francesco Somma, MD, Napoli, Italy (Presenter) Nothing to Disclose
Antonio Orlacchio, MD, Rome, Italy (Abstract Co-Author) Nothing to Disclose
Gianluca Gatta, Naples, Italy (Abstract Co-Author) Nothing to Disclose
Francesco Fiore, MD, Naples, Italy (Abstract Co-Author) Nothing to Disclose
Giovanni Pecoraro, Napoli, Italy (Abstract Co-Author) Nothing to Disclose

PURPOSE
To evaluate the efficacy and safety of trans-arterialchemo-occlusion (TACO) using Degradable-Starch-Microspheres (DSMs) for unresectable hepatocellular carcinoma (HCC) treatment.

METHOD AND MATERIALS
We prospectively enrolled 28 HCC cirrhotic patients (23/5 M/F, mean age 66.3±10.5 years), to be treated with three repeated DSMs-TACO procedures (225 mg of DSMs, Embocept®, PharmaCept and Doxorubicin Cloridrate, 50 mg/m2), performed at 4-6 week intervals. Patients were clinically evaluated before and after each procedure and disease severity scored according to Child Pugh and MELD scores. Treatment response was assessed by CT-scan 4 weeks after each procedure, according to mRECIST criteria.

RESULTS
Complete response (CR) was observed in 6 (20.8%), 11 (37.5%) and 14 (58.3%) patients after the first, second and third procedure, respectively. At the end of the treatment course all patients experienced at least a partial response. Patients with monolobar disease (16/28; 57.1%) showed higher CR rates after the first procedure compared to those with bilobar HCC (6 vs 0, p=0.017). No differences between mono or bi-lobar disease were observed in CR (64.2% vs 50%; p=ns). Eight patients (33.3%) did not complete the planned repeated procedures. In most cases treatment discontinuation was due to worsening liver function, mainly in patients with more advanced liver disease.

CONCLUSION
DSMs-TACO offers a valid therapeutic option in patients with unresectable HCC. A careful patients selection is required in order to avoid worsening liver function in patients with border-line liver compensation. Further investigations to establish the best treatment schedule and to define the effect of DSMs-TACO on survival are required.

CLINICAL RELEVANCE/APPLICATION
Temporary embolization of the hepatic artery using DSMs is feasible and safe in patients with HCC and an impaired liver function.

RC814-04  Locoregional Treatment of Advanced HCC with Complete Portal Vein Thrombosis: The Impact of Radioembolization Using 90Y

Participants
Fabrizio Chegai, MD, Rome, Italy (Presenter) Nothing to Disclose
Antonio Orlacchio, MD, Rome, Italy (Abstract Co-Author) Nothing to Disclose
Stefano Merolla, Rome, Italy (Abstract Co-Author) Nothing to Disclose
Laura Greco, Roma, Italy (Abstract Co-Author) Nothing to Disclose
Elisa Costanzo, Rome, Italy (Abstract Co-Author) Nothing to Disclose
Giovanni Simonetti, MD, Rome, Italy (Abstract Co-Author) Nothing to Disclose

PURPOSE
Our purpose is to assess effectiveness and safety of Trans-arterial Radioembolization (TARE) using microspheres containing 90Y in case of advanced HCC with thrombosis of both portal branches.

METHOD AND MATERIALS
Between March 2010 and March 2013, 41 TARE were performed in 33 patients with unresectable HCC and bilirubine values up to 2.8 mg/dl. Among these, 23 had one portal branch thrombosis and 11 had thrombosis of both portal branches. Multislice Computed Tomography (MSCT) scans and angiography were used to assess the baseline burden and the follow-up studies according to the modified RECIST guideline. Some patients underwent the embolization of the Gastro-duodenal artery, using micro-coils. In these cases, a previous study was performed with the injection of TC-99MAA through a 3F microcatheter. Proton-Pump Inhibitors (PPI) were administered to prevent gastritis and ulcers.

RESULTS
The average dose administered was 1.8GBq. After the treatment, a post-embolization syndrome was found in 31/41 patients with no statistically significant difference between patients with portal thrombosis and those without. According to the RECIST guideline at least a partial response was found in 33/41 (79%) of cases three months after the procedure and in 35/41 (88%) at nine months. At two-year follow-up, patients with thrombosis of two portal branches presented survival rates similar to patients with one portal branch thrombosis, and only slightly inferior if compared to patients without thrombosis. Moreover, a retraction of portal vein thrombosis was registered in more than 60% of patients with thrombosis (21/34).

CONCLUSION
TARE showed to be a safe and effective locoregional treatment of locally advanced HCC, even in case of patients with portal vein thrombosis. Indeed, it does not worsen the post-embolization symptoms, while helping retracting portal vein thrombosis if present. Therefore, this condition not only has no impact on TARE, but represents an indication, even in case of thrombosis of both portal branches.
**CLINICAL RELEVANCE/APPLICATION**

If compared to patients without thrombosis, TARE in patients with HCC and portal thrombosis does not reduce the post-treatment quality of life. Thrombosis of both portal branches does not interfere with TARE, and represents one of its major indications in case of locally advanced unresectable HCC, even in case of recurrence after other locoregional treatments.

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**RC814-05 Irreversible Electroporation (IRE) of Malignant Liver Tumors Close to Major Portal or Hepatic Veins Does not Influence Perfusion of Hepatic or Portal Veins but Can Result in Bile Duct Strictures**

Friday, Dec. 4 9:15AM - 9:25AM Location: N228

- **Participants**
  - Martina Distelmaier, Aachen, Germany (Presenter) Nothing to Disclose
  - Alexandra Barabasch, MD, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
  - Nils A. Kraemer, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
  - Philipp Heil, Aachen, Germany (Abstract Co-Author) Nothing to Disclose
  - Christiane K. Kuhl, MD, Bonn, Germany (Abstract Co-Author) Nothing to Disclose
  - Philipp Bruners, MD, Aachen, Germany (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

IRE has been proposed as a non-thermal ablation method that offers specific advantages over thermal ablation, notably absence of heat sink effect and preservation of both, blood vessels and bile ducts. The purpose of our study was to verify the theoretical advantages of IRE by systematically investigating clinical efficacy and complications of percutaneous IRE for hepatic malignancies located immediately adjacent to major portal and bile ducts or hepatic veins. We were specifically interested in the long-term patency of adjacent venous and biliary vessels.

**METHOD AND MATERIALS**

CT-guided percutaneous IRE of 37 primary or secondary liver malignancies (mean size 17 mm; range 7-44 mm) was performed in 27 patients (mean age 59 y; 13 men). All lesions were located immediately adjacent to major hepatic veins (n=16), portal vein branches or both (n=21) and therefore not suitable for RFA or MWA. Per standard IRE protocol, 3 to 5 probes (active tip length 1.5-2.5 cm) were placed strictly parallel under CT-guidance. All patients underwent systematic follow-up by CT or MRI.

**RESULTS**

No major procedure-related complications were observed. All adjacent major portal or hepatic veins remained perfused even at long term follow-up. Complete ablation of the target was achieved in 34/37 (92%) cases with a safety margin of 5-10 mm, confirmed by CT and MRI. In 9 cases (24%) local recurrences within or adjacent to the ablation zone were observed between 1-12 months after treatment. 5 patients with tumors located next to portal veins/ bile ducts (5/21=24%) developed mild to moderate segmental/lobar cholestasis, not requiring treatment. In one patient a clinically asymptomatic arterio-portal fistula developed.

**CONCLUSION**

IRE for primary and secondary liver malignancies located adjacent to large portal or hepatic veins proved to be safe and effective with regards to local control, and will leave venous blood vessels unaffected. Bile duct strictures may, however, occur, in up to 25% of lesions located close to portal structures.

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**RC814-06 Y-90 Complications**

Friday, Dec. 4 9:25AM - 9:40AM Location: N228

- **Participants**
  - Robert J. Lewandowski, MD, Chicago, IL (Presenter) Advisory Board, BTG International Ltd; Advisory Board, Boston Scientific Corporation; Consultant, Cook Group Incorporated; Consultant, ABK Medical Inc

**ABSTRACT**

Not applicable.
Learning Objectives

View learning objectives under main course title.

Abstract

Not applicable.

RC814-09  Incidence of Tumor Seeding after Percutaneous Radiofrequency Ablation of Hepatocellular Carcinoma: A Six Year Experience in 581 Nodules in 305 Consecutive Patients

Friday, Dec. 4 10:25AM - 10:35AM Location: N228

Participants
Sornrach Thamtorawat, MD, Los Angeles, CA (Presenter) Nothing to Disclose
Steven S. Raman, MD, Santa Monica, CA (Abstract Co-Author) Nothing to Disclose
Justin P. McWilliams, MD, Santa Monica, CA (Abstract Co-Author) Nothing to Disclose
Michelle L. Doueri, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Simin Bahrami, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
David Y. Lu, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose

Purpose

Tumor seeding along the needle tract or peritoneum is a dreaded complication of percutaneous liver ablation, especially in potential liver transplant patients with a reported incidence up to 4.4%. Therefore, the objective of our study was to determine the incidence of tumor seeding after percutaneous RF ablation of hepatocellular carcinoma (HCC).

Method and Materials

With IRB approval and HIPAA compliance, our institutional clinical database was queried to access all patients who had development of one or more extrahepatic recurrences in the skin, subcutaneous tissues, or peritoneum from March 2006 to December 2012. The study cohort consisted of 305 consecutive patients (217 men and 88 women) and a total of 498 RFA sessions. All lesions were treated with single, double or cluster internally cooled straight electrodes mated to a 200W generator and switching controller (Covidien, Boulder Co) by one of four experienced interventionalists. Tract ablation was used in almost all cases. Six patients were treated by using combined ethanol injection.

Results

Over a 6 year period, 581 HCC nodules were treated by RF ablation with a mean follow up of 28±16 months (range from 3-66 months). Tumor seeding was evaluated by pathological report of explant liver in 96 patients and by imaging follow up in 209 patients. During this time in two patients, single chest wall nodules were detected in or near the needle tract (0.3% per nodule, 0.6% per patient) in the setting of extrahepatic metastases. One nodule was detected at 5.3 months post ablation concurrent with lymph node metastasis. The other nodule was detected at 18.3 month after liver transplantation in a patient with concurrent lung metastases. In both cases, the ablated nodules were subcapsular, poorly differentiated on concurrent biopsy with direct electrode insertion into the nodule. There was no further lesion treatment due to advanced metastatic disease.

Conclusion

In this series, no needle tract seeding was detected in patients without concurrent extrahepatic metastases. However, with two solitary chest wall nodules at or near the needle tract, the possible risk of tumor seeding after RF Ablation of HCC was 0.3% per nodule and 0.6% per patient. Both nodules were poorly differentiated and subcapsular.

Clinical Relevance/Application

Using optimal technique, there is very low risk of possible tumor seeding after percutaneous radiofrequency ablation of hepatocellular carcinoma.

RC814-10  Utility and Safety of Radiofrequency Ablation for Focal Hepatic Lesions Adjacent to Gallbladder in Ablating between GB Fossa and Contralateral Safety Margin

Friday, Dec. 4 10:35AM - 10:45AM Location: N228

Participants
In Young Choi, MD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Pyo Nyun Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Hyoung Jin Won, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
So Jeon Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Yong Moon Shin, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

Purpose

To evaluate safety and therapeutic efficacy of radiofrequency (RF) ablation for treatment of focal hepatic lesions (FHL) adjacent to gallbladder (GB) with reduction of ablation time and rearrangement of electrode.

Method and Materials

We retrospectively evaluated 36 patients who underwent RF ablation of FHL adjacent to GB (less than 10mm) from January 2011 to March 2014. Follow-up period was ranged from 9 to 50 months (mean, 25 months). The electrode was inserted parallel direction to GB. Patients were divided into two subgroups based on whether the lesion was abutting GB (less than 5mm, n=17) or not (more than 5mm, n=19). In abutting group, the electrode was inserted eccentrically after measuring the diameter between GB fossa and contralateral safety margin and ablation time was decreased for reducing the diameter of ablated zone in horizontal axis to GB. Fourteen of abutting group were performed with artificial ascites (5% dextrose aqueous solution) and 8 of non-abutting group were performed with artificial ascites. A panel of radiologists blinded to the patients’ clinical histories reviewed immediate follow up CT for complication and late follow up CT for local tumor progression. Statistical evaluation was performed with Chi-square test and...
Fisher’s exact test.

RESULTS

There were no major complications in both groups. Enhancing wall thickening of GB adjacent to RFA zone was noted in 19.4% (7/36, abutting group; 5, non-abutting group; 2) and it disappeared on subsequent follow-up imaging. There is no statistically significant difference between abutting group and non-abutting group (p >0.05). The technical success rate based on immediate follow-up and one-month follow-up CT was 94.4% (34/36) and two patients remained enhancing foci on immediate follow up (1 abutting group, 1 non-abutting group) and they were retreated successfully. Local tumor progression of completely ablated tumors during follow-up period less than 6 months was noted in two patients (2/34, 1 abutting group, 1 non-abutting group). Except these two patients, there was no local tumor progression during follow-up periods.

CONCLUSION

RF ablation can be a safe and effective treatment for FHL adjacent to GB with rearrangement of electrode and reduction of ablation time.

CLINICAL RELEVANCE/APPLICATION

The treatment of FHL adjacent to GB is challenging issue. RF ablation may be a safe and effective treatment option even though the lesion is located right beside GB.
**RC829**

**Body MRI: Clinical Challenges (An Interactive Session)**

**Participants**

**Sub-Events**

**RC829A Imaging Perianal Fistulae**

Participants

Damian J. Tolan, MBBCh, FRCR, Leeds, United Kingdom, (damian.tolan@nhs.net) (Presenter) Speaker, Bracco Group; Speaker, Merck & Co, Inc

**LEARNING OBJECTIVES**

1) To understand how to describe the different types of fistula. 2) To learn how to perform, interpret and report MRI for the initial assessment of fistula in ano. 3) To learn the implications of MR findings in planning surgical treatment.

**RC829B Pelvic Endometriosis**

Participants

Evan S. Siegelman, MD, Philadelphia, PA (Presenter) Consultant, BioClinica, Inc; Consultant, ICON plc; Consultant, ACR Image Metrix

**LEARNING OBJECTIVES**

1) Review the theories concerning the pathogenesis of endometriosis. 2) Discuss the clinical indications that may indicate the use of pelvic imaging to diagnose endometriosis. 3) Assess the current MR techniques used in the detection and characterization of endometriosis. 4) Describe the imaging features of endometriomas and deeply infiltrative endometriosis.

**ABSTRACT**

Endometriosis is defined as the presence of ectopic endometrial glands and stroma outside the uterus. Endometriosis is a common cause of pelvic pain and infertility, affecting as many as 10% of premenopausal women. Radiologists should be familiar with the various imaging manifestations of endometriosis, especially those that allow its differentiation from other pelvic lesions. The MR 'pearls' offered here apply to the detection and characterization of pelvic endometriosis. The inclusion of T1-weighted fat-suppressed sequences is recommended for all MR examinations of the female pelvis because such sequences facilitate the detection of small endometriomas and aid in their differentiation from mature cystic teratomas. Benign endometriomas can exhibit restricted diffusion and should not be confused with ovarian cancer. Although women with endometriosis are at risk for developing clear cell and endometrioid epithelial ovarian cancers (ie, endometriosis-associated ovarian cancers), imaging findings such as enhancing mural nodules should be confirmed before a diagnosis of ovarian malignancy is suggested. The presence of a dilated fallopian tube, especially one containing hemorrhagic content, is often associated with pelvic endometriosis. Deep (solid infiltrating) endometriosis can involve the pelvic ligaments, anterior rectosigmoid colon, bladder, uterus, and cul-de-sac, as well as surgical scars; the lesions often have poorly defined margins and T2 signal hypointensity as a result of fibrosis. The presence of subcentimeter foci with T2 hyperintensity representing ectopic endometrial glands within these infiltrating fibrotic masses may help establish the diagnosis.

**Honored Educators**

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Evan S. Siegelman, MD - 2013 Honored Educator

**RC829C Cholangiocarcinoma Diagnosis and Staging: What the Surgeon Needs to Know**

Participants

Eduard E. De Lange, MD, Charlottesville, VA, (delange@virginia.edu) (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) To learn about staging cholangiocarcinoma. 2) To understand how the tumor is classified surgically. 3) To get insight into the various surgical procedures for tumor resection. 4) To understand the importance of vascular involvement for determining tumor resectability.

**ABSTRACT**

Active Handout:Eduard E. De Lange


Handout:Eduard E. De Lange

http://abstract.rsna.org/uploads/2015/15002799/Course RC829C- de Lange EE - Cholangiocarcinoma - What the surgeon needs to
**Tumor Ablation beyond the Liver: Practical Techniques for Success**

Friday, Dec. 4 8:30AM - 10:00AM Location: S403A

**Participants**
Debra A. Gervais, MD, Chestnut Hill, MA (Moderator) Nothing to Disclose
Terrance T. Healey, MD, Providence, RI (Presenter) Nothing to Disclose
Anil N. Kurup, MD, Rochester, MN, (kurup.anil@mayo.edu) (Presenter) Nothing to Disclose
Muneeb Ahmed, MD, Wellesley, MA, (mahmed@bidmc.harvard.edu) (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**
1) Gain knowledge as to how to approach tumor ablation in extrahepatic sites. 2) How to avoid and manage organ specific complications. 3) Review results of tumor ablation in the lung, kidney, and bone.

**ABSTRACT**

Pulmonary malignancies, and specifically lung cancer, are a leading cause of death worldwide. Utilization of best current therapies results in an overall five-year relative survival rate for all stages combined to be only 15%, necessitating the use of alternative therapies. Image-guided ablation of lung malignancies is a revolutionary concept whose clinical applications are just beginning to be developed. It has some advantages over traditional radiotherapy and chemotherapy. Its safety profile is similar to percutaneous image guided lung biopsy. Almost all image-guided ablative procedures can be performed in an outpatient setting, mostly with conscious sedation. Multiple applications can be performed without any additional risks. Contraindications are few and include uncontrollable bleeding diathesis and recent use of anticoagulants. Image-guided ablation of lung malignancies is performed with two basic rationales. In the first group it is used with an intention of achieving definitive therapy. These are patients who are not candidates for surgery because of co-morbid medical contraindications to surgery, like poor cardiopulmonary reserve or patients refusing to undergo operation. This cohort could potentially derive significant benefit form a minimally invasive alternative therapy. In the second group it is used as a palliative measure as follows: (a) to achieve tumor reduction before chemotherapy (b) to palliate local symptoms related to aggressive tumor growth, such as chest pain, chest wall pain or dyspnea (c) hematogenous painful bony metastatic disease (d) tumor recurrence in patients who are not suitable for repeat radiation therapy or surgery. Image-guided ablation is expanding treatment options for the local control of non-small cell lung cancer and metastatic disease.
**RC851**

**Imaging in Practice: DWI in the Abdomen and Pelvis**

Friday, Dec. 4 8:30AM - 10:00AM Location: S406A

**Participants**

**Sub-Events**

**RC851A  How to Perform DWI - Principles and Protocol**

Participants
Shreyas S. Vasanawala, MD, PhD, Palo Alto, CA (Presenter) Research collaboration, General Electric Company; Consultant, Arterys; Research Grant, Bayer AG;

**LEARNING OBJECTIVES**

1) Understand basic principles of contrast formation in diffusion weighted MRI. 2) Understand sources of artifacts in diffusion weighted MRI. 3) Know techniques to reduce artifacts to produce diagnostic quality diffusion weighted images.

**ABSTRACT**

Diffusion-weighted imaging is being used with increasing frequency in body MRI. The basic mechanism of contrast generation is the use of large motion-sensitizing gradients such that water molecules undergoing random motion are dephased, resulting in signal loss. Tissues and lesions with high cellularity have reduced diffusive motion of water, which results in relatively high signal. However, a number of issues make diffusion-weighted imaging in the body challenging relative to neurological applications. First, the vast majority of clinical DWI is performed with an echo-planar technique, which suffers from image distortions due to field inhomogeneity. These become problematic particularly where there are gas-tissue interfaces, such as at the dome of the liver and near gas-filled bowel. The presentation will discuss methods to minimize these distortions. Second, the T2 relaxation rates of abdominal tissues are less than that of pelvic viscera and much less than that of the brain, whereas normal water diffusivity is higher; as the choice of diffusion sensitivity (b value) heavily influences the echo time, lower b values must be used. Third, motion from cardiac pulsations, respiration, and peristalsis produce artifacts, some of which are easily recognizable, and others which can subtly hide pathology. Techniques to minimize these pitfalls will be presented. Finally, issues of reproducibility that affect the practical clinical use of DWI for lesion characterization in body MRI will be discussed, along with approaches to improve reliability.

**RC851B  Interpretation of DWI - How to Create and Use ADC Maps in Your Practice**

Participants
Thomas A. Hope, MD, San Francisco, CA, (thomas.hope@ucsf.edu) (Presenter) Advisory Committee, Guerbet SA; Research Grant, General Electric Company

**LEARNING OBJECTIVES**

1) Understand the principles of calculating ADC. 2) Understand the effect of b-value selection and weighting on diffusion calculations. 3) Explore the value of IVIM and other parameters.

**ABSTRACT**

In order to incorporate diffusion weighted imaging into clinical practices, it is important to understand how diffusion data is evaluated. Qualitatively, one can simply say that lesions are "bright" on diffusion, but intensity on high b-value imaging is not always equal to a lesion that has reduced diffusion. The understanding and implementation of quantitative analysis is therefore critical for both research and everyday clinical practice. The first step is the calculation of the apparent diffusion coefficient (ADC) map, which is used to help tease out the differences in intrinsic T2 hyperintensity and diffusivity. The calculation of the ADC map is greatly affected by the methodology used as well as the selection of b-values acquired. The ADC of a tissue describes how quickly signal decreases as the b-value is increased. Those lesions with high diffusivity will have high ADC values, while those lesions with reduced diffusion will have lower ADC values. In addition to ADC, other parameters have been describe that affect the measured diffusivity. The most commonly discussed is intravoxel incoherent motion (IVIM) that is thought to represent the random movement of blood within the capillary system, often called pseudodiffusion. This parameter has its greatest effect on diffusion weighted images at low b-values.

**RC851C  Applications of DWI in Clinical Practice - When It Does and Doesn't Help**

Participants
Frank H. Miller, MD, Chicago, IL (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Demonstrate the utility of diffusion weighted imaging in the abdomen. 2) Show advantages and limitations of diffusion weighted imaging in the abdomen.

**ABSTRACT**

Diffusion weighted imaging (DWI) has been used in neuroimaging for many years. It has only more recently become feasible in the abdomen. The objective of this talk is to emphasize the important role that diffusion-weighted imaging can have in your practice
and that it can be used routinely without difficulty in the abdomen and pelvis. DWI potentially can detect additional lesions and direct the radiologist to lesions that are not as well seen on conventional imaging. DWI helps in characterization of lesions but does have limitations in specificity which will be discussed. Qualitative and quantitative evaluation can be performed and the applications of these techniques clinically will be described. The strengths and limitations of DWI in multiple organs including the liver, pancreas, adrenal gland, kidney, and evaluation for metastases and infections will be discussed. DWI is especially helpful for identify lymph node and peritoneal metastases. Emerging techniques include the use of diffusion weighted imaging to assess response to therapy following liver-directed therapy will also be discussed. In summary, DWI should be used routinely if not being used at your institution. This talk will show benefits and limitations of DWI in a number of organs in the body.

**Honored Educators**

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Frank H. Miller, MD - 2012 Honored Educator
Frank H. Miller, MD - 2014 Honored Educator
LEARNING OBJECTIVES

1) An important aspect of Nuclear Medicine and Molecular Imaging is that the same core compound of the administered radiopharmaceutical can be labeled with both gamma emitters (for diagnostic) and beta (or alpha) emitters (for therapy), allowing for the targeted treatment of lesions. This is an expression of theranostics, the combination of therapy and diagnostics that is based on the specific tumor biology of each patient's disease. This proposed session will provide several examples of such paired diagnostic studies and treatments using Nuclear Medicine methods.

Sub-Events

**SPNM61A** **Radioactive Iodine and Thyroid Cancer - Current Use and Controversies**

Participants

Douglas Van Nostrand, MD, Washington, DC, (douglas.van.nostrand@medstar.net) (Presenter) Speakers Bureau, sanofi-aventis Group

LEARNING OBJECTIVES

1) Define remnant ablation, adjuvant treatment, and treatment of locoregional/distant metastases. 2) Discuss the indications and controversies of 131I for each. 3) Discuss the range of prescribed activity of 131I for each.

**SPNM61B** **Bone Scintigraphy and the Use of Radionuclides in the Management of Patients with Metastatic Castrate-Resistant Prostate Cancer**

Participants

Hossein Jadvar, MD, PhD, Los Angeles, CA, (jadvar@med.usc.edu) (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To review bone scintigraphy with single photon and PET radiotracers in the imaging evaluation of patients with prostate cancer. 2) To summarize the results of the ALSYMPCA clinical trial for 223Ra dichloride therapy in patients with castrate resistant metastatic prostate cancer.

**SPNM61C** **Updates on the Use of PET/CT (and PET/MRI) and Radioimmunotherapy in NHL**

Participants

Erik S. Mittra, MD, PhD, Stanford, CA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

**SPNM61D** **Peptide Receptor Radionuclide Imaging and Therapy: Where Are We in Europe and What Shall the US Do to Catch Up?**

Participants

Frederik L. Giesel, MD, MBA, Heidelberg, Germany (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the concept of theragnostic. 2) Identify promising candidates for PRRT. 3) Challenges and limitations of PRRT. 4) Future perspective using alpha-emitters.

**ABSTRACT**

Well-differentiated neuroendocrine tumors (NETs) demonstrate modest responses to conventional chemotherapy due to their slow proliferation rate. However, the expression of somatostatin receptors by NET enables targeting with high affinity peptides. When these octreotide analogue peptides are labelled with beta emitters such as 90Y or 177Lu promising anti-tumor effects have been observed. The presentation will introduce the concept of theragnostic (68Ga-DOTATOC and 90Y/177Lu-DOTATOC) for improved patient stratification. Today, PRRT is well established for a long time in NET-patients. However challenges and limitations will be discussed in regard to other systemic therapies such as everolimus or sunitinib. Finally, outlook will be given in regard to the novel of targeted alpha therapy in NET-patients and its implication to other tumor entities.

**URL**
Selective Internal Radiation Therapy for Hepatic Malignant Lesions

Ghassan El-Haddad, MD, Tampa, FL, (ghassan.elhaddad@moffitt.org) (Presenter) Speaker Bureau, Bayer AG

LEARNING OBJECTIVES

View learning objectives under main course title.
**SST04-01**  **Improving the Quality of 2D GRE MR Elastography of Chronic Liver Diseases Using a Shorter, In-Phase Echo Time**

**Participants**
Vamsi R. Narra, MD, FRCR, Saint Louis, MO (Moderator) Consultant, Biomedical Systems; Bobby T. Kalb, MD, Tucson, AZ (Moderator) Nothing to Disclose

**Purpose**
The purpose of this study was to validate the improvement in image quality of 2D GRE MR elastography (MRE) using a shorter, in-phase echo time (TE) for patients with chronic liver diseases, steatosis, and iron deposition.

**Method and Materials**
With IRB approval and patient authorization, 308 consecutive patients with clinically indicated chronic liver diseases underwent MRE exams using a 2D GRE MRE sequence on 1.5T. They were randomly separated into 2 groups based on the TE used. Group 1 used an in-phase TE of 18 ms (160/308, 52%) and Group 2 used the current standard TE of 21 ms (148/308, 48%). Hepatic relative fat fraction (RFF) was measured by using a two-point Dixon method. The iron concentration in blood samples analyzed in standard laboratory tests was used to assess the iron deposition in liver. Clinical information collected at the same time as the MRE exam included blood pressures, and pulse rate. The fraction of the acquired liver volume with an MRE inversion-derived confidence level of over 95%, as well as the average SNR within the liver were computed for each patient and compared between the short TE and long TE groups with analysis of variance (ANOVA). The effect of age, gender, BMI, Total.Iron.Bind.Capacity, iron, systolic pressure, diastolic pressure, FOV, TE, fat concentration (%), and pulse rate on SNR and ROI volume were evaluated by a mixed-effect model.

**Results**
No significant differences were found in epidemiological and etiological parameters between the two groups (P>0.05). The SNR of MRE images in Group 1 was significantly higher than that in Group 2 (23.73 ± 0.61 vs. 18.01 ± 0.63, p<.0001). ROI volume for reporting hepatic tissue stiffness was significantly larger in Group 1 (323.70 ± 9.36 cm³ vs. 255.53 ± 9.73 cm³, p<.0001). Only TE had a statistically significant effect on SNR (p < .0001); only fat (p<.0001) and iron (p=0.0379) were statistically significant effects on volume.

**Conclusion**
The SNR and reliable ROI volume of 2D GRE MRE can be significantly improved by using a shorter, in-phase TE of 18 ms compared to the current standard of 21 ms.

**Clinical Relevance/Application**
The quality of 2D GRE MRE can be significantly improved by using a shorter, in-phase TE. A direct measurement of fat and iron disposition in the liver might provide better statistical significance.
To evaluate the effect of fitting algorithms and number of b-values on the measurement repeatability of intravoxel incoherent motion (IVIM) parameters of the abdominal organs.

METHOD AND MATERIALS

The institutional review board approved the study protocol, and informed consent was obtained. Twelve healthy volunteers (M:F = 6:6; mean age, 30 years) underwent navigator-triggered DWI twice on an 1.5T system using nine different b-values (0, 30, 60, 100, 150, 200, 400, 600, 900). DWI data were processed using full-biexponential fitting algorithm which estimates slow diffusion (Ds), fast diffusion (Df), and perfusion fraction (f) simultaneously and using segmented fitting algorithm which estimates Ds with higher b-value (≥ 200) data and subsequently estimates f and Df. IVIM parameters were measured on the right lobe of the liver, spleen, pancreas, right renal cortex, and right renal medulla on each set of IVIM parametric maps generated by full-biexponential and segmented fitting algorithms. Measurement repeatability of IVIM parameters over two repeated scans were evaluated using the within-subject coefficient of variation (wCV).

RESULTS

For all abdominal organs and two fitting algorithms, Df showed the poorest repeatability (the range of wCV, 29.5%-144.1%) among IVIM parameters (wCV for Ds, 4.1%-16.9%; wCV for f, 8.5%-46.2%). For spleen, pancreas, renal medulla, segmented fitting resulted in better repeatability of Ds (wCV, 4.9%-11.9% vs. 8.0%-16.9%) and f (wCV, 8.5%-37.9% vs. 17.3%-46.2%) than full-biexponential fitting. For liver, full-biexponential fitting resulted in better repeatability of all IVIM parameters (wCV, 4.1%, 29.5%, and 9.7% for Ds, Df, and f, respectively) than segmented fitting (wCV, 4.8%, 43.0%, and 12.8% for Ds, Df, and f, respectively). For renal cortex, the measurement repeatability of Ds was better with full-biexponential fitting, but that of f was better with segmented fitting.

CONCLUSION

Df is not a reliable parameter for the evaluation of abdominal organs. Despite some inconsistent results across different organs, segmented fitting algorithm generally results in better repeatability of Ds and f than full-biexponential fitting algorithm.

CLINICAL RELEVANCE/APPLICATION

Segmented fitting is a preferred fitting algorithm for IVIM analysis of abdominal organs.

SST04-03  Fast Advanced Spin Echo Diffusion-Weighted Imaging in the Abdomen

Participants

Takeshi Yoshikawa, MD, Kobe, Japan (Abstract Co-Author) Research Grant, Toshiba Corporation
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PURPOSE

To assess values of Fast Advanced Spin Echo (FASE)-diffusion-weighted imaging in evaluation of abdominal diseases

METHOD AND MATERIALS

Fifty-two patients (32 men and 20 women, mean: 69.4 years), who were suspected to have hepatobiliary-pancreatic malignancy and underwent 3T-MRI, were enrolled. FSE-T2WI, SE-EPI-DWI (b=1000), and FASE-DWI (600) were obtained in all patients. Amount of abdominal gas and ascites on images was recorded for each patient using a 5-point scale. Anteroposterior (AP) and right-to-left (RL) abdominal diameters were measured on the slice with most severe image distortion and diameters of the right upper liver near the diaphragm were measured for each sequence and each patient, and correlation analyses were performed. Overall image quality and severity of image distortion were visually assessed using a 5-point scale on EPI-DWI and FASE-DWI, and compared. Regression analyses were done to estimate factors for low image quality and severe distortion. Malignant lesion (n=39) conspicuity was visually assessed separately on EPI-DWI and FASE-DWI, and compared. Diagnostic confidence levels were compared between EPI-DWI alone and EPI-DWI+FASE-DWI sets.

RESULTS

Correlation coefficient was the highest between T2WI and FASE-DWI for all the diameters, indicating less image distortion on FASE-DWI. Lower correlation coefficients, indicating more severe distortion, were observed in abdominal AP direction and right liver RL direction on EPI-DWI. Image distortion was significantly more severe on EPI-DWI (p<0.0001). There was no significant difference between overall image quality and malignant lesion conspicuity. Age, sex, and gas were found to be significant factors for image quality on EPI-DWI (0.047, 0.004, 0.018), and sex and AP diameter were significant factors for image quality on FASE-DWI (0.005, 0.043). Diagnostic confidence level for malignant lesion was significantly higher on EPI-DWI+FASE-DWI set (0.022).

CONCLUSION

FASE-DWI can provide additional diagnostic information in evaluation of various abdominal diseases and be used as an alternative to EPI-DWI.

CLINICAL RELEVANCE/APPLICATION

FASE-DWI can provide additional diagnostic information in evaluation of various abdominal diseases and be used as an alternative to EPI-DWI.
Techniques to Generate High-accuracy Computed Diffusion-weighted Images (cDWIs) of the Liver

Friday, Dec. 4 11:00AM - 11:10AM Location: E353A

Participants
Toru Higaki, PhD, Hiroshima, Japan (Presenter) Nothing to Disclose
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Background
Computed diffusion-weighted images (cDWIs) are virtual DWIs calculated from actual DWIs using two arbitrarily selected low b-values. cDWI is advantageous because images can be generated on MR scanners that do not allow the acquisition of high b-value DWIs. cDWI can also reduce the scan time and lower the image noise when DWIs are acquired with routinely-used b-values. However, the image quality of cDWIs may be degraded without adequate image processing. We propose techniques to generate high-accuracy cDWIs.

Evaluation
Six healthy volunteers (4 males, 2 females, age 31-52 years) underwent hepatic MRI on a 3T MR scanner (Vantage Titan 3T, Toshiba Medical Systems, Tokyo, Japan). We obtained 21 DWIs at b-values raised at 50 s/mm² (from 0 to 1000 s/mm²). We developed software to generate cDWIs via plug-in into NIH ImageJ (http://www.nih.gov/ij/). cDWIs at b=1000 were generated from various combinations of input b-values and the optimal combination was determined quantitatively. We applied some preprocessing as this can reduce artifacts or image noise. One method was non-rigid image registration of DWIs with two input b-values. The other used an image filter to remove abnormal values from the ADC map. Images generated with/without preprocessing were evaluated qualitatively.

Discussion
For the input image of low b-value, we employed image with b=150 because effect of micro-perfusion which strongly arises at b=0 is disappeared at b=150. Quantitative comparisons between cDWIs and actual DWIs obtained at b=1000 showed that the fewest errors in signal intensity were recorded when the combination of input b-values was 150 and 600. Qualitative comparisons revealed that the image quality of the proposed cDWIs obtained with non-rigid image registration and image filtering was superior to that of conventional cDWIs (see attached figures).

Conclusion
When generating cDWIs at b=1000 sec/mm², the optimal combination of b-values for the cDWI input was b=150 and 600. The proposed preprocessing techniques, non-rigid image registration, and image filtering contributed to the improved image quality of cDWIs.

Accuracy of MR-determined Hepatic Proton Density Fat Fraction (PDFF) and Histology-determined Fat Fraction for Estimation of Triglyceride Concentration in Twenty-one Ex-vivo Human Livers

Friday, Dec. 4 11:10AM - 11:20AM Location: E353A

Participants
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Claude B. Sirlin, MD, San Diego, CA (Abstract Co-Author) Research Grant, General Electric Company; Speakers Bureau, Bayer AG; Consultant, Bayer AG;

PURPOSE
To assess the accuracy of magnetic resonance (MR)-determined hepatic proton density fat fraction (PDFF) and histology-determined fat fraction (histology-FF) for estimation of triglyceride concentration ([TG]) in ex-vivo human liver using biochemically-determined liver [TG] as a reference standard.

METHOD AND MATERIALS
Twenty-one postmortem whole livers were obtained from the National Disease Research Interchange and scanned at 3T using a cardiac coil within 48 hours of death. Donors (31 - 67 [mean 55 ± 11] yrs; 11 female) had or were at risk for hepatic steatosis based on medical history. Five 1.5-cm radius circular locations were selected in each specimen. Unenhanced two-dimensional axial spoiled gradient-recalled-echo images of the specimens were obtained. Using published MR techniques, MR spectroscopy (MRS), magnitude-based MRI (M-MRI), and complex-based MRI (C-MRI) hepatic PDFF estimations were computed at each location. Six
biopsies were also obtained at each location (thirty biopsies per liver): three for histologic analysis to determine histology-FF and three for biochemical analysis to determine [TG]. The average of [TG] at each location was used as a reference standard for that location. Regression analyses were performed for [TG] versus MRS-PDFF, M-MRI-PDFF, C-MRI-PDFF, and histology-FF. R²'s with bootstrap-based bias-corrected, accelerated 95% confidence intervals were computed and served as metrics of accuracy. Pairwise comparisons of the R²'s were performed using bootstrap-based tests to adjust for within-liver dependence.

**RESULTS**

MRS-PDFF, M-MRI-PDFF, C-MRI-PDFF, histology-FF and [TG] of liver specimens ranged from 0.1 - 23.5%, -7.4 - 26.3%, 1.3 - 21.2%, 0 - 70 %, and 1.2 - 31.3 mg/100g respectively. The R²'s from the regression models between [TG] and MRS-PDFF, M-MRI-PDFF, C-MRI-PDFF, and histology-FF were 0.95 (0.86 - 0.98), 0.90 (0.62 - 0.97), 0.92 (0.55 - 0.99), and 0.92 (0.78 - 0.94) respectively. The differences between R²'s were not statistically significant (all p>0.05).

**CONCLUSION**

In this ex-vivo study, using biochemically-determined liver [TG] as a reference standard, MR-determined hepatic PDFF and histology were accurate for estimation of hepatic [TG].

**CLINICAL RELEVANCE/APPLICATION**

This study helps to validate the MR-determined hepatic PDFF as an accurate biomarker of hepatic steatosis.

**PURPOSE**

To evaluate the diagnostic performance of Multiecho Single voxel spectroscopy and 3-D GRE sequences in predicting dichotomised histologic steatosis grades.

**METHOD AND MATERIALS**

This prospective, IRB approved, HIPAA-compliant single-center study was conducted in 71 consecutive adults who also had simultaneous liver biopsy. MR imaging fat fraction was estimated at 1.5 T by using T1-VIBE low-flip-angle multiecho gradient-recalled-echo imaging with T2* correction and multipeak modeling as well as multiecho single voxel spectroscopy. Steatosis was graded histologically on a semi-quantitative scale as the percentage of hepatocytes with macrovesicular steatosis (grades 0:5%, 1:5-10%, 2:10-20%, and 3:>20%). Sensitivity, specificity, and binomial confidence intervals were calculated for proposed MR imaging fat percentage threshold.

**RESULTS**

The proposed MR imaging fat fraction threshold of 5% to diagnose grade 1 or higher steatosis had 88% sensitivity (95% confidence interval [CI]: 83, 93) and 89% specificity (95% CI: 78, 100). The diagnostic performance to diagnose grade 2 or higher steatosis had 84% sensitivity (CI: 74, 94) and 92% specificity (95% CI: 85, 99). Accuracy to diagnose grade 3 steatosis had 81% sensitivity (95% CI: 71, 91) and 90% specificity (95% CI: 83, 97).

**CONCLUSION**

The fat fraction thresholds provided high sensitivity and specificity for diagnosis of grade 1 or higher, grade 2 or higher, and grade 3 steatosis. More clinical and longitudinal studies are now needed to further validate these high-specificity thresholds for inclusion in the clinical practise.

**CLINICAL RELEVANCE/APPLICATION**

MR based evaluation of liver fat fraction is an accurate technique across all histologic grades of hepatic steatosis.

**PURPOSE**

The purposes are three-folds, 1) to assess the usefulness of elastic belt bracing the upper abdomen for reducing the miscalculated areas (cross-hatches) of the pancreas on the stiffness map of MR elastography (MRE), 2) to establish the stiffness of normal...
pancreas in normal subjects and 3) to investigate the feasibility of MRE in differentiating between normal pancreas and the focal pancreatic diseases.

METHOD AND MATERIALS
First, 8 normal volunteers were examined with MRE with or without elastic belt. On the stiffness map, the pancreatic areas with or without cross-hatches were measured by drawing the region of interest and were compared between MRE with and without belt. Second, 14 normal volunteers were examined with MRE with elastic belt for the measurements of normal pancreas stiffness. Third, consecutive 11 adult patients suspected of having pancreatic lesions underwent MR examination at 3.0T including MRE with elastic belt for the assessment of the lesion stiffness. A spin-echo based echo planar MRE utilized MEG of 80Hz, external driver frequency/amplitude of 60Hz/50% and temporal phase of 6.

RESULTS
The median percentages of measurable areas of pancreatic stiffness of 8 normal volunteers were 57.4 % with elastic belt and 35.3 % without the belt (p = 0.0078). The mean stiffness of the pancreatic areas of the 14 normal volunteers was 2.37 ± 0.16 kPa for the head, 2.46 ± 0.17 kPa for the body, 2.58 ± 0.26 kPa for the tail and 2.47 ± 0.11 kPa for the overall area. Of 11 patients, 8 patients were diagnosed as having solid pancreatic lesions consisted of 7 pancreatic cancers and 1 inflammatory pseudotumor. The mean stiffness of 7 pancreatic cancers was 6.06 ± 0.49 kPa that was significantly higher than normal pancreatic stiffness. The mean stiffness of inflammatory pseudotumor was 6.2 kPa and it was also higher than normal pancreatic parenchyma.

CONCLUSION
With elastic belt, miscalculation of the pancreatic stiffness was reduced. MRE implicates its potential to differentiate between normal pancreas and pancreatic diseases namely desmoplastic pancreatic lesions.

CLINICAL RELEVANCE/APPLICATION
With improved accuracy with elastic belt, MRE shows a potential to differentiate between normal pancreatic parenchyma and desmoplastic pancreatic lesion based on the stiffness value.

SST04-08 Balanced Steady State Free Precession Sequences for Efficient 3D Whole Organ Liver Iron Content Determination Using MRI: Proof of Principle

Friday, Dec. 4 11:40AM - 11:50AM Location: E353A

Participants
Arthur P. Wunderlich, PhD, Ulm, Germany (Presenter) Nothing to Disclose
Stefan A. Schmidt, Ulm, Germany (Abstract Co-Author) Nothing to Disclose
Holger Cario, Ulm, Germany (Abstract Co-Author) Nothing to Disclose
Meinrad J. Beer, MD, Wuerzburg, Germany (Abstract Co-Author) Research Consultant, Shire plc

PURPOSE
Current MRI based methods for determining liver iron content (LIC) suffer from multiple restrictions, one of them incomplete liver coverage. 3D balanced steady state free precession (bSSFP) has the potential to overcome this limitation, but was not yet tested for 3D LIC analysis.

METHOD AND MATERIALS
34 patients (8f, 26m, age 23 ± 12.9 y) suspected for liver iron overload were investigated by 1.5 T MRI (Siemens Avanto, Siemens Healthcare, Iselin, NY). To reduce banding artefacts, shim volume was placed over the liver. A transversal volume was acquired with bSSFP using the whole-body resonator as receiver coil with flip angle (FA) of 7, 10, 17 and 30 and TR/TE 3.5/1.75 ms. Acquisition was performed in free breathing with 3 long-term averages at matrix size 192x192x20 yielding a resolution of 2.2x2.2x4 mm in 35 s acquisition time per FA. Liver-to-muscle signal intensity ratio (SIR) and its uncertainty was calculated by manually placing ROIs in artefact-free liver parenchyma and paraspinal muscles. Results were correlated to LIC determined by Ferriscan® as reference method.

RESULTS
3D whole liver coverage was possible in 27/34 patients. Liver was imaged without visible artefacts in 30/34 patients.SIR uncertainty was below 10% in all FA except 30°, where it remained below 15%. Correlation was best for SIR vs. logarithm of reference LIC at 30° FA with R² = 0.815.

CONCLUSION
bSSFP is known as MRI sequence with highest efficiency, capable of contiguous 3D acquisition. Short TR/TE allow for whole organ coverage, and high SNR is useful for LIC determination at low uncertainty. Free breathing was chosen because it has the potential of reducing pulsation artefacts by long-term averaging, and is useful in sedated and uncooperative patients. However, bSSFP is prone to susceptibility artefacts, which we handled to a stage of invisibility by shim optimisation in most patients. Probably invisible banding caused only moderate correlation. Results are promising, even with the simple SIR approach. Increasing scan length in head-feet direction will allow for coverage of the entire liver in all patients at the cost of slightly longer measurement times. Quantitative analysis to evaluate tissue T2 is under way, however, challenging due to inhomogeneous liver tissue.

CLINICAL RELEVANCE/APPLICATION
Whole-organ MRI based contiguous 3D LIC determination using the efficient bSSFP sequence is a promising new approach. However, optimization is needed.

SST04-09 Magnetic Resonance Performance in Quantifying Activity of Small Bowel Crohn’s Disease

Friday, Dec. 4 11:50AM - 12:00PM Location: E353A

Participants
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Uri Kopylov, Ramat Gan, Israel (Abstract Co-Author) Nothing to Disclose
Rami Eliakim, Ramat Gan, Israel (Abstract Co-Author) Nothing to Disclose

PURPOSE
Magnetic Resonance Index of Activity (MaRIA), is a Magnetic Resonance Enterography (MRE)-based score in the evaluation of distal small bowel and colonic Crohn’s disease. The gold standard for quantifying mucosal inflammation is with capsule endoscopy either by Lewis score (LS) or, Capsule Endoscopy Crohn’s Disease Activity Index (CECDAI). The aim of this study was to compare the quantification of distal small bowel inflammation using MRE, capsule endoscopy and inflammatory markers.

METHOD AND MATERIALS
Patients with small bowel Crohn’s disease in clinical remission or mild symptoms (CDAI<220) were prospectively recruited and underwent MRE and capsule endoscopy, after approval by our institutional review board and signing an informed consent. MaRIA, LS and CECDAI scores were calculated for the distal small bowel. C-reactive protein (CRP) and fecal calprotectin (FCP) levels were evaluated in association with the clinical scores.

RESULTS
Active inflammation was detected in 47/56 patients. A significant correlation was demonstrated between MaRIA and capsule endoscopy scores. The correlation between the MaRIA and either the LS and CECDAI was similar (r=0.51, p=0.0001 and r=0.54, p=0.0001, respectively). The mean MaRIA score was significantly lower in patients with mucosal healing, defined as LS<135 (18.8±10.7 vs 10.7±7.1, p=0.002). CRP did not correlate with either MaRIA or capsule endoscopy indices. FCP demonstrated stronger correlation with the MaRIA (r=0.49, p=0.0001) in comparison to capsule endoscopy scores (r=0.36, p=0.007 and r=0.45, p=0.001 for LS and CECDAI, respectively).

CONCLUSION
Significant correlation was observed between quantitative MRE and capsule endoscopy based indices of inflammation in the distal small bowel. FCP correlated better with MRE than with capsule endoscopy scores.

CLINICAL RELEVANCE/APPLICATION
The MaRIA score can be used to non-invasively quantify distal small bowel Crohn’s disease, and thus help guide clinical decisions regarding prognosis and treatment.
**SST05**

**Gastrointestinal (Stomach Cancer and Masses)**

Friday, Dec. 4 10:30AM - 12:00PM Location: E353B

**Participants**
Seong Ho Park, MD, Seoul, Korea, Republic Of (Moderator) Nothing to Disclose
Douglas R. Kitchin, MD, Middleton, WI (Moderator) Nothing to Disclose

**Sub-Events**

**SST05-01**  
**Chemotherapy Response Evaluation for Late-stage Gastric Cancer by Spectral CT Imaging: Correlation with RECIST Criteria**

Friday, Dec. 4 10:30AM - 10:40AM Location: E353B

**Participants**
Yong Yu, Xianyang City, China (Presenter) Nothing to Disclose
Zhong Hui, MMed, Xianyang City, China (Abstract Co-Author) Nothing to Disclose
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Hai Peng Duan, Xianyang City, China (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
To study the clinical value of using the iodine content in tumors obtained in Spectral CT imaging for chemotherapy response evaluation of late-stage gastric cancer in correlation with the RECIST criteria.

**METHOD AND MATERIALS**
A total of 18 patients (11 women, mean age of 60y) with pathologically proved gastric cancer by endoscopy were prospectively enrolled in our study. All patients were certified as having un-resectable gastric cancers and received three months of chemotherapy. Contrast-enhanced spectral CT scans were performed before and after the 3 months chemotherapy. Patients were classified into a good response group or poor response group according to the RECIST criteria (tumor volume reduction exceeds 30% is considered having good response). The iodine concentration (IC) values from the iodine-based material decomposition images of spectral CT for the tumors were measured before and after the chemotherapy. IC reduction ratio was calculated as: (IC(before) - IC(after))/IC(before). The iodine concentration value before the chemotherapy and the IC reduction ratio after the chemotherapy between the good- and poor- response groups were analyzed statistically by independent-samples t test. The correlation between the IC reduction ratio and response was calculated using spearman correlation test.

**RESULTS**
The iodine concentration values (figure) of the tumors before chemotherapy were significantly different between the good-response group (2.44±0.83mg/ml) and poor-response group (1.65±0.64mg/ml) in the arterial phase (P<0.05). The good-response group had a higher IC reduction ratio of 0.42±0.23 in the tumor than that in the poor-response group (0.29±0.17). Significant correlation was seen between IC reduction ratio and responses with correlation coefficient of r =-0.73 (P=0.007).

**CONCLUSION**
The iodine content in tumors and its reduction ratio after chemotherapy measured in Spectral CT has significant correlation with the treatment responses defined by RECIST criteria, and may be used as good indications for the chemotherapy prognosis of late-stage gastric cancers.

**CLINICAL RELEVANCE/APPLICATION**
Spectral CT may provide a new imaging method for evaluating the chemotherapy response for late-stage gastric cancers.

**SST05-02**  
**'Gastric Comb Sign' for Prediction of Lymphovascular Invasion in Gastric Cancer on Contrast-Enhanced CT**

Friday, Dec. 4 10:40AM - 10:50AM Location: E353B

**Participants**
Hyun-Jung Baek, Yang-San, Korea, Republic Of (Presenter) Nothing to Disclose
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Tae Un Kim, MD, Yangsang, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
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Ga Jin Han, Busan, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

**PURPOSE**
Gastric cancer is the fourth most common cancer and the second leading cause of cancer-related death worldwide. Although the depth of invasion and lymph node are independent prognostic factors for gastric cancer and associated with patient survival, several studies have reported that lymphovascular invasion (LVI) by cancer cells are associated with poor survival or early recurrence in gastric cancer. The role of CT for predicting LVI remains controversial. The purpose of our study was to evaluate CT findings for predicting LVI in gastric cancer.
METHOD AND MATERIALS

We retrospectively reviewed 194 patients with gastric cancer who underwent contrast-enhanced CT within 6 weeks before the operation between January 2012 to December 2012. The degree of contrast enhancement, location, gastric comb sign (multiple engorged tubular, tortuous opacities radiating from the thickened gastric wall), and ulceration were assessed on CT. Histopathologic analysis was performed for size of the tumor and T stage. The relationship between gastric cancer with LVI and the CT and histopathologic findings was statistically analyzed. Multivariate logistic regression was used to identify independent imaging variables.

RESULTS

Gastric cancer with LVI demonstrated stronger enhancement (80.4%) more often than those without LVI (19.6%) (p = 0.0001). There was a statistically significant difference regarding the presence of gastric comb sign between both groups; gastric cancer with LVI (94.3%) and gastric cancer without LVI (5.7%) (p = 0.0001). There was a statistically significant difference in the presence of ulceration between both groups; 77.6% vs 22.4% (p = 0.014). The statistically significant histopathologic feature was T stage (p = 0.0001). In multivariate logistic analysis, the gastric comb sign and T stage were the most significant findings in differentiation between gastric cancer with LVI and those without LVI. The strongest imaging predictor for LVI in the gastric cancer was gastric comb sign (p = 0.026).

CONCLUSION

Our findings suggest that CT can provide valuable information for prediction of LVI in patients with gastric cancer.

CLINICAL RELEVANCE/APPLICATION

Gastric comb sign may be useful in predicting LVI in gastric cancer and used to stratify patients with gastric cancer who will benefit from adjuvant systemic therapy.

SST05-03 Gastrointestinal Stromal Tumours (GIST): A CT Proposal for Predicting the Risk of Malignancy

Friday, Dec. 4 10:50AM - 11:00AM Location: E353B

Participants
Maria A. Mazzei, MD, Siena, Italy (Abstract Co-Author) Nothing to Disclose
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Carla Vindigni, Siena, Italy (Abstract Co-Author) Nothing to Disclose
Giulia Sadotti, Siena, Italy (Abstract Co-Author) Nothing to Disclose
Paola Mercuri, Siena, Italy (Abstract Co-Author) Nothing to Disclose
Lorenzo Righi, Siena, Italy (Abstract Co-Author) Nothing to Disclose
Susanna Guerini, MD, Siena, Italy (Abstract Co-Author) Nothing to Disclose
Francesco G. Mazzesi, MD, Siena, Italy (Abstract Co-Author) Nothing to Disclose
Luca Volterrani, Siena, Italy (Abstract Co-Author) Nothing to Disclose

PURPOSE

The purpose of this study was to identify the predictors of malignancy on CT for the evaluation of gastrointestinal stromal tumours of the stomach (GIST), correlating CT findings with the mitotic index.

METHOD AND MATERIALS

The medical records at our institution of 42 patients (mean age 68 years, range 26-91 y) with a histologic diagnosis of GIST were reviewed. One radiologist and one resident in radiology with 10 and 4 years experience in oncological field, retrospectively and blindly reviewed the CT findings by consensus with respect to location, lesion size, contour, tumour growth pattern, enhancing pattern, degree of enhancement of tumour, percentage of CT tumour hypodensity, mesenteric fat infiltration, ulceration, calcification, regional lymphadenopathy, direct invasion to adjacent organ, and distant metastasis. All parameters were correlated with the mitotic index evaluated at histopathological analysis following surgery. Normality of variables was evaluated using Shapiro-Wilk test. Pearson's correlation test was used to test the interaction between variables. The diagnostic accuracy of percentage of CT tumour hypodensity in detecting if the number of mitosis per 50 high-power fields was >5 was measured by using receiver operating characteristic (ROC) analysis.

RESULTS

A significant statistical correlation was found between percentage of CT tumour hypodensity and the mitotic index (p<0.005), dimension and location of the tumour. Using a percentage of CT hypodensity major than 20% as the CT feature to compare with the mitotic index in creating a "modified Miettinen CT index" for evaluating the malignancy risk of GISTs we obtained a Cohen's weighted k of 0.80 (95% CI 0.66-0.92) between Miettinen risk assessment and "modified Miettinen CT index".

CONCLUSION

MDCT could be an accurate technique in the prediction of malignancy of GIST in a CT risk assessment system, based on the location of the tumour, its size and the percentage of intralesional CT hypodensity.

CLINICAL RELEVANCE/APPLICATION

The primary aim of this project is to find a modified Miettinen CT index useful to predict the malignancy of GIST, in order to tailor the treatment in elderly or complex patients.

SST05-04 Neuroendocrine Carcinomas of the Stomach: CT, Clinical and Pathologic Findings in 32 Patients

Friday, Dec. 4 11:00AM - 11:10AM Location: E353B

Participants
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Chang Hee Lee, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jae Woong Choi, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
SST05-05  Preoperative Whole-tumor Texture Analysis by Contrast Enhanced CT in Gastric Cancer: Correlations with Post-operative T Staging

Friday, Dec. 4 11:10AM - 11:20AM Location: E353B

Participants
Francesco Giganti, MD, Milan, Italy (Presenter) Nothing to Disclose
Annalaura Salerno, MD, Milan, Italy (Abstract Co-Author) Nothing to Disclose
Paolo Marra, Milan, Italy (Abstract Co-Author) Nothing to Disclose
Sofia Antunes, Milan, Italy (Abstract Co-Author) Nothing to Disclose
Francesco A. De Cobelli, MD, Milan, Italy (Abstract Co-Author) Nothing to Disclose
Alessandro Del Maschio, MD, Milan, Italy (Abstract Co-Author) Nothing to Disclose

PURPOSE
To describe the computed tomographic (CT) findings and the clinicopathologic features of neuroendocrine carcinomas (NECs) of the stomach.

METHOD AND MATERIALS
The CT examinations of 32 patients with gastric NECs were reviewed retrospectively for the morphology, size, CT attenuation of the tumor, CT attenuation of the lymph node, associated findings such as peritoneal infiltration, liver metastasis and peritoneal carcinomatosis. The ages of patients ranged from 45 to 79 years (mean: 62 years). 27 patients (84%) were men. Pathologic diagnosis was made by gastrectomy (n=28) and endoscopic biopsy (n=4). 19 patients underwent Multidetector CT with water as an oral contrast agent, 12 patients underwent helical CT with water, and one underwent non-helical CT with water-soluble contrast material.

RESULTS
Among the three CT morphologic types (polypoid, ulcerofungating, ulceroinfiltrative), 63% of the gastric NECs were ulcerofungating (n=20), 37% were ulceroinfiltrative and none were polypoid. All were larger than 5 cm in the greatest dimension (mean size: 7.8 centimeter). The characteristic features were focal (n=3) or diffuse (n=15) low attenuation within mass, extensive large necrotic lymphadenopathy (n=13), and liver metastasis (n=6) at presentation. Preoperatively, CT findings were interpreted as gastric adenocarcinoma (n=29) or lymphoma (n=3).

CONCLUSION
Although differential diagnosis between gastric adenocarcinoma and gastric NEC is difficult, gastric NEC should be considered in the differential diagnosis when CT shows a large ulcerofungating tumor with low attenuation areas, especially combined with extensive necrotic lymphadenopathy, and frequent hepatic metastasis.

CLINICAL RELEVANCE/APPLICATION
Gastric NEC should be considered in the differential diagnosis when CT shows a large ulcerofungating tumor with low attenuation areas, especially combined with extensive necrotic lymphadenopathy, and frequent hepatic metastasis.

SST05-06  Diffusion-weighted Magnetic Resonance Imaging in Submucosal Tumors of the Stomach: Preliminary Results

Friday, Dec. 4 11:20AM - 11:30AM Location: E353B

Participants
Atsushi Tani, MD, PhD, Kagoshima, Japan (Presenter) Nothing to Disclose
Yoriko Kaijya, Kagoshima, Japan (Abstract Co-Author) Nothing to Disclose
Tetsuya Shinhara, MD, Kagoshima City, Japan (Abstract Co-Author) Nothing to Disclose
Takashi Yoshiura, MD, PhD, Kagoshima, Japan (Abstract Co-Author) Nothing to Disclose

PURPOSE
Computed tomography texture analysis (CTTA) is an emerging tool to assess and quantify tumor heterogeneity, that is strictly related to cancer aggressiveness. Many quantitative features can be obtained from CTTA. We investigated the correlation of some of these parameters with postoperative T staging in gastric cancer.

RESULTS
Among all parameters, the following showed significant correlations (p<0.01): energy (without and with all filters, r ranging from 0.43 to 0.59), entropy (filtered, r ranging from -0.52 to -0.36) and uniformity (filtered, r ranging from 0.34 to 0.50). Mean values were significantly different (p<0.05) between the two groups (pT1-3 vs pT4) for the following: energy (with and without filtered image), entropy and uniformity.

CONCLUSION
CTTA features can help to predict T staging. Uniformity is directly correlated to pT stages: our hypothesis is that the increased vascularity - characteristic of more aggressive tumors - leads to greater parenchymal enhancement and lower contrast resolution, resulting in higher uniformity during CTTA. All the aforementioned parameters could represent promising, non-invasive and easily applicable diagnostic tools to evaluate the aggressiveness of gastric cancer.

CLINICAL RELEVANCE/APPLICATION
CTTA can quantify the heterogeneity of gastric cancer, opening a new window for the evaluation and treatment planning of this type of tumor.
To describe the appearance of submucosal tumors of the stomach on diffusion-weighted magnetic resonance imaging (DWI).

**METHOD AND MATERIALS**

Ten consecutive patients (5 males and 5 females: age range, 32 to 84 years) with a submucosal tumor of the stomach were included in this retrospective study. Pathological diagnosis was confirmed in all patients either by surgery (8 patients) or biopsy (2 patients). DWI with b values of 0 and 800 s/mm² was performed using a 1.5T system. Visual evaluation of DWI was independently performed by two radiologists and the signal intensity (SI) of each lesion was evaluated using a five-point scale (1, unrecognizable; 2, recognizable but SI lower than muscle; 3, SI equal to or higher than muscle but lower than kidney; 4, SI equal to or higher than kidney but lower than spleen; 5, SI equal to or higher than spleen). Interobserver agreement in visual analysis was good (weighted kappa=0.78). ADC values for 6 patients with GIST ranged from 1.35x10⁻³ to 2.11x10⁻³ mm²/s (mean: 1.52x10⁻³ mm²/s), which were higher than that of a malignant lymphoma (1.18 x10⁻³ mm²/s).

**RESULTS**

The pathological diagnoses were gastrointestinal stromal tumor (GIST) (n=7), leiomyosarcoma (n=1), malignant lymphoma (n=1) and ectopic pancreas (n=1). All lesions except an ectopic pancreas showed a conspicuous high SI on DWI and the mean of visual scores was 4.5 for both readers. Interobserver agreement in visual analysis was good (weighted kappa=0.78). ADC values for 6 patients with GIST ranged from 1.35x10⁻³ to 2.11x10⁻³ mm²/s (mean: 1.52x10⁻³ mm²/s), which were higher than that of a malignant lymphoma (1.18 x10⁻³ mm²/s).

**CONCLUSION**

The majority of gastric submucosal tumors show conspicuous high SI on DWI. DWI may be helpful in the preoperative evaluation of the tumor extent in these patients.

**CLINICAL RELEVANCE/APPLICATION**

DWI can visualize the majority of submucosal tumors of the stomach and may help us evaluate the extent of these lesions.

**SST05-07 Dynamic Contrast-enhanced Computed Tomography (DCE-CT) as a Prognostic Marker for Overall Survival in Gastroesophageal Junctional Cancer and Gastric Cancer after Preoperative Chemotherapy**

Friday, Dec. 4 11:30AM - 11:40AM Location: E353B

Participants
Martin Lundsgaard, MD, Kobenhavn, Denmark (Presenter) Nothing to Disclose
Eva Fallentin, MD, Kobenhavn, Denmark (Abstract Co-Author) Nothing to Disclose
Lene Bæksgaard, PhD,MD, Copenhagen, Denmark (Abstract Co-Author) Nothing to Disclose
Birgitte Federspiel, MD, Copenhagen, Denmark (Abstract Co-Author) Nothing to Disclose
Lars Bo Svendsen, DSc, MD, Copenhagen, Denmark (Abstract Co-Author) Nothing to Disclose
Michael B. Nielsen, MD, PhD, Copenhagen, Denmark (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To evaluate whether changes in DCE-CT parameters during pre-operative chemotherapy predict overall survival in patients with gastro-esophageal junction (GEJ) cancer and gastric cancer.

**METHOD AND MATERIALS**

Twenty-eight patients with adenocarcinoma of the gastro-esophageal junction (GEJ) and stomach were followed for a minimum of 2 years after completed surgery. All patient had received three series of chemotherapy before surgery, and were all evaluated with a DCE-CT scan prior to chemotherapy, after the first series of chemotherapy, and after three series of chemotherapy. The DCE-CT scans were performed using a 320-detector row scanner covering 12 - 16 cm in the z-axis. The total scan duration was 55-60 seconds with a variable scan delay determined by a test bolus. Analyses of the DCE-CT scans were done in consensus between two radiologists. Maximum slope model and Patlak analysis were used to calculate the following DCE-CT parameters: tissue perfusion (ml/min/100ml), blood volume (ml/100ml) and permeability (ml/min/100ml). Changes in DCE-CT parameters during pre-operative chemotherapy were calculated. Data on death were collected from the Electronic Patient Record. Patients who were not resected due to tumour invasion (n=1) or died caused by severe complications after surgery (within 30 days) (n=1), were excluded from the survival analysis. Survival analysis was done using Log Rank Test and Kaplan-Meier plot. The protocol was approved by the Committees on Biomedical Research for [BLINDED] with oral and written consent from patients.

**RESULTS**

Minimum follow-up time was 885 days after inclusion in the study. Surgery was performed at a median of 88 days (range 66-119) after enrolment. Changes in permeability after the first series of chemotherapy ranged from -51% to 86% (median: -19.3%; 25th percentile:-38.1%, 75th percentile:6.6%). Patients with the largest decrease in permeability (using the median as cut-off) had a significant longer overall survival (p=0.03). Changes in tissue perfusion and blood volume were not a significant prognostic factor.

**CONCLUSION**

Changes in permeability measured with DCE-CT during pre-operative chemotherapy may have a predictive value on overall survival after preoperative chemotherapy and surgery in GEJ cancer and gastric cancer.

**CLINICAL RELEVANCE/APPLICATION**

DCE-CT may have a role in patient stratification in the management of preoperative chemotherapy for GEJ cancer and gastric cancer.

**SST05-08 Hydro-Multidetector CT in the Staging of Gastric Adenocarcinoma. A Comparative Study with Surgical and Histopathological Specimen**

Friday, Dec. 4 11:40AM - 11:50AM Location: E353B

Participants
Marco Di Girolamo, MD, Rome, Italy (Presenter) Nothing to Disclose
Francesco Carbonetti, MD, Rome-Roma, Italy (Abstract Co-Author) Nothing to Disclose
PURPOSE
To evaluate the accuracy of hydro-MDCT in the evaluation of gastric adenocarcinoma with subsequent surgical and histopathological specimen.

METHOD AND MATERIALS
65 patients with gastric adenocarcinoma diagnosed by endoscopy and biopsy, underwent hydro-MDCT (16 detectors). The distension of the gastric lumen was obtained after the oral administration of 500ml of water and i.v. injection of spasmolytic agent. The dynamic study was performed during arterial and portal phase.

RESULTS
Contrast-enhanced Hydro-MDCT always detected the gastric cancer as a focal or diffuse gastric wall thickening with or without abnormal enhancement. The tumor was pre-operatively classified as T1 stage in 11 cases, T2 in 21, T3 in 25 and T4 stage in 8. In 49/65 patients the assessment of local tumor extension on hydro-MDCT was identical to the histopathological results in defining the T category according TNM classification, with overall accuracy of 75%. We found overstaging in 12 and understaging in 4 cases. The local enlarged lymphnodes were always identified but MDCT results in the N stage were in agreement with histo-pathological samples in 69% of cases. For the evaluation of metastatic disease hydro-MDCT had an accuracy of 99%.

CONCLUSION
Hydro-MDCT is a reliable technique in the preoperative staging of gastric adenocarcinoma.

CLINICAL RELEVANCE/APPLICATION
Hydro-MDCT is a reliable technique in the preoperative staging of gastric adenocarcinoma.

PURPOSE
To determine the role of follow-up abdominopelvic CT in detecting extragastric recurrence in patients who had undergone curative endoscopic submucosal dissection (ESD) for early gastric cancers (EGCs) based on expanded indications.

METHOD AND MATERIALS
This retrospective study was institutional review board approved with waiver of patients’ informed consent. Patients who underwent curative ESD for EGCs based on expanded indications between November 2005 and December 2009 as well as post-ESD CT and endoscopy comprised our study population. The primary outcome was post-ESD CT discovery of extragastric recurrence (i.e., lymph nodes or distant metastases) not detected by endoscopy. The incidence of gastric recurrence detected by endoscopy and/or CT was also analyzed. The cumulative incidence of gastric recurrence over the post-ESD follow-up period was analyzed using the Kaplan-Meier method.

RESULTS
The final cohort included 652 patients (297 based on absolute indications [234 men and 63 women; mean age, 64 years] and 390 patients based on expanded indications [311 men and 79 women; mean age, 63 years]). In a total of 611 post-ESD CTs performed over a mean follow-up of 59.1 months (Total 3013 CT scans; range, 4-113 months), extragastric recurrence (lymph node metastasis) was detected in only 2 patients (1 meeting absolute indications and 2 meeting expanded indications). Among the 8 local recurrences and 3 synchronous and 18 metachronous gastric cancers detected by endoscopy, 11 gastric recurrences were also detected on CT. Cumulative incidence of gastric recurrence 1, 3, and 5 years after ESD was 1.6%, 2.8%, and 7.1%, respectively.

CONCLUSION
When EGC meets expanded indications, surveillance CT following curative ESD rarely detects extragastric recurrence during 5-year post-ESD follow-up. However, owing to the high incidence of gastric recurrence, endoscopy surveillance is strongly warranted during this period.

CLINICAL RELEVANCE/APPLICATION
The role of CT surveillance is limited in patients who undergo curative ESD for early gastric cancers based on expanded indications as extragastric recurrence is rare.
**SST06-01**

**T2-Weighted and Gd-EOB-DTPA Enhanced T1-weighted Magnetic Resonance Cholangiography for Evaluation of Biliary Anatomy in Living Liver Donors**

*Friday, Dec. 4 10:30AM - 10:40AM Location: E353C*

**Participants**
- Janio Szklaruk, MD, PhD, Bala Cynwyd, PA (*Moderator*) Nothing to Disclose
- Puneet Bhargava, MD, Shoreline, WA (*Moderator*) Editor, Reed Elsevier

**Sub-Events**

**Purpose**
The aim of our study was to determine the utility of T2-weighted and Gd-EOB-DTPA enhanced T1-weighted MR cholangiography (MRC) at 3-Tesla for bile duct visualization and for predicting biliary anatomy.

**Method and Materials**
This study included 35 consecutive donors who underwent either right or left lobectomy for transplantation. Pre-operative MRC studies were acquired on a 3-Tesla scanner and included 3D T2 MRC and 3D Gd-EOB-DTPA enhanced T1 MRC. Two readers independently rated the quality of second-order bile duct visualization on the T2- and T1- MRC images on a 4 point scale (0, not seen; 3, excellent visualization), and also noted the presence of variant second-order biliary anatomy. MR findings were compared to those at surgery. Wilcoxon test was used to compare the MRC sequences, and Kappa analysis was performed to estimate inter-observer agreement.

**Results**
There was good inter-observer agreement for bile duct visualization (κ=0.72-0.76). The mean second order bile duct visualization scores were significantly higher for Gd-EOB-DTPA enhanced T1 MRC than 3D T2 MRC (2.4±0.7 vs 2.0±0.8, p=0.01). Thirteen of 35 donors underwent right lobectomy; biliary variant was noted at surgery in 11 of 13 right lobe donors. The biliary anatomy on MR was concordant with intraoperative finding in 10 of 13 donors (77%) for reader 1 and in 11/13 donors (85%) for reader 2. Twenty-two of 35 donors underwent left lobectomy; variant biliary anatomy was noted at surgery in 2 left lobe donors, one of which was predicted at MR by both readers. Both readers also noted variant biliary anatomy in 3 additional left lobe donors at MRC. These were not confirmed at surgery, and likely because commonly noted variant second order biliary anatomy predominantly affects right rather than left lobectomy and may not be visualized during left lobectomy.

**Conclusion**
Gd-EOB-DTPA Enhanced MRC provides improved bile duct visualization compared to 3D T2 MRC. Combined 3D T2-weighted and Gd-EOB-DTPA enhanced T1-weighted MRC at 3-Tesla depicts variant biliary anatomy with good accuracy.

**Clinical Relevance/Application**
Combined 3D T2-weighted and Gd-EOB-DTPA enhanced T1-weighted MRC at 3-Tesla depicts variant biliary anatomy with good accuracy.

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**SST06-03**

**Biliary Cast Syndrome in Patients after Liver Transplantation: Which Non-Enhanced T1-weighted Sequence is Able to Show Cast Best?**

*Friday, Dec. 4 10:50AM - 11:00AM Location: E353C*

**Participants**
- Larry Cai, BS, San Francisco, CA (*Presenter*) Nothing to Disclose
- Benjamin M. Yeh, MD, San Francisco, CA (*Abstract Co-Author*) Research Grant, General Electric Company; Author with royalties, Oxford University Press; Shareholder, Nextrast, Inc.
- Antonio C. Westphalen, MD, Mill Valley, CA (*Abstract Co-Author*) Nothing to Disclose
- John P. Roberts, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
- Zhen J. Wang, MD, Hillsborough, CA (*Abstract Co-Author*) Nothing to Disclose

**Purpose**
It is already known that the addition of T1-weighted (T1w) images to MR cholangiopancreatography (MRCP) facilitates detection of cast in biliary cast syndrome in patients after liver transplantation. Aim of this retrospective study was to compare T1w sequences with regard to the visibility of cast in patients with endoscopically saved biliary cast.

**Conclusion**
Out of the three evaluated T1w non-enhanced sequences, T1w opposed phase was superior regarding image quality and
**Clinical Relevance/Application**

Using T1w opposed-phase as single non-enhanced T1w sequence in addition to MRCP for detection of cast in patients after liver transplantation might shorten the MR protocol and optimize workflow in clinical routine.

**SST06-04 Determining the Extent of Cholecystectomy Using Intraoperative Specimen Ultrasonography in Patients with Suspected Early Gallbladder Cancer**

Participants

Ji Hoon Park, MD, Seongnam-Si, Korea, Republic Of (Presenter) Research Grant, Bracco Group
Young Hoon Kim, MD, PhD, Seongnam-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Yoon Jin Lee, MD, Seongnam-si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

**Purpose**

Accumulating evidence and guidelines recommend extended cholecystectomy for T1b or greater gallbladder cancers. This study aimed to evaluate the feasibility of intraoperative ultrasonography of a resected gallbladder specimen (specimen US) for the determination of the extent of cholecystectomy.

**Method and Materials**

The study included 37 patients (27 women; median [interquartile range] age, 66 [57-74] years) who underwent specimen US. After simple laparoscopic cholecystectomy, a gallbladder specimen was examined to evaluate the depth of tumor invasion by specimen US and frozen section examination. Then the operating surgeon decided whether to undergo extended cholecystectomy. The technical success rate and the examination time of the specimen US procedure were measured. The sensitivity and specificity in diagnosing T1b or greater cancer were calculated using permanent pathology as the reference standard.

**Results**

Among 17 patients in whom adenocarcinomas were confirmed, 14 patients had T1b or greater cancers. The technical success rate was 97% (95% confidence interval, 85-100%). The mean examination time was 8.5 minutes (standard deviation, 4.3 minutes). The sensitivity and specificity was 79% (49%-95%) and 91% (71%-99%), respectively.

**Conclusion**

The specimen US is feasible to be incorporated in the clinical practice, and provides useful information to determine the extent of cholecystectomy.

**Clinical Relevance/Application**

Providing high image resolution which has not been achieved by other diagnostic imaging modalities, intraoperative ultrasonography of a resected gallbladder specimen is feasible to be incorporated in the clinical practice for the determination of the extent of cholecystectomy.

**SST06-05 Utility of Diffusion-Weighted MRI for Differentiating Acute from Non-Acute Cholecystitis**

Participants

Annie M. Wang, MD, New York, NY (Presenter) Nothing to Disclose
Diane M. Dunst, MD, North Bellmore, NY (Abstract Co-Author) Nothing to Disclose
Krishna Prasad Shanbhogue, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Cristina H. Hajdu, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Andrew B. Rosenkrantz, MD, New York, NY (Abstract Co-Author) Nothing to Disclose

**Purpose**

To assess the utility of diffusion-weighted imaging (DWI) for differentiating acute from non-acute cholecystitis, in comparison with conventional MRI features.

**Method and Materials**

83 patients with abdominal pain who underwent 1.5T liver MRI including DWI (b-values 0, 500, and 1000 s/mm2) within 30 days before cholecystectomy were included. Two radiologists assessed cases for a spectrum of conventional MRI features associated with acute cholecystitis, as well as for visually increased mural signal on high b-value images and visually decreased mural ADC. ADC of the gallbladder wall was also measured. Features were compared between acute and non-acute cholecystitis.

**Results**

43% (47/83) had acute cholecystitis; 57% (47/83) had non-acute cholecystitis. Conventional MRI features with significantly greater frequency in acute cholecystitis for both readers were: wall thickening, pericholecystic fluid, pericholecystic stranding, gallbladder distension, increased pericholecystic liver enhancement, mural T2 hyperintensity, increased mural enhancement, striated mural appearance, and mural defect (all p≤0.003). Increased mural signal on high b-value images was significantly more frequent in acute than in non-acute cholecystitis for both readers (R1: 92% vs. 32%, R2: 83% vs. 30%; p<0.001). For R1 and R2, increased mural signal on high b-value images had a sensitivity of 92% and 83% and a specificity of 68% and 70%, respectively. Visually low ADC was more frequent in acute cholecystitis for R2 (p<0.001) but not for R1 (p=0.406); ADC values were not different between the two groups for either reader (p=0.104-0.139). At multivariable analysis, independent predictors of acute cholecystitis were, for R1: gallbladder distension, increased pericholecystic liver enhancement, and increased mural signal on high b-value images (combined AUC 89%), and for R2: pericholecystic fluid and increased mural signal on high b-value images (combined AUC 89%).

**Conclusion**

Visually increased mural signal on high b-value DWI was highly sensitive and moderately specific in identifying acute cholecystitis.
serving as a significant independent predictor of this diagnosis relative to conventional MRI features for both readers.

**CLINICAL RELEVANCE/APPLICATION**

Diffusion-weighted imaging (particularly the high b-value images) may have additive value relative to conventional MRI in guiding clinical management in patients with suspected acute cholecystitis.

**Honored Educators**

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Krishna Prasad Shanbhogue, MD - 2012 Honored Educator
Krishna Prasad Shanbhogue, MD - 2013 Honored Educator

**SST06-06** Intraductal Papillary Mucinous Neoplasms (IPMN) of the Pancreas: Diagnostic Accuracy of Low-dose Abdominal MDCT Scan

Friday, Dec. 4 11:20AM - 11:30AM Location: E353C

Participants
Federica Leone, MD, Monza, Italy (Presenter) Nothing to Disclose
Davide Ippolito, MD, Monza, Italy (Abstract Co-Author) Nothing to Disclose
Pietro A. Bonafini, MD, Monza, Italy (Abstract Co-Author) Nothing to Disclose
Camillo R. Talei Franzesi, Milan, Italy (Abstract Co-Author) Nothing to Disclose
Pietro Allegranza, MD, Monza, Italy (Abstract Co-Author) Nothing to Disclose
Sandro Sironi, MD, Monza, Italy (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To evaluate the diagnostic accuracy of low-dose MDCT combined with iterative reconstruction algorithm (iDose4) in the assessment of intraductal papillary mucinous neoplasms (IPMN) of the pancreas, to determining the correct surgical approach.

**METHOD AND MATERIALS**

We retrospectively evaluated nineteen patients (13 men; mean age 70.7±13.1 years) with pancreatic IPMN and who underwent from January 2013 to March 2015 an abdominal MDCT examination on a 256-slice scanner (iCT; Philips), with low-dose scanning protocol (120 kV, mAs determined by x-, y- and z-axis dose modulation) and iDose4 reconstruction modulation. Standard Magnetic Resonance (MR) imaging examination was used as reference standard for diagnosis of IPMN. For every IPMN the following data and morphologic features were reported: location within the gland (head, uncinate process, neck, body, tail), number (multifocality), maximum diameter(measured either on axial images or multiplanar reconstructions), communication with the main pancreatic duct (MPD), maximum MPD diameter, presence of septa, wall thickening, mural enhancing nodules and close adjacency to the portal vein, according to surgical guidelines of International Association of Pancreatology.

**RESULTS**

Multiplanar CT reconstructions were performed and the imaging data were reviewed as axial and as MPR images: coronal, sagittal and curved oblique, to evaluate the surgical criteria of malignancies and therefore the surgical approach. A total of 44 IPMN (26 in the tail, 8 in the body, 6 in the head, 2 in the neck) in 19 patients were evaluated (six in 8 cases, multiple in 11). The main lesion diameter was 14.4±6.8 mm; 22/44 (50%) demonstrated a distinct communication with MPD and MPD mean diameter was 2.7±0.7 mm. 5/44 (11%) lesions demonstrated inner septa and 10/44 (23%) wall thickening and 2/44 (4%) mural enhancing nodules. 8/44 (18%) of IPMN demonstrated close proximity to the portal vein.

**CONCLUSION**

Low-dose abdominal MDCT scans with iDose4 reconstruction algorithm are able to properly depict morphologic features of pancreatic IPMNs that may allow their proper characterization according to surgical guidelines.

**CLINICAL RELEVANCE/APPLICATION**

MDCT scans combined with iDose4 might represents a useful imaging technique, rapid and widely available, for the proper surgical assessment of pancreatic IPMN.

**SST06-07** Application of Contrast-enhanced Ultrasound in the Diagnosis of Space-occupying Lesions in Extrahepatic Bile Duct -A Comparison of Conventional Ultrasound and Contrast-enhanced CT

Friday, Dec. 4 11:30AM - 11:40AM Location: E353C

Participants
Wei Wu, MD, Beijing, China (Presenter) Nothing to Disclose
Yue Cong, Beijing, China (Abstract Co-Author) Nothing to Disclose
Zhong-Yi Zhang, PhD, Beijing, China (Abstract Co-Author) Nothing to Disclose
Kun Yan, BS, Beijing, China (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

To investigate the application of contrast-enhanced ultrasound (CEUS), compared with conventional ultrasound (US) and contrast enhanced computed tomography (CECT) in the diagnosis of space-occupying lesions in the extrahepatic bile duct.

**METHOD AND MATERIALS**

Seventy two patients with pathological diagnosis of space-occupying lesions in the extrahepatic bile duct were retrospectively recruited. All 72 patients underwent US, CEUS and CECT. The Sensitivity, specificity and diagnostic accuracy were obtained and compared.
RESULTS

Among 72 patients, 11 cases were benign and 61 cases were malignant. The diagnostic accuracy of US, CEUS and CECT were 66.67% (48/72), 90.28% (65/72) and 88.89% (64/72), respectively. The Youden index showed that CEUS (0.811) is comparable to contrast enhanced CT (0.720) and higher than US (0.159). There was a significant difference between US and CEUS (p=0.001) and US and CECT (p=0.001) in terms of accuracy of diagnosis, however, no significant difference between CEUS and CECT (p=0.785). Sensitivity results showed a significant difference between US and CEUS (p=0.006) and CECT (p=0.006) whilst CEUS was comparable to contrast enhanced CT (p=1.000). There was no significant difference in specificity among the three imaging techniques (p=0.05). There was a significant difference in the number of lesions with clear boundaries displayed, 16 in the US and 56 in CEUS (p=0.006).

CONCLUSION

CEUS can observe dynamic blood supply in the space-occupying pathological regions in the extrahepatic bile duct. The diagnosis accuracy of CEUS in the extrahepatic bile duct was higher than that of conventional US and comparable to that of contrast-enhanced CT. Therefore, CEUS may be a promising imaging technique in the diagnosis of space-occupying disease in the extrahepatic bile duct.

CLINICAL RELEVANCE/APPLICATION

The diagnosis accuracy of CEUS in the extrahepatic bile duct was higher than that of conventional US and comparable to that of contrast-enhanced CT.

PURPOSE

Heterogeneity in the tumor structure or vasculature is a well-recognized feature of malignancy. On the other hand, mutation in the isocitrate dehydrogenase (IDH) is the most common genetic alternations in cholangiocarcinoma, which has been reported its association with progression to metastases. The purpose of this study is to compare computed tomography texture analysis (CTTA) with genetic mutation of IDH and survival in unresectable cholangiocarcinoma.

METHOD AND MATERIALS

46 patients (22 M / 24 W; median age: 61.3 years) with unresectable cholangiocarcinoma were retrospectively evaluated. Median follow-up time was 24.0 months. Contrast enhanced (CE) CT were performed before the therapy. Tumor texture parameters including mean gray intensity (MGI), standard deviation (SD), Entropy, mean of positive pixels (MPP) were measured on portal-phase CECT images by a texture analysis software (TexRAD, Somerset, UK), where the filtration (spatial scale filter, SSF) extracted features of medium texture scale (SSF=3 mm in radius). Correlations of texture parameters with IDH mutations were investigated, and those parameters were also compared with overall survival (OS) using Cox regression and Kaplan-Meier analysis.

RESULTS

Low SD value of tumor significantly associated with IDH mutation (P=0.01). In univariate Cox regression analysis, MGI showed significant correlations with OS (P=0.008). Kaplan-Meier analysis demonstrated that lower MGI (< -4.623) associated with favorable OS (P=0.01).

CONCLUSION

Pre-therapeutic tumor texture parameter may serve as a predictive imaging biomarker for gene mutation and survival in cholangiocarcinoma patients.

CLINICAL RELEVANCE/APPLICATION

CT texture analysis can be a widely applicable noninvasive biomarker for predicting gene mutation and survival in cholangiocarcinoma patients, and it would help select an optimal therapy for those patients.

Honored Educators

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Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator

SST06-09 Common Bile Duct Stone: Value of Adding Single-Shot Balanced Turbo Field-Echo Sequence to Conventional MR Imaging

Friday, Dec. 4 11:50AM - 12:00PM Location: E353C

Participants
PURPOSE

To evaluate the value of adding single-shot balanced turbo field-echo (b-TFE) sequence to conventional magnetic resonance (MR) imaging for the detection common bile duct (CBD) stone.

METHOD AND MATERIALS

Our institutional review board approved this prospective study and written informed consent was obtained. One-hundred thirty-seven consecutive patients with suspected CBD stone underwent MR imaging, including balanced turbo field-echo sequence. Among 137 patients, 25 patients were confirmed having CBD stone by endoscopic retrograde cholangiopancreatography or ultrasonography. A radiologist reviewed the following two image sets for the detection of CBD stone; image set A, a conventional MR images (unenhanced T1-, T2-, heavily T2-, and MRCP images), and image set B, combined conventional images and b-TFE. The sensitivities, specificities, and area under the receiver-operating-characteristic curve (AUC) for the detection of CBD stone were compared.

RESULTS

AUC for the detection of CBD stone were 0.86 and 0.93 for image sets A and B, respectively. The AUC for image set B was significantly greater than that for image set A (P = 0.030). For the detection of CBD stone, sensitivity was comparable between two image sets but image set 2 (99%) yielded better specificity than image set 1 (92%) (P = 0.0078).

CONCLUSION

Adding single-shot b-TFE to conventional MR imaging improves the diagnostic performance for CBD stone.

CLINICAL RELEVANCE/APPLICATION

For the evaluation of common bile duct stone, single-shot balanced turbo field-echo sequence significantly improve a confidence rating for the presence.
Vascular/Interventional (Innovation in Non-Vascular Interventions)
Friday, Dec. 4 10:30AM - 12:00PM Location: E350

Gastroduodenal Stent Placement versus Surgical Gastrojejunostomy for the Palliation of Gastric Outlet Obstructions in Patients with Unresectable Gastric Cancer: A Propensity Score-Matched Analysis

Friday, Dec. 4 10:30AM - 10:40AM Location: E350

Participants
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Sub-Events
SST15-01 Gastroduodenal Stent Placement versus Surgical Gastrojejunostomy for the Palliation of Gastric Outlet Obstructions in Patients with Unresectable Gastric Cancer: A Propensity Score-Matched Analysis

Friday, Dec. 4 10:30AM - 10:40AM Location: E350

Participants
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Jiaywei Tsauo, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
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Young Chul Cho, BS, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

PURPOSE
To compare the outcomes between stent placement and surgical GJ for the palliation of gastric outlet obstruction (GOO) in patients with unresectable gastric cancer.

METHOD AND MATERIALS
A retrospective study was performed in a single university hospital in 676 patients with GOO, and who were treated either by stent placement (n = 301) or surgical GJ (n = 375). The outcomes were assessed with reference to the following variables with the use of propensity-score matching: success rates; adverse events; dysphagia scores, albumin, and BMI; survival; symptom free duration; and hospitalization.

RESULTS
224 of 676 patients were enrolled in accordance with inclusion and exclusion criteria. In the 74 matched cohorts, there was no significant difference between the two groups following variables: success rates, adverse events, and survival. The dysphagia score seven days after treatment in the stent group was significantly better than in the surgery group (1.50 vs. 2.07, P < 0.001). Albumin level one month after treatments in stent group was significantly lower than in the surgery group (3.33 vs. 4.12, P < 0.001). Duration of symptom free and hospitalization were significantly longer in the surgery group than in the stent group (P = 0.002, P < 0.001, respectively). The recurrence rate was significantly higher in the stent group than in the surgery group (P = 0.032).

CONCLUSION
In a matched cohort of patients, stent placement can provide faster symptom relief and shorter hospitalization, while surgical GJ can provide longer symptom free duration, less recurrent obstruction symptoms and better nutritional status.

CLINICAL RELEVANCE/APPLICATION
Stent placement provides more immediate symptom relief and shorter hospitalization compared with surgical GJ, but is associated with a shorter symptom free duration, a greater chance of recurrent obstruction symptoms, and poorer nutritional status.

SST15-02 Fluoroscopic Stent Placement versus Endoscopic Stent Placement for the Palliation of Malignant Gastric Outlet Obstruction: A Retrospective Comparison Study

Friday, Dec. 4 10:40AM - 10:50AM Location: E350

Participants
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PURPOSE
Endoscopic stent placement (ESP) and fluoroscopic stent placement (FSP) are both well-established methods for the palliation of malignant gastric outlet obstruction (GOO). To date, there has been no study comparing these two procedures. The aim of this study was to compare retrospectively the outcomes of ESP with FSP in patients with malignant GOO.

METHOD AND MATERIALS
A retrospective study was performed in a single university hospital in 306 patients with malignant GOO, and who were treated either by ESP (n = 181) or FSP (n = 125). The outcomes were assessed with reference to the following variables: success rates;
RESULTS
A total of 193 patients met our inclusion/exclusion criteria, including 68 patients who underwent ESP and 125 patients who underwent FSP. The technical and clinical success rates, adverse events, re-intervention rates, stent patency, and patient survival rate were not significantly different between two groups. GOOSS score improved significantly in both groups after the procedure. Stent migration rate and number of re-intervention procedures was significantly higher in the ESP group than in the FSP group (P = 0.002 and P = 0.024, respectively). Stent collapse rate was lower in the ESP group than in the FSP group (P = 0.021). Six-month stent patency rate was statistically higher in the ESP group than in the FSP group (P = 0.044).

CONCLUSION
Despite similar outcomes and adverse events, partially covered SEMSs for TTS delivery system were associated with a higher migration rate and a more frequent need for re-interventional procedure, while lower stent collapse rate compared with partially covered dual SEMS for the palliation of malignant GOO.

CLINICAL RELEVANCE/APPLICATION
Our study demonstrated that both FSP and ESP using a partially covered SEMS are an effective therapeutic option for the palliation of malignant GOOs.

PURPOSE
To reduce the stent dysfunction rate, we developed a new self-expandable metallic stent (SEMS) with double step flanges at both ends coated with silicone and a main body externally covered with a polytetrafluoroethylene membrane. The purpose of this study was to investigate the efficacy and safety of the new SEMS for the palliation of malignant esophageal strictures.

METHOD AND MATERIALS
With approval from our institutional review board, the records of 76 patients who underwent the new SEMS placement were retrospectively reviewed. Patients with benign strictures or who underwent temporary stenting for other therapies were excluded. Fifty-one patients (44 men, 86.3%; mean age, 63.7 years) were included in this study. Technical and clinical success, stent dysfunction, survival, and complications were analyzed.

RESULTS
Technical and clinical success was achieved in all patients (100%). The dysphagia score improved from 3.2±0.6 to 1.1±0.7 after treatment (P<0.001). Stent dysfunction occurred in 10 patients (19.6%): migration in four (7.8%), tumor overgrowth in five (9.8%), and food impaction in one (2.0%). The major complication was a tracheoesophageal fistula in one patient (2.0%). Minor complications, including mild pain and gastroesophageal reflux, were observed in 10 patients (19.6%). The median survival was 160 days. Twenty-four patients who underwent tumor treatments after stenting had a longer survival but had more stent dysfunction than those on supportive care (P<0.05).

CONCLUSION
The new stent was safe and effective for the palliation of malignant esophageal strictures, and resulted in relatively low migration and tumor overgrowth rates compared to those reported previously.

CLINICAL RELEVANCE/APPLICATION
This newly designed fully covered self-expandable metallic stent could be used for the management of malignant esophageal strictures. Owing to its new design, patients with malignant esophageal strictures could benefit from its low stent dysfunction and complication rates.

PURPOSE
To evaluate the safety and efficacy of fluoroscopic removal of retrievable expandable metallic stents (REMSs) in patients with malignant esophageal strictures, to compare clinical outcomes regarding removal techniques and removal timing, and to identify predictive factors related to successful removal.

METHOD AND MATERIALS
In this retrospective study, 129 patients with a total of 139 stent placements were reviewed retrospectively. Of the 139 stents, 95 stents were removed electively. Technical success rate and complication rate of the standard removal technique (Primary technical success) and modified removal technique (Secondary technical success) were evaluated. Logistic regression models were constructed to identify predictive factors related to successful removal.

RESULTS
Primary technical success rate was 78.4% (109/139) and secondary technical success rate was 100% (30/30). We observed 6 (4.3%) cases of complications associated with the removal. All complications were caused by the standard removal technique. There was no complication noted when REMSs were removed within 4 weeks of placement. Stent location at the upper esophagus (P=0.006), and stricture length ≥ 8cm (P=0.026) were negative predictive factors for technical success of the standard technique.

CONCLUSION
Fluoroscopic removal of retrievable SEMSs for malignant esophageal strictures can be performed in a safe and convenient manner. Caution should be posed when removing stents located at the upper esophagus and stricture length ≥ 8cm as they show higher tendency to failure of the standard removal technique.

CLINICAL RELEVANCE/APPLICATION
Stent removal within 4 weeks might be ideal in minimizing stent-induced complication, albeit further studies are to be performed for verification.

SST15-05  Airway Stent Placement for Malignant Tracheobronchial Strictures in Patients with an Endotracheal Tube

Friday, Dec. 4 11:10AM - 11:20AM Location: E350

Participants
Min Jung Kim, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Ji Hoon Shin, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jung-Hoon Park, MS, RT, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Young Chul Cho, BS, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jin Hyoung Kim, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

PURPOSE
To evaluate the technical feasibility and safety of airway stent placement for malignant tracheobronchial strictures in patients with an endotracheal tube.

METHOD AND MATERIALS
We retrospectively analyzed the data regarding retrievable, expandable, metal, stent placement under fluoroscopic guidance in 21 patients with an endotracheal tube inserted for malignant tracheobronchial strictures. The clinical effectiveness was assessed using the following variables: technical and clinical success; procedure and stent-related complications; and duration of intubation following stent placement.

RESULTS
Stent placement was technically successful in all 21 patients (100%), and with 20 of the 21 patients (95%) showing symptomatic improvement within five days. The endotracheal tube could be removed during (n=7) or after (n=13) stent placement, and the mean duration of intubation following stent placement was 1.4 days (range 0–4 days). One patient could not have its endotracheal tube removed and he died nine days following stent placement in an intubation state. Mild bleeding was a procedure-related complication that occurred in one patient and which resolved spontaneously within three days. Stent-related complications in four patients included stent migration (n=3) and tumor overgrowth (n=1), all of which were managed with a second stent placement (n=3) or stent removal and a second stent placement (n=1).

CONCLUSION
Airway stent placement under fluoroscopic guidance in patients with an endotracheal tube inserted for malignant tracheobronchial strictures, is both technically feasible and safe.

CLINICAL RELEVANCE/APPLICATION
Airway stent placement through an endotracheal tube is technical feasible and safe.

SST15-06  Intervention Planning using a Laser Navigation System (LNS) for CT-guided Interventions: A Phantom and Patient Study

Friday, Dec. 4 11:20AM - 11:30AM Location: E350

Participants
Tatjana Gruber-Rouh, Frankfurt Am Main, Germany (Presenter) Nothing to Disclose
Thomas J. Vogl, MD, PhD, Frankfurt, Germany (Abstract Co-Author) Nothing to Disclose
Clara Lee, MD, Frankfurt am Main, Germany (Abstract Co-Author) Nothing to Disclose
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Nagy N. Naguib, MD, MSc, Frankfurt Am Main, Germany (Abstract Co-Author) Nothing to Disclose
Stefan Zangos, MD, Frankfurt Am Main, Germany (Abstract Co-Author) Nothing to Disclose

PURPOSE
To investigate the effects of a novel Laser Navigation System (LNS) on accuracy, efficiency and radiation dose compared to free-handed punctures at CT.

METHOD AND MATERIALS
Using a phantom and a human body, we compared the accuracy of punctures using the LNS-guided method and the free-hand method.
Using a phantom body 60 punctures were performed comparing the conventional free-handed procedure to the LNS-guided method to investigate accuracy, timely effort and radiation dose. Additional 20 LNS-guided interventions were performed on another phantom in order to confirm the accuracy. Ten subsequent patients then underwent LNS-guided puncture.

RESULTS

Phantom 1-LNS group showed a target point accuracy of 4.01 ±2.72 mm (freehand 6.30 ±3.58 mm), entrance point accuracy of 0.76 ±0.6 mm (freehand 6.11 ±4.66 mm), needle angulation accuracy of 1.27 ±0.93° (freehand 3.36 ±3.10°), intervention time of 7:03 ±5:18 minutes (freehand 8:38 ±4:09 minutes) and the number of CT images 4.2 ±3.6 (freehand 7.9 ±5.1). Results showed significant improvement compared to freehand in 60 punctures. Phantom 2-LNS group showed a target point accuracy of 3.57 ±2.50 mm, entrance point accuracy of 1.39 ±1.99 mm, needle angulation accuracy of 0.95 ±1.19°, intervention time of 1:44 ±0.22 minutes and the number of CT images was 3.4 ±1.7. Regarding the first experience with patients, the LNS group achieved target point accuracy of 5.01 ±1.20 mm, an entrance point accuracy of 2.0 ±1.54 mm, a needle angulation accuracy of 1.5 ±0.3°, an interventional time of 12:08 ±3:07 minutes and using 5.7 ±1.6 CT-images.

CONCLUSION

LNS can improve CT-guided interventions with regard to accuracy, duration of intervention and radiation dose.

CLINICAL RELEVANCE/APPLICATION

The LNS may improve the accuracy, speed and safety of CT-guided interventions. With this system, the needle can be placed in a more accurate position at a faster speed while requiring a lower number of images, thereby reducing the patients’ and working staff exposure to radiation during the procedure.
RESULTS
Technical success was achieved in 87% of attempted placements (28 of 32 attempts). Technical failure was due to excessive target bowel mobility. Average procedural time was 88 minutes with a median of 77 minutes. Pericatheter leakage was the most common complication, occurring in 78% of patients (22 of 28). There were no major complications.

CONCLUSION
Use of CT to guide placement of percutaneous jejunal catheters is safe and effective, with technical success and complication rates similar to reported rates when using fluoroscopy. CT offers distinct advantages in certain patients over fluoroscopy, including the ability to more easily select a bowel loop with no intervening structure at risk of inadvertent injury.

CLINICAL RELEVANCE/APPLICATION
Transgastric access for enteral feeding may be unavailable in patients with upper abdominal malignancy or prior GI surgery; CT-guided jejunal tube placement is a safe and effective method to obtain access in these patients.

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Peter R. Mueller, MD - 2012 Honored Educator
Peter R. Mueller, MD - 2013 Honored Educator

PURPOSE
Central stentoplasty is a novel technique where a single stent is implanted in the center of the vertebral body under cone-beam CT guidance. Data on this technique including technical feasibility, safety and outcome however remains limited. The purpose of this study is to described the technical results of the first 40 cases of central stentoplasty in our institution.

METHOD AND MATERIALS
Consecutive cases of central stentoplasty (CS) from our prospective registry was analysed. Patient demographics, indications and pre-procedural imaging were reviewed. Technical success was defined as successful midline stent implantation, on antero-posterior fluoroscopy and in the coronal view on completion cone-beam CT. Procedure related complications were recorded and pain score were obtained immediately before and within 6 hours after the procedure.In addition, fractured vertebral bodies with > 30% height loss were assessed for deformity correction using vertebral angle and anterior vertebral height ratio.

RESULTS
From September 2013 to March 2015, a total of 35 patients (9 men, 26 women) with mean age of 70.8 years (range 51 - 90 years) underwent central stentoplasty. Among them, 40 vertebral levels were treated, consisting of thoracic (n=17) and lumbar (n=23) vertebrae. Etiologies included osteoporotic (n=25), traumatic (n=5) and malignant (n=5). Technical success was achieved in 100% of the cases. Complications included: asymptomatic cement extravasation (n=4) and self-limiting track hematoma (n=1). No stent malpositioning, neurological deficit or complication resulting in escalation of care or surgical intervention was recorded. Visual analogue score improvement of > 3 was recorded in 39 out of 40 patients.A total of 15 fractured vertebral bodies had > 30% loss of height and were further analysed for deformity correction. These vertebral bodies had a mean pre-procedure sagittal index (SI) of 0.82 and the post procedure SI of 0.92. The pre-procedure wedge angle (WA) was 5.38° compared to post-procedure mean WA of -3.54°. The mean pre-procedure segmental kyphosis was -7.00° and the mean post-procedure segmental kyphosis was -4.43°.

CONCLUSION
CS is technically feasible and a low complication rate is expected. It can be applied across various etiologies and have the potential for deformity correction in vertebral bodies with significant vertebral height loss.

CLINICAL RELEVANCE/APPLICATION
CS is a feasible technique in spinal augmentation.