

Friday

RC801

Imaging of Cardiothoracic Emergencies (An Interactive Session)

Friday, Dec. 2 8:30AM - 10:00AM Room: E353C

CH ER

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

LEARNING OBJECTIVES

1) To review imaging manifestations of common life-threatening complications of thoracic trauma. 2) To highlight common difficulties radiologists encounter when interpreting imaging studies in patients with thoracic trauma. 3) Overview current imaging strategies and key facts in Pulmonary Embolism imaging. 4) Provide an update on current issues and challenges in Pulmonary Embolism imaging.

Sub-Events

RC801A Thoracic Trauma

Participants

Santiago Martinez-Jimenez, MD, Kansas City, MO (*Presenter*) Author, Reed Elsevier; Author, Oxford University Press

LEARNING OBJECTIVES

1) To review imaging manifestations of common life-threatening complications of thoracic trauma. 2) To highlight common difficulties radiologists encounter when interpreting imaging studies in patients with thoracic trauma.

ABSTRACT

Thoracic trauma is common, may imply life-threatening complications, and could be especially challenging for radiologists. Several reasons known to add complexity of interpretation of imaging studies include: lack of direct interaction with patients, unawareness of the mechanism of trauma, inherent poor diagnostic quality, satisfaction of search, and lack of knowledge of resultant pathophysiologic mechanisms. In this case based lecture several scenarios are presented with detailed analyses of imaging studies, mechanisms of trauma and pertinent involved pathophysiological principles. Some of the cases included are: acute traumatic aortic injury, diaphragmatic rupture, airway injury, aspiration, flail chest, and steno-clavicular dislocation.

Active Handout: Santiago Martinez-Jimenez

http://abstract.rsna.org/uploads/2016/16000670/RC801A_Trauma_RSNA_2016_003.pdf

Honored Educators

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Santiago Martinez-Jimenez, MD - 2014 Honored Educator
Santiago Martinez-Jimenez, MD - 2015 Honored Educator

RC801B Pulmonary Embolism

Participants

Ioannis Vlahos, MRCP, FRCR, London, United Kingdom, (johnny.vlahos@stgeorges.nhs.uk) (*Presenter*) Research Consultant, Siemens AG; Research Consultant, General Electric Company;

LEARNING OBJECTIVES

1) Overview current imaging strategies and key facts in Pulmonary Embolism imaging. 2) Provide an update on current issues and challenges in Pulmonary Embolism imaging.

ABSTRACT

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Ioannis Vlahos, MRCP, FRCR - 2015 Honored Educator

RC801C Acute Aortic Syndrome

Participants

Jonathan H. Chung, MD, Chicago, IL (*Presenter*) Royalties, Reed Elsevier; Consultant, F. Hoffmann-La Roche Ltd; Consultant, Boehringer Ingelheim GmbH; Consultant, Veracyte, Inc

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Jonathan H. Chung, MD - 2013 Honored Educator

RC801D Acute Coronary Syndrome

Participants

Harold I. Litt, MD, PhD, Philadelphia, PA (*Presenter*) Research Grant, Siemens AG ; Research Grant, Heartflow, Inc; Travel Support, General Electric Company;

LEARNING OBJECTIVES

1) Understand the demographics and clinical presentations of patients with suspected acute coronary syndromes and the pathways and guidelines used in their care. 2) Describe the evidence supporting the use of coronary CT angiography, SPECT myocardial perfusion imaging and stress echocardiography in low to intermediate risk chest pain patients. 3) Demonstrate typical findings at coronary CT angiography in patients with suspected acute coronary syndromes.

RC802

Educating and Developing Tomorrow's Imaging Health Services: Researchers and Policy Experts

Friday, Dec. 2 8:30AM - 10:00AM Room: E261



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credit: 0

Participants

Richard Duszak JR, MD, Atlanta, GA (*Moderator*) Nothing to Disclose

Andrew B. Rosenkrantz, MD, New York, NY, (Andrew.Rosenkrantz@nyumc.org) (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define the key attributes of a successful health policy educational curriculum. 2) Describe training strategies that radiologists may pursue to enhance their skills in health services research. 3) Identify potential data sources and other research-related resources to assist radiologists pursuing health services research.

ABSTRACT

Health services research investigates the quality, cost, and value of health care. Health services research is now more critical than ever before in the current era of healthcare reform and increasing focus on transparency and value-driven care. It is essential that radiologists be properly trained in the conduct of high-quality health services research in order to optimally impact ongoing policy decisions and to ensure that their unique perspectives are considered in evolving practice models. A spectrum of opportunities exist for developing skills in health services research and initiating relevant research projects, though greater dissemination and awareness of such resources may help encourage deeper involvement by radiologists in such research the early stages of their careers. Thus, this session will address core aspects of promoting robust health services research by radiologists. Addressed topics will include the implementation of a health policy educational curriculum for junior radiologists, additional training opportunities in health services research that radiologists may pursue, as well as possible data and other resources available to radiologists in pursuing health services research. It is anticipated that at the conclusion of the session, participants will have an understanding of an array of resources and approaches that may be useful in becoming a successful radiology health services researcher.

Sub-Events

RC802A Creating a Health Policy Educational Curriculum for Radiologists

Participants

Margaret Fleming, MD, Atlanta, GA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC802B Training Resources for Radiologists Pursuing Health Services Research

Participants

Pari Pandharipande, MD, MPH, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC802C Data and Research Resources for Radiologists Pursuing HSR

Participants

Andrew B. Rosenkrantz, MD, New York, NY, (Andrew.Rosenkrantz@nyumc.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC804

Muscle Imaging: Beyond the Basics

Friday, Dec. 2 8:30AM - 10:00AM Room: E450A

MK

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Robert D. Boutin, MD, Davis, CA (*Director*) Nothing to Disclose

LEARNING OBJECTIVES

1) Become familiar with normal anatomy and common pathology of muscles and tendons of the torso and pelvis. 2) Demonstrate understanding of the pathomechanisms and imaging findings of musculotendinous disorders of the torso and pelvis. 3) Define the musculo-tendinous anatomy of the hamstring and quadriceps muscle groups. 4) Identify on imaging and classify patterns of injury to the hamstring and quadriceps muscle complexes. 5) Develop criteria for evaluation of the prognostic significance of imaging findings in injuries of the hamstring and quadriceps muscle complexes. 6) Recognize common muscle disorders in the leg and foot due to a variety of traumatic, inflammatory, congenital and neurogenic causes. 7) Use imaging findings to help prognosticate and guide therapy for muscle disorders in the calves. 8) Recognize clinical situations in which percutaneous therapy for muscle injuries may be indicated 9) Describe the logistics and risks of percutaneous therapy 10) Understand the current evidence for efficacy of percutaneous treatment of muscle injuries

Sub-Events

RC804A Sarcopenia is Significant: Why Muscle Matters

Participants

Robert D. Boutin, MD, Davis, CA (*Presenter*) Nothing to Disclose

RC804B Musculotendinous Disorders in the Torso and Pelvis

Participants

Miriam A. Bredella, MD, Boston, MA, (mbredella@mgh.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Become familiar with normal anatomy and common pathology of muscles and tendons of the torso and pelvis. 2) Demonstrate understanding of the pathomechanisms and imaging findings of musculotendinous disorders of the torso and pelvis.

ABSTRACT

RC804C Musculotendinous Injuries in the Thigh

Participants

James M. Linklater, MBBS, St Leonards, Australia (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

Define the musculo-tendinous anatomy of the hamstring and quadriceps muscle groups. Identify on imaging and classify patterns of injury to the hamstring and quadriceps muscle complexes. Develop criteria for evaluation of the prognostic significance of imaging findings in injuries of the hamstring and quadriceps muscle complexes.

ABSTRACT

Active Handout: James Macpherson Linklater

http://abstract.rsna.org/uploads/2016/16000507/RC804C_HANDOUT.pdf

RC804D Muscle Derangements Below the Knee

Participants

David A. Rubin, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize common muscle disorders in the leg and foot due to a variety of traumatic, inflammatory, congenital and neurogenic causes. 2) Use imaging findings to help prognosticate and guide therapy for muscle disorders in the calves.

ABSTRACT

RC804E Sonographic Evaluation and Percutaneous Treatment of Muscle Injuries

Participants

Christopher F. Beaulieu, MD, PhD, Stanford, CA, (beaulieu@stanford.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the clinical situations in which percutaneous therapy for muscle injuries may be indicated 2) Describe the logistics and risks

1) Recognize clinical situations in which percutaneous therapy for muscle injuries may be indicated 2) Describe the logistics and risks of percutaneous therapy 3) Understand the current evidence for efficacy of percutaneous treatment of muscle injuries

ABSTRACT

RC804F Advanced MRI Techniques; Myositis, Myopathy, and More

Participants

John A. Carrino, MD, MPH, New York, NY (*Presenter*) Research Consultant, BioClinica, Inc; Research Consultant, Pfizer Inc; Research Consultant, Carestream Health, Inc; Advisory Board, General Electric Company; Advisory Board, Halyard Health, Inc; ;

LEARNING OBJECTIVES

1) To describe the technical advances of muscle MRI. 2) To show normal features of muscle with MRI advanced techniques. 3) To illustrate common and uncommon muscle pathologies revealed by MRI.

ABSTRACT

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John A. Carrino, MD, MPH - 2013 Honored Educator
John A. Carrino, MD, MPH - 2015 Honored Educator

RC805

Horse or Zebra? Mimics of Common Neuro and Head and Neck Lesions (An Interactive Session)

Friday, Dec. 2 8:30AM - 10:00AM Room: E451A

NR

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Deborah R. Shatzkes, MD, New York, NY, (shatzkes@hotmail.com) (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review typical CT and MRI findings in multiple sclerosis, brain tumors, pituitary adenoma, and vestibular schwannoma. 2) Recognize clinical history and imaging features that distinguish these diseases from their most common mimics. 3) Understand the role of laboratory analysis, clinical and imaging follow-up to help in differentiating these diseases from other disorders with similar imaging findings.

Sub-Events

RC805A Multiple Sclerosis or Mimic?

Participants

Christopher P. Hess, MD, PhD, San Francisco, CA, (christopher.hess@ucsf.edu) (*Presenter*) Research Grant, General Electric Company; Research Grant, Quest Diagnostics Incorporated; Research Grant, Cerebrotech Medical Systems, Inc; Speaker, Siemens AG;

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC805B Brain Tumor or Mimic?

Participants

Girish M. Fatterpekar, MBBS, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1. Discuss key imaging findings to help distinguish a tumor mimic from a tumor. 2. Discuss the importance of integrating clinical history when evaluating a tumor/tumor mimic case. 3. Provide imaging pearls to identify the specific etiology associated with the tumor mimic.

RC805C Pituitary Adenoma or Mimic?

Participants

Mari Hagiwara, MD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) List the differential diagnosis of pituitary adenomas. 2) Recognize characteristic imaging findings that may help differentiate pituitary adenomas from its mimics.

ABSTRACT

Adenomas are by far the most common lesions seen involving the pituitary gland. There are however mimics of pituitary adenomas which should be considered in the differential diagnosis. These mimics and their imaging characteristics will be reviewed during this session.

RC805D Vestibular Schwannoma or Mimic?

Participants

Claudia F. Kirsch, MD, New York, NY, (cfekirsch@gmail.com) (*Presenter*) Stockholder, ABIOMED, Inc; Stockholder, LeMaitre Vascular, Inc; Stockholder, Becton, Dickinson and Company; Royalties, Informa plc;

LEARNING OBJECTIVES

1) An improved understanding and review of the relevant radiographic anatomy and critical structures in the internal auditory auditory canal and cerebellopontine angle. 2) The radiographic characteristics of vestibular schwannomas and their clinical implications. 3) The radiographic features of clinical pathology that may imitate vestibular schwannomas including tumors, infectious and inflammatory etiologies.

ABSTRACT

Although pathological lesions in the internal auditory canal and cerebellopontine angle cistern are approximately 90% of the time a slow growing benign tumor such as a vestibular schwannoma additional pathologies including meningiomas, metastatic disease, fibrous connective tissue disorders, infectious and inflammation can mimic the appearance. This talk presents the relevant anatomy, important clinical implications and key radiographic characteristics that distinguish pathologies that may mimic a vestibular schwannoma.

RC809

Six Common Difficult Problems in GI and GU MRI: The Expert's Approach

Friday, Dec. 2 8:30AM - 10:00AM Room: E353B

GI **GU** **CT** **MR**

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants

Hero K. Hussain, MD, Ann Arbor, MI (*Moderator*) Nothing to Disclose

Sub-Events

RC809A The CT Indeterminate Lesion in the Non-Cirrhotic Liver: Extracellular or Hepatobiliary Contrast-Enhanced MRI

Participants

Reena C. Jha, MD, Washington, DC, (jhar@gunet.georgetown.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Compare the advantages and limitations of extracellular and hepatocellular contrast agents for indeterminate liver lesion. 2) Apply the most appropriate radiological guidance based on clinical context.

ABSTRACT

RC809B Is MRI Needed to Further Evaluate a CT Indeterminate Renal Mass?

Participants

Maryellen R. Sun, MD, Boston, MA, (msun@bidmc.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the heterogeneity of renal masses and importance of renal mass diagnosis to treatment planning and prognosis. 2) Discuss MRI technique and interpretation in characterization of renal masses. 3) Learn scenarios in which MRI evaluation of renal masses can further enhance diagnosis and clinical management of previously indeterminate lesions.

ABSTRACT

RC809C Perianal Fistulae: What Does the Surgeon Want to Know?

Participants

Mahmoud M. Al-Hawary, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify normal pelvic muscles, pelvic spaces and anal sphincter complex on MRI examination. 2) Differentiate and classify types of perianal fistulas and associated complications. 3) Develop a system of reporting the findings to clinical providers.

ABSTRACT

RC809D How Do I Perform and Interpret MRI of Pelvic Floor Weakness?

Participants

Victoria Chernyak, MD, Bronx, NY, (vichka17@hotmail.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Familiarize themselves with MR protocols for assessment of pelvic floor dysfunction. 2) Learn techniques for improving patient cooperation for dynamic images. 3) Identify normal anatomy of anterior, middle and posterior compartments. 4) Apply reference lines and angles used in assessment of pelvic floor dysfunction. 5) Identify and grade the severity of pelvic floor relaxation. 6) Identify and grade the severity of pelvic organ prolapse.

ABSTRACT

Active Handout:Victoria Chernyak

[http://abstract.rsna.org/uploads/2016/16000436/RC809D_V_Chernyak - MRI.pdf](http://abstract.rsna.org/uploads/2016/16000436/RC809D_V_Chernyak_-_MRI.pdf)

RC809E Is MRI the Next Step after US to Evaluate Non-Obstetric Pelvic Pain in Pregnancy?

Participants

Keyanoosh Hosseinzadeh, MD, Winston Salem, NC, (khossein@wakehealth.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss non-obstetric etiologies of pelvic pain in pregnancy. 2) Highlight indeterminate or inconclusive sonographic appearance of

1) Discuss non-obstetric etiologies of pelvic pain in pregnancy. 2) Highlight indeterminate or inconclusive sonographic appearance of pathologies. 3) Discuss technique and added value of MRI for certain conditions.

ABSTRACT

RC809F How Do I Perform a Diagnostic MRI in a Non-cooperative Patient?

Participants

Mustafa R. Bashir, MD, Cary, NC, (mustafa.bashir@duke.edu) (*Presenter*) Research support, Siemens AG; Research support, Guerbet SA; Research support, General Electric Company; Imaging Core Lab, NGM Biopharmaceuticals; Imaging Core Lab, TaiwanJ Pharma

LEARNING OBJECTIVES

1) Describe patient and technical factors that may contribute to suboptimal or nondiagnostic body MRI examinations. 2) Assess methods for reducing the impact of the above factors.

ABSTRACT

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David A. Mankoff, MD, PhD - 2013 Honored Educator

RC813

Pediatric Neuro

Friday, Dec. 2 8:30AM - 10:00AM Room: E450B



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Sub-Events

RC813A Imaging of Sensorineural Hearing Loss in Children

Participants

Maura E. Ryan, MD, Chicago, IL, (mryan@luriechildrens.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review pertinent anatomy of the inner ear structures. 2) Describe pathologic CT and MRI findings of the inner ear, membranous labyrinth and cochlear nerve associated with pediatric sensorineural hearing loss.

ABSTRACT

Active Handout:Maura E. Ryan

[http://abstract.rsna.org/uploads/2016/16000499/ACTIVE RC813A.pdf](http://abstract.rsna.org/uploads/2016/16000499/ACTIVE_RC813A.pdf)

RC813B Pediatric Posterior Fossa Tumors: Common Lesions and Mimics

Participants

Luke L. Linscott, MD, Cincinnati, OH, (luke.linscott@gmail.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Compare the salient imaging and clinical features of the 4 major posterior fossa masses in children. 2) Identify the less common tumors that mimic the 4 major pediatric posterior fossa tumors.

ABSTRACT

RC813C Pattern Approach to Pediatric Neurometabolic Disorders

Participants

Bruno P. Soares, MD, Baltimore, MD, (bruno.soares@emory.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize normal myelin maturation. 2) Identify most common leukodystrophies. 3) Distinguish hypomyelinating from demyelinating leukodystrophies. 4) Identify most common neurometabolic disorders of the newborn.

ABSTRACT

RC813D Presurgical Imaging of Pediatric Epilepsy

Participants

Sanjay P. Prabhu, MBBS, Boston, MA, (sanjay.prabhu@childrens.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) How to design an optimal MRI protocol that can help maximise detection of epileptogenic foci. 2) Describe a systematic approach to reviewing MRI of children with drug resistant epilepsy. 3) Appreciate value of multimodality and interdisciplinary approaches to the management of this group of children. 4) Describe potential pitfalls whilst reviewing preoperative imaging studies in these patients 5.) Optimize evaluation of imaging studies in patients with recurrent seizures after epilepsy surgery.

ABSTRACT

RC814

Interventional Series: Peripheral and Visceral Occlusive Disease

Friday, Dec. 2 8:30AM - 12:00PM Room: E352



AMA PRA Category 1 Credits™: 3.25
ARRT Category A+ Credits: 3.75

FDA Discussions may include off-label uses.

Participants

Parag J. Patel, MD, Milwaukee, WI, (papatel@mcw.edu) (*Moderator*) Consultant, Abbott Vascular, Inc; Consultant, C. R. Bard, Inc; Consultant, Penumbra, Inc;
Sanjay Misra, MD, Rochester, MN (*Moderator*) Data Safety Monitoring Board, Flexible Stenting Solutions, Inc
Charles E. Ray JR, MD, PhD, Chicago, IL (*Moderator*) Data Safety Monitoring Board, Novate Medical Ltd; Editor, Thieme Medical Publishers, Inc; Consultant, W. L. Gore & Associates, Inc; Consultant, Medtronic plc ; ; ; ;

LEARNING OBJECTIVES

1) Describe pros and cons of intervention for median arcuate ligament compression on the celiac axis. 2) Explain the use of radial artery access. 3) Outline 3 recommendations for endovascular treatment of peripheral vascular disease. 4) Describe current status of true percutaneous endovascular repair of abdominal aortic aneurysms. 5) Describe 2 vascular compression syndromes.

ABSTRACT

Sub-Events

RC814-01 Radial Artery Access. Why? When? How?

Friday, Dec. 2 8:30AM - 8:45AM Room: E352

Participants

Marcelo S. Guimaraes, MD, Charleston, SC, (guimarae@musc.edu) (*Presenter*) Consultant, Cook Group Incorporated ; Consultant, Baylis Medical Company; Consultant, Terumo Corporation; Patent holder, Cook Group Incorporated

LEARNING OBJECTIVES

1) Rationale to support transradial interventions. 2) Patient selection and work-up. 3) Equipment set-up and supplies. 4) Technical details. 5) How to avoid and manage complications. 6) Indications and results.

ABSTRACT

Radial Artery Access. Why? When? How? Marcelo Guimaraes, MD FSIR The use of radial access by Vascular Interventional Radiologists is growing exponentially. The presentation will provide the rationale to support transradial interventions, patient selection and work-up, necessary equipment set-up and supplies to perform the transradial interventions safely. Also it will be discussed technical details, how to avoid and manage complications, indications and results.

RC814-02 Compressive Vascular Syndromes

Friday, Dec. 2 8:45AM - 9:00AM Room: E352

Participants

Minhaj S. Khaja, MD, MBA, Ann Arbor, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

In addition to learning objectives in main title: 1) learn the different types of compressive syndromes and potential therapeutic options; review diagnostic criteria for compressions, understand clinical manifestations of vascular compressive syndromes.

RC814-03 Median Arcuate Ligament Syndrome

Friday, Dec. 2 9:00AM - 9:15AM Room: E352

Participants

Jonathan M. Lorenz, MD, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RC814-04 Evaluation of a Novel 2D-perfusion Angiography Technique Independent of Pump Injections for Assessment of Interventional Treatment of Peripheral Vascular Disease

Friday, Dec. 2 9:15AM - 9:25AM Room: E352

Participants

Jan Hinrichs, MD, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Tim Murray, Dublin, Ireland (*Abstract Co-Author*) Nothing to Disclose
Muharrem Akin, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Micheal U. Brehm, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Matthias Wilhelm, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Frank K. Wacker, MD, Hannover, Germany (*Abstract Co-Author*) Research Grant, Siemens AG; Research Grant, Pro Medicus Limited;

Research Grant, Delcath Systems, Inc;
Thomas Rodt, MD, Hannover, Germany (*Presenter*) Nothing to Disclose

PURPOSE

To evaluate a novel 2D-perfusion angiography (2D-PA) technique allowing pro- and retrospective flow analysis based on a proximal reference region of interest (ROI) and distal target ROI in patients treated for peripheral arterial disease.

METHOD AND MATERIALS

2D-PA allows quantifying blood flow by post-processing of digital subtraction angiography (DSA). 2D-PA was performed pre- and post-interventional treatment of peripheral arterial disease (n=24; 13 PTAs, 11 stents) in 21 patients (17men, 72±9y) applying a proximal reference ROI (arterial inflow) and a target ROI distal to the treated lesion. Time-to-peak (TTP), peak density (PD) and area-under-the-curve (AUC) were calculated. Ratios of the reference and the target ROI (TTP_ROI/TTP_REF; PD_ROI/PD_REF; AUC_ROI/AUC_REF) were calculated and correlated to changes in the ankle-brachial-index (ABI).

RESULTS

2D-PA was technically feasible allowing quantitative flow analysis in all cases. A significant ABI increase was seen after interventional treatment (0.69±0.16 vs. 0.96±0.19 (39%), p<0.0001). ABI increase was accompanied by an increase of 36% of PD_ROI/PD_Ref (0.72±0.44 vs. 0.98±0.43; p<0.0001), a 52% decrease of TTP_ROI/TTP_REF (1.81±1.37 vs. 0.95±0.89; p=0.0007) and a 69% increase of AUC_ROI/AUC_REF (0.69±0.5 vs. 1.17±0.58; p<0.0001). The difference of TTP pre- and post-intervention showed a correlation with the difference in ABI (r=-0.53, p=0.0081). The other measured parameters missed significant correlation with improvement of ABI.

CONCLUSION

The presented 2D-PA technique allows quantitative assessment of arterial flow before, during and after interventional treatment. Furthermore, this technique has great potential for individual therapeutic optimisation and quantification of technical success for scientific purposes, respectively.

CLINICAL RELEVANCE/APPLICATION

Perfusion angiography bares the potential to monitor interventional treatment results directly in the interventional suite and to determine possible endpoints for revascularization to optimize patient care.

RC814-05 Creation of an Extraluminal Subcutaneous Arterial Bypass Graft Using Percutaneous Methods: Feasibility Study in a Porcine Model

Friday, Dec. 2 9:25AM - 9:35AM Room: E352

Awards

Student Travel Stipend Award

Participants

Jessica K. Stewart, MD, Durham, NC (*Presenter*) Nothing to Disclose

Scott S. Perkins, BS, Durham, NC (*Abstract Co-Author*) Nothing to Disclose

Charles Y. Kim, MD, Durham, NC (*Abstract Co-Author*) Consultant, Halyard Health, Inc; Consultant, Cryolife, Inc; Consultant, Merit Medical Systems, Inc

PURPOSE

Patients with severely calcified arterial occlusions of the SFA that are poor endovascular candidates often require surgical bypass; however, some patients may be poor candidates for the requisite general anesthesia due to comorbidities. The purpose of this study was to assess the feasibility of a totally percutaneous arterial bypass graft without a surgical anastomosis.

METHOD AND MATERIALS

Nine swine were utilized for this IACUC approved study using a carotid bypass model. Using sonographic guidance, percutaneous access was obtained to the proximal and distal common carotid artery. From a groin approach, a Viabahn stent graft (Gore, Flagstaff, AZ) was advanced through the proximal carotid access site, tunneled subcutaneously, then advanced through the distal carotid access site and deployed. The grafts were monitored weekly for patency using Doppler ultrasound. Angiography was performed at 4 weeks to assess graft patency and to evaluate for stenosis. Animals were euthanized and gross pathologic analysis was performed at the surgical site.

RESULTS

Technical success was achieved in 8 out of the 9 swine utilized (89%) with successful exclusion of the bypassed segment of carotid artery and preserved brisk flow to the carotid circulation. In one swine, the stent graft was maldeployed and unsalvageable. An additional swine died shortly after the procedure of a likely stroke or seizure. One swine served as practice for technical refinement. Of the remaining 6 swine, 4 grafts were patent at the 4 week end point. Both prematurely occluded stent grafts were due to extraluminal extrusion of one end of the stent graft related to neck movement and significant swine growth (doubling of weight over the 4 week period). Stent-graft associated fibrous intimal hyperplasia was identified in 75%.

CONCLUSION

The percutaneous arterial bypass technique had a high technical success rate and a graft patency rate of 66% at 4 weeks, with early occlusions likely related to limitations of this animal model.

CLINICAL RELEVANCE/APPLICATION

This technique could provide a novel method for treating PAD patients with severely calcified occlusive SFA disease who are poor endovascular and surgical candidates. The technical expertise required for this complex ultrasound-guided access make this technique well-suited for mastery by interventional radiologists.

RC814-06 Immediate Changes of Tissue Perfusion during Tibial Angioplasty- Measurements with Respect to Angiosomes

Friday, Dec. 2 9:35AM - 9:45AM Room: E352

Participants

Ulrich Rother, Erlangen, Germany (*Presenter*) Nothing to Disclose
Werner Lang, MD, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Raymund E. Horch, MD, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Axel Schmid, MD, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Marco Heinz, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Alexander Meyer, MD, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Susanne Regus, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

In recent years a controversial discussion about the clinical relevance of the angiosome concept during tibial angioplasty has developed. Therefore, we conducted a prospective study to evaluate the angiosome concept on the level of microcirculation during tibial vascular interventions.

METHOD AND MATERIALS

30 patients with isolated tibial angioplasty were examined prospectively. Macrocirculation was evaluated by measurement of the ankle-brachial index. For the assessment of microcirculation a combined method of laser-doppler flowmetry and tissue spectrometry (O2C, LEA Medizintechnik GmbH, Giessen, Germany) was applied. Microcirculatory parameters were measured continuously during the procedures. Measuring points were located over different angiosomes of the index foot, while a control probe was placed on the contralateral leg.

RESULTS

Cumulated microcirculation parameters (sO₂, Flow) as well as the ankle arm index showed a significant improvement postinterventionally. Assessment of the separate angiosomes of the index leg, and the comparison of the direct and indirect revascularized angiosomes showed no significant difference concerning the micro-perfusion postinterventionally as well as during angioplasty. Even a further subdivision of the collective in diabetics and renal-insufficient patients could not demonstrate a superiority of the direct revascularization at the level of microcirculation in these patients.

CONCLUSION

There is a significant overall improvement in tissue perfusion of the foot immediately after tibial angioplasty. The effect shown in this study however was found to be global and was not restricted to certain borders, such as defined by angiosomes.

CLINICAL RELEVANCE/APPLICATION

Due to the findings in this study, an uncritical adaption of the angiosome concept as a model of decision making in tibial angioplasty can not be confirmed.

RC814-07 Advanced Arterial Revascularization

Friday, Dec. 2 9:45AM - 10:00AM Room: E352

Participants

Robert J. Abraham, MD, Halifax, NS, (robert.abraham@dal.ca) (*Presenter*) Co-founder, ABK Biomedical Inc; Director, ABK Biomedical Inc; Stockholder, ABK Biomedical Inc; Spouse, Stockholder, ABK Biomedical Inc; CEO, ABK Biomedical Inc; Officer, ABK Biomedical Inc; Researcher, BTG International Ltd; Co-founder, Covina Biomedical Inc; Stockholder, Covina Biomedical Inc; Officer, Covina Biomedical Inc

LEARNING OBJECTIVES

Upon completion of this session, participants should be able to:1. Discuss tools and techniques used to reconstruct Aorto-Iliac level arterial occlusive disease2. Describe tools and techniques used to reconstruct Femoral-Popliteal level arterial occlusive disease3. Describe tips, tools and techniques to treat acute complications in advanced arterial interventions.

Active Handout:Robert Joseph Abraham

[http://abstract.rsna.org/uploads/2016/16001202/Advanced Arterial Interventions Handout Robert Abraham_Final.pdf](http://abstract.rsna.org/uploads/2016/16001202/Advanced%20Arterial%20Interventions%20Handout%20Robert%20Abraham_Final.pdf)

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC814-08 The 5 Most Important PAD Papers, 2015-2016

Friday, Dec. 2 10:00AM - 10:15AM Room: E352

Participants

Robert A. Lookstein, MD, New York, NY (*Presenter*) Consultant, Boston Scientific Corporation;

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC814-09 Below-the-Knee Interventions

Friday, Dec. 2 10:30AM - 10:45AM Room: E352

Participants

Parag J. Patel, MD, Milwaukee, WI, (papatel@mchw.edu) (*Presenter*) Consultant, Abbott Vascular, Inc; Consultant, C. R. Bard, Inc; Consultant, Penumbra, Inc;

LEARNING OBJECTIVES

1) Describe techniques for revascularization of the tibial vessels. 2) Develop a strategy to target infrapopliteal revascularization utilizing the angiosome concept. 3) Describe the technique for pedal access.

ABSTRACT

RC814-10 Mesenteric Ischemia

Friday, Dec. 2 10:45AM - 11:00AM Room: E352

Participants

James R. Stone, MD, Charlottesville, VA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC814-11 Presepsin and Inflammatory Markers Correlate with Non-occlusive Mesenteric Ischemia after Cardiovascular Surgery

Friday, Dec. 2 11:00AM - 11:10AM Room: E352

Participants

Jonas Stroeder, MD, Homburg, Germany (*Presenter*) Nothing to Disclose

Heinrich Groesdonk, Homburg, Germany (*Abstract Co-Author*) Nothing to Disclose

Hans-Joachim Schaefers, MD, Homburg, Germany (*Abstract Co-Author*) Nothing to Disclose

Matthias Klingele, Homburg, Germany (*Abstract Co-Author*) Nothing to Disclose

Stefan Wagenpfeil, Homburg, Germany (*Abstract Co-Author*) Nothing to Disclose

Marcus Katoh, MD, Krefeld, Germany (*Abstract Co-Author*) Consultant, Straub Medical AG Consultant, Medtronic, Inc

Hagen Bomberg, Homburg, Germany (*Abstract Co-Author*) Nothing to Disclose

Arno Buecker, MD, Homburg, Germany (*Abstract Co-Author*) Research Grant, Siemens AG; Consultant, Bracco Group; Speaker, Bracco Group; Consultant, Medtronic plc; Speaker, Medtronic plc; Research Grant, Novartis AG; Research Grant, GlaxoSmithKline plc; Research Grant, Biotest AG; Research Grant, OncoGenex Pharmaceuticals, Inc; Research Grant, Bristol-Myers Squibb Company; Research Grant, Eli Lilly & Company ; Research Grant, Pfizer Inc; Research Grant, F. Hoffmann-La Roche Ltd; Research Grant, sanofi-aventis Group; Research Grant, Merrimack Pharmaceuticals, Inc; Research Grant, Sirtex Medical Ltd; Research Grant, Concordia Healthcare Corp; Research Grant, AbbVie Inc; Research Grant, Takeda Pharmaceutical Company Limited ; Research Grant, Merck & Co, Inc; Research Grant, Affimed NV; Research Grant, Bayer AG; Research Grant, Johnson & Johnson; Research Grant, Seattle Genetics, Inc; Research Grant, Onyx Pharmaceuticals, Inc; Research Grant, Synta Pharmaceuticals Corp; Research Grant, Siemens AG; Research Grant, iSYMED GmbH; Research Grant, St. Jude Medical, Inc; Co-founder, Aachen Resonance GmbH; Peter Minko, MD, Homburg, Germany (*Abstract Co-Author*) Speaker, Straub Medical AG Consultant, Straub Medical AG

PURPOSE

The aim of our study was to prospectively evaluate the inflammatory response to the occurrence and severity of non-occlusive mesenteric ischemia (NOMI) using a standardized scoring system.

METHOD AND MATERIALS

Between 2/2011 and 3/2012 a total of 865 patients (median age: 67 years) underwent cardiovascular surgery during this ethics committee approved, prospective study. Patients with clinical suspicion of NOMI underwent catheter angiography of the superior mesenteric artery. Images were assessed by two experienced radiologists on consensus basis using a previously published standardized reporting system (Homburg-NOMI score: consisting of three categories namely vessel morphology, reflux of contrast medium into the aorta and time to portal vein filling). These data were correlated to inflammatory blood markers assessed pre- and postoperatively: C-reactive protein (CRP), leucocytes, procalcitonin (PCT) as well as presepsin and outcome data (death, acute renal failure) using linear and logistic regressions, as well as nonparametric tests and ROC-analysis.

RESULTS

Significant correlations were found between pre- and postoperative presepsin ($p < 0.001$ / $p < 0.001$) and the NOMI-Score as well as for pre- and postoperative CRP ($p < 0.001$ / $p = 0.001$) and the NOMI-Score. No significant correlation was found for preoperative leucocytes ($p = 0.147$) and preoperative PCT ($p = 0.599$), but the postoperative values significantly correlated with the score ($p = 0.002$ and $p < 0.001$). ROC-Analysis yielded an AUC of 0.837 for postoperative presepsin with a sensitivity and specificity of 74.6% and 83%, respectively.

CONCLUSION

Presepsin shows good sensitivity and specificity regarding the occurrence and severity of NOMI and could find use in postoperative lab workup. The established inflammatory blood markers significantly correlate with the development and severity of NOMI.

CLINICAL RELEVANCE/APPLICATION

Patients with elevated inflammatory blood markers (especially presepsin) before or after undergoing cardiovascular surgery should receive an early diagnostic angiogram if non-occlusive mesenteric ischemia is clinically suspected as the disease presents with more severity. An inflammatory genesis of NOMI should be always kept in mind and further research should be conducted to find the pathophysiological connection.

RC814-13 Anemia: A Risk Factors of Restenosis after Stenting of Femoropopliteal Artery Occlusive

Friday, Dec. 2 11:20AM - 11:30AM Room: E352

Participants

Hairui Wang, Shenyang, China (*Presenter*) Nothing to Disclose

Zhaoyu Liu, MD, Shenyang, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To explore the relationship between anemia and the incidence of in-stent restenosis after intervention of arteriosclerosis obliterans (ASO).

METHOD AND MATERIALS

A retrospective collection in January 2012 - December 2013 at our departments, the clinical data and result of follow-up of patients after intervention of superficial femoral artery obliterans were analyzed. The cut-off point is the time of first in-stent restenosis after stenting, record its time.

RESULTS

The total of 201 patients enrolled in the study were followed up until December 2015, 66 cases of in-stent restenosis and 135 patients without restenosis. The percentage of anemia in the restenosis group was 54.5% (36 / 66), while 28.1% (38 / 135) in the non-restenosis group ($\chi^2 = 13.279$, $P < 0.05$), the baseline data of groups showed no statistical difference ($P > 0.05$). In restenosis group, the mean time of restenosis of anemia is earlier than the non-anemia, the difference was statistically significant ($t = -4.898$, $P < 0.05$). The Logistic regression analysis showed that anemia is risk factors of restenosis ($P < 0.05$). The cox proportional hazard model shows that a lower level of hemoglobin is associated with a higher risk of restenosis after stenting (HR 1.142; 95% CI 1.059-1.230).

CONCLUSION

The incidence of anemia is higher in the restenosis patients, the time of restenosis is earlier. Anemia and its severity is a risk factor of in-stent restenosis after intervention of ASO.

CLINICAL RELEVANCE/APPLICATION

Anemia is associated with poorer outcome in coronary artery disease (CAD) and heart failure (HF), it was hypothesized that anemia is associated with in-stent restenosis after the intervention of ASO, and this relationship would be proportional to the severity of the anemia.

RC814-14 Biology of Vascular Disease

Friday, Dec. 2 11:30AM - 11:45AM Room: E352

Participants

Sanjay Misra, MD, Rochester, MN (*Presenter*) Data Safety Monitoring Board, Flexible Stenting Solutions, Inc

LEARNING OBJECTIVES

View learning objectives under the main course title.

ABSTRACT

RC814-15 Debate: What is Wrong with Femoral Arterial Access?

Friday, Dec. 2 11:45AM - 12:00PM Room: E352

Participants

Robert A. Morgan, MD, London, United Kingdom, (Robert.morgan@stgeorges.nhs.uk) (*Presenter*) Proctor, Medtronic, Inc
Marcelo S. Guimaraes, MD, Charleston, SC, (guimarae@musc.edu) (*Presenter*) Consultant, Cook Group Incorporated; Consultant, Baylis Medical Company; Consultant, Terumo Corporation; Patent holder, Cook Group Incorporated

LEARNING OBJECTIVES

View Learning Objectives under the Main Course Title.

ABSTRACT

LEARNING OBJECTIVES

1) Provide the rationale to support transradial interventions. 2) Radial access is not just an alternative access but is part of a patient care model that is aligned with best practices and is aligned with ongoing changes of the healthcare reform.

ABSTRACT

RC815

Breast Imaging: Fundamentals of Interpretation

Friday, Dec. 2 8:30AM - 10:00AM Room: E451B

BR

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Cherie M. Kuzmiak, DO, Chapel Hill, NC, (Cherie_kuzmiak@med.unc.edu) (*Moderator*) Research Grant, FUJIFILM Holdings Corporation;

LEARNING OBJECTIVES

ABSTRACT

Sub-Events

RC815A Breast Calcifications

Participants

Stephen A. Feig, MD, Orange, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe calcifications using BI-RADS descriptors for morphology and distribution. 2) Recommend diagnostic imaging workup for specific cases of screen-detected calcifications. 3) Estimate the likelihood of malignancy for these cases using BI-RADS Final Assessment Categories. 4) Debate the clinical significance of DCIS detected on basis of calcifications alone.

RC815B Breast Masses

Participants

Gilda Cardenosa, MD, Richmond, VA (*Presenter*) Nothing to Disclose

RC815C Asymmetries & Associated Findings

Participants

Paula B. Gordon, MD, Vancouver, BC (*Presenter*) Stockholder, OncoGenex Pharmaceuticals, Inc ; Scientific Advisory Board, Hologic, Inc; Scientific Advisory Board, Real Imaging Ltd

LEARNING OBJECTIVES

1) Describe the types of asymmetries using BI-RADS descriptors. 2) Demonstrate options for diagnostic imaging workup for specific cases. 3) Discuss options for biopsy. 4) Estimate the likelihood of malignancy for these cases using BI-RADS Final Assessment Categories.

ABSTRACT

The Role of Advanced Imaging in Unraveling the Secrets of Ancient Art and Artifacts

Friday, Dec. 2 8:30AM - 10:00AM Room: E351

OT

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

FDA

Discussions may include off-label uses.

Participants

Barry D. Daly, MD, Baltimore, MD, (bdaly@umm.edu) (*Moderator*) Nothing to Disclose

Barry D. Daly, MD, Baltimore, MD, (bdaly@umm.edu) (*Presenter*) Nothing to Disclose

Vahid Yaghmai, MD, Chicago, IL (*Presenter*) Nothing to Disclose

Jonathan P. Brown, MS, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To describe the novel use of advanced imaging techniques in the non-invasive investigation of historic art treasures. 2) To identify related benefits for both research and educational activities at museums and art institutions.

ABSTRACT

In recent years museums worldwide have sought to partner with radiology departments in the non-invasive investigation of ancient and fragile treasures. Advanced digital imaging and 3D CT have been used to determine the age, authenticity, composition and geographic origin of these artifacts, to investigate their internal contents, and to detect prior structural damage and hidden repairs. The subject material of this course includes a diverse range of significant artifacts such as Egyptian and Peruvian mummies, Mesoamerican and Chinese ceramics, Mesopotamian stucco art, Judaic tabernacles, European medieval religious artifacts, Renaissance paintings, Stradivarius violins and Japanese wood sculptures. Some conservators now have access to 3D imaging software at museums or may conduct remote collaborative analysis of cases with radiologists via cloud-based 3D servers. The speakers include two radiologists with extensive experience in the technical approach to imaging these treasures and a senior conservator at the Field museum who will provide an expert's perspective on the research and educational value of such initiatives.

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/>

Vahid Yaghmai, MD - 2012 Honored Educator

Vahid Yaghmai, MD - 2015 Honored Educator

RC825

Perception in the Clinic

Friday, Dec. 2 8:30AM - 10:00AM Room: E263

PH SQ

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credit: 1.00

Participants

Sub-Events

RC825A Impact of Fatigue on Radiologists' Performance

Participants

Elizabeth A. Krupinski, PhD, Atlanta, GA, (ekrupin@emory.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe how fatigue impacts diagnostic accuracy. 2) Describe how fatigue impacts the efficiency with which cases are interpreted. 3) Provide ways to avoid & ameliorate fatigue.

ABSTRACT

Today's radiologists are under increased pressure to read more cases and more complex cases in less time, but are expected to maintain the same level of diagnostic accuracy. This is not however always possible and increasingly it is becoming apparent that radiologists are becoming more fatigued. The question whether this fatigue impacts diagnostic performance. Recent studies have begun to address this issue by exploring methods to objectively characterize visual strain and fatigue by measuring visual accommodation and dark vergence, assessing subjective feelings of fatigue, and measuring the impact of fatigue on diagnostic accuracy. These studies have demonstrated that fatigue negatively impacts accuracy and may impact visual search strategies, especially in residents. Radiologists need to be aware of their limits and how fatigue can impact image interpretation.

Active Handout: Elizabeth Anne Krupinski

http://abstract.rsna.org/uploads/2016/16001191/ACTIVE_RC825A.pdf

RC825B Perception of Volumetric Image Data

Participants

Geoffrey D. Rubin, MD, Durham, NC, (grubin@duke.edu) (*Presenter*) Consultant, Fovia, Inc; Consultant, Informatics in Context, Inc; Research Consultant, General Electric Company;

LEARNING OBJECTIVES

1) Provide an overview of the role of volumetric imaging in radiology. 2) Describe the perceptual challenges in interpreting volumetric data. 3) Review evidence on differences in visual search between 2D & 3D image set.

ABSTRACT

The depth and complexity of volumetric imaging data such as those acquired using CT or MRI scanning is profound. Early work in medical image perception focused on two-dimensional images represented by radiographs and in particular mammograms and chest radiographs. The paradigm for lesion detection in this setting is limited as all imaging data are presented to the interpreter in a single view or small set of views that are simultaneously available for search. In contrast, volumetric images, which are typically presented as stacks of cross-sections, necessitate active exploration using computer controls in order to bring lesions into view, providing an opportunity for recognition. This presentation will review the results of recent investigations that shed light on reader performance in relation to volumetric search strategies and perceptual characteristics.

RC825C Role of Image Quality in Perception

Participants

Justin B. Solomon, PhD, Durham, NC, (justin.solomon@duke.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define image quality and its most common metrics. 2) Present the impact of image resolution on diagnostic performance. 3) Present the impact of image noise and dose on diagnostic performance.

ABSTRACT

This session focuses on how physical image characteristics such as noise, contrast, and resolution impact image perception and diagnosis. CT images will be used as examples but the concepts are applicable to any modality. Special attention will be given to CT iterative reconstruction algorithms and the interdependent relationship between noise, resolution, contrast, and anatomical complexity in iteratively reconstructed images.

Diversity and Inclusion: Leadership Imperatives in the Radiological Professions

Friday, Dec. 2 8:30AM - 10:00AM Room: E260

LM

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Johnson B. Lightfoote, MD, MBA, Pomona, CA, (Lightfoote@msn.com) (*Coordinator*) Shareholder, Pomona Valley Imaging Medical Group

LEARNING OBJECTIVES

1) Understand the current state of diversity in the radiological profession with respect to race, gender, and ethnicity, and describe trends. 2) Compare representation of diverse groups among our service populations, and various stages of education and seniority in the radiological professions. 3) Cite examples of successful diversity initiatives from outside the radiological professions. 4) Identify critical success factors for diversity and inclusion initiatives in industry, government and academia. 5) Describe appropriate goals, objectives, and resource requirements for a diversity and inclusion program. 6) Design, implement and measure a diversity and inclusion program in the learner's institution.

ABSTRACT

Diversity and inclusion have become top-of-mind imperatives for leaders of organizations that serve an increasingly diverse American population. The current representation of groups in our population in the radiologic professions will be reviewed, with special reference to women and people underrepresented in medicine. Comparisons with the general population, other industries, other medical specialties, and at various stages of radiology training and seniority are illuminating. Enterprises beyond the radiological professions provide signal examples of successful diversity and inclusion initiatives. Identifying imperatives and opportunities for improving the diversity and responsiveness of our professional workforce is a central task of effective top leadership in radiology. Illustration and discussion will focus on initiating, designing, implementing and measuring a diversity, inclusion and representation program for a radiological professions organization.

Active Handout: Johnson B. Lightfoote

http://abstract.rsna.org/uploads/2016/16000905/ACTIVE_RSNA_Course_832_Handout.pdf

Sub-Events

RC832A The State of Diversity, Inclusion and Representation in Radiology and Radiation Oncology: History, Trends, and Where We Are Today

Participants

Curtiland Deville, MD, Baltimore, MD, (cdeville@jhmi.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To describe the trends in historical and current representation. 2) To identify the potential barriers to diversity and inclusion in training and advancement. 3) To address potential interventions and solutions.

ABSTRACT

RC832B Leveraging Diversity and Inclusion: Leadership Lessons from Outside the House of Radiology

Participants

Johnson B. Lightfoote, MD, MBA, Pomona, CA, (Lightfoote@msn.com) (*Presenter*) Shareholder, Pomona Valley Imaging Medical Group

LEARNING OBJECTIVES

1) Describe socioeconomic imperatives prompting organizations to expand their diversity and inclusiveness. 2) Identify the benefits of a diverse workforce and inclusive culture for private and public enterprises outside the House of Radiology. 3) Specify industries, companies, and academic institutions which have implemented diversity, representation and inclusion programs. 4) Specify health care services, medical specialty, and medical education organizations which have developed diversity, representation and inclusion programs. 5) Define the critical success factors for a successful diversity and inclusion initiative. 6) Compare the impetus, methods and outcomes in diversity and inclusion initiatives in non-radiology organizations with practices and programs within the radiological professions. 7) Appraise the diversity and inclusiveness of organizations, particularly the learner's own organization. 8) Formulate diversity and inclusiveness initiatives for an organization, particularly the learner's own organization.

ABSTRACT

Maturing, successful and advancing organizations universally recognize the importance of a diverse workforce, and the value of including and representing constituents in their operations. The radiological professions can inform their own diversity initiatives by reviewing the success and cautionary tales from private enterprise, government, academic institutions, health care organizations, medical education organizations, and other medical specialty societies. Critical success factors include (a) primary commitment of top leadership, (b) committed resources, and (c) measurable process goals. Clinical radiologists and practice leaders have an opportunity to imitate the success of enterprises outside the House of Radiology, and to leverage those lessons to improve the effectiveness of their own imaging, intervention and radiation oncology practices.

Active Handout: Johnson B. Lightfoote

http://abstract.rsna.org/uploads/2016/16002848/ACTIVE_RC832B_RSNA_Course_832_Handout.pdf

Carotid and Renal Doppler (Hands-on)

Friday, Dec. 2 8:30AM - 10:00AM Room: E264



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants

Gowthaman Gunabushanam, MD, New Haven, CT (*Presenter*) Editor, WebMD Health Corp ;
 Shweta Bhatt, MD, MBBS, Rochester, NY, (Shweta_Bhatt@urmc.rochester.edu) (*Presenter*) Nothing to Disclose
 Wui K. Chong, MD, Chapel Hill, NC (*Presenter*) Advisory Board, Bracco Group;
 Corinne Deurdulian, MD, Los Angeles, CA, (Corinne.Deurdulian@med.usc.edu) (*Presenter*) Nothing to Disclose
 Vikram S. Dogra, MD, Rochester, NY (*Presenter*) Editor, Wolters Kluwer nv ;
 Ulrike M. Hamper, MD, MBA, Baltimore, MD (*Presenter*) Nothing to Disclose
 Davida Jones-Manns, Hampstead, MD (*Presenter*) Nothing to Disclose
 Mark E. Lockhart, MD, Birmingham, AL, (mlockhart@uabmc.edu) (*Presenter*) Author, Oxford University Press
 Margarita V. Revzin, MD, Wilton, CT (*Presenter*) Nothing to Disclose
 Michelle L. Robbin, MD, Birmingham, AL (*Presenter*) Consultant, Koninklijke Philips NV;
 Leslie M. Scoutt, MD, New Haven, CT, (leslie.scoutt@yale.edu) (*Presenter*) Consultant, Koninklijke Philips NV
 Ravinder Sidhu, MD, Rochester, NY (*Presenter*) Nothing to Disclose
 Sadhna Verma, MD, Cincinnati, OH, (drsadhnaverma@gmail.com) (*Presenter*) Nothing to Disclose
 M. Robert Dejong, Baltimore, MD, (rdejong@jhmi.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the technique and optimally perform carotid Doppler ultrasound. 2) Describe the technique and optimally perform renal Doppler ultrasound. 3) Review qualitative and quantitative criteria for diagnosing abnormalities in carotid and renal ultrasound Doppler examinations.

ABSTRACT

This hands-on course will provide participants with a combination of didactic lectures and an extended "live" scanning opportunity on normal human volunteers, as follows: Didactic lectures (30 minutes): 1. Carotid Doppler Ultrasound: scanning technique, diagnostic criteria and interesting teaching cases. 2. Renal Doppler Ultrasound: scanning technique, diagnostic criteria and interesting teaching cases. Mentored scanning (60 minutes): Following the didactic lectures, the participants will proceed to a scanning area with normal human volunteers and ultrasound machines from different manufacturers. Participants will be able to perform live scanning with direct assistance (if needed) by faculty. Faculty will be able to offer feedback, help participants improve their scanning technique as well as answer any questions. Faculty will also be available to answer general questions relating to all aspects of vascular Doppler, not limited to carotid and renal Doppler studies.

Honored Educators

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Leslie M. Scoutt, MD - 2014 Honored Educator
 Sadhna Verma, MD - 2013 Honored Educator

RC854

Growing Your Business with Social Media, Tips and Tricks for Department and Practice Managers

Friday, Dec. 2 8:30AM - 10:00AM Room: E350



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credit: 0

Participants

Alex Towbin, MD, Cincinnati, OH, (alexander.towbin@cchmc.org) (*Presenter*) Author, Reed Elsevier; Grant, Guerbet SA; Grant, Siemens AG;
Saad Ranginwala, MD, Cincinnati, OH (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

After attending this lecture, attendees will be able to:1. describe how social media can be used to promote a radiology practice2. name 3 social media platforms, their benefits, and constraints.

ABSTRACT

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Alex Towbin, MD - 2014 Honored Educator

SPHT61

Novel Concepts in Hepatobiliary Tumor Imaging Symposium: Current Concerns (In Conjunction with Society of Abdominal Radiology (SAR), Japanese Society of Abdominal Radiology (JSAR), Korean Society of Abdominal Radiology (KSAR), and French Society of Abdominal Radiology (SIAD))

Friday, Dec. 2 8:30AM - 9:30AM Room: E253BCD



AMA PRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants

Judy Yee, MD, Clayton, CA, (judy.yee@ucsf.edu) (*Moderator*) Research Grant, EchoPixel, Inc
Won Jae Lee, MD, Seoul, Korea, Republic Of (*Director*) Research Grant, Samsung Electronics Co, Ltd
Takamichi Murakami, MD, PhD, Osakasayama, Japan (*Director*) Nothing to Disclose
Judy Yee, MD, Clayton, CA, (judy.yee@ucsf.edu) (*Director*) Research Grant, EchoPixel, Inc
Marc Zins, MD, Paris, France, (mzins@hpsj.fr) (*Director*) Nothing to Disclose

LEARNING OBJECTIVES

ABSTRACT

URL

Sub-Events

SPHT61A How to Screen and Diagnose HCC: American, Asian, and European Guidelines; Why are They Different and What are the Consequences?

Participants

Alain Luciani, MD, PhD, Creteil, France, (alain.luciani@aphp.fr) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To describe and compare current international guidelines for the non-invasive diagnosis of HCC. 2) To understand how to apply current international guidelines in clinical practice for the diagnosis of HCC. 3) To highlight the role of a multimodal approach for the optimisation of HCC diagnosis

ABSTRACT

The American Association for the Study of Liver Disease (AASLD), the European Association for the Study of the Liver (EASL) the Asian Pacific Association for the Study of the Liver (APASL) and the Japanese Society of Hepatology (JSH) all provide recommendations for the use of non invasive imaging for the diagnosis of HCC. The lecture will review differences between these current guidelines, addressing specific issues such as the potential use of CEUS and Hepatobiliary specific contrast agents, the importance of size and / or vascular profile for establishing an HCC diagnosis.

URL

SPHT61B Advanced HCC, Diagnosis, Present and Future Treatment

Participants

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

LEARNING OBJECTIVES

1) To define the stage "advanced HCC" 2) To discuss the need of pathological sampling for diagnosis 3) To explain the current therapies with prognosis impact 4) To debate the different used response criteria

SPHT61C Why We Need LI-RADS and Future Directions

Participants

Claude B. Sirlin, MD, San Diego, CA (*Presenter*) Research Grant, General Electric Company; Research Grant, Siemens AG; Research Grant, Guerbet SA; ;

LEARNING OBJECTIVES

1) Understand the need for standardized terminology, interpretation, and reporting for clinical care. 2) Understand the need for standardized terminology, interpretation, and reporting for research. 3) Become familiar with LI-RADS terminology, interpretation, and reporting.

SPHT61D Unusual Appearances of HCC and Lesions that Simulate HCC: How to Put These in Clinical Perspective

Participants

Richard L. Baron, MD, Chicago, IL, (rbaron@uchicago.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Appropriately utilize the noninvasive imaging based diagnosis criteria for hepatocellular carcinoma in patients with chronic liver

disease. 2) Differentiate imaging appearances of unusual benign vascular liver lesions and atypical hepatocellular carcinoma in patients with cirrhosis.

ABSTRACT

Current treatment of patients with chronic liver disease rely on noninvasive, imaging based diagnosis of hepatocellular carcinoma (HCC). These criteria are meant to be very specific, but are known to have low sensitivity due to the broad spectrum of imaging appearances of HCC. This lecture will review unusual appearances of HCC in patients with chronic liver disease that can be detected at imaging and confirmed with biopsy to allow timely effective treatment. Atypical presentations of common benign processes that can simulate HCC will be presented to aid radiologists in avoiding misdiagnosis of HCC, essential in current era of noninvasive imaging diagnosis directing patient care.

URL

SPHT62

Novel Concepts in Hepatobiliary Tumor Imaging Symposium: State-of-the-Art Imaging Techniques (In Conjunction with Society of Abdominal Radiology (SAR), Japanese Society of Abdominal Radiology (JSAR), Korean Society of Abdominal Radiology (KSAR), and French Society of Abdominal Radiology (SIAD))

Friday, Dec. 2 9:45AM - 10:45AM Room: E253BCD



AMA PRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants

Takamichi Murakami, MD, PhD, Osakasayama, Japan (*Moderator*) Nothing to Disclose
Won Jae Lee, MD, Seoul, Korea, Republic Of (*Director*) Research Grant, Samsung Electronics Co, Ltd
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Takamichi Murakami, MD, PhD, Osakasayama, Japan (*Director*) Nothing to Disclose

Sub-Events

SPHT62A Gadoxetic Acid (Gd-EOB-DTPA) Enhanced MR Imaging of Hepatocellular Carcinoma: Molecular and Genetic Background

Participants

Azusa Kitao, MD, Kanazawa, Japan (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1. Estimate the molecular background (hepatocyte membrane transporter expression) of enhancement mechanism on gadoxetic acid enhanced MR imaging in hepatocellular carcinoma (HCC). 2. Describe the reason of usefulness of gadoxetic acid enhanced MR imaging in early diagnosis of HCC. 3. Identify molecular subtype of HCC by gadoxetic acid enhanced MR imaging and apply to personalized medicine.

ABSTRACT

In hepatocellular carcinoma (HCC), organic anion transporting polypeptide 1B3 (OATP1B3) is the main uptake transporter of gadoxetic acid. The hepatobiliary phase of gadoxetic acid enhanced MR imaging is a molecular imaging that sensitively reflects expression of OATP1B3. From the stage of high-grade dysplastic nodule to overt HCC, the enhancement ratio on hepatobiliary phase decreases in accordance with the decline of OATP1B3 expression. The decrease of enhancement ratio on hepatobiliary phase is the most useful finding for early diagnosis of HCC among existing imaging modality. In other word, decrease of OATP1B3 is a sensitive molecular marker reflecting early stage of hepatocarcinogenesis. In addition, most of overt HCC show low contrast enhancement on hepatobiliary phase with decreased expression of OATP1B3, whereas 10% of them show high enhancement due to atypically increased expression of OATP1B3. These highly enhanced HCC may be classified into a less aggressive subtype of HCC with some particular molecular backgrounds such as beta-catenin or hepatocyte nuclear factor 4a activation. It can be applied to the future personalized medicine. In conclusion, to understand the molecular background of gadoxetic acid enhanced MR imaging is important to appropriate diagnosis and treatment for HCC.

URL

SPHT62B Hepatic Dynamic CT with Iterative Reconstruction

Participants

Takeshi Nakaura, MD, Kumamoto, Japan, (kff00712@nifty.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the technical explanation and the non-linear nature of MBIR as compared with FBP reconstruction. 2) Address the point of optimal MBIR setting for hepatic dynamic CT. 3) Display hepatic dynamic CT images reconstructed with FBP, IR and MBIR.

ABSTRACT

Image noise is a serious problem in hepatic dynamic CT because of the requirements for low-contrast detectability. Additionally low kilo-voltage (kVp) scan is recently used for low contrast and low radiation dose CT; however, increased image noise is a problem. It is difficult to achieve the high-resolution and high-quality CT images without increase in radiation dose because image noise of filtered back projection (FBP) technique is proportional to radiation dose. Iterative reconstruction (IR) techniques have re-emerged in CT reconstruction to increase image quality and decrease radiation dose. Recent introduced model based IR (MBIR) dramatically reduces image noise, offers accurate CT attenuation, and enables improvement in low-contrast detectability especially at thin slice images. CT manufacturers take unique approaches to offer the high image quality, and also provide complicated settings and the nonlinear nature for these iterative reconstruction techniques. At a glance, the principles of these reconstruction techniques seem very complicated; however, the required knowledge for clinicians about the recent advantages is not complicated. We aim to demonstrate the recent advances in CT reconstruction techniques, and the required knowledge to optimize the reconstruction setting for the hepatic dynamic CT.

URL

SPHT62C Quantitative Assessment of Tissue Perfusion in HCC and Liver Cirrhosis

Participants

Jeong Min Lee, MD, Seoul, Korea, Republic Of (*Presenter*) Grant, Guerbet SA; Support, Siemens AG; Grant, Bayer AG; Grant, General Electric Company; Grant, STARmed Co, Ltd; Grant, RF Medical Co, Ltd; Grant, Toshiba Corporation; Grant, Samsung Medical Healthcare

LEARNING OBJECTIVES

1) To review various imaging based approaches to evaluate perfusion characteristics of the liver and hepatocellular carcinomas. 2) To address strengths and weaknesses of imaging modalities for evaluation of liver perfusion. 3) To illustrate the potential role of perfusion imaging in management of liver cirrhosis and HCC.

ABSTRACT

Recent technological development of magnetic resonance imaging (MRI) and multidetector CT(MDCT) with wide detector or dual source technology improved temporal resolution significantly, which resulted in more practical use of perfusion imaging techniques for evaluation of hepatocellular carcinoma (HCC) and liver cirrhosis. Currently, intravoxel incoherent motion (IVIM) diffusion-weighted imaging (DWI), dynamic contrast-enhanced MRI (DCE-MRI), dual energy CT and perfusion CT are common imaging based tools to evaluate perfusion properties of liver tumors. Moreover, IVIM-DWI and DCE-MRI can be performed during the same session of liver MRI, thus providing a comprehensive "one-step" morphological and functional evaluation of HCC and background liver parenchyma. These functional imaging techniques may predict prognosis or clinical outcome before treatment, and also, may play an important role for post-treatment assessment, especially after Sorafenib treatment or interventional treatments. The aim of this shorty presentation is to describe possible applications of new perfusion imaging techniques in management of patients with HCCs, with a particular emphasis on prognostic stratification and post-treatment monitoring.

SPHT62D Contrast US for HCC

Participants

Yasunori Minami, MD, PhD, Osaka-sayama, Japan (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand properties of Sonazoid contrast-enhanced ultrasonography (CEUS) and realize the differences of other contrast agents. 2) Learn the typical enhancement patterns of HCC during the vascular phase and defects during the post vascular phase on Sonazoid CEUS. 3) Understand Sonazoid CEUS improve the diagnosis of HCC using defect reinjection technique.

ABSTRACT

Two breakthroughs in the field of US technology, harmonic imaging and the development of second-generation contrast agents, have demonstrated the potential to dramatically broaden the scope of US diagnosis of hepatic lesions. Second-generation microbubbles provide stable nonlinear oscillation in a low power acoustic field because of the hard shell of these bubbles, producing great detail in the harmonic signals in real-time. Perfluorocarbon microbubbles (Sonazoid®) is the only contrast agent that can be taken up by Kupffer cells in the liver. Contrast-enhanced US (CEUS) using Sonazoid ® can provide detailed data, not only of the perfusion features during the vascular phase, but also of Kupffer imaging during the post vascular phase. The typical Sonazoid CEUS findings of typical hepatocellular carcinoma (HCC) show diffuse enhancement during the vascular phase and defects during the post vascular phase. However, Sonazoid CEUS findings of HCC can vary according to the degree of differentiation. Hepatocarcinogenesis is the step-wise development from a low-grade dysplastic nodule (DN), high-grade DN, high-grade DN with malignant foci, and well-differentiated HCC, to classical HCC. The intranodular blood supply changes in accordance with this progression. Moreover, an additional injection of Sonazoid ® is used to determine the presence or absence of arterial blood flow in the defective area (defect reinjection test). A fast wash-in of arterial flow in the Kupffer defect area can confirm the diagnosis of HCC. Worldwide, US imaging plays an important role not only in screening, evaluating, staging and monitoring disease, but also in surveillance following tumor ablation. Advances in US imaging techniques increase our ability to detect and characterize focal liver lesions.

URL

SST01

Breast Imaging (Multi-modality Diagnostic)

Friday, Dec. 2 10:30AM - 12:00PM Room: E450B



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Discussions may include off-label uses.

Participants

Mary S. Newell, MD, Atlanta, GA (*Moderator*) Stockholder, Kimberly-Clark Corporation ; Stockholder, E. I. du Pont de Nemours & Company ; Stockholder, Bristol-Myers Squibb Company; Stockholder, Merck & Co, Inc; Stockholder, Johnson & Johnson ; Stockholder, Eli Lilly and Company
Sarah M. Friedewald, MD, Chicago, IL (*Moderator*) Consultant, Hologic, Inc; Research Grant, Hologic, Inc; Consultant, C. R. Bard, Inc

Sub-Events

SST01-01 Changes in Patients' Surgical Management after Preoperative Breast MRI: Preliminary Results from the MIPA Study

Friday, Dec. 2 10:30AM - 10:40AM Room: E450B

Participants

Rubina Manuela Trimboli, San Donato Milanese, Italy (*Presenter*) Nothing to Disclose
Giovanni Di Leo, San Donato Milanese, Italy (*Abstract Co-Author*) Travel support, Bracco Group
Ritse M. Mann, MD, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Research agreement; Siemens AG; Research agreement, Seno Medical Instruments, Inc
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Francesco Sardanelli, MD, San Donato Milanese, Italy (*Abstract Co-Author*) Speakers Bureau, Bracco Group Research Grant, Bracco Group Speakers Bureau, Bayer AG Research Grant, Bayer AG Research Grant, IMS International Medical Scientific
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Julia Camps Herrero, DIPLPHYS, Alzira, Spain (*Abstract Co-Author*) Nothing to Disclose
Gabor Forrai, MD, Budapest, Hungary (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

MIPA is an ongoing prospective observational multicenter study enrolling two concurrent groups of women with a newly diagnosed breast cancer, not candidate to neoadjuvant therapy, receiving or not receiving MRI before surgery.

METHOD AND MATERIALS

A total of 34 centers from 14 countries were selected for participation. For each breast, the surgical treatment planned at mammography/US and the actually performed one were recorded. For the MRI group, any change in the patients' surgical management due to MRI was noted. Mastectomies and reoperations were the surgical patients' outcomes. Raw odds ratios (OR) were adjusted for patient age and breast density for MRI group over non-MRI group. McNemar and c2 tests were used for comparisons.

RESULTS

Up to March 2016, 1st, 4,295 patients were enrolled, 1,926 (45%) having a complete case report form and suited for analysis. Of 1,926 patients, 954 (49.5%) did not undergo MRI and 972 (50.5%) underwent MRI. Mastectomy rate planned at mammography/US was 134/954 (14.0%) for the non-MRI group and 195/972 (20.1%) for the MRI group ($P < .001$): adjusted OR 1.4 (95% confidence interval [CI] 1.2–1.6). In the MRI-group, planned mastectomies passed to 203/972 (20.9%) after MRI ($P = .016$). MRI-detected new contralateral cancers were 8/972 (0.8%). Actual mastectomy rate was 140/954 breasts (14.7%) in the non-MRI group and 203/972 (20.9%) in the MRI group ($P < .001$): adjusted OR 1.4 (95%CI 1.2–1.6). Of 769 breasts conservatively treated, MRI did not change

the surgical treatment in 569 (74%), while prompted a wider or >1 excision in 100 (13%) and a less extensive surgical treatment in 100 (13%). Per-patient reoperation rate for close/positive margins was 124/954 (13.0%) in the non-MRI group and 68/972 (7%) in the MRI group ($P < .001$): adjusted OR 0.5 (95%CI 0.4–0.6).

CONCLUSION

These preliminary results showed that most mastectomies were already planned at mammography/US so that preoperative MRI was used mainly as a confirmation tool. This selection bias also contributed in determining a lower reoperation rate in women undergoing MRI. Conservative treatment was modified by MRI in relation to disease extent, with a balance between increased and decreased breast tissue removal.

CLINICAL RELEVANCE/APPLICATION

Preoperative MRI prompts a very low rate of additional mastectomies and allows for tailoring conservative treatment.

SST01-02 **Role of Breast MRI for Detecting and Characterizing Papillary Lesions: Comparison with Conventional Digital Ductography and Histological Findings**

Friday, Dec. 2 10:40AM - 10:50AM Room: E450B

Participants

Marco Moschetta, MD, Bari, Italy (*Presenter*) Nothing to Disclose
Michele Telegrafo, MD, Bari, Italy (*Abstract Co-Author*) Nothing to Disclose
Tina Introna, Bari, Italy (*Abstract Co-Author*) Nothing to Disclose
Luigi Coi, Bari, Italy (*Abstract Co-Author*) Nothing to Disclose
Amato Antonio Stabile Ianora, Bari, Italy (*Abstract Co-Author*) Nothing to Disclose
Giuseppe Angelelli, Bari, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the role of breast contrast enhanced MR imaging (CE-MR) for detecting and characterizing papillary lesions and to compare the obtained results with conventional digital ductography, having the histological findings as the reference standard.

METHOD AND MATERIALS

49 consecutive patients with spontaneous, unilateral, single-pore nipple discharge underwent conventional digital ductography and CE-MRI (1.5 Tesla device) with morphological (T2-TSE, STIR) and dynamic sequences (THRIVE). Sensitivity, specificity and diagnostic accuracy values for both ductography and CE-MRI were calculated having post-surgical histological examination ($n=43$) and 12 month MR follow up ($n=6$) as the reference standard. The obtained performance values were compared by using Mc Nemar test searching for any statistical significant difference between the two imaging tools.

RESULTS

CE-MRI detected papillary lesions in 41/49 (84%) patients (mass like enhancement, $n=30$ - papillomas; ductal enhancement, $n=7$ - papillomatosis; linear enhancement, $n=4$ - papillary carcinomas) with sensitivity, specificity and accuracy values of 95%, 100% and 96%, respectively. Conventional digital ductography detected papillary lesions in 33/49 (67%) patients (single filling defects, $n=26$ - papillomas; multiple filling defects, $n=4$ - papillomatosis; filling stops with ductal distortions, $n=3$; papillary carcinomas) with sensitivity, specificity and accuracy values of 77%, 100% and 80%, respectively. A significant difference between the two imaging tools was found in terms of sensitivity and diagnostic accuracy ($p < 0.05$).

CONCLUSION

Breast CE-MRI represents an accurate and non invasive tool for diagnosing and classifying papillary lesions with higher sensitivity and accuracy values as compared with conventional ductography.

CLINICAL RELEVANCE/APPLICATION

Breast CE-MRI allows to diagnose and classify papillary lesions with high accuracy and can replace conventional ductography in the management of patients.

SST01-03 **Dynamic Contrast-Enhanced and Diffusion-Weighted MR Imaging of Estrogen Receptor-positive Invasive Breast Cancers: Correlations between Quantitative MR Parameters and Ki-67 Proliferation Status**

Friday, Dec. 2 10:50AM - 11:00AM Room: E450B

Participants

Jin You Kim, MD, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyun Jung Kang, MD, Busan, Korea, Republic Of (*Presenter*) Nothing to Disclose
Seung Hyun Lee, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Tae Hong Lee, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Suk Kim, MD, Pusan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

We explored whether quantitative parameters derived from dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) and diffusion-weighted imaging (DWI) correlated with the Ki-67 proliferation status in patients with estrogen receptor (ER)-positive invasive breast cancer.

METHOD AND MATERIALS

Between October 2014 and February 2015, 88 women with 88 ER-positive invasive breast cancers underwent preoperative DCE-MRI and DWI. The perfusion parameters (K_{trans} , K_{ep} , and V_e) and apparent diffusion coefficients (ADC) of each tumor were recorded. Correlations between these quantitative parameters and the Ki-67 proliferation status were sought using multivariate regression analysis and by construction of receiver operating characteristic (ROC) curves. The Ki-67 proliferation index was categorized as high ($\geq 14\%$) or low ($< 14\%$).

RESULTS

In the high-Ki-67 group, the mean Ktrans was significantly higher ($P < 0.001$) than that of the low-Ki-67 group, and the mean ADC significantly lower ($P < 0.001$). However, the mean K_{ep} and V_e values did not differ between the two groups ($P = 0.248$ and $P = 0.055$, respectively). The ROC curve showed that cutoffs of 0.277 for Ktrans and 0.894×10^{-3} mm²/s for ADC, respectively, optimally predicted a high Ki-67 status (areas under the curve = 0.728 and 0.722; both P values < 0.001). Univariate analysis showed that a higher Ktrans (≥ 0.277), a lower ADC ($\leq 0.894 \times 10^{-3}$ mm²/s), a larger tumor size (> 2 cm), a higher histological grade (grade 3), and the presence of axillary metastasis were significantly associated with high-Ki-67 status (all P values < 0.05). Of these variables, a higher Ktrans (> 0.277 ; adjusted odds ratio (OR) = 8.893, 95% CI = 1.937-40.821; $P = 0.005$) and a higher histological grade (grade 3; adjusted OR = 8.353, 95% CI = 1.521-45.862; $P = 0.015$) independently predicted a high Ki-67 status.

CONCLUSION

MRI-derived quantitative parameters including Ktrans and the ADC were correlated significantly with the Ki-67 proliferation status in patients with ER-positive invasive breast cancer. Furthermore, upon multivariate analysis, a higher Ktrans was the strongest independent predictor of a high Ki-67 proliferation index.

CLINICAL RELEVANCE/APPLICATION

Quantitative parameters derived from DCE-MRI and DWI facilitate evaluation of proliferative tumor activity before surgery and may serve as useful imaging biomarkers predicting breast cancer prognosis.

SST01-04 Invasive Lobular Carcinoma: Detection and Multiplicity with Multimodalities

Friday, Dec. 2 11:00AM - 11:10AM Room: E450B

Participants

In Hye Chae, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Jin Chung, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
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Jeoung Hyun Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the diagnostic performances of mammography, sonography, breast specific gamma imaging (BSGI), PET, digital breast tomosynthesis (DBT) and magnetic resonance imaging (MRI) for the detection of invasive lobular carcinoma (ILC).

METHOD AND MATERIALS

This is a retrospective study of women with surgically proven ILC. All patients underwent surgery at our institution from October 2011 to November. All patients were performed various imaging modalities, prior to the surgery; mammography, sonography, BSGI, PET, DBT, and/or 3-T MRI. The imaging findings were classified as positive or negative for ILC, by experienced breast radiologists. The final surgical pathology made into the reference standard. The detection rate was evaluated for each index cancer per breast. The diagnostic performances were also evaluated for multiple suspicious lesions per breasts.

RESULTS

A total of 78 breasts in 76 women (mean age; 51 years, range; 33-85 years) had ILCs, two patients had bilateral invasive lobular carcinomas and 32 breasts had multiple ILCs per breast. Patients preoperatively underwent mammography (n=72), sonography (n=77), BSGI (n=50), PET (n=74), DBT (n=15), and MRI (n=76). For index cancer, the detection rate was 100 % for sonography, MRI, and DBT, while the detection rate of BSGI, PET and mammography were follows; 96.0%, 93.2% and 87.5%, respectively. For multiple ILCs, DBT had a sensitivity of 100%, MRI had a sensitivity of 93.3%, sonography, PET, BSGI, and mammography as follows (75.0%, 56.7%, 38.1% and 22.6%, respectively). The sensitivity of sonography for multiple ILCs (75.0%) was significantly higher than that of mammography (22.6%, $P = .000$) and BSGI (38.1%, $P = .006$). The diagnostic accuracy for multiple ILCs were 100% in DBT, 73.6% in PET, 71.4% in sonography, 67.1% in MRI, 60% in BSGI and 56.9% in mammography.

CONCLUSION

Sonography, DBT and MRI showed 100% detection rate of main ILCs. DBT was the most accurate imaging modality, whereas mammography and BSGI showed relatively low diagnostic performances, for the multiplicity of ILCs. DBT is an effective modality for patients with ILCs, and has a promising role in the diagnosis of multiple ILCs.

CLINICAL RELEVANCE/APPLICATION

Digital breast tomosynthesis can demonstrate multiple suspicious lesions of invasive lobular carcinoma and is recommended as part of preoperative evaluation in patients with invasive lobular carcinoma.

SST01-05 National Performance Benchmarks for Modern Diagnostic Digital Mammography: Update from the Breast Cancer Surveillance Consortium

Friday, Dec. 2 11:10AM - 11:20AM Room: E450B

Participants

Brian L. Sprague, PhD, Burlington, VT (*Abstract Co-Author*) Nothing to Disclose
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Diana S. Buist, PhD, MPH, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To establish contemporary performance benchmarks for modern diagnostic digital mammography.

METHOD AND MATERIALS

This HIPAA compliant, IRB approved study included data from six Breast Cancer Surveillance Consortium registries (414 radiologists;90 radiology facilities). Women characteristics, mammogram indication and findings, linked with cancer diagnoses from state cancer registries were prospectively collected on women undergoing diagnostic digital mammography at participating facilities. We included 373,176 examinations conducted during 2007-2013 on 246,206 women. Performance statistics overall and stratified by diagnostic indication were calculated according to the American College of Radiology BI-RADS 5th edition. Benchmarks were derived from the distribution of performance metrics across radiologists.

RESULTS

Overall, diagnostic performance measures were: cancer detection rate (CDR), 32.9 per 1000; abnormal interpretation rate, 12.6%; positive predictive value-2, 26.2%; positive predictive value-3, 28.9%; false negative rate, 4.8 per 1000; sensitivity, 87.2%; specificity, 90.4%; cancers stage 0 or 1, 63.9%; minimal cancers, 46.9%; mean size of invasive cancers, 21.1 mm; invasive cancers node negative, 70.1%. Performance varied widely across specific diagnostic indications (e.g., additional evaluation of a recent mammogram, breast lump, short interval follow-up) and across radiologists. CDR ranged from 9.9/1000 for short interval follow-up exams to 61.4/1000 for evaluation of a breast lump. Cancers detected for exams evaluating a breast lump had poorer prognostic characteristics, including a high percentage of invasive cancers (93.3%), low percentage of minimal cancers (17.0%), larger mean tumor size (28.4 mm), and a high percent of node positive disease (41.0%). Comparison to prior studies reveals substantial changes in diagnostic mammography performance since the change from film to digital mammography, including increased cancer detection rates and declining specificity and positive predictive values.

CONCLUSION

These performance measures can serve as national benchmarks, which may help transform variation in radiologists' diagnostic interpretive performance into targeted quality improvement efforts.

CLINICAL RELEVANCE/APPLICATION

Data from a large set of mammography facilities in the US linked to cancer registries provide contemporary performance benchmarks for diagnostic mammography in the era of modern digital mammography.

SST01-06 Dense or Not Dense: Implications of Visual and Quantitative Mammographic Density Assessment

Friday, Dec. 2 11:20AM - 11:30AM Room: E450B

Awards

Student Travel Stipend Award

Participants

Meaghan Mackesy, MD, Boston, MA (*Presenter*) Nothing to Disclose
Elisabeth P. Frost, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Eva C. Gombos, MD, Boston, MA (*Abstract Co-Author*) Royalties, Reed Elsevier
Catherine S. Giess, MD, Wellesley, MA (*Abstract Co-Author*) Nothing to Disclose
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Sugra Raza, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Legislation requiring radiologists to inform women if they have mammographically dense tissues exists in numerous states and is expanding. The historically used visual assessment of density is known to suffer from intra- & inter-observer variability. Ideally, computer based quantitative tools should be objective & more robust. The purpose of this study was to assess the frequency of agreement between visual and quantitative density-based risk stratification in a screening mammography population.

METHOD AND MATERIALS

IRB approved review of 2566 screening mammograms performed between December 2015 & March 2016 was performed, noting radiologists' visually assessed density (RD) & quantitative (Quantra™) density (QD) assignment for each case, based on BIRADS density categories A-D. All cases with discrepant RD & QD categories were tabulated. Within discrepant cases, we identified those with the discrepancy between categories A/B and C/D, or non-dense versus dense (NDvD). NDvD cases were blindly reviewed by a consortium of experienced breast imagers who assigned a visual density category to each case by consensus. This categorization was then compared to the prospective RD and QD.

RESULTS

RD & QD assignments were discrepant in 590 out of 2566 cases (23%). Of the discrepant cases, 224/590 (38%) had NDvD discrepancy (accounting for 8.7% of all 2566 cases). Of the 224 NDvD discrepant cases, RD resulted in 128 heterogeneous or extremely dense cases, QD resulted in 96. Of the 224 NDvD cases, there were 13 RD category A, all assigned category C by QD; and 5 RD category D cases which were assigned QD category A (3) or B (2). Consortium review deemed QD assignments in these cases unquestionably incorrect. In 177/224 (79%) of NDvD discrepant cases, the consortium density assignment was in agreement with prospective RD.

CONCLUSION

Quantitative density assessment would ideally categorize density of all screening mammograms correctly, identifying women at higher cancer risk who may benefit from supplemental screening. However, at present, this method has limitations and concurrent visual inspection is necessary to avoid misclassification of screening mammograms.

CLINICAL RELEVANCE/APPLICATION

Given legislation requiring density reporting, variability of qualitative & quantitative density assessment has far-reaching implications, both for supplemental screening & overall risk assessment.

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/>

Catherine S. Giess, MD - 2015 Honored Educator
Eren D. Yeh, MD - 2015 Honored Educator
Sugra Raza, MD - 2015 Honored Educator

SST01-07 **Dedicated Breast PET (dbPET): The Extraordinary Contribution of Molecular Imaging in the Management Breast Cancer**

Friday, Dec. 2 11:30AM - 11:40AM Room: E450B

Participants

Michel Herranz Camero, Santiago de Compostela, Spain (*Presenter*) Nothing to Disclose
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Ines Dominguez, Santiago de Compostela, Spain (*Abstract Co-Author*) Nothing to Disclose
Alvaro Ruibal, MD, PhD, Santiago de Compostela, Spain (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the value of this technology in the routine management of breast cancer patients. Different approaches are discussed, from the use in monitoring therapy, to correlation with magnetic Resonance imaging and even the development of the first 3D PET guided biopsy system on the world.

METHOD AND MATERIALS

Five hundred women with known or suspected breast carcinoma were enrolled in this study. A prone position high-resolution dedicated breast PET and MRI examinations were performed. A joint reading of MRI and PET scans side-by-side by a nuclear medicine physician and a radiologist was performed. Sensitivity, specificity, positive and negative predictive value, functional quantification, volume characterization and heterogeneity were registered. Final consideration of MRI and dbPET scans were compared with post-surgical pathology reports

RESULTS

A total of 537 lesions were assessed. Lesion size range was 0.2 to 7.6 cm. In lesion-by-lesion analysis, sensitivity and specificity of MRI alone were 91% and 54%, respectively; while lesion-based sensitivity of dbPET was 93% and breast-based specificity was 100%. The positive predictive value and the negative predictive value for MRI alone were 69% and 85%, respectively; and for dbPET were 100% and 89%, respectively. In a significant number of cases, dbPET helped to clarify or disprove positive findings by MRI, and helped to define new positives that had gone unnoticed at MRI. When treatment was successful, a significant difference was found between pre- and post-Neoadjuvant Chemotherapy status and the SUVmax ($p < 0.001$) of breast tumors. An exquisite and unexpected millimeter correlation with post-surgical pathology at the end of neoadjuvant therapy has been found in dbPET images.

CONCLUSION

Dedicated breast PET scans increase the specificity of MRI. The results of the current study show that FDG-dbPET is more effective than MRI in detecting true breast cancer positives. dbPET MAMMI has proven to be an excellent tool for monitoring of neoadjuvant therapy, showing earlier and better precision and accuracy than conventional techniques. Such an association might be of relevant importance to treatment continuity or adjustment.

CLINICAL RELEVANCE/APPLICATION

dbPET MAMMI has proven to be an excellent tool for diagnosis and monitoring of neoadjuvant therapy, showing earlier and better precision and accuracy than conventional techniques.

SST01-08 **89Zr-trastuzumab PET/CT for Detection of Unsuspected HER2-positive Metastases in Patients with HER2-negative Primary Breast Cancer**

Friday, Dec. 2 11:40AM - 11:50AM Room: E450B

Participants

Gary A. Ulaner, MD, PhD, New York, NY (*Presenter*) Research support, General Electric Company; Research support, F. Hoffmann-La Roche Ltd
Serge Lyashchenko, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Jason S. Lewis, PhD, New York, NY (*Abstract Co-Author*) Shareholder, pHILIP, Inc; Research support, MabVax Therapeutics, Inc
David Hyman, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Jorge Carrasquillo, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine if imaging with 89Zr-trastuzumab, a HER2-targeting PET tracer, can detect HER2-positive metastases in patients with HER2-negative primary breast cancer.

METHOD AND MATERIALS

Patients with HER2-negative primary breast cancer and distant metastases evident on CT, MR, or FDG PET/CT were enrolled in an IRB-approved prospective clinical trial. Patients underwent PET/CT with 5 mCi of 89Zr-trastuzumab in a total of 50 mg trastuzumab to screen for 89Zr-DFO-trastuzumab-avid metastases. Metastases avid for 89Zr-trastuzumab were biopsied to define HER2 status. Patients with pathologically proven HER2-positive metastases went on to receive HER2 targeted therapy to evaluate treatment response.

RESULTS

Nineteen patients have been enrolled in this prospective clinical trial, all of whom had pathologic retesting that confirmed HER2-negative primary breast cancer, and 13 of whom have so far been imaged with 89Zr- trastuzumab PET/CT. Seven patients demonstrated suspicious foci on 89Zr-DFO-trastuzumab PET/CT. Three of these seven patients had 89Zr-DFO-trastuzumab directed biopsy that confirmed the presence of HER2-positive metastases on pathology (by ASCO criteria). Four of these seven patients with suspicious foci had HER2-negative disease on pathology, and were classified as false positives for HER2-imaging on 89Zr-trastuzumab PET/CT. Of the three patients with biopsy proven HER2-positive metastases, two have completed a course of HER2-targeted therapy, and both demonstrated treatment response.

CONCLUSION

89Zr-trastuzumab PET/CT imaging may detect unsuspected HER2-positive metastases in patients with HER2-negative primary breast cancer. 89Zr-trastuzumab PET/CT also demonstrated a number of foci which were HER2-negative on pathology, and may represent false positive HER2-imaging.

CLINICAL RELEVANCE/APPLICATION

This is a proof of concept that HER2-targeted imaging can identify unsuspected HER2-positive malignancy and identify additional candidates for HER2-targeted therapy.

SST01-09 Quantitative CAD for Mammograms: Reducing False Positive Biopsies

Friday, Dec. 2 11:50AM - 12:00PM Room: E450B

Participants

Alyssa T. Watanabe, MD, Los Angeles, CA (*Presenter*) Consultant, CureMetrix, Inc
Rebecca Rakow-Penner, MD, PhD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
William Daughton, PhD, La Jolla, CA (*Abstract Co-Author*) Employee, CureMetrix, Inc
Hoanh X. Vu, PhD, San Diego, CA (*Abstract Co-Author*) Employee, CureMetrix, Inc
Michele Rochelle, MD, Poway, CA (*Abstract Co-Author*) Nothing to Disclose
Haydee Ojeda-Fournier, MD, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Mohammad Eghtedari, MD, PhD, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Noha Abdelgelil, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
William G. Bradley JR, MD, PhD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Eric Weise, San Diego, CA (*Abstract Co-Author*) Researcher, CureMetrix, Inc

PURPOSE

Almost 2% of screening mammograms result in biopsy, and approximately 70% of these biopsies are benign (Allison, Cancer, 2015). Decreasing the number of unnecessary biopsies would be cost effective and decrease patient anxiety about breast cancer screening. We evaluated a novel algorithm that differentiates benign and malignant calcifications and compared these results to those of experienced radiologists in selecting cases for biopsy. The algorithm is based on a quantitative learning algorithm that takes into account morphology and clustering formation of benign and malignant calcifications as well as stability over time.

METHOD AND MATERIALS

In this IRB approved study, we performed a comparative analysis on 391 patients' screening and diagnostic mammograms where tissue was sent to biopsy based on suspicious calcifications detected by MQSA certified, fellowship-trained breast imaging radiologists. Cases from 2 different centers were reviewed. These images were evaluated with the qCAD and compared to the expert radiologists' reads. The outcome of the algorithm is an analytical function determined by the training datasets that mathematically define both malignant and benign calcifications. The algorithm is self-learning, improving over time as it encounters more patient cases.

RESULTS

Out of the 391 cases sent to biopsy, 302 cases were benign and 89 malignant (including DCIS). In a preliminary study using 44 cases (30 cases benign and 14 malignant), the algorithm detected 100% of confirmed cancer cases and had 11 cases with false positives, substantially fewer than the 30 false positives by the radiologists. If biopsy recommendations were based on the algorithm up to 63% of biopsies could have been avoided. The PPV of 32% could have been increased to 56% with the benefit of the qCAD.

CONCLUSION

This novel algorithm demonstrates that it can reduce the number of false negative biopsies based on suspicious calcifications by up to 63%. Also, the algorithm can be used to evaluate both screening and diagnostic mammograms.

CLINICAL RELEVANCE/APPLICATION

The use of this quantitative CAD for mammography may be useful in reducing false positive breast biopsies and significantly increasing the positive predictive value (PPV) of biopsy. This may lead to health savings costs as well as eliminate pain and distress for many patients.

SST02

Cardiac (Quantitative Imaging)

Friday, Dec. 2 10:30AM - 12:00PM Room: E450A

CA BQ CT MR

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants

Seth J. Kligerman, MD, Denver, CO (*Moderator*) Nothing to Disclose
Bernd J. Wintersperger, MD, Toronto, ON (*Moderator*) Speakers Bureau, Siemens AG; Research support, Siemens AG

Sub-Events

SST02-01 Native T1 Variations after Repeated Measurements: Implication for Defining Regional Myocardial Changes Using MRI

Friday, Dec. 2 10:30AM - 10:40AM Room: E450A

Participants

Kai Lin, MD, MSc, Chicago, IL (*Presenter*) Nothing to Disclose
Jeremy D. Collins, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Kenichiro Suwa, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Zhanming Fan, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Michael Markl, PhD, Chicago, IL (*Abstract Co-Author*) Institutional research support, Siemens AG; Consultant, Circle Cardiovascular Imaging Inc;
James C. Carr, MD, Chicago, IL (*Abstract Co-Author*) Research Grant, Astellas Group Research support, Siemens AG Speaker, Siemens AG Advisory Board, Guerbet SA

PURPOSE

Changes of native T1 values may reflect the progression of cardiovascular diseases (CVDs). However, It can be difficult to determine whether a local change in native T1 values in the left ventricle (LV) is caused by measurement inaccuracies due to reproducibility and/or observer variability or by real changes in tissue structure as a result of improvement or deterioration of cardiovascular diseases. The aim of the present study was to establish normal T1v variation (T1v) thresholds for repeated measurements of regional T1 values using magnetic resonance imaging (MRI).

METHOD AND MATERIALS

This HIPAA compliant study was approved by the institutional review board (IRB). Eighteen healthy volunteers (38.5 ± 15.4 years [mean \pm SD]; age range: 23 - 70 years; 12 male and 6 female) recruited to undergo 2 consecutive cardiac MRI scans using modified Look-Locker Inversion recovery (MOLLI) with two basal resolutions on different days to repeat T1 measurements on LV (at base, mid-ventricular and apex levels). The absolute differences (d) and standard deviations (SDs) of regional T1 values were acquired with the two scans (with basal resolutions 256 and 384) and two readers. T1v threshold (mean difference + 2SD), intra-class correlation coefficient (ICC) and coefficient of variation (CoV) were calculated on LV slices and segments.

RESULTS

T1 mapping using the MOLLI sequence was successfully performed in all 18 volunteers twice. For all participants, there was no significant difference of heart rates and blood pressure between two scans. There were totally 54 LV slices and 288 myocardial segments eligible for analysis. On a per-slice basis (n = 54), ICCs for intra-observer, inter-observer, inter-resolution, inter-study T1v were 0.988, 0.899, 0.763 and 0.6. CoVs were 0.72%, 2.39%, 3.90% and 4.28%. T1v thresholds were 22 ms, 66 ms, 118 ms and 120 ms. On a per-segment basis (n = 288), ICCs for T1v were 0.974, 0.859, 0.711 and 0.594. CoVs were 1.09%, 3.36%, 4.69% and 5.01%. T1v thresholds were 33 ms, 94 ms, 140 ms and 144 ms. See figure 1 and 2.

CONCLUSION

The regional T1v thresholds from repeated measurements found in our study demonstrate the underlying variability of the MOLLI techniques which is commonly used for myocardial native T1 quantification.

CLINICAL RELEVANCE/APPLICATION

Based on our data, we suggest not considering a regional T1v from an individual patient that is inside of T1v thresholds, as an indication of the progression of CVDs.

SST02-02 Evaluation of Radiation-induced Cardiac Injury based on Native T1 and Extracellular Volume

Friday, Dec. 2 10:40AM - 10:50AM Room: E450A

Awards

Student Travel Stipend Award

Participants

Hideobu Takagi, MD, PhD, Morioka, Japan (*Presenter*) Nothing to Disclose
Hideki Ota, MD, PhD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Rei Umezawa, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomoyoshi Kimura, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Keiichi Jingu, MD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Kei Takase, MD, PhD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate radiation-induced cardiac injury after chemoradiotherapy (CRT) for esophageal cancer using myocardial T1 and extracellular volume (ECV) fraction.

METHOD AND MATERIALS

This institutional review board-approved prospective study enrolled 26 patients (15 men, 11 women) with esophageal cancer scheduled for CRT between January 2013 and April 2015. No subjects had known cardiovascular comorbidity. Patients underwent serial cardiac MR examinations using a 3T whole body scanner before (n = 26), 0.5 years after (n = 21) and 1.5 years after (n = 15) CRT. Scan protocol included cine MR imaging, T1 mapping using modified Look-Locker inversion recovery before and after gadolinium-contrast administration and late gadolinium enhanced MR imaging. Mean T1 time in the left ventricular myocardium and blood pool were measured on both T1 maps in 4-chamber plane images (T1myo pre, T1myo post, T1blood pre and T1blood post). Regions of interest were placed on midwall of basal interventricular septum (IVS) as an irradiated area and that of the apical lateral wall as a non-irradiated area. ECV fraction was calculated using the following formula: $(1 - \text{hematocrit})(1/T1_{\text{myo post}} - 1/T1_{\text{myo pre}})/(1/T1_{\text{blood post}} - 1/T1_{\text{blood pre}})$. Ejection fraction (EF) derived from cine MR imaging, myocardial native T1 (T1myo pre) and ECV values after CRT were compared with those at the baseline as the reference using repeated measures ANOVA with Turkey's honestly significant difference test. $P < 0.05$ indicated statistical significance.

RESULTS

All patients completed CRT with median total radiation dose of 60 Gy (range, 50.4–66 Gy). EF was not significantly changed after CRT. On basal IVS, native T1 of 0.5 (1256 ± 33 ms) and 1.5 years (1223 ± 59 ms) after CRT were significantly higher than that of baseline (1179 ± 41 ms, $p < 0.01$ for both); ECV of 0.5 (32 ± 3%) and 1.5 years (28 ± 4%) after CRT were significantly higher than that of baseline (26 ± 3%, $p < 0.05$ for both). On apical lateral wall, no significant change was found in native T1 nor ECV after CRT.

CONCLUSION

Myocardial native T1 and ECV in basal IVS were increased after CRT. These results indicate radiation-induced subclinical myocardial injury with preserved left ventricular function.

CLINICAL RELEVANCE/APPLICATION

Native T1 and ECV can demonstrate radiation-induced subclinical myocardial toxicity in patients with esophageal cancer treated with chemoradiotherapy.

SST02-03 Effects of 24-Hour-Shift Related Short Term Sleep Deprivation on Cardiac Function: A CMR Based Study

Friday, Dec. 2 10:50AM - 11:00AM Room: E450A

Participants

Daniel Kuetting, MD, Bonn, Germany (*Presenter*) Nothing to Disclose
Andreas Feisst, MD, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose
Rami Homs, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose
Julian A. Luetkens, MD, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose
Daniel K. Thomas, MD, PhD, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose
Hans H. Schild, MD, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose
Darius Dabir, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Sleep deprivation is known to increase blood pressure, inflammatory processes, and stress hormone secretion. This study sought to investigate the immediate effects of 24 hour shift associated sleep deprivation on radiologists.

METHOD AND MATERIALS

15 subjects (1, female, mean age 31.6 ± 2.1 years; mean EF 60.5 %) were scanned on a clinical 1.5 T CMR scanner (Philips Ingenia) before and following a 24 hour shift with an average of 3 hours of sleep. In addition venous blood and urine samples were collected from all subjects and blood pressure (BP) as well as heart rate (HR) were measured. Short axis slices as well as horizontal long axis views were acquired using standard SSFP-sequences. Standard CMR parameters for left ventricular volumes, ejection fraction and wall thickness as well as Feature Tracking derived circumferential and longitudinal strain parameters were measured.

RESULTS

Following short term sleep deprivation (average sleep duration: 182 min) significant increases in systolic (pre: 112.6 ± 12.9 mm Hg; post: 118.5 ± 14.3 mm Hg; $p = 0.017$) and diastolic BP (pre: 63.9 ± 12.3 mm Hg; post: 71.5 ± 7.7 mm Hg, $p = 0.021$), HR (pre: 66 ± 9.8 min⁻¹; post: 71.4 ± 11.6 min⁻¹; $p = 0.002$) as well as peak systolic circumferential strain (PSCS; pre: -22.3 ± 2.4 %; post: -23.9 ± 2.4%, $p = 0.011$) and peak systolic longitudinal strain (PSLS; pre: -21.4 ± 1.9 %*s⁻¹; post: -23.1 ± 1.9 %*s⁻¹, $p = 0.005$) were revealed. Additionally significant increases in cortisol (pre: 10.0 ± 4.4 µg/dl; post: 14.7 ± 5.7 µg/dl; $p = 0.023$), TSH (pre: 1.6 ± 0.5 µU/ml, post: 2.7 ± 1.0 µU/ml; $p = 0.002$) FT3 (pre: 3.1 ± 0.98 pg/ml, post: 3.4 ± 0.5 pg/ml; $p = 0.039$) and FT4 (pre: 0.9 ± 0.1 ng/dl, post: 1.0 ± 0.1 ng/dl; $p = 0.039$) levels were found. In contrast, left ventricular ejection fraction, noradrenalin, glucose and insulin levels were unchanged ($p = \text{ns}$).

CONCLUSION

For the first time it could be shown that 24 hour shift related short term sleep deprivation leads to a significant increase in cardiac contractility, blood pressure, heart rate and stress hormone secretion.

CLINICAL RELEVANCE/APPLICATION

The clinical relevance is not yet well understood, since these effects may only be short lived and should be further studied in a larger cohort.

SST02-04 Quantitative Assessment of Left Ventricular Three-dimensional Maximum Principal Strain Using

Cardiac Computed Tomography: Identification of Myocardial Infarction Assessed by Cardiac Magnetic Resonance Imaging

Friday, Dec. 2 11:00AM - 11:10AM Room: E450A

Participants

Takahiro Yokoi, Toon, Japan (*Presenter*) Nothing to Disclose
Yuki Tanabe, Toon, Japan (*Abstract Co-Author*) Nothing to Disclose
Teruhito Kido, MD, PhD, Toon, Japan (*Abstract Co-Author*) Nothing to Disclose
Naoki Fukuyama, Toon, Japan (*Abstract Co-Author*) Nothing to Disclose
Akira Kurata, PhD, Toon, Japan (*Abstract Co-Author*) Nothing to Disclose
Ryo Ogawa, MD, Toon, Japan (*Abstract Co-Author*) Nothing to Disclose
Masashi Nakamura, Toon, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomoyuki Kido, Toon, Japan (*Abstract Co-Author*) Nothing to Disclose
Masao Miyagawa, MD, PhD, Toon, Japan (*Abstract Co-Author*) Nothing to Disclose
Teruhito Mochizuki, MD, Toon, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Myocardial strains have a potential for accurate and objective assessment of regional cardiac dysfunction. The purpose of this study was to investigate the feasibility of three-dimensional (3D) maximum principal strain (MP-strain) of left ventricle (LV) for detecting myocardial infarction (MI) assessed by late gadolinium enhancement-magnetic resonance imaging (LGE-MRI).

METHOD AND MATERIALS

This study population consisted of 59 patients (mean age: 65.7±9.2 years), who underwent coronary CT angiography (CTA) with retrospective ECG gated mode and LGE-MRI for evaluation of coronary artery disease. Short axial images of LV were reconstructed every 10% (0-90%) of the RR interval of the ECG signal. The MP-strain value was analyzed in the endocardium based on the 16-segment model by using prototype software algorithm (Ziostation 2, Ziosoft Inc., Tokyo, Japan). All myocardial segments were defined as normal or infarcted segments [subendocardial (LGE<50%) and transmural infarction (LGE≥50%)] by LGE-MRI. The peak endocardial MP-strain values were analyzed at a segment level, and compared between normal and infarcted segments. Diagnostic performance [sensitivity, specificity, positive and negative predictive value (PPV and NPV)] of endocardial MP-strain for detecting MI was evaluated by receiver operating characteristic (ROC) analysis.

RESULTS

A total of 913 segments (97%) could be assessed for MP-strain analysis. Of 913 segments, 112 segments (12%) were diagnosed as infarcted segments. The peak endocardial MP-strain at infarcted segments were significantly lower than normal segments (median: 0.28 vs. 0.64, $p < 0.05$), and significantly decreased in order to normal, subendocardial and transmural infarction (median: 0.64 vs. 0.34 vs. 0.23, $P < 0.05$). The peak endocardial MP-strain had the area under the curve of 0.92 (95% confidence interval (CI): 0.89-0.94). Sensitivity, specificity, and PPV and NPV (95% CI) were 86% (80-92), 85% (82-87), 44% (38-51), and 97% (96-98) using a cut-off value of 0.40.

CONCLUSION

Quantitative assessment of CT MP-strain is feasible for detecting myocardial infarction assessed by LGE-MRI with high diagnostic performance.

CLINICAL RELEVANCE/APPLICATION

The MP-strain is available for the quantitative assessment of regional cardiac dysfunction by post-processing of coronary CTA data sets without additional radiation exposure and contrast medium.

SST02-05 Characteristics of Myocardial Scar Assessed by T1 Mapping in MI Patients: A Preliminary CMR Study

Friday, Dec. 2 11:10AM - 11:20AM Room: E450A

Participants

Chen Cui, MSc, Beijing, China (*Presenter*) Nothing to Disclose
Shihua Zhao, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

LGE cannot separate fat from fibrosis in scar tissue, for both of them manifest as high signals in LGE image. The main aim of present study is to investigate if T1 mapping by MRI is able to distinguish the difference between fat deposition, fibrosis and intact myocardium

METHOD AND MATERIALS

Twenty four Patients with myocardial infarction and ten healthy volunteers were studied after written informed consent was obtained. The MRI scan protocols included a series of short axis cine imaging of LV for function analysis, water-fat separation imaging, LGE imaging and T1 maps acquired by MOLLI sequence. The patients were divided into two groups depended on the presence or absence of fat in water-fat separation image. The scar tissue characteristics was determined by the results of water-fat separation and LGE image. The T1 values of the different scar areas represent fat, fibrosis and normal myocardium were compared.

RESULTS

The fat deposition was found in half of the patients (12 of 24). In patient with fat deposition, the distribution of fat deposition segments are identical with the LGE area. There are significant different between the T1 value of the scar area in patient with fat disposition, without fat disposition and the normal (remote) area of the patients (521±76 vs 1001.9±50.2 vs 1171.1±109 msec). In patient without fat disposition, we used the remote myocardium of LGE as the standard true negative for fibrosis. The area under the ROC curve is 0.917±0.062; the best cut-off value for T1 value to detect fibrosis is 1095 msec (sensitivity of 83.3%, specificity of 91.7%).

CONCLUSION

LVMI. Increased levels of ADC were associated with reduced peak systolic and early diastolic circumferential strain rate across all subjects.

CONCLUSION

Contrast-free non-invasive quantitative DWI is a feasible alternative to the native T1 value and established contrast-enhanced ECV-CMR for the identification of diffuse myocardial fibrosis in HTN patients. HTN LVH patients have greater diffuse fibrosis and reduced circumferential strain and circumferential strain rate compared with HTN non-LVH and control subjects. Although diffuse fibrosis is linearly related to worsening circumferential strain, variations in ADC among patients with LVH may provide insight into the differential expression of fibrosis and myocyte hypertrophy among patients with HTN. ADC Measurement may serve as a useful novel target to monitor the efficacy of therapies for HTN patients.

CLINICAL RELEVANCE/APPLICATION

HTN LVH subject had greater ADC value and associated reduction in peak systolic circumferential strain, and early diastolic strain rate compared with HTN non-LVH and normal control subjects. Contrast-free DW-CMR is an alternative sequence to ECV in the evaluation of extent of fibrosis in HTN LVH and HTN Non-LVH while native T1 has its limited value.

SST02-08 Demonstration of Subclinical Myocardial Fibrosis in Patients with Primary Aldosteronism by Native T1 Time and Extracellular Volume Fraction

Friday, Dec. 2 11:40AM - 11:50AM Room: E450A

Participants

Hideobu Takagi, MD, PhD, Morioka, Japan (*Presenter*) Nothing to Disclose
Hideki Ota, MD, PhD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Ryo Morimoto, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Yoshikiyo Ono, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Kentaro Takanami, MD, PhD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Kei Takase, MD, PhD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the degree of myocardial fibrosis in patients with primary aldosteronism (PA) based on native T1 and extracellular volume (ECV).

METHOD AND MATERIALS

This retrospective study included 36 PA patients (20 men, 16 women) diagnosed by experienced endocrinologists and 15 control patients (9 men, 6 women) with essential hypertension. No subjects had known cardiovascular comorbidity nor severe renal dysfunction. All patients underwent cardiac MR examinations using a 3T whole body scanner between January 2013 and March 2016. Scan protocol included cine MR imaging, T1 mapping using modified Look-Locker inversion recovery before and after gadolinium-contrast administration and late gadolinium enhanced MR imaging. Mean T1 time on left ventricular myocardium and blood pool were measured on 4-chamber plane images before and after gadolinium-contrast injection. Regions of interest were placed on the midwall of basal interventricular septum (IVS) and apical lateral wall and left ventricular chamber. ECV fraction was calculated using hematocrit and individual T1 values. Presence of late gadolinium enhancement (LGE) was evaluated. The mean values of native T1 and ECV fraction as well as the presence of LGE were compared between PA and control groups. $P < 0.05$ indicated statistical significance.

RESULTS

The prevalence of LGE, native T1 and ECV in PA group were significantly higher than that of control group (prevalence of LGE, 44.1% vs. 6.7%, $p = 0.02$, native T1, basal IVS, 1240±8ms vs. 1183±15ms, apical lateral, 1185±9ms vs. 1124±16 ms, $p < 0.01$ for both, ECV, basal IVS, 29±1% vs. 26±1%, apical lateral, 30±1% vs. 26±1%, $p < 0.05$ for both). A similar tendency was found in 19 PA patients and 14 controls who had no LGE (native T1, basal IVS, 1236±13ms vs. 1189±17ms, apical lateral, 1189±14ms vs. 1126±17ms, $p < 0.05$ for both, ECV, basal IVS, 29±1% vs. 26±1%, apical lateral, 30±1% vs. 26±1%, $p < 0.05$ for both).

CONCLUSION

Myocardial native T1 and ECV in PA group were significantly higher than that of control hypertensive patients. These results indicate increased myocardial fibrosis in PA patients who has no history of cardiovascular disease.

CLINICAL RELEVANCE/APPLICATION

Native T1 and ECV can assess subclinical myocardial damage in PA patients.

SST02-09 CT-Derived Coronary Functional Flow Reserve: Computational Fluid Dynamics versus Machine Learning

Friday, Dec. 2 11:50AM - 12:00PM Room: E450A

Participants

Moritz H. Albrecht, MD, Charleston, SC (*Presenter*) Nothing to Disclose
Christian Tesche, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
U. Joseph Schoepf, MD, Charleston, SC (*Abstract Co-Author*) Research Grant, Astellas Group; Research Grant, Bayer AG; Research Grant, General Electric Company; Research Grant, Siemens AG; Research support, Bayer AG; Consultant, Guerbet SA; ; ;
Matthias Renker, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
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Stefan Baumann, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Richard Bayer, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
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Chris Schwemmer, Erlangen, Germany (*Abstract Co-Author*) Employee, Siemens AG
Max Schoebinger, Heidelberg, Germany (*Abstract Co-Author*) Employee, Siemens AG
Akos Varga-Szemes, MD, PhD, Charleston, SC (*Abstract Co-Author*) Consultant, Guerbet SA
Carlo N. De Cecco, MD, PhD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare two technical approaches for CT-derived coronary functional flow reserve (cFFR) determination: a method based on computational fluid dynamics (cFFRCFD) and a machine learning algorithm (cFFRML).

METHOD AND MATERIALS

Sixty-seven coronary lesions in 58 patients (61±12 years, 64% male) who had undergone CT angiography (CTA) followed by invasive FFR were included in this single-center retrospective study. cFFR values were derived from CTA datasets on-site on a local workstation using both cFFRCFD and cFFRML based on coronary artery anatomy and ventricular mass integrated with hemodynamic parameters. Diagnostic performance of both cFFR techniques was compared and evaluated for detection of lesion-specific ischemia against visual stenosis grading on CCTA, quantitative coronary angiography (QCA), and invasive FFR as the reference standard.

RESULTS

On a per-lesion and per-patient level, cFFRML showed a sensitivity of 77% and 87%, and a specificity of 96% and 89% for detecting lesion-specific ischemia, respectively. Furthermore, cFFRCFD resulted in a sensitivity of 77% and 85% and a specificity of 91% and 88% on a per lesion and per-patient basis ($p=0.89$ and $p=0.95$, respectively). At receiver operating characteristics analysis on a per-lesion level, cFFRML (AUC 0.85) and cFFRCFD (AUC 0.84) showed significantly higher discriminatory power for detecting lesion-specific ischemia compared to CCTA (AUC 0.62) and QCA (AUC 0.69) (cFFRML, $p=0.001$ and $p=0.03$; cFFRCFD, $p=0.003$ and $p=0.04$). Also on a per-patient level, cFFRML (AUC 0.88) and cFFRCFD (AUC 0.88) performed significantly better (cFFRML $p=0.003$ and $p=0.04$; cFFRCFD $p=0.003$ and $p=0.04$) than CCTA (AUC 0.62) and QCA (AUC 0.69). Mean total processing time per-patient for cFFRML and cFFRCFD determination was 40.4±6.8 minutes and 43.7±7.2 minutes ($p=0.086$), respectively.

CONCLUSION

The cFFRML algorithm shows a higher specificity, with no significant difference in diagnostic accuracy for detecting lesion-specific ischemia compared to the cFFRCFD approach. Both methods outperform CCTA and QCA accuracy in the detection of flow limiting stenosis.

CLINICAL RELEVANCE/APPLICATION

While both methods provide high diagnostic accuracy in the detection of flow limiting stenosis, our data suggests that the cFFRML algorithm may be preferable over the cFFRCFD technique due to higher specificity in the objective quantification of lesion-specific ischemia.

SST03

Chest (Lung Cancer Screening)

Friday, Dec. 2 10:30AM - 12:00PM Room: E451B

CH CT

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants

Sudhakar N. Pipavath, MD, Mercer Island, WA (*Moderator*) Consultant, Boehringer Ingelheim GmbH; Advisor, Boehringer Ingelheim GmbH; Speaker, Boehringer Ingelheim GmbH
Girish S. Shroff, MD, Houston, TX (*Moderator*) Nothing to Disclose

Sub-Events

SST03-01 The Vancouver Lung Cancer Risk Prediction Model: Assessment using a Subset of the National Lung Screening Trial Cohort

Friday, Dec. 2 10:30AM - 10:40AM Room: E451B

Participants

Charles S. White, MD, Baltimore, MD (*Presenter*) Consultant, Koninklijke Philips NV
Ekta D. Dharaiya, MS, Highland Heights, OH (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Erin Campbell, BS, Briarcliff Manor, NY (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Jason W. Mitchell, MD, Ellicott City, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the likelihood of malignancy among a subset of nodules in the National Lung Screening Trial (NLST) using a risk calculator based on nodule and patient characteristics.

METHOD AND MATERIALS

All authors received approval for use of NLST data. Nodule characteristics and patient attributes of benign and malignant nodules in the NLST were applied to the nodule risk calculator described by McWilliams et al. of Vancouver, Canada. Patient populations and their nodule characteristics were compared between the NLST and Vancouver cohorts. Based on output from the risk calculator, multiple thresholds were tested to distinguish a benign from malignant nodule using the NLST dataset. An optimized threshold value was used to determine positive and negative predictive values and a full logistic regression-model was applied to the NLST dataset.

RESULTS

Sufficient data were available for 4,431 nodules (benign = 4315, malignant = 116) from the NLST dataset. The NLST and Vancouver datasets differed in that the former included fewer nodules per study (likely due to use of a higher size cut off for designating a nodule as actionable) and fewer non-solid nodules as well as more nodule spiculation and emphysema. A threshold value of 10% was determined to be optimal, demonstrating sensitivity, specificity, positive and negative predictive values of 85.3%, 93.9%, 27.4%, and 99.6%, respectively. The ROC curve for the full regression model applied to the NLST database revealed AUC = 0.963 (0.945, 0.974).

CONCLUSION

Application of an NLST data subset to the Vancouver risk calculator yielded a high discriminant value, supporting the use of risk calculator methodology as a valuable approach to distinguish between benign and malignant nodules.

CLINICAL RELEVANCE/APPLICATION

Improved discriminant value in designating nodules as benign or malignant can result in refinement of follow-up strategies for patient evaluation and management, which may lead to a reduction in cost of care and allay patient anxiety.

SST03-02 Accuracy of the PanCan Risk Model for Predicting Cancer in Screen-Detected Nodules Compared With Trainee and Experienced Radiologists

Friday, Dec. 2 10:40AM - 10:50AM Room: E451B

Participants

Heber MacMahon, MD, Chicago, IL (*Presenter*) Consultant, Riverain Technologies, LLC; Stockholder, Hologic, Inc; Royalties, UCTech; Research support, Koninklijke Philips NV; Consultant, General Electric Company
Feng Li, MD, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Samuel G. Armato III, PhD, Chicago, IL (*Abstract Co-Author*) Consultant, Aduro Biotech, Inc

PURPOSE

A lung cancer risk assessment model known as the Brock or PanCan model, which incorporates nodule features in addition to other risk factors, has been tested on a screening population, with impressive results. Therefore, we conducted an observer performance test to compare the accuracy of the model with that of radiologists in a simulated clinical environment.

METHOD AND MATERIALS

One hundred cases from the National Lung Screening Trial (NLST) Database were selected in the size range of 4-25 mm, including 20 proven cancers and 80 size-matched benign nodules. Three experienced thoracic radiologists and three trainee radiologists were

asked to estimate the likelihood of cancer in each case first without, and then with, the use of the model. The results for the model using both automated and manual feature extraction were also compared through ROC analysis. The areas under the ROC curves for each viewing condition were calculated, and statistical significance was estimated using De Long's test.

RESULTS

Experienced radiologists and trainees were more accurate than the model in estimating the risk of malignancy in size-matched, screen-detected nodules ($P < 0.001$), and both groups had lower accuracy when using the model. Experienced radiologists performed better than trainees and were less influenced by the model. Review of individual cases revealed that observers could better distinguish benign from malignant nodule morphology compared with the model.

CONCLUSION

Experienced and trainee radiologists had superior ability to predict the risk of cancer in size-matched nodules from a screening trial compared with the Brock (PanCan) model, and use of the model resulted in a decrease in radiologist accuracy. The possible reasons for this result will be discussed.

CLINICAL RELEVANCE/APPLICATION

Despite impressively high overall accuracy in a screening population, use of the PanCan model failed to improve the accuracy of radiologists in predicting the risk of cancer in an observer test using screen-detected nodules.

SST03-03 Lung-RADS Category 4X: Does It Improve Prediction of Malignancy in Screen-Detected Subsolid Nodules?

Friday, Dec. 2 10:50AM - 11:00AM Room: E451B

Participants

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Colin Jacobs, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Research Grant, Varian Medical Systems, Inc
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Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Advisory Board, Riverain Technologies, LLC

PURPOSE

Lung-RADS category 4X allows radiologists to upgrade Lung-RADS category 3, 4A and 4B nodules to a higher risk-group if deemed as more suspicious, triggering a more intense work-up. Purpose of this study was to retrospectively estimate the probability of malignancy of Lung-RADS nodule categories 3, 4A, 4B and 4X for subsolid nodules (SSNs) in the National Lung Screening Trial (NLST) cohort.

METHOD AND MATERIALS

Based on recorded nodule size, we identified all baseline scans from the NLST database in which SSNs were recorded and would have been classified as Lung-RADS category 3 or higher. An experienced screening radiologist volumetrically segmented all solid cores and assigned categories 4A and 4B based on core size. He also located all malignant SSNs visible on the baseline scans. Four experienced chest radiologists were independently asked to determine which nodules to upgrade to 4X. We compared malignancy rates of pure size-based categories to those including category 4X.

RESULTS

We identified 47 non-solid ≥ 20 mm and 348 part-solid nodules ≥ 6 mm in the records of NLST baseline scans. Nodule identification on the scan was possible in 95% of the lesions, resulting in 374 nodules for analysis. Among these, 17 category 3, 11 category 4A, and 28 category 4B lesions turned out to be cancers during the follow-up period. The four observers upgraded a nodule to 4X in 15-20% of all cases. Pure size-based malignancy rates were 9% for category 3, 19% for 4A and 23% for 4B. Depending on the observer, malignancy rates increased to 52-57% for category 4X. On average, 59% of malignancies among category 3 nodules, 45% among 4A and 68% among 4B nodules were upgraded to 4X by the observers. After reclassifying nodules to 4X the malignancy rates in the remaining nodules dropped to 4% for category 3, 12% for category 4A and 11% for category 4B.

CONCLUSION

Lung-RADS category 4X substantially improves prediction of malignancy in subsolid nodules and is associated with a $> 50\%$ malignancy rate independent of the observer.

CLINICAL RELEVANCE/APPLICATION

Lung-RADS category 4X is associated with a high malignancy rate in subsolid nodules and justifies a more aggressive management approach.

SST03-04 Lung-RADS Category 4X for Screen-detected Subsolid Nodules: Do Radiologists Agree with Each Other?

Friday, Dec. 2 11:00AM - 11:10AM Room: E451B

Participants

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Cornelia M. Schaefer-Prokop, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Advisory Board, Riverain Technologies, LLC

PURPOSE

Lung-RADS category 4X provides the option to radiologists to upgrade nodules of categories 3, 4A and 4B to a higher risk group, triggering a more intense management, if they consider the lesions more suspicious. This introduces a subjective observer component in the nodule management process. Purpose of this study was to determine the inter-observer variability of this category among radiologists for subsolid nodules (SSNs).

METHOD AND MATERIALS

We included all baseline scans from the National Lung Cancer Trial (NLST) database in which an SSN was recorded and would have been classified as Lung-RADS category 3 or higher. An experienced screening radiologist segmented all solid cores using in-house software (Cirrus Lung Screening) and identified all lung cancer nodules on the scans, as the NLST does not provide actual lesion coordinates. Four experienced chest radiologists were asked to determine which SSNs should be upgraded to 4X. Inter-observer variability was assessed using Kappa statistics.

RESULTS

Retrospective identification of the nodule on the scan was possible in 95% of the SSNs. This resulted in a total of 374 SSNs to be classified as at least Lung-RADS category 3 and available for the observer study. Fifty-six nodules were eventually diagnosed as malignant and visible at T0 (baseline scan). Twenty-eight were diagnosed at T0, 16 at T1, 5 at T2 and 7 in later years. Inter-observer agreement was moderate with a mean kappa value of 0.539 (range 0.451 – 0.589). All four observers agreed on category 4X in 61% of the cancers diagnosed at baseline, but in only in 11% of the cancers diagnosed at a later stage. Agreement remained moderate for subgroups of categories 3, 4A and 4B nodules (mean kappa 0.531, 0.418 and 0.537 respectively). At least 1 of the 4 observers upgraded a malignant SSN to category 4X in 89% of the baseline cancers and 79% of those diagnosed after baseline.

CONCLUSION

Inter-observer agreement for upgrading SSNs to 4X is moderate. The fact that the majority of subsolid nodules later diagnosed as malignant were assigned to category 4X by at least one radiologist already at baseline, suggests the presence of visually accessible morphological features for nodule classification.

CLINICAL RELEVANCE/APPLICATION

The moderate inter-observer agreement for upgrading subsolid nodules from Lung-RADS category 3, 4A and 4B to 4X suggests that efforts should be made to further define features for this category.

SST03-05 Lung Cancer Growth Rates in the NLST: Does Sex Matter?

Friday, Dec. 2 11:10AM - 11:20AM Room: E451B

Participants

Phillip M. Boiselle, MD, Boston, MA (*Presenter*) Nothing to Disclose
Caroline Chiles, MD, Winston-Salem, NC (*Abstract Co-Author*) Nothing to Disclose
Stavroula Chysanthopoulou, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Fenghai Duan, PhD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Judith K. Amorosa, MD, Somerville, NJ (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate volume doubling times (VDTs) among CT screen-detected lung cancers (LCs), stratified by sex and nodule consistency.

METHOD AND MATERIALS

From a random sample of 200 LC cases diagnosed following positive incidence screens in the NLST-CT arm, we performed a retrospective analysis of 173 LC cases (89 men, 84 women) with measurable lesions and images available for review. A nodule/mass within the LC lobe specified in the NLST database was identified on each participant's final CT screen and matched to a nodule on ≥ 1 prior CT-screens. Nodule consistencies (solid=SN, part-solid=PSN, non-solid=NSN) and volumes were determined by 2 readers using segmentation analysis and tracking tools on 3D-workstations. VDTs were calculated for each LC and categorized by growth rate (in days): very fast (<100), fast (101-400), intermediate (401-800), and slow (>801). VDTs and LC mortality were compared in men and women by nodule consistency.

RESULTS

Overall mean nodule VDTs were significantly faster for men than for women (536 ± 600 vs 1108 ± 2054 , $P=0.00142$). In men, the most common LC pattern was a fast- to intermediate-growing SN [51 (57.3%) of 89 LCs, mean VDT = 420 ± 515 days]. In women, the most common LC pattern was a slow-growing PSN [45 (53.6%) of 84 LCs, mean VDT 1371 ± 2590 days]. LC mortality was significantly higher for men than women for both SNs and PSNs (SNs, 35.3% vs. 6.1%, $P=0.0050$; PSNs, 25.8% vs. 9.5%, $P=0.0094$). Similarly, nodule VDTs were significantly faster for men than women for both SNs and PSNs (SNs, 420 ± 515 days vs 717 ± 1148 , $P=0.0983$; PSNs, 646 ± 677 vs 1371 ± 2590 , $P=0.0249$). Potentially overdiagnosed LCs included 36 (20.8%) of 173 LCs with a VDT > 800 days, including 19 (22.6%) of 84 LCs in women and 17 (19.1%) of 89 LCs in men ($P=0.7022$).

CONCLUSION

Screen-detected LCs differ by sex and most commonly present as fast- to intermediate-growing SNs in men and slow-growing PSNs in women. The rate of potentially overdiagnosed LCs did not differ significantly by sex.

CLINICAL RELEVANCE/APPLICATION

Differences in growth rates of screen-detected LC between men and women suggest the need to personalize nodule management algorithms by sex for both SNs and PSNs.

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/>

Phillip M. Boiselle, MD - 2012 Honored Educator

SST03-06 A Retrospective Lung Cancer Screening Study with and without a Computer-Aided LDCT System Consisting of Vessel Suppression Function and CADe Marks

Friday, Dec. 2 11:20AM - 11:30AM Room: E451B

Participants

Shih-Chung B. Lo, PhD, Arlington, VA (*Abstract Co-Author*) Institutional research contract, Riverain Technologies, LLC
Matthew T. Freedman, MD, MBA, Baltimore, MD (*Abstract Co-Author*) Institutional research contract, Riverain Technologies, LLC
Laura Gillis, PhD, Mount Airy, MD (*Abstract Co-Author*) Nothing to Disclose
Charles S. White, MD, Baltimore, MD (*Presenter*) Consultant, Koninklijke Philips NV

PURPOSE

The study was performed to determine if there was improvement of radiologists' performance in detecting actionable nodules on thoracic CT when aided by a computer-aided detection (CADe) system consisting of a vessel suppression function and CADe marks.

METHOD AND MATERIALS

A novel CADe system, which is capable of vessel suppression while not suppressing potentially actionable nodules, was developed to assist radiologists in reading thoracic CT. Twelve radiologists participated in a comparative study without and with the CADe. 324 LDCT cases in a 2:1 nodule-free-to-nodule ratio were used for the study. Approximately 90% of these cases were selected from among NLST stage 1A cancer cases with two matched normal cases. Both receiver operating characteristic (ROC) and localized receiver operating characteristic (LROC) methods were used for analysis.

RESULTS

In a stand-alone analysis, CADe detected 89.5% and 82.0% of cancer lesions and all nodule lesions, respectively. The corresponding false positive rate per CT scan was 0.747. All cases were blind to the CADe system prior to the reader study. The performance of each reader and the combined result showed improvement. For the reader study, the area under the combined LROC curve increased significantly from 0.633 unaided to 0.773 aided by CADe ($P = 7.3 \times 10^{-5}$) for the detection of lung cancer. The area under the combined LROC curve increased significantly from 0.584 unaided to 0.693 aided ($P = 0.0005$) for the detection of all actionable nodules, benign and malignant. Readers detected 80.0% of the cancers when using the aided system versus 64.45% when unaided ($P = 2.5 \times 10^{-5}$); specificity decreased from 89.9% to 84.4% ($P = 0.0025$). Radiologist read time significantly decreased by an average of 26% per case when aided as compared to unaided.

CONCLUSION

Radiologists using the CADe system significantly increased their detection of lung cancers and actionable benign nodules with somewhat lower specificity. The vessel suppressed series allowed radiologists to increase their reading speed by a factor of $\sim 1/4$.

CLINICAL RELEVANCE/APPLICATION

Our study suggests that the use of the novel vessel subtraction based CADe approach has the potential to assist the radiologist in the detection of more actionable nodules on thoracic CT and to do so more expeditiously than without CADe.

SST03-07 Incidental Findings and Extrapulmonary Malignancies in Participants Screened with Chest CT in the National Lung Screening Trial

Friday, Dec. 2 11:30AM - 11:40AM Room: E451B

Participants

Xuan V. Nguyen, MD, Columbus, OH (*Presenter*) Nothing to Disclose
Louise Davies, MD,MS, Hanover, NH (*Abstract Co-Author*) Nothing to Disclose
Jenny K. Hoang, MBBS, Durham, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To estimate prevalence and malignancy rates of incidental extrapulmonary findings on low-dose chest CT for lung cancer screening.

METHOD AND MATERIALS

Prospectively acquired data on 17309 participants who underwent low-dose screening chest CT from August 2002 through September 2007 during the National Lung Screening Trial (NLST) were retrospectively analyzed for incidental extrapulmonary findings. NLST radiologist readers coded incidentally detected findings as "minor" or "potentially significant". This study also assigned incidental findings to five organ groupings (cardiovascular, thyroid, adrenal, renal, and hepatobiliary) and categories based on descriptors of morphology. The prevalences of organ-specific incidental findings were calculated, and data on newly diagnosed extrapulmonary malignancies during the NLST were used to estimate malignancy rates among incidental findings. Exemption from human subjects research review was obtained.

RESULTS

58.7% (95% CI: 58.0-59.5%) of CT screened participants had incidental findings, and 19.6% (95% CI: 19.0-20.2%) of participants had incidental findings that were coded as potentially significant. Prevalence of potentially significant abnormalities among

participants was highest for cardiovascular findings (8.5%), followed by renal (2.4%), hepatobiliary (2.1%), adrenal (1.2%) and thyroid (0.6%) lesions. 67 (0.4%; 95% CI: 0.3-0.5%) participants had cancers diagnosed during screening. Among focal lesions regarded as potentially significant, thyroid lesions had the highest malignancy rate (8.1%), followed by renal lesions (3.0%).

CONCLUSION

Indiscriminate workup of incidental findings detected on CT lung cancer screening could place a significant burden on patients and the healthcare system with little benefit since incidental findings are extremely common, but extrapulmonary malignancies diagnosed during screening are rare.

CLINICAL RELEVANCE/APPLICATION

Programs participating in CT lung screening should be provided with recommendations for reporting incidental findings in order to minimize unnecessary workup in low-risk lesions.

SST03-08 Computed Tomographic Findings are Associated with Respiratory Mortality in the National Lung Screening Trial

Friday, Dec. 2 11:40AM - 11:50AM Room: E451B

Awards

Student Travel Stipend Award

Participants

Esther Pompe, MD, Utrecht, Netherlands (*Presenter*) Nothing to Disclose

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David A. Lynch, MBBCh, Denver, CO (*Abstract Co-Author*) Research support, Siemens AG Scientific Advisor, PAREXEL International Corporation Consultant, Boehringer Ingelheim GmbH Consultant, Gilead Sciences, Inc Consultant, F. Hoffmann-La Roche Ltd Consultant, Veracyte, Inc

Nikolas Lessmann, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose

Jan-Willem J. Lammers, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose

Ivana Isgum, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Research Grant, Pie Medical Imaging BV Research Grant, 3mensio Medical Imaging BV

Pim A. De Jong, MD, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Almost 10% of all deaths in the computed tomography (CT) arm of the National Lung Cancer Screening Trial (NLST) were due to respiratory illnesses other than lung cancer. We evaluated the importance of lung abnormalities on screening CT for survival in NLST participants.

METHOD AND MATERIALS

Subjects were derived from the CT-arm of the NLST that died of a respiratory illness other than lung cancer, as defined on the death certificate, matched with an equal number of control subjects, based on age, sex, pack-years, and smoking status. A chest radiologist and senior radiology resident independently and blindly scored baseline CTs for the presence of emphysema, airway wall thickening, or fibrotic lung disease. Associations between CT abnormalities and death was evaluated with a logistic regression model.

RESULTS

172 died from a respiratory cause other than lung cancer. Radiologic diseases were significantly associated with higher mortality; severe emphysema OR (95%CI) 9.7 (4.6– 20.4), airway wall disease OR (95%CI) 2.3 (1.3–3.9) or fibrotic lung disease OR (95%CI) 39.1 (5.1–289.6). 81 subjects were evaluated by the EVP and confirmed the diagnosis in 55 subjects. In this group, the presence of severe emphysema was significantly associated with mortality (OR=17.2, $p<0.001$), as well as airway remodeling (OR=3.2, $p=0.01$). In the 26 non-confirmed subjects no significant difference in CT lung abnormalities between participants who were alive and participants who died was found.

CONCLUSION

CT-diagnosis of fibrosis, emphysema, airway remodeling are important for survival. By screening CT-scans for these abnormalities, next to lung cancer, deaths related to respiratory causes other than lung cancer may be preventable."The authors thank the National Cancer Institute for access to NCI's data collected by the National Lung Screening Trial. The statements contained herein are solely those of the authors and do not represent or imply concurrence or endorsement by NCI."

CLINICAL RELEVANCE/APPLICATION

CT-diagnosis of fibrosis, emphysema, and airway remodeling are important for survival in lung cancer screening.

SST03-09 Low Dose CT for Screening of Lung Cancer in High Risk Nonsmokers: A Multicenter Study

Friday, Dec. 2 11:50AM - 12:00PM Room: E451B

Participants

Yung-Liang Wan, MD, Taoyuan City, Taiwan (*Presenter*) Nothing to Disclose

Chien-Jen Chen, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose

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Chao Agnes Hsiung, Miaoli, Taiwan (*Abstract Co-Author*) Nothing to Disclose

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Yeun-Chung Chang, MD, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose

Chih-Yi Chen, Taichung, Taiwan (*Abstract Co-Author*) Nothing to Disclose

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Chong-Jen Yu, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Pan-Chyr Yang, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To study the prevalence of lung cancer in high risk non-smokers using low dose CT (LDCT).

METHOD AND MATERIALS

This was a prospective, nationwide and multicenter study sponsored by The Ministry of Health and Welfare. In a period from Feb. 2015 to Dec. 2015, 4,498 subjects (aged 33 to 75, mean age 61.6, 3,365 females) underwent LDCT for lung cancer screening. The major inclusion criteria were ages between 55-75, non-smoking or light ex-smoking history (< 10 pack-year and had quit > 15 years), and having one of the following risk factors: family history of lung cancer (n = 1,738, 38.9%), environmental tobacco smoking exposure (n = 3,382, 75.2%), TB/COPD history (n = 334, 7.4%), cooking index ≥ 110 (n = 1,769, 39.3%), and not using ventilator during cooking (n = 197, 4.4%). The LDCT was conducted mainly according to the guideline suggested by American College of Radiology. The mean effective radiation dose of LDCT was 1.064 mSv (SD = 0.316 mSv). A solid or part-solid (PS) nodule larger than 6 mm or pure ground glass nodule (GGN) larger than 5 mm in diameter was designated as positive finding on LDCT. Each Institute Review Board approved the project and an informed consent was obtained from each subject.

RESULTS

Of 4,498 subjects, 4,395 (97.7%) conformed to the inclusion criteria. Among them, 19.9% of the subjects were considered positive on LDCT and 1.64% (n = 72) underwent invasive procedures. The final pathology showed 2 cases of atypical adenomatous hyperplasia, 14 cases of benign lesions, and 56 (1.27%) cases of lung cancer (adenocarcinoma in situ or AIS = 6, minimally invasive adenocarcinoma or MIA = 10, invasive adenocarcinoma or IVA = 40). Of 56 patients with lung cancer, 96% were stage I or less. The nodule of 6 AIS were GGN in 4, PS in 2, the nodule of the 10 MIA featured GGN in 6, PS in 4, and that of 40 IVA were GGN in 17, PS in 20, and solid in 3. The mean diameter \pm SD of AIS, MIA and IVA were 11.50 ± 4.35 , 11.77 ± 5.52 , 13.4 ± 6.86 , respectively.

CONCLUSION

Our study disclosed that the detection rate of lung cancer in high risk non-smokers by LDCT was comparable to that of the high risk smoking group in National Lung Screening Trial.

CLINICAL RELEVANCE/APPLICATION

Risk factors other than active smoking play a significant role in the etiologies of lung cancer in this area. LDCT might be used to screen lung cancer in high risk population without active smoking.

SST04

Gastrointestinal (Oncology Imaging and Response)

Friday, Dec. 2 10:30AM - 12:00PM Room: E353B



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
Janio Szklaruk, MD, PhD, Bala Cynwyd, PA (*Moderator*) Nothing to Disclose

Sub-Events

SST04-01 **Personalized 3D-printed Transparent Liver Model Using the Hepatobiliary Phase MR Imaging: Usefulness in the Lesion-by-lesion Imaging-pathologic Matching of Focal Liver Lesions - Preliminary Results**

Friday, Dec. 2 10:30AM - 10:40AM Room: E353B

Participants

Ijin Joo, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Jung Hoon Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Joon Park, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyung Bun Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Nam-Joon Yi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the usefulness of personalized three-dimensional (3D)-printed transparent liver model using MR imaging for focal liver lesions (FLLs) in the lesion-by-lesion imaging-pathologic matching.

METHOD AND MATERIALS

This preliminary prospective study was approved by our institutional review board and written informed consents were obtained. Eleven patients with multiple FLLs who underwent gadoteric acid-enhanced MRI for the preoperative workup of colorectal liver metastases (CRLM) or hepatocellular carcinoma (HCC) were included. A total of 51 indeterminate or malignant FLLs (13.5±14.0 mm; range, 2~80 mm) were detected on MRI. After the digital segmentation of hepatobiliary phase MR images, a transparent 3D-printed liver model with colored anatomical structures and FLLs at a 50% scale (except for too small FLLs at 100 or 150% scales) was produced. During gross sectioning of formalin-fixed liver specimen, a lesion-by-lesion matching between FLLs on liver model and on gross specimen was performed, and if needed, additional cross-section of the specimen was made.

RESULTS

Imaging-pathologic matching was successfully performed in 98.0% (50/51) of MRI-detected FLLs. On gross pathology analysis, 80.4% (41/51) of FLLs (14.8±15.1 mm) including histologically confirmed 36 CRLM, 4 HCC, and 1 no viable tumor were found on initial assessment; and 17.6% (9/51) of FLLs (7.3±3.3 mm) including 6 CRLM, 2 HCC, and 1 focal nodular hyperplasia were additionally found by second review of the specimen with an aid of 3D-printed transparent liver model with or without additional cross section (5.9%, 3/51 and 11.8%, 6/51, respectively). One FLL (2.0%, 1/51) of 2 mm was not found even after additional cross section of the specimen.

CONCLUSION

3D-printed liver model with FLLs enhances the lesion detection in the resected specimen and imaging-pathologic matching which may be helpful for making an accurate assessment of tumor burden as well as obtaining a reliable reference for imaging-detected FLLs.

CLINICAL RELEVANCE/APPLICATION

1. 3D-printed liver model with focal liver lesions (FLLs) might be helpful in the pathologic tumor staging by avoiding missed diagnosis of small FLLs.
2. A lesion-by-lesion imaging-pathologic matching using 3D-printed liver model may provide a reliable reference of standard for each FLL which is essential in the evaluation of diagnostic performance of imaging studies.

SST04-02 **Automated Computed Tomography Volumetry to Predict Hemihepatectomy Specimens' Volumes in Patients with Primary or Secondary Hepatic Malignancy: Correlation with Intraoperative Volumes**

Friday, Dec. 2 10:40AM - 10:50AM Room: E353B

Participants

Philipp Mayer, MD, Heidelberg, Germany (*Presenter*) Nothing to Disclose
Martin Groezinger, Heidelberg, Germany (*Abstract Co-Author*) Nothing to Disclose
Peter Schemmer, Heidelberg, Germany (*Abstract Co-Author*) Nothing to Disclose
Hans-Ulrich Kauczor, MD, Heidelberg, Germany (*Abstract Co-Author*) Research Grant, Siemens AG Research Grant, Bayer AG Speakers Bureau, Boehringer Ingelheim GmbH Speakers Bureau, Siemens AG Speakers Bureau, Novartis AG Speakers Bureau, GlaxoSmithKline plc Speakers Bureau, Almirall SA
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PURPOSE

One of the major causes of perioperative mortality of patients undergoing major hepatic resections is post-hepatectomy liver failure (PHLF). For surgical planning and preoperative appraisal of the risk of PHLF it is important to accurately predict the resectate

volume and the volume of the future liver remnant.

METHOD AND MATERIALS

The objective of our study is to prospectively evaluate the accuracy of hemihepatectomy resectate volumes determined by computed tomography volumetry (CTV) using an automated Liver Analysis Module (**S**) (syngo.CT, Siemens, Erlangen Germany) when compared with intraoperatively measured volumes and weights as gold standard in patients undergoing hemihepatectomy. Between January 2014 and November 2015, 24 patients (13 women, 11 men) scheduled for hemihepatectomy due to histologically proven primary or secondary hepatic malignancies were included in our study. Conversion factors between CT volumes on the one side and intraoperative volumes and weights on the other side were calculated using the method of least squares. Absolute and relative disagreements between CT volumes (with and without conversion factors) and intraoperative volumes were determined.

RESULTS

A conversion factor of $c = 0.9057$ most precisely predicted intraoperative volumes of exsanguinated hemihepatectomy specimens from CT volumes in all patients with mean absolute and relative disagreements between CT volumes and intraoperative volumes of 56.80 ml and 6.25 %. The use of operation-specific conversion factors yielded even better results.

CONCLUSION

CTV performed with **S** accurately predicts intraoperative volumes of hemihepatectomy specimens when applying conversion factors.

CLINICAL RELEVANCE/APPLICATION

Precise preoperative estimation of the resectate volume and the volume of the future liver remnant can help to minimize the risk of PHLF in patients undergoing major hepatic resections.

SST04-03 Differentiation of Intrahepatic Mass-forming Cholangiocarcinoma from Liver Abscess by Dual Source Dual-energy Spectral CT Quantitative Parameters

Friday, Dec. 2 10:50AM - 11:00AM Room: E353B

Participants

Ji Eun Kim, MD, Jinju, Korea, Republic Of (*Presenter*) Nothing to Disclose
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Jae Min Cho, MD, Jinju, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

To investigate the use of dual source dual-energy spectral CT quantitative parameters compared with the use of conventional CT imaging features for differentiating intrahepatic mass-forming cholangiocarcinoma (IMCC) from liver abscess (LA).

METHOD AND MATERIALS

In this institutional review board-approved, retrospective study, 64 patients with IMCC and 52 patients with LA who were imaged in the portal venous phase (PVP) using dual energy-mode were included. Regions of interest were placed within each lesion to measure the mean CT value and its standard deviation (SD), normalized iodine concentration (NIC), and slope (k) of the spectral curve on virtual monochromatic spectral (VMS) images. Two observers qualitatively evaluated lesion types on the basis of conventional CT features. Independent samples t-test was used to compare quantitative parameters between IMCC and LA. Parameters were fitted to logistic regression models. Sensitivity and specificity analyses were performed by using receiver operating characteristic curves and were compared with data from the qualitative analysis.

RESULTS

The CT value on VMS images at 50-130 keV (20 keV-interval), NIC, and k value were significantly higher in IMCCs than in LAs ($P < .0001$). The best single parameter for differentiating IMCC from LA was CT value at 90 keV, with sensitivity, specificity, accuracy, positive predictive value, and negative predictive value of 89.1%, 86.5%, 87.9%, 89.1%, and 86.5%, respectively. The best combinations of parameters were CT value at 70-130 keV and NIC, with values of 87.5-90.6%, 75.0-78.9%, 83.6%, 81.7-83.6%, and 83.7-86.7%, respectively. Compared with qualitative analysis, the CT value at 90 keV showed higher accuracy (87.9% vs 74.1%, $P = .0113$) and sensitivity (89.1% vs 71.9%, $P = .0433$) and similar specificity (86.5% vs 76.9%, $P > .05$), and the combined CT value at 110-130 keV and NIC showed higher sensitivity (90.6% vs 71.9%, $P = .0118$) and similar specificity (75.0% vs 76.9%, $P > .05$) and accuracy (83.6% vs 74.1%, $P > .05$).

CONCLUSION

Quantitative analysis of dual source dual-energy spectral CT quantitative parameters showed higher sensitivity than qualitative analysis of conventional CT imaging features for differentiating IMCC from LA.

CLINICAL RELEVANCE/APPLICATION

The results of this study suggest that quantitative parameters of dual-source dual energy spectral CT imaging can be complementary to conventional CT imaging for differentiating IMCC from LA.

SST04-04 Dynamic Enhancement Pattern of Insulinomas on Volume Perfusion CT

Friday, Dec. 2 11:00AM - 11:10AM Room: E353B

Participants

Liang Zhu, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Huadan Xue, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Wei Liu, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Hao Sun, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Gu Mu Yang Zhang, MD, Beijing, China (*Presenter*) Nothing to Disclose

PURPOSE

To assess the enhancement pattern of insulinomas on volume perfusion CT (VPCT), and to select phases for optimal tumor-parenchyma contrast.

METHOD AND MATERIALS

From August 2014 to December 2015, consecutive patients who underwent VPCT of the pancreas (80kV) with clinically suspected insulinomas were identified. Patients who received surgery and had pathological diagnosis of insulinomas were included, and patients with known multiple endocrine syndrome were excluded. Two experienced radiologists retrospectively evaluated tumor enhancement patterns on VPCT and analyzed the time-attenuation curve of the tumor and pancreatic parenchyma in consensus. The tumors were identified on CT with reference to surgical reports. Tumor-parenchyma contrast at each time point was measured and phases for optimal tumor-parenchyma contrast were selected.

RESULTS

Sixty-three patients were included, with 63 tumors. Five tumors were isoattenuating (tumor-parenchyma contrast <20HU in all 25 dynamic phases), 19 tumors had transient hyperenhancement (tumor-parenchyma contrast >20HU, duration < 10s), and 39 tumors had persistent hyperenhancement. Optimal tumor-parenchyma contrast was observed 9 s after abdominal aorta arriving at threshold of 200HU (AAT), with mean tumor-parenchyma attenuation difference of 77.6±57.2HU. At 9 s after AAT, 14 tumors were isoattenuating, including 5 tumors with intrinsic low contrast and 9 tumors with missed transient hyperenhancement. Complementary phases could be 12 s after AAT (detects another 4 tumors), 4 s after AAT and 1s after AAT (both detect another 3 tumors).

CONCLUSION

VPCT enables detection of insulinomas even if the hyperenhancement is transient. Optimal tumor-parenchyma contrast occurs 9 s after AAT. Tumors that are inconspicuous on single- or biphasic contrast enhanced CT are mainly due to missed transient hyperenhancement.

CLINICAL RELEVANCE/APPLICATION

By analyzing dynamic enhancement of insulinomas, a single optimal phase was selected, which yielded the maximum tumor-parenchyma contrast and facilitates detection of insulinomas with low radiation dose. It was also found that transient hyperenhancement was the main reason that some insulinomas were inconspicuous on single- or biphasic enhanced CT. VPCT could detect insulinomas even if the hyperenhancement was transient.

SST04-05 Early Evaluation of Sunitinib for the Treatment of Advanced Gastroenteropancreatic Neuroendocrine Neoplasms via CT Imaging: RECIST or Choi Criteria?

Friday, Dec. 2 11:10AM - 11:20AM Room: E353B

Participants

Yanji Luo, Guangzhou, China (*Presenter*) Nothing to Disclose
Shiting Feng, MD, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Zi-Ping Li, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Jie Chen, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of this study was to assess and compare the Response Evaluation Criteria in Solid Tumors (RECIST) and the Choi criteria for evaluating the early response of advanced gastroenteropancreatic neuroendocrine neoplasms (GEP-NENs) treated with sunitinib.

METHOD AND MATERIALS

Eighteen patients with pathologically proven advanced GEP-NENs treated with sunitinib were enrolled in the study. Pre- and post-treatment CT scans (plain, biphasic enhanced CT scan) were performed on all patients. Changes in the target tumor size and density from pre-treatment to 1.4-3.1 months after treatment were measured and recorded for each patient. Tumor responses were identified using RECIST and the Choi criteria. The time to tumor progression (TTP) for each patient was measured and compared between groups using the Kaplan-Meier method. The expression of vascular endothelial growth factor receptor 2 (VEGFR 2) was detected in 10 GEP-NEN tissues via immunohistochemical (IHC) staining.

RESULTS

Among the 18 patients, 4 (22%) exhibited a partial response (PR), 9 (50%) exhibited stable disease (SD), and 5 (28%) experienced progressive disease (PD), according to RECIST. However, based on the Choi criteria, 8 (44%) patients exhibited a PR, 4 (22%) exhibited SD, and 6 (33%) experienced PD. According to RECIST, the TTP of the PR group was significantly longer than that of the PD group ($P=0.007$) but not the SD group ($P=0.131$). According to the Choi criteria, the TTP of the PR group was significantly longer than that of the SD ($P=0.026$) and PD groups ($P<0.001$). Among the 10 patients showing IHC staining for VEGFR 2, seven (70%) tissues showed positive results, among which 3 (42.9%) and 4 (57.1%) exhibited PR, according to RECIST and the Choi criteria at early evaluation, respectively.

CONCLUSION

The Choi criteria appear to be more sensitive and more precise than RECIST for assessing the early response of advanced GEP-NENs treated with sunitinib.

CLINICAL RELEVANCE/APPLICATION

Choi criteria might be considered as an alternative to RECIST to evaluate the effects of sunitinib in patients with advanced GEP-NENs.

SST04-06 Agreement of Six- and Composite Three-echo Magnitude PDFF-Estimation MRI Sequences in a Multi-center Clinical Trial

Friday, Dec. 2 11:20AM - 11:30AM Room: E353B

Participants

Michael S. Middleton, MD, PhD, San Diego, CA (*Presenter*) Consultant, Allergan plc Institutional research contract, Bayer AG Institutional research contract, sanofi-aventis Group Institutional research contract, Isis Pharmaceuticals, Inc Institutional research contract, Johnson & Johnson Institutional research contract, Synageva BioPharma Corporation Institutional research contract, Takeda Pharmaceutical Company Limited Stockholder, General Electric Company Stockholder, Pfizer Inc Institutional research contract, Pfizer Inc

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Claude B. Sirlin, MD, San Diego, CA (*Abstract Co-Author*) Research Grant, General Electric Company; Research Grant, Siemens AG; Research Grant, Guerbet SA; ;

PURPOSE

Most MR scanners can acquire 6-echo and/or composite 3-echo magnitude MRI sequences to estimate proton density fat fraction (PDFF). PDFF estimated from the first 3 echos of a 6-echo sequence is nearly equivalent to that estimated from all 6-echos. However, to pool data in clinical trials, we need to show that PDFF derived from 6-echo sequences is essentially equivalent to that derived from separately-acquired composite 3-echo sequences. Hence, the purpose of this study was to calculate the agreement of baseline 6- and composite 3-echo sequences using regression and Bland-Altman analysis in a multi-center clinical trial.

METHOD AND MATERIALS

Anonymized baseline MRIs were analyzed to estimate PDFF for 64 subjects from 7 sites in an ongoing multi-center clinical trial. A multi-echo (ME) magnitude spoiled gradient-recalled-echo (6-echos) MRI sequence, and a pair of double-echo sequences were acquired for each subject. A composite 3-echo dataset was created from the double-double-echo (DDE) sequences. Two additional composite three-echo datasets (one from 1st, 2nd, an 4th echoes; one from first 3 echoes) were created directly from the ME sequence. Three co-localized regions of interest were placed in the right lobe of the liver for all sequences. PDFF was calculated for each dataset using a custom MatLab algorithm. Regression and Bland-Altman analysis was performed to evaluate agreement between PDFF derived from the three composite DDE datasets, and the ME sequence.

RESULTS

ME sequence-derived PDFF ranged from 2.11 to 35.07%. PDFFs from separately- acquired ME and composite DDE sequences showed strong agreement (slope near 1, intercept near 0), but were slightly different (mean difference 0.46%; difference range - 2.01 to 1.96%; $p < 0.0001$). Agreement was even stronger for the composite DDE sequences derived directly from the ME sequence, with best agreement for the composite DDE sequence derived from the first 3 echos of the ME sequence (mean difference 0.14%; difference range -0.86 to 0.69%).

CONCLUSION

PDFFs derived from ME sequences showed strong agreement with those derived from separately-acquired and derived composite DDE sequences, with small differences that are likely to be considered negligible in clinical trials.

CLINICAL RELEVANCE/APPLICATION

Our data support that PDFFs from 6-echo and separately-acquired composite 3-echo magnitude MRI sequences may be pooled, given their strong agreement in a multi-center clinical trial.

SST04-07 Diagnostic Value of Low Dose CT-protocol with 4th Generation Iterative Reconstruction Algorithm in Assessment of Mesorectal Fascia Invasion in Rectal Cancer: Comparison with Magnetic Resonance

Friday, Dec. 2 11:30AM - 11:40AM Room: E353B

Participants

Silvia Girolama Drago, Monza, Italy (*Presenter*) Nothing to Disclose

Davide Ippolito, MD, Monza, Italy (*Abstract Co-Author*) Nothing to Disclose

Cammillo R. Talei Franzesi, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose

Alessandra S. Casiraghi, Casatenovo, Italy (*Abstract Co-Author*) Nothing to Disclose

Sandro Sironi, MD, Monza, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the diagnostic efficacy in terms of radiation dose and image quality of low dose CT protocol combined with iterative reconstruction algorithm (iDose4) in the assessment of mesorectal fascia (MRF) invasion in rectal cancer patients in comparison with standard dose CT, using MRI as reference standard.

METHOD AND MATERIALS

Ninety-one patients with biopsy proven primary rectal adenocarcinoma underwent CT whole-body staging: 42 of them underwent low-dose CT while 49 underwent standard CT protocol. Low dose contrast-enhanced MDCT scans were performed on a 256 (ICT, Philips) scanner with tube voltage 120 KV, automated mAs modulation and slice thickness 2 mm, using iDose4 iterative reconstruction algorithm. The control group of 49 patients underwent standard dose (120 KV, 200-300mAs) contrast-enhanced MDCT examination on the same scanner. All patients were also evaluated with standard lower abdomen MR study, performed on 1.5 T magnet, including standard multiplanar sequences, considered as reference standard. Diagnostic accuracy in terms of MRF assessment was determined on CT images in portal venous phase for both CT protocol and compared with MRI imaging finding. Dose length product (DLP) calculated for both groups was compared and statistically analyzed.

RESULTS

Low-dose protocol combined with iDose4 showed high diagnostic quality in assessment of MRF involvement, also in comparison with standard MR studies. Total DLP was significantly ($p < 0.0081$) lower for low dose protocol studies (2453.4 mGy*cm), as compared to standard dose examinations (3194.3 mGy*cm), allowing an overall dose reduction of 23 %. Image noise was slightly higher in low dose images but the difference was not statistically significant.

CONCLUSION

Low dose CT protocol combined with iDose4 reconstruction algorithm offers high quality images with significant reduction of

Low-dose CT protocol combined with iDose4 reconstruction algorithm offers high quality images with significant reduction of radiation dose, being a useful tool in the evaluation of MRF involvement in rectal cancer patients.

CLINICAL RELEVANCE/APPLICATION

MDCT with low dose protocol, due to radiation dose reduction and high image quality, should be considered a reliable tool in rectal cancer staging, especially in patient with MRI contraindications.

SST04-08 Quantitative Functional Evaluation of Advanced Hepatocellular Carcinoma: Correlation between Dual-energy Iodine Maps and Perfusion CT Parameters

Friday, Dec. 2 11:40AM - 11:50AM Room: E353B

Participants

Sebastien Mule, MBBS, Reims, France (*Abstract Co-Author*) Nothing to Disclose
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Ronan Quelever, BUC, France (*Abstract Co-Author*) Employee, General Electric Company
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Alain Luciani, MD, PhD, Creteil, France (*Presenter*) Nothing to Disclose

PURPOSE

To determine whether dual-energy CT (DECT) iodine concentrations correlate with perfusion CT parameters in patients with advanced hepatocellular carcinomas (HCC).

METHOD AND MATERIALS

Sixteen patients with advanced HCC who underwent dynamic perfusion CT and multiphase DECT using a single source DECT (GE HD750) were retrospectively included. Iodine maps and blood flow (BF), blood volume (BV), hepatic arterial BF (artBF), and hepatic portal BF (portBF) maps were calculated. Circular regions of interest were manually drawn in HCC and tumor-free liver parenchyma and copied to all perfusion and iodine maps. Correlation between arterial and portal iodine maps and perfusion maps was calculated (Pearson correlation coefficient). An adjusted P value (Holm's method) < 0.05 was considered significant.

RESULTS

Mean HCC and liver-free parenchyma iodine concentrations were 22.7 mg/ml and 17.1 mg/ml at arterial phase (p=0.02), and 18.7 mg/ml and 24.5 mg/ml at portal phase (p=0.07), respectively. A significant correlation was found between BF and arterial iodine concentration (r=0.73, p<0.0001), BF and portal iodine concentration (r=0.72, p<0.0001), artBF and arterial iodine concentration (r=0.74, p<0.0001), BV and arterial iodine concentration (r=0.56, p=0.0027), BV and portal iodine concentration (r=0.53, p=0.0094).

CONCLUSION

DECT derived iodine maps correlate with perfusion parameters and may therefore allow accurate tumor functional evaluation in patients with advanced HCC.

CLINICAL RELEVANCE/APPLICATION

DECT derived iodine concentration significantly correlate with perfusion parameters and may therefore allow accurate longitudinal tumor functional evaluation in patients with advanced HCC.

SST04-09 Value of Pelvis CT during Follow-up of Patients with Pancreatic Adenocarcinoma

Friday, Dec. 2 11:50AM - 12:00PM Room: E353B

Awards

Student Travel Stipend Award

Participants

Jason J. Bailey, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
James H. Ellis, MD, Ann Arbor, MI (*Abstract Co-Author*) Consultant, General Electric Company
Matthew S. Davenport, MD, Cincinnati, OH (*Abstract Co-Author*) Royalties, Wolters Kluwer nv ;
Richard H. Cohan, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Bin Nan, PhD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Aishwarya Parameswaran, MS, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Lin Hsu, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
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Isaac R. Francis, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the frequency in which the pelvis component of an abdominopelvic CT provides information that would influence clinical management in patients with previously resected or locally advanced pancreatic ductal adenocarcinoma (PDA).

METHOD AND MATERIALS

This institutional review-board approved retrospective study with waived informed consent included 247 subjects with histologically proven PDA, including 153 post-pancreaticoduodenectomy and 94 with locally advanced unresectable disease who had imaging interpreted at our cancer center between January 2005 and December 2013. Imaging reports were obtained from our institution's Radiology Information System, reports were searched for the words "whipple" and "unresectable" to create two cohorts, and the radiology report associated with the first examination intended for oncologic treatment guidance was chosen for review. Separate abdomen and pelvis CT findings were reviewed and graded for their likelihood of representing metastatic disease. Probability of finding isolated metastatic disease on pelvic CT was determined using 95% binomial proportion confidence intervals.

RESULTS

No subjects who had undergone pancreaticoduodenectomy had an isolated pelvic metastasis on follow-up imaging (0%; 95% CI 0-2.38, $p = 0.0004$); 33 had metastatic disease in the abdomen, and 120 had no or equivocal evidence of abdominopelvic metastatic disease. One subject with locally advanced unresectable PDA had a possible isolated pelvic metastasis on follow-up imaging (1.1%; 95% CI 0.03-5.79, $p = 0.048$); 20 had metastatic disease in the abdomen, and 73 had no or equivocal evidence of abdominopelvic metastatic disease.

CONCLUSION

Isolated pelvic metastatic disease rarely occurs in patients with PDA who have had prior pancreaticoduodenectomy or have a locally advanced unresectable primary tumor, suggesting that routine pelvic CT follow-up imaging of these patients is unnecessary.

CLINICAL RELEVANCE/APPLICATION

Routine pelvic CT may not be necessary in follow-up of patients with pancreatic adenocarcinoma who have had prior pancreaticoduodenectomy or have a locally advanced unresectable primary tumor.

SST05

Genitourinary (Multimodality Imaging of Pregnancy and Pelvic Floor)

Friday, Dec. 2 10:30AM - 12:00PM Room: E351

GU **OB** **MR**

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants

Paul Nikolaidis, MD, Chicago, IL (*Moderator*) Nothing to Disclose
Liina Poder, MD, San Francisco, CA (*Moderator*) Nothing to Disclose

Sub-Events

SST05-01 **The Role of Urethral Sphincter Dysfunction and Funneling Change in Indicating the De Novo SUI in Severe Anterior Vaginal Wall Prolapse Women Before Pelvic Floor Rehabilitation**

Friday, Dec. 2 10:30AM - 10:40AM Room: E351

Participants

Na Li, Tianjin, China (*Presenter*) Nothing to Disclose
Wen Shen, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose
Changlu Yu, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Patients with severe anterior vaginal wall prolapse are inclined to demonstrate de novo stress urinary incontinence (SUI) after pelvic floor rehabilitation. The aim of our study was to investigate the role of urethral sphincter dysfunction and funneling change of urethrovesical junction in predicting de novo SUI preoperation.

METHOD AND MATERIALS

47 patients with severe anterior vaginal wall prolapse but without complaining of SUI were enrolled. Preoperatively static and dynamic MRI examination of pelvic floor were performed with prolapse reduction. Urethral sphincter dysfunction was indicated when widening of the proximal urethra and funneling at the urethrovesical junction was observed. Urethral mobility was defined by rotation of urethra. Vesical neck movement was evaluated by its distance to pubococcygeal line (PCL). A published levator ani muscle (LAM) scoring system was used to characterize morphological changes of LAM and divided the severity of injury into three categories as none, minor and major. Primary outcome was de novo SUI at 1 year postoperative follow-up by an experienced gynecologist.

RESULTS

Of the 47 patients, 5 cases (10.6 %) demonstrated de novo SUI postoperatively. Urethral sphincter dysfunction and funneling were present in all of de novo SUI patients whilst only 7.14% in continent patients. De novo SUI patients were having more minor but not major LAM defects than continent patients, both in puborectal muscle (minor 40.0% vs. 21.4%, major 60.0% vs. 50%; $P=0.06$) and iliococcygeal muscle (minor 80.0% vs. 33.3%, major 20.0% vs. 19.0%; $P=0.33$). The value of vesical neck downward movement measured in de novo SUI patients was more than in continent patients (23.4 ± 16.4 vs. 19.9 ± 11.4 , $P=0.06$) though without significant difference. Urethral mobility was equally active in de novo SUI patients and continent patients (50.8 ± 32.4 vs. 50.4 ± 26.1 , $P=0.46$).

CONCLUSION

The urethral sphincter dysfunction and funneling can be treated as a practical indicator of de novo SUI preoperation for patients with severe anterior vaginal wall prolapse, especially when combined with more minor LAM injury and more active vesical neck downward movement.

CLINICAL RELEVANCE/APPLICATION

Severe anterior vaginal wall prolapse women with urethral sphincter dysfunction and funneling change during MR examination have higher risk of developing de novo SUI, we suggest counselling such women for concomitant Pelvic rehabilitation and anti-incontinent surgery.

SST05-02 **Diagnostic Accuracy of Abnormal Placentation on MRI Correlated with the Surgical Findings**

Friday, Dec. 2 10:40AM - 10:50AM Room: E351

Participants

Ayumi Seko, MD, Otsu, Japan (*Presenter*) Nothing to Disclose
Yukihiro Nagatani, MD, Otsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Norihsa Nitta, MD, Kyoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Hitoshi Kitahara, MD, Otsu-Shi, Japan (*Abstract Co-Author*) Nothing to Disclose
Kiyoshi Murata, MD, Otsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Shun-Ichiro Tsuji, Otsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Keiko Tsuchiya, Otsu, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study was to assess the preoperative diagnostic accuracy of abnormal placentation by MRI.

METHOD AND MATERIALS

Forty-one gravid women with placenta previa or low-lying placenta who underwent MRI were retrospectively assessed. Their mean

age was 34 years old (22-42). We compared 5 MR findings and the prevalence of abnormal placentation. The MR findings that we assessed were 1) heterogeneous signal intensity within the placenta, 2) dark intraplacental bands on T2WI, 3) focal uterine bulging, 4) focal interruptions in the myometrial wall and 5) flow voids in the placenta. The numbers of dark intraplacental bands on T2WI were also counted.

RESULTS

All patients had C-section. Eight patients were identified with placenta accreta, one was placenta increta and one was placenta percreta, pathologically. Three cases which had a defect of the myometrium after the placental removal and one case which the placenta attached firmly to the myometrium are included to a placenta accreta (PA). MR findings 1)-5) had sensitivity of 0.642, 0.857, 1, 0.714 and 0.57, specificity 0.74, 0.629, 0.592, 0.888, and 0.703, positive predictive value (PPV) of 0.562, 0.545, 0.538, 0.769 and 0.6, and negative predictive value (NPV) of 0.8, 0.894, 1, 0.857, and 0.904, respectively. The average numbers of "dark bands" on T2WI were 0.69 with PA(-) and 2.93 with placenta accreta, increta or percreta (+).

CONCLUSION

Of the five MRI findings, the dark intraplacental bands on T2WI had the highest sensitivity and the focal uterine bulging had the highest specificity. Higher numbers of dark intraplacental bands on T2WI could indicate abnormal placentation. When a number of evaluated MRI findings increases the risk of abnormal placentation also increases.

CLINICAL RELEVANCE/APPLICATION

Patients with two or more of our evaluated five findings were considered as a high risk group when they were delivering. Radiologists should be careful not to overlook our evaluated findings.

SST05-04 Abnormalities of the Yolk Sac and Its Association with First Trimester Abortion

Friday, Dec. 2 11:00AM - 11:10AM Room: E351

Participants

Krishnarjun Peethambaram, MBBS, Davangere, India (*Presenter*) Nothing to Disclose
Parthasarathy K R, MBBS, MD, Bangalore, India (*Abstract Co-Author*) Nothing to Disclose
Kishan A. Bhagwat, MBBS, MD, DAVANGERE, India (*Abstract Co-Author*) Nothing to Disclose
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Shashikiran B R, MBBS, Davangere, India (*Abstract Co-Author*) Nothing to Disclose
Naveen Rathod, Gulbarga, India (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine all the sonological abnormalities of the yolk sac and establish their association with adverse perinatal outcomes in the first trimester

METHOD AND MATERIALS

The study involves the prospective analysis of 578 pregnant women, who came for first trimester scan (5th to 13th week gestational age). All examinations were performed with GE Voluson 730 expert ultrasound equipment in a 5-9MHz endocavitary 3D probe (GE healthcare, Milwaukee, WI). The gestational sac measurements were taken along with the CRL (crown rump length), yolk sac diameter and FHR (fetal heart rate). All 578 cases were divided into the control group (normal yolk sac) and the study group (abnormal yolk sac) and subjected to statistical analysis. The primary outcome measure was the abortion rate between the two groups.

RESULTS

Out of the 578 cases, 104 had abnormal yolk sacs. The study group was divided into the patients who had a normal or uneventful outcome of pregnancy and patients who had an abnormal outcome (embryonic demise, anembryonic pregnancy). Out of the 104 cases of abnormal yolk sac, 54 patients were associated with first trimester abortion and 50 patients had an uneventful pregnancy. The statistical analysis demonstrated a sensitivity of 94.9%, specificity of 61.9% and chi-square statistic of 80.2131. The p value is <0.00001, which shows that the results are significant. The overall abortion rate with abnormal yolk sacs was 51.9%. The outcome of pregnancy was also studied with respect to the sonological abnormality of the yolk sac. Absent and calcified yolk sacs always lead to abortion. Large and small yolk sacs had a 40-50% abortion rate. Irregular yolk sacs had a 25% abortion rate. But echogenic and persistent yolk sacs had an overall abortion rate of only 9%.

CONCLUSION

Evaluating the yolk sac should be an integral part of the overall first trimester sonological examination as it can be used to anticipate the course of pregnancy.

CLINICAL RELEVANCE/APPLICATION

Importance of the size, shape and internal contents of the yolk sac can predict embryonic death or abnormalities in the first trimester.

SST05-05 Predibirth Software Prospective Study: The Interest of the Virtual Trial of Labor (VTOL)

Friday, Dec. 2 11:10AM - 11:20AM Room: E351

Participants

Olivier Ami, MD, PhD, Clermont Ferrand, France (*Presenter*) Nothing to Disclose
Lucie Cassagnes, MD, Clermont-Ferrand, France (*Abstract Co-Author*) Nothing to Disclose
Jean-Christophe Maran, PhD, MA, Creteil, France (*Abstract Co-Author*) Nothing to Disclose
Dominique Musset, MD, Clamart, France (*Abstract Co-Author*) Nothing to Disclose

Louis B. Boyer, MD, Clermont-Ferrand, France (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of this study was to evaluate the diagnostic interest of computerized virtual trial of labor from 482 finite elements reconstruction of the maternal pelvis and fetus from magnetic resonance imaging data sets, followed by 3D childbirth simulation.

METHOD AND MATERIALS

482 pregnant women were enrolled in this prospective study (NATVISTA study). A pelvimetry with MRI on every pregnant woman on 4 maternity centers over a 6 months duration of study. Both fetus and pelvis were segmented for 3D vectorial reconstruction with Predibirth (Babyprogress - France) software. Favorability of childbirth was estimated using the percentage of possibility to deliver regarding tested possibilities for fetal engagement, descent and rotation for each variety of presentation tested. Childbirth was defined with a percentage of fetal head compression along the birth canal.

RESULTS

Of the 482 pregnant women tested, the mean MAGNIN score was 23. The positive predictive value of predibirth was 96 %, the negative predictive value was 97 %, the false positives rate was 4 %, the false negatives rate was 2%. Maternal satisfaction using virtual trial of labor was 93%. Caregivers satisfaction using virtual trial of labor was 90%. Compared to obstetrical decisions based on pelvimetry, the VTOL improved of 80 % birth predictions. The overall cesarean section rate didn't change (from 28 % before VTOL to 27 % with VTOL), but the emergency C-section rate dropped drastically (from 16 % before VTOL, to 3 % after VTOL).

CONCLUSION

VTOL with Predibirth software is a new and promising tool to detect labor dystocia and seem to be a significant improvement over pelvimetry to decrease biomechanical risks during childbirth.

CLINICAL RELEVANCE/APPLICATION

VTOL may soon change obstetrical decisions at the time of Childbirth

SST05-06 Utility of Diffusion-Weighted MR Imaging in the Diagnosis of Morbidly Adherent Placenta

Friday, Dec. 2 11:20AM - 11:30AM Room: E351

Participants

Anna Ellermeier, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

Tom Winter, Salt Lake Cty, UT (*Abstract Co-Author*) Nothing to Disclose

Susanna I. Lee, MD, PhD, Boston, MA (*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

Manjiri K. Dighe, MD, Seattle, WA (*Presenter*) Research Grant, General Electric Company

PURPOSE

Rising incidence and potential for catastrophic surgical outcomes underscore the need for sensitive prenatal diagnosis of morbidly adherent placenta (MAP). As such, ambiguous US findings often necessitate MRI. By better defining the border between placenta and myometrium, we hypothesized that diffusion-weighted imaging (DWI) may be a useful adjunct to traditional prenatal MRI.

METHOD AND MATERIALS

Following IRB approval, 2 radiologists blinded to history and pathology retrospectively reviewed MR images (1.5T) from singleton pregnancies with and without pathologically-proven MAP. T2W only and T2W+DWI images were reviewed in separate sessions 2 weeks apart to avoid recall bias, with normal and MAP randomized within and between sessions. Reviewers completed questionnaires regarding placenta/uterus features, MAP presence and diagnostic confidence. MR findings were compared to pathology results with Chi-squared tests, interreader agreement was evaluated with Cohen's kappa and diagnostic accuracy was compared with the sign test.

RESULTS

In total, 17 patients (mean gest 27w4d) were reviewed (indications: suspected MAP 14/17, fetal anomaly 2/17, abd pain 1/17). Typical MR criteria were reported more frequently with pathologic MAP: loss of retroplacental T2 dark zone (T2W, $p=0.008$) and dark/thick interplacental bands (T2W+DWI, $p=0.032$). Compared with T2W only, addition of DWI significantly increased interreader agreement ($p=0.045$) and tended to increase sensitivity (69% vs. 94%, $p=0.25$) but decrease specificity (56% vs. 39%, $p=0.5$) for MAP. Although readers reported increased diagnostic confidence with DWI in 65%, explicit confidence ratings ($p=0.7$) and diagnostic accuracy ($p>0.99$) did not change.

CONCLUSION

MAP is a potentially life-threatening condition that requires increased clinical and radiographic sensitivity to optimize management. Small sample size (due to low incidence), inexperience with DWI interpretation in pregnancy, and poor resolution of DWI are limitations of our study. Trends toward increased sensitivity and improved interreader agreement suggest that DWI may complement traditional MRI evaluation of MAP but more experience and sequence improvement are necessary to improve diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

DWI in conjunction with traditional prenatal MRI may aid in evaluation of MAP, a potentially life-threatening condition that requires extensive surgical planning and patient counseling.

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/>

Susanna I. Lee, MD, PhD - 2013 Honored Educator

SST05-07 Quantitative Heterogeneity Analysis of MRI Can Aid in the Diagnosis of Placenta Accreta

Friday, Dec. 2 11:30AM - 11:40AM Room: E351

Awards

Student Travel Stipend Award

Participants

Christopher Miller, Chicago, IL (*Presenter*) Nothing to Disclose

Kejia Cai, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

Winnie A. Mar, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Accurate antenatal diagnosis of placenta accreta remains a challenge. Placental heterogeneity is an MRI feature of placenta accreta which is subjectively determined. The purpose of this study is to evaluate advanced quantitative mathematical algorithms for heterogeneity analysis in order to differentiate placenta accreta from normal placentas objectively.

METHOD AND MATERIALS

We performed retrospective image analysis of 23 cases, with 16 normal cases and 7 cases of placenta accreta based on pathological diagnosis. Sagittal single shot fast spin echo T2-weighted MRI sequences acquired on a GE 1.5 T MRI scanner were analyzed using custom in house software run on a Matlab platform. An ROI of the entire placenta was manually drawn, and confirmed by an experienced radiologist. Placental heterogeneity was quantified with various mathematic algorithms: coefficient of variation, histogram analysis, gray level co-occurrence matrices (GLCM), histogram oriented gradients (HOG), random walk analysis, and fractal analysis with box size from 2 to 256. One-tailed unpaired Student's t test was used to compare the group heterogeneity indices with statistical significance prescribed with $p < 0.05$.

RESULTS

Each algorithm produced a different quantitative measure of image heterogeneity. With a limited sample size, fractal analysis with a box size of 256 provides the highest statistical power for differentiating placenta accreta from normal ($p = 0.02$). The analyses obtained from HOG ($p = 0.08$) and GLCM ($p = 0.09$) are encouraging, with p values approaching significance. The least statistical power was observed from random-walk, histogram, and co-variance analysis with $p = 0.48, 0.34,$ and 0.16 respectively.

CONCLUSION

Fractal analysis was found to be the most promising objective approach in identifying placenta accreta in the limited sample size we have so far. Work will be continued with further algorithm optimization and increased sample size. Quantitative heterogeneity analysis shows promise in the diagnosis of placenta accreta with MRI.

CLINICAL RELEVANCE/APPLICATION

Quantitative heterogeneity analysis may be used to increase diagnostic certainty in the diagnosis of placenta accreta with MRI.

SST05-08 Can Three-Dimensional Pelvimetry by Low-Dose Stereoradiography Replace Low-Dose Helical CT Pelvimetry?

Friday, Dec. 2 11:40AM - 11:50AM Room: E351

Participants

Sebastien L. Aubry, MD, PhD, Besancon, France (*Presenter*) Nothing to Disclose

Pierre Padoin, MD, Besancon, France (*Abstract Co-Author*) Nothing to Disclose

Yolande R. Petegnief, PhD, DIPLPHYS, BESANCON, France (*Abstract Co-Author*) Nothing to Disclose

Jean-Philippe Nueffer, MD, Besancon, France (*Abstract Co-Author*) Nothing to Disclose

Didier Riethmuller, MD, PhD, Besancon, France (*Abstract Co-Author*) Nothing to Disclose

Eric Delabrousse, MD, Besancon, France (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the reliability of pelvimetry measurements assessed by stereoradiography imaging (SRI) and to assess maternal and fetal radiation dose compared to low-dose helical CT (MDCT) pelvimetry.

METHOD AND MATERIALS

The institutional review board approved this study, and written informed consent was obtained from thirty-five pregnant women. They were prospectively included and underwent consecutively a synchronous front and lateral low-dose SRI and a low-dose MDCT of the pelvis. Pelvimetry measurements were anonymously measured on dedicated SRI software and PACS viewer, and were then compared. Skin dosimeters were used to evaluate the radiation dose.

RESULTS

SRI-MDCT correlation (Pearson; mean bias) was very good for the transverse inlet diameter ($0.92; -0.09$ cm), the anteroposterior diameter of pelvic Inlet ($0.92; 0.47$ cm), the maximal transverse diameter ($0.9; 0.21$ cm), and the sacrum length ($0.9; 0.09$ cm). Correlation was good for the sacrum curvature ($0.75; 0.06$ cm), the Magnin index ($0.7; 0.5$ cm) and the anteroposterior diameter of pelvic outlet ($0.6; 0.52$ cm). It was low for the transverse outlet diameter (0.5) and very low for the bispinous diameter ($0.22; -0.8$ cm). The fetal dose was 13.1 times lower in SRI ($87 \pm 26 \mu\text{Gy}$) than in CT ($1140 \pm 220 \mu\text{Gy}$, $p < 0.0001$). The effective maternal dose was 3.1 times lower in SRI ($97 \pm 21 \mu\text{Sv}$) than in CT ($310 \pm 60 \mu\text{Sv}$, $p < 0.0001$).

CONCLUSION

Pelvic inlet measurements by SRI are reliable. For each of the other diameters, measurement bias is low. Compared to CT pelvimetry, SRI leads to a significant decrease in fetal and maternal radiation dose.

CLINICAL RELEVANCE/APPLICATION

Reliability of the pelvic inlet measurements and lower radiation dose suggests that SRI should be proposed as an alternative to CT pelvimetry.

SST05-09 Regional Placental Bold Changes with Gestational Age in Normally Developing Pregnancies using Long Duration R2* Mapping in Utero

Friday, Dec. 2 11:50AM - 12:00PM Room: E351

Participants

Manjiri K. Dighe, MD, Seattle, WA (*Presenter*) Research Grant, General Electric Company

Bhagya Sannananja, MD, San Antonio, TX (*Abstract Co-Author*) Nothing to Disclose

Debosmita Biswas, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

Susan McKown, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

Jason Cacutt, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

J C. Gatenby, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

Colin Studholme, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The placenta is a key organ determining healthy fetal development. Pathological development of the placenta has been related to fetal growth restriction and pre-eclampsia (PE). Blood flow in the maternal and fetal regions within the placenta permit the transfer of both oxygen and nutrients to the fetus and the removal of waste products. BOLD MRI can assess tissue oxygenation non-invasively and is based on the magnetic properties of hemoglobin. The purpose of our study was to examine the use of R2* mapping with BOLD MRI in the placenta with the aim of providing a reference for blood oxygenation levels.

METHOD AND MATERIALS

Written informed consent was obtained from pregnant patients with uncomplicated pregnancies. Imaging was performed on a Philips 1.5T scanner, using a 16-channel Torso XL coil. Dual echo EPI BOLD data was collected and repeated in a dynamic acquisition consisting of between 90 and 150 time frames. A set of multiple 3D regions of interest were manually outlined within the placenta on each frame using the segmentation tool in the rview software <http://rview.colin-studholme.net>. The ROI's were separately adjusted on each frame and each slice to ensure selected voxels fell within the placenta. A total of between 3 and 5 slices clearly in the placenta were marked on each subject. Mean R2* values were then calculated.

RESULTS

The average age of the fetus was 28 weeks 1 day. Average R2* in the placenta was 8.99 +/- 2.21 (range 2.17 to 14.51). There was an increase in the R2* with gestational age. In fetuses with multiple scans performed at different time points, there was an increase in the R2* over time. The average standard deviation in the multiple acquisitions in each patient was 0.75. One outlier was seen with a low R2* and this variability could be due to motion seen in the images in this outlier.

CONCLUSION

Evaluating the R2* in placenta is feasible. The R2* values were seen to increase with gestational age. It will be possible to evaluate the R2* in placenta in patients with intrauterine growth retardation (IUGR) which is expected to be lower than the normal R2*.

CLINICAL RELEVANCE/APPLICATION

Evaluation of the R2* in the placenta with BOLD MRI is feasible and can help in early prediction of placenta dysfunction like in IUGR. Further studies of IUGR patients are needed to assess the utility of BOLD imaging in the placenta.

SST06

Science Session with Keynote: Musculoskeletal (Technique and Outcome in Intervention)

Friday, Dec. 2 10:30AM - 12:00PM Room: E451A



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Luca Maria Sconfienza, MD, PhD, Milano, Italy (*Moderator*) Travel support, Bracco Group
William E. Palmer, MD, Boston, MA (*Moderator*) Nothing to Disclose

Sub-Events

SST06-01 Musculoskeletal Keynote Speaker: When Technique Matters

Friday, Dec. 2 10:30AM - 10:50AM Room: E451A

Participants

William E. Palmer, MD, Boston, MA (*Presenter*) Nothing to Disclose

SST06-03 Safety of Omitting Routine Coagulation Blood Testing Prior to Image Guided Musculoskeletal Biopsy

Friday, Dec. 2 10:50AM - 11:00AM Room: E451A

Awards

Student Travel Stipend Award

Participants

Yuri Shif, MD, Boston, MA (*Presenter*) Nothing to Disclose
Justin W. Kung, MD, Brookline, MA (*Abstract Co-Author*) Nothing to Disclose
Colm J. McMahon, MBCh, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jennifer Nimhurchearthaigh, MBCh, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jim S. Wu, MD, Boston, MA (*Abstract Co-Author*) Research Grant, Kaneka Corporation

PURPOSE

Preprocedure coagulation testing prior to image guided musculoskeletal (MSK) soft tissue and bone biopsy can increase cost and may delay patient care. The purpose of the study is to evaluate the safety of withholding preprocedure coagulation blood testing, international normalized ratio (INR) and platelets, in a population undergoing musculoskeletal soft tissue and bone biopsies.

METHOD AND MATERIALS

Prior to 10/7/2014 all patients undergoing image guided bone or soft tissue biopsy at one institution underwent pre-procedure INR and platelet count testing. All cases (N=1167) from 1/5/2006 through 10/2/2014 were retrospectively reviewed to determine the incidence of biopsy related bleeding complication (hematoma, ecchymosis, or excessive bleeding). Due to the low rate of bleeding complications a policy was adopted whereby patients were screened with a bleeding risk questionnaire, and unless risk factors were identified, pre-procedure blood tests were withheld. Under the new policy, all cases (N=190) from 10/7/2014 through 10/28/2015 were prospectively followed and the incidence of bleeding complications recorded.

RESULTS

Preceding the new policy there were 551 soft tissue biopsies and 616 bone biopsies. In total there were 30 biopsy related bleeding complications (2.6%). Soft tissue biopsies had a higher rate of bleeding than bone (20 vs 10 respectively) ($p=0.031$). No patient with a bleeding complication had an INR (>1.5) or platelet count (<50) which exceeded the recommended limits based on hospital policy or the Society of Interventional Radiology Consensus Guidelines. In the subsequent year after implementation of the new policy there were 2 bleeding complications (1.1%) which was not significantly different than the prepolicy group ($P = 0.201$).

CONCLUSION

Omitting routine pre-procedure coagulation profiles does not result in an increase in hemorrhagic complications during MSK lesion biopsy. Routine coagulation testing does not help predict which patients will have bleeding complications after undergoing MSK soft tissue or bone biopsy.

CLINICAL RELEVANCE/APPLICATION

Radiologists can consider omitting pre-procedure coagulation testing during MSK biopsy as doing so does not adversely affect patient care, and may simplify the pre-procedure work-up and reduce costs.

SST06-04 Utility of Core Needle Rebiopsy of Initially Non-Diagnostic Musculoskeletal Lesions

Friday, Dec. 2 11:00AM - 11:10AM Room: E451A

Participants

Jim S. Wu, MD, Boston, MA (*Presenter*) Research Grant, Kaneka Corporation
Colm J. McMahon, MBCh, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Santiago Lozano-Calderon, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Justin W. Kung, MD, Brookline, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the utility of repeat image guided core needle biopsy (CNB) of musculoskeletal lesions in the setting of an initially non-

diagnostic biopsy.

METHOD AND MATERIALS

Following IRB approval, a retrospective review was conducted of 1302 consecutive CNBs performed on bone or soft tissue lesions at a single institution. All cases where a repeat biopsy of the same lesion was requested by the referring physician due to non-diagnostic biopsy results were included in the study. Tumor characteristics such as lesion size and type (bone versus soft tissue) were correlated with diagnostic yield on repeat biopsy. Technical factors including the modality used, number of passes performed, gauge of the biopsy device, radiologist performing the procedure and portion of the lesion biopsied were also correlated.

RESULTS

Of the 1302 CNBs performed, 26 (2.0%) were referred for repeat biopsy. A diagnosis was obtained in 38.5% (10/26) of cases following a repeat CNB. In 5 out of the 26 cases (19.2%), a repeat CNB yielded malignancy. Overall, eleven cases were ultimately of malignant histology, of which 5 (45.4%) were diagnostic following rebiopsy. Fourteen cases were benign, of which 5 (35.7%) were diagnostic following rebiopsy. One case was lost to follow-up. A statistically significant difference in diagnostic yield was found between cases where an increased number of passes were made between the initial and repeat ($p=0.047$) biopsies.

CONCLUSION

Repeat core needle biopsy of initially non-diagnostic musculoskeletal lesions can be potentially useful. Increasing the number of passes on the second biopsy can increase diagnostic yield.

CLINICAL RELEVANCE/APPLICATION

Repeat CNB of musculoskeletal lesions should be considered after an initially non-diagnostic result as an alternative to more invasive and costly surgical biopsy.

SST06-05 Selective 3-Tesla MR Neurography-guided Retroperitoneal Genitofemoral Nerve Blocks for the Diagnosis of Genitofemoral Neuralgia

Friday, Dec. 2 11:10AM - 11:20AM Room: E451A

Participants

Jan Fritz, MD, Baltimore, MD (*Presenter*) Research Grant, Siemens AG; Scientific Advisor, Siemens AG; Scientific Advisor, Alexion Pharmaceuticals, Inc; Speaker, Siemens AG
A. L. Dellon, Towson, MD (*Abstract Co-Author*) Nothing to Disclose
Eric H. Williams, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Gedge D. Rosson, Baltimore, MD (*Abstract Co-Author*) License agreement, Aegeria Soft Tissue LLC
Alan Belzberg, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Frederick Eckhauser, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Diagnostic genitofemoral nerve blocks are frequently utilized to establish and validate the diagnosis of genitofemoral neuralgia. Genitofemoral nerve blocks in the groin area are widely performed, but are prone to inaccuracies due to concomitant anesthesia of nearby nerves. Therefore, we prospectively evaluate the technical and diagnostic effectiveness and safety of 3-Tesla MR neurography-guided retroperitoneal genitofemoral nerve blocks.

METHOD AND MATERIALS

Our institutional review board approved this prospective HIPAA compliant study. Informed consent was obtained from all participants. Patients with intractable groin pain were included. Diagnostic MR neurography-guided genitofemoral nerve blocks were performed using a retroperitoneal approach and clinical wide-bore 3 Tesla MRI system. Outcome variables were assessed including technical success, complications, and efficacy. P-values ≤ 0.05 were considered statistically significant.

RESULTS

30 retroperitoneal genitofemoral nerve blocks were performed in 26 subjects (16 men, 10 women; mean age, 42 years; age range, 24–78 years; mean body mass index (BMI), 28 kg/m², BMI range 20–35 kg/m²), of which 12/30 (40%) were performed with an anterior, 12/30 (40%) lateral and 6/30 (20%) posterior needle path. Genitofemoral nerve blocks achieved appropriate anesthesia in 24/26 (92%) subjects. No complications occurred. Genitofemoral nerve blocks had a sensitivity, specificity, positive and negative likelihood ratio, and accuracy of 93%, 75%, 3.73, 0.09, and 84%, respectively for the diagnosis of genitofemoral neuralgia.

CONCLUSION

Selective retroperitoneally-directed MR neurography-guided genitofemoral nerve blocks are safe and effective with high technical success and diagnostic accuracy for the diagnosis of genitofemoral neuralgia.

CLINICAL RELEVANCE/APPLICATION

Selective MR neurography-guided genitofemoral nerve blocks in the retroperitoneum are safe, allow for a technical success rate of 92% and a diagnostic accuracy of 84% for the diagnosis of genitofemoral neuralgia.

SST06-06 Ultrasound-Guided Dry Needling and High Volume Stripping for Achilles Tendinopathy: Outcomes For Our Cohort

Friday, Dec. 2 11:20AM - 11:30AM Room: E451A

Participants

Maira Hameed, BA, BMBCCh, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Catriona E. Reid, MBBS, MA, Portsmouth, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Ajay Sahu, MBBS, MRCS, Plymouth, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Maria B. Johnson, MB CHB, FRCR, Southampton, United Kingdom (*Presenter*) Nothing to Disclose

PURPOSE

Chronic Achilles tendinopathy is a prevalent overuse injury often observed in athletes. There is significant morbidity associated with surgical treatment and so minimally invasive treatments are now in favour. There are multiple potential modalities of treatment including autologous blood injection and corticosteroids. Dry needling is the procedure of repeatedly passing a fine needle through the abnormal tendon substance under local anaesthesia. Its rationale is to stimulate an inflammatory response followed by formation of reparative tissue, with a view to strengthen the tendon. We aimed to analyse our practice of ultrasound-guided dry needling and percutaneous high volume stripping of the Achilles tendon as a novel treatment paradigm for this condition.

METHOD AND MATERIALS

Sixty-four patients with sonographically-confirmed Achilles tendinopathy were analysed. All were symptomatic for more than four months and had failed alternative conservative treatment modalities. Ultrasound-guided dry needling of neovascular areas and percutaneous high volume stripping was undertaken by two dedicated musculoskeletal radiologists. We performed sonographic assessment of the tendon's thickness and neovascularity. Patient satisfaction was the primary outcome measure with a follow up period of three months. Secondary outcome measures included, pain scores (comparing these to pre-procedure levels), complication rate, and success rate.

RESULTS

54 out of 64 tendons have been successfully treated and the remainder are still undergoing their long term follow up. Our combined therapeutic intervention led to a significant improvement in pain scores and the majority of the patients, >85%, are satisfied with outcomes. There were no adverse events reported.

CONCLUSION

Ultrasound-guided dry needling and percutaneous high volume stripping has a high treatment success rate and few adverse events in our cohort of Achilles tendinopathy. Patients satisfaction rates are high and comparable to those documented in the literature for other minimally invasive treatment options. This option is favourable to the longer recovery time and higher risks associated with surgery.

CLINICAL RELEVANCE/APPLICATION

Ultrasound-guided dry needling and percutaneous high volume stripping shows promise as a novel minimally invasive treatment modality for chronic Achilles tendinopathy.

SST06-07 Tendinopathy of the Achilles Tendon: Clinical and Imaging Evaluation after Two Different Ultrasound (US)-Guided Percutaneous Treatments: Dry Needling versus Platelet Rich Plasma (PRP)

Friday, Dec. 2 11:30AM - 11:40AM Room: E451A

Participants

Federico Bruno, MD, LAquila, Italy (*Presenter*) Nothing to Disclose
Simone Quarchioni, Laquila, Italy (*Abstract Co-Author*) Nothing to Disclose
Silvia Mariani, MD, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose
Alice La Marra, MD, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose
Francesco Arrigoni, Coppito, Italy (*Abstract Co-Author*) Nothing to Disclose
Luigi Zugaro, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose
Antonio Barile, MD, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose
Carlo Masciocchi, MD, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate and show the different clinical and instrumental outcome after intratendinous injection of Platelet Rich Plasma (PRP) and percutaneous needle tenotomy (needling) in patients with tendinosis of Achilles tendon.

METHOD AND MATERIALS

60 patients (30 men, 30 women, mean age 49.1 years) with refractory Achilles tendon tendinopathy who underwent either dry needling (n=30) or PRP injection (n=30). Pre-treatment evaluation included ultrasound and MRI scan, analysis of visual analogue pain scores (VAS) and VISA-A score for functionality. Clinical (VAS and VISA-A) and instrumental (US and MRI) follow-up was performed 6 months after the treatment.

RESULTS

The study group (PRP) showed recovery of tendon echogenicity and MRI signal intensity in 20 patients, 6 patients showed no improvement and 4 patients showed worsening of the tendinopathy. 24 patients (80%) reported mild to moderate pain reduction (mean VAS score 3, range 0-5), 6 patients had no improvement. The mean VISA-A values improvement was 65%. In the control group we noted recovery of tendon echogenicity and MRI signal intensity in 19 patients, 5 patient showed no improvement and 6 patients showed worsening of the tendinopathy. 75% of the patients showed improvement in VAS and 60% in VISA-A values.

CONCLUSION

Both PRP and needling are effective minimally invasive treatments for chronic, recalcitrant tendinosis of the Achilles tendon.

CLINICAL RELEVANCE/APPLICATION

Dry needling shows promise as an alternative, cheaper and effective treatment for the management of Achilles tendon degenerative pathology. As for PRP injection, it is important to carry out this technique under sonographic guidance so that the abnormal tendon can be targeted precisely for dry needling.

SST06-08 Short-term Comparison Between Blind and Ultrasound-guided Injection in Morton Neuroma

Friday, Dec. 2 11:40AM - 11:50AM Room: E451A

Participants

Fernando Ruiz Santiago, PhD, granada, Spain (*Presenter*) Nothing to Disclose
Nicolas Prados Olleta, PhD, Granada, Spain (*Abstract Co-Author*) Nothing to Disclose
Pablo Tomas Munoz, MD, Granada, Spain (*Abstract Co-Author*) Nothing to Disclose

Luis Guzman Alvarez, DPhil, Granada, Spain (*Abstract Co-Author*) Nothing to Disclose
Antonio Jesus Lainez Ramos-Bossini, MA, Granada, Spain (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of this work in progress report is to compare the effectiveness of blind vs. ultrasound-guided injection in Morton neuroma in order to determine which one is more appropriate as initial procedure in conservative treatment.

METHOD AND MATERIALS

This is a patient-blinded randomized trial. The final sample size has been calculated to be 100 patients. Fifty patients from group 1 will be injected by an experienced orthopaedic surgeon, based upon anatomical landmark. Fifty patients from group 2 will be injected by an experienced musculoskeletal radiologist under ultrasound guidance. The main inclusion criterion is clinical suspicion of Morton neuroma confirmed by ultrasound scan. Patients included are clinically assessed by the VAS score, the Manchester Foot Pain and Disability Schedule (MFPDS), and a generic quality-of-life instrument, the EQ-5D. Injection includes 1 cc of 2% mepivacaine and 40 mg of triamcinolone in each web space with Morton neuroma. According to the patient's evolution, up to 4 injections were allowed during the first 2 months of follow-up. Follow-up was performed by phone calls and/or scheduled consultations at 15 days, 1 month, 45 days, 2 months, 3 months, 6 months and 1 year. Statistical analysis was performed by unpaired Student's t-test

RESULTS

Currently, 33 patients have been included in the study, 16 of which have completed 3 months of follow-up. No differences in age or clinical measures were found at presentation between Group 1 (blind injection) (VAS: 8.1 ± 0.4 ; MFPDS: 27.6 ± 2.1 ; EQ-5D: 3.7 ± 0.3) and Group 2 (ultrasound-guided injection) (VAS: 8.1 ± 0.3 ; MFPDS: 24.6 ± 2.5 ; EQ-5D: 3.3 ± 0.4). At 3 months of follow-up, both groups showed statistical improvement, although ultrasound-guided group showed greater symptomatic relief (VAS: 6.7 ± 1.2 vs. 3.1 ± 0.9 , $p = 0.034$; MFPDS: 23.8 ± 4.4 vs. 10.4 ± 3.8 , $p = 0.038$; EQ-5D: 3.8 ± 0.9 vs. 2.8 ± 1.2 , $p = 0.55$)

CONCLUSION

Injections relieved symptoms of Morton neuroma in a high percentage of patients.

CLINICAL RELEVANCE/APPLICATION

According to our results, injection under ultrasound guidance is worthwhile because a more significant improvement was observed in comparison with blind injection.

SST06-09 Clinical Outcomes of Percutaneous Lumbar Facet Synovial Cyst Rupture

Friday, Dec. 2 11:50AM - 12:00PM Room: E451A

Participants

Stijn A. Bos, Boston, MA (*Presenter*) Nothing to Disclose
Ambrose J. Huang, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Martin Torriani, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Frank J. Simeone, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Stuart R. Pomerantz, MD, Boston, MA (*Abstract Co-Author*) Research Grant, General Electric Company
Miriam A. Bredella, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Lumbar facet synovial cysts (LFSC) can cause low back pain (LBP), spinal stenosis and radiculopathy. The purpose of our study was to evaluate the therapeutic value, safety and clinical outcomes of percutaneous LFSC rupture in patients with LBP.

METHOD AND MATERIALS

Our study was IRB approved and HIPAA compliant. The study group comprised 48 patients (19 m, 29 f, mean age: 67 ± 1.7 (SEM) yrs) with LBP and MRI findings of LFSC that corresponded with the patients' clinical symptoms, who underwent CT or fluoroscopy-guided percutaneous synovial cyst rupture and steroid injection. Success of LFSC rupture, injectate, complications, and long-term clinical outcome including repeat procedures or surgery were recorded. Groups were compared using the Chi-square or Fisher's Exact test.

RESULTS

Fifty-six percutaneous LFSC ruptures were performed in 48 patients. CT-guidance was used in 38 cases and fluoroscopy-guidance in 18 cases. LFSC rupture was technically successful in 40/56 cases (71%) confirmed by contrast filling the LFSC and extending into the epidural space. There was a higher likelihood of a technically successful rupture using CT vs fluoroscopy-guidance ($p=0.03$). In 48 cases LFSC rupture was performed by facet joint injection and in 8 cases by direct puncture of the synovial cyst, which did not result in a difference in technical success rate ($p=0.8$). In all cases a mix of 1 cc of triamcinolone and 1 cc of anesthetic (lidocaine /ropivacaine) and saline was injected (mean volume 3.7 ± 0.3 cc). 2 patients were lost to follow-up. Over a mean follow-up time of 34 ± 5 months, 19 patients (41%) were pain-free, 3 patients (7%) underwent repeat cyst rupture, and 22 patients (48%) eventually underwent surgery. There was no statistical significance between a successful outcome and age, sex or level of LFSC ($p>0.1$). There were 2 complications (4%) (severe pain following procedure requiring in-hospital observation, $n=1$; bacterial infection, $n=1$).

CONCLUSION

Percutaneous LFSC rupture is an effective and safe non-surgical treatment for LFSC with higher technical success rate using CT vs fluoroscopy-guidance. More than half of treated patients were able to avoid subsequent surgery.

CLINICAL RELEVANCE/APPLICATION

Percutaneous LFSC rupture is a safe and effective minimally invasive procedure which may obviate the need for surgical intervention.

SST07

Nuclear Medicine (Endocrine, Lymphoma and Other Imaging)

Friday, Dec. 2 10:30AM - 12:00PM Room: E353C

CT **MR** **NM**

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

FDA Discussions may include off-label uses.

Participants

Michael V. Knopp, MD, PhD, Columbus, OH (*Moderator*) Nothing to Disclose
Matthew S. Robertson, MD, Columbus, OH (*Moderator*) Nothing to Disclose

Sub-Events

SST07-01 Comparative Performance of Two Tc-99m Radiopharmaceuticals for Intraoperative Identification of Sentinel Lymph Nodes in Melanoma

Friday, Dec. 2 10:30AM - 10:40AM Room: E353C

Awards

Student Travel Stipend Award

Participants

Przemyslaw Ignaciuk, MD, Lexington, KY (*Presenter*) Nothing to Disclose
Elizabeth Cheatham, Lexington, KY (*Abstract Co-Author*) Nothing to Disclose
Peter A. Hardy, PhD, Lexington, KY (*Abstract Co-Author*) Nothing to Disclose
M. Elizabeth Oates, MD, Lexington, KY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Surgical staging of regional lymph nodes with intraoperative lymphatic mapping and sentinel lymph node (SLN) biopsy is the standard of care for patients with melanomas exceeding 1 mm in depth. Tc-99m filtered sulfur colloid (SC) is the traditional radiopharmaceutical for guiding intraoperative SLN biopsy. In May 2013, the FDA approved Tc-99m tilmanocept (TM) (Lymphoseek), a low molecular weight, mannose receptor-targeted radiopharmaceutical. While published data suggest that TM may reduce the number of "hot" lymph nodes needed for accurate staging, the higher cost of TM is paramount to its clinical acceptance.

METHOD AND MATERIALS

Retrospective analysis compared two cohorts of male and female patients with melanoma: 41 TM (age range 11-92, mean 55.9 yr) and 41 SC (age range 23-84, mean 56.3 yr). Primary measures were number of "hot" SLN removed, determination of positive (metastatic) SLN, and average time required to visualize lymph nodes by preoperative scintigraphy when requested by the single surgeon.

RESULTS

The number of excised "hot" SNL was similar in both cohorts (mean TM: 1.6 vs SC: 2.1, $p < 0.79$). There was no difference in the sensitivity of the radiopharmaceuticals in determining metastatic involvement (mean TM 0.37 vs SC 0.49, $p < 0.64$). Less time was required to complete preoperative imaging on SC patients (mean TM: 54 min vs SC: 30 min, $p < 0.04$).

CONCLUSION

In comparing the number of excised "hot" lymph nodes, statistically there was no difference between the TM and SC cohorts. There was equivalent sensitivity of both radiopharmaceuticals for determining the presence of regional lymphatic metastases. When imaged, on average, it required less time to visualize the SLN for the SC cohort. Based on these results, it is difficult to justify the higher cost of TM.

CLINICAL RELEVANCE/APPLICATION

Currently, the contract price for TM is approximately four times that of SC. The prices of TM and SC will increase in 2016; there will continue to be an approximately 3.6-fold difference in cost. Reimbursements for SC and TM are now bundled into the payment for the procedure. Given that TM has not been shown to result in higher sensitivity for detection of metastatic regional spread to SLN, its clinical relevance becomes less favorable, particularly in the face of increasing prices and bundled reimbursements. Additionally, longer imaging times limit camera availability for other examinations.

SST07-02 SUV Max: An Underused Tool in the Prognostication of Uveal Melanoma

Friday, Dec. 2 10:40AM - 10:50AM Room: E353C

Participants

Adelola Oseni, MBBS, PhD, Coulsdon, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Cindy Leung, MBCh, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Ewa Nowosinska, MBBS, MRCP, Cambridge, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Anya Simeonova, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Hikmat Jan, MD, MBChB, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Ayshea Hameeduddin, MD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Athar Haroon, MBBS, Peterborough, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
William Fleming, London, United Kingdom (*Presenter*) Nothing to Disclose

PURPOSE

The diagnosis of uveal melanoma is a devastating one with 50% of patients going on to develop metastasis. Despite advancements in modern medicine the median survival for liver metastasis remains at 6 months. The purpose of this study was to correlate maximal Standardized Uptake Values (SUV max) on PET-CT for primary uveal melanoma with prognostic factors and outcomes post treatment of the tumour. Can SUV max be used to forecast likely disease progression in patients diagnosed with uveal melanoma?

METHOD AND MATERIALS

160 patients who received a clinical diagnosis of uveal melanoma between January 2012 to June 2015 and underwent a staging PET-CT scan were included in this retrospective study. The metabolic activities of these tumours were established by recording the SUV max of the tumour. This information was correlated with patient's demographic information, tumour size, stage and cytogenetic analysis. Additionally, SUV max was correlated with outcomes post treatment, namely tumour recurrence, metastasis and uveal melanoma related mortality.

RESULTS

The age and gender of patients conferred no significant difference in the SUV max recorded. There was a significant positive correlation between tumour height ($P<0.0001$, $r=0.61$) and tumour diameter ($P<0.0001$, $r=0.35$). SUV max was significantly higher with worsening stages of melanoma according to COMS and AJCC staging. SUV max was significantly increased in patients who developed tumour metastasis compared with those who did not ($p<0.0001$). There was also a significant difference in the SUV max of patients who died under 12 months from diagnosis of their melanoma compared with those who did not ($p=0.0027$). There was no significant difference in the SUV max of patients who developed recurrence.

CONCLUSION

SUV max greater than 6 can be associated with a greater risk of metastasis and mortality under 12 months from diagnosis. Increasing intensity of metabolic activity can be positively correlated with a worse outcome from the diagnosis of uveal melanoma and can be used to risk stratify patients, especially those who may warrant more frequent surveillance.

CLINICAL RELEVANCE/APPLICATION

SUV max greater than 6 can be used to risk stratify patients at greater risk of metastasis and mortality under 12 months from diagnosis of Uveal Melanoma.

SST07-03 Diffusion Weighted Chest MRI and FDG-PET/CT in Pediatric Patients Suffering from Primary Lymphoma: Does the Apparent Diffusion Coefficient (ADC) Correlate with Tracer Uptake (SUV)

Friday, Dec. 2 10:50AM - 11:00AM Room: E353C

Participants

Marc Regier, Hamburg, Germany (*Presenter*) Nothing to Disclose
Melissa Stoffels, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Cyrus Behzadi, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Michael G. Kaul, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Gerhard B. Adam, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Jochen Herrmann, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate diffusion weighted MR imaging (DWI) with ADC measurement for quantitative tumor analysis in primary pediatric lymphoma and to compare it to standardized uptake values (SUV) determined by FDG-PET/CT.

METHOD AND MATERIALS

Both DWI (TR/TE, 2000/66ms; FOV, 425x298mm; Matrix 256; slice thickness, 4mm; b-values, 0,25,50,75,100,500 and 1000s/mm² at 3T) and FDG-PET/CT were performed in 37 consecutive pediatric patients with histologically verified primary lymphoma prior to initiation of treatment. By placing a Region of Interest (ROI) encovering the entire tumor manifestation the mean (ADC_{mean}), minimum (ADC_{min}) and maximum ADC (ADC_{max}) were determined by two independent radiologists. Furthermore, the relative ADC_{min} ($rADC_{min}=ADC_{min}/ADC_{mean}$) and ADC_{max} ($rADC_{max}=ADC_{max}/ADC_{mean}$) were assessed. Reading the FDG-PET/CT images calculation of the mean (SUV_{mean}) and maximum (SUV_{max}) tumor metabolism as well as the relative SUV_{mean} ($rSUV_{mean}$) and SUV_{max} ($rSUV_{max}$) was consensually performed. The results of DWI and PET-CT were intraindividually compared. For statistical analysis Pearson's correlation coefficient was assessed.

RESULTS

Comparison of the ADC_{min} (mean, $0.89 \times 10^{-3} \text{mm}^2/\text{s}$) and SUV_{max} (mean, 6.2) revealed an inverse correlation ($r, 0.81$; $p, 0.04$). Furthermore, the $rADC_{min}$ and $rSUV_{max}$ showed a strong inverse correlation which was statistically significant ($r, 0.91$; $p, 0.024$). In contrast, there was no correlation between maximum ADCs and minimum SUVs ($r, 0.21$; $p, 0.69$) or between mean ADCs and SUVs ($r, 0.32$; $p, 0.49$), regardless of absolute or relative quantitative analysis.

CONCLUSION

Minimum ADCs correlate with higher tumor metabolism as determined by FDG-PET/CT and SUV measurements. As higher standardized uptake values can indicate a rather limited clinical course in primary lymphoma, DWI with ADC measurement might serve as a radiation free alternative severity marker in pediatric patients suffering from primary lymphoma.

CLINICAL RELEVANCE/APPLICATION

Due to the absence of x-ray exposition, injection of tracer or contrast material diffusion weighted MRI with determination of the minimum ADC might prove to serve as a valuable complementary technique in the evaluation of tumor metabolism in pediatric lymphoma patients.

SST07-04 Optimizing the Workflow of PET/MR for Pediatric Oncological Imaging

Friday, Dec. 2 11:00AM - 11:10AM Room: E353C

Participants

Anne Muehe, MD, Stanford, CA (*Presenter*) Nothing to Disclose
Lillian M. Lai, MD, Iowa City, IA (*Abstract Co-Author*) Nothing to Disclose
Praveen Gulaka, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Valentina Taviani, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
David B. Larson, MD, MBA, Los Altos, CA (*Abstract Co-Author*) License agreement, Bayer AG; Potential royalties, Bayer AG
Heike E. Daldrup-Link, MD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose
Samantha Holdsworth, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To streamline the workflow for whole-body PET/MR staging of pediatric cancer patients.

METHOD AND MATERIALS

In this prospective IRB-approved, HIPAA-compliant study we evaluated 15 "one stop" staging and restaging whole-body PET/MR scans in 11 pediatric patients with solid tumors. We mapped the PET/MR workflow by measuring the time for each step. This included the time for check-in (e.g. MRI eligibility), scan preparation (time placing coils, sequence planning), duration of PET/MRI scan, and image post-processing and PACS transfer. We also generated a satisfaction questionnaire for the patient and radiologist based on the United Airlines post-flight customer satisfaction survey. After the first five scans, we applied time saving interventions and re-evaluated the above-mentioned variables in 10 additional scans. Results before and after intervention were compared using a student's t-test, with $p < 0.05$ being considered statistically significant.

RESULTS

The initial workflow consisted of 28 minutes for patient preparation, 117 minutes for the actual PET/MR scan, and 8.5 hours for data post-processing. Upon streamlining the workflow patient preparation took 9 minutes; the PET/MR scan with coil placement could be reduced to 90 minutes; and data post-processing took less than 60 minutes. These time-savings of 19, 27 and 450 minutes were statistically significant. This led to improved patient satisfaction. Radiologist satisfaction was also elevated due to faster image data access, exam loading time, and sequence identification.

CONCLUSION

The workflow of whole-body PET/MR can be specifically streamlined for cancer staging of pediatric patients. This improves satisfaction of both patients and radiologists and results in a more economic scan protocol.

CLINICAL RELEVANCE/APPLICATION

PET/MR combines the high anatomical resolution and soft tissue contrast of MRI with the high sensitivity of PET, thereby overcoming both the limited sensitivity of traditional MRI approaches and the limited anatomical detail of PET/CT scans. Pediatric patient-specific workflows will improve the integration of this new technology into clinical practice.

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/>

David B. Larson, MD, MBA - 2014 Honored Educator

SST07-05 Use of Tc-99m SPECT/ CT Fusion Images to Enhance Therapeutic Efficacy of Percutaneous Ethanol Injection (PEI) in Autonomously Functioning Thyroid Nodule (AFTN)

Friday, Dec. 2 11:10AM - 11:20AM Room: E353C

Participants

Kunihiro Nakada, Sapporo, Japan (*Presenter*) Nothing to Disclose
Keiichi Kamijo, MD, PhD, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose
Noriyoshi Kato, MD, PhD, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose
Masayuki Sakurai, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

This study was aimed to determine whether fusion images of Tc-99m SPECT and CT is valuable in improving therapeutic efficacy of PEI for AFTN.

METHOD AND MATERIALS

39 patients with solitary AFTN and 7 patients with multiple AFTNs underwent PEI. 21 patients had hyperthyroidism while the remaining 25 had subclinical hyperthyroidism. 6 patients were refractory to I-131 therapy. All nodules were proved to be benign by FNA and were 3.1-5.3 cm in the diameter. Combination of Tc-99m SPECT and CT were repeatedly performed before and after completion of PEI session. Thin-slice MPR images of the neck were obtained using a 64-row MDCT with enhancement. 2D and 3D fusion images of Tc-SPECT and CT were obtained using a workstation. On the 3D images, the superior thyroid artery was identified as a feeding artery of the nodule in all. PEI was performed as a fractionated session. After local anesthesia, absolute ethanol was injected into the nodule under the guidance of a 12MHz US probe. Ethanol was also injected to make embolization in the feeding artery. Based upon findings of fusion images of 2nd study, patients were assigned to either of the following subgroups; A) those associated with complete disappearance of Tc uptake on the nodule and complete blocking of feeding artery (n=32). or B) others (n=7). Patients were further followed up for 36 months or longer.

RESULTS

The average of volume reduction rate (%), rate of achievement of normalized serum TSH, and rate of recurrence of

The average of volume reduction rate (%), rate of achievement of normalized serum TSH, and rate of recurrence of hyperthyroidism in the group A vs. the group B were 81 vs. 76 (ns), 100 vs. 56 ($p < 0.01$), and 5 vs. 56 ($p < 0.005$), respectively.

CONCLUSION

Fusion images of Tc-99m SPECT and CT are highly predictive of outcome of PEI in AFTN. Disappearance of Tc uptake and blocking of the feeding artery indicates long-lasting efficacy of PEI.

CLINICAL RELEVANCE/APPLICATION

•By use of SPECT/CT fusion image, feeding artery can be easily identified. Ablation of feeding artery may be a key issue for successful PEI for AFTN

SST07-06 Ectopic Thyroid Tissue Identified Through Radioiodine SPECT/CT in Patients with Thyroid Cancer Following Total Thyroidectomy

Friday, Dec. 2 11:20AM - 11:30AM Room: E353C

Awards

Student Travel Stipend Award

Participants

Anna Y. Li, BA, Shreveport, LA (*Presenter*) Nothing to Disclose

David H. Ballard, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to Disclose

Luis M. De Alba Padilla, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to Disclose

Horacio R. D'Agostino, MD, FACR, Shreveport, LA (*Abstract Co-Author*) Inventor, Vibrynt, Inc Consultant, Boston Scientific Corporation Speaker, Cook Group Incorporated

Zhiyun Yang, MD, Shreveport, LA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Ectopic thyroid tissue (ETT) can be readily localized with radioiodine SPECT/CT (RSPECT/CT) but may remain indeterminately localized with conventional radioiodine whole body scans (RWBS). We aimed to visualize ETT on RSPECT/CT and correlate the presence of orthotopic thyroid tissue (OTT) and/or ETT with quantitative parameters of functioning thyroid tissue in thyroid cancer patients after total thyroidectomy.

METHOD AND MATERIALS

A retrospective review of 20 consecutive patients with pathologically confirmed thyroid cancer who underwent radioiodine imaging after total thyroidectomy was performed over an 18-month period. RWBS were used to identify functioning thyroid tissue while RSPECT/CT was used to determine the thyroid tissue as orthotopic or ectopic, with ETT defined as thyroid tissue beyond C5-C7. The thyroglobulin (TG) to thyroid stimulating hormone (TSH) ratio, total uptake count, and total lesion volume were analyzed. The TG/TSH ratio equaled the total TG per number of post-operative days divided by the total TSH per number of post-operative days. Total lesion volume equaled the sum of the ellipsoid volume of each lesion. Total uptake count equaled the sum of the counts per lesion, calculated from total volume multiplied by the count difference/ 1.8 cm^3 at the lesion center, with count difference as count at the lesion center minus the background count measured at the C3 vertebral body.

RESULTS

On RSPECT/CT, 13 of 20 cases showed both OTT and ETT: 5 with high TG/TSH ratios (>1), 2 with expected high TG/TSH ratios (TG level not obtained due to slow-rising TSH after thyroidectomy), and 6 with low TG/TSH ratios (<1). Seven of 20 cases showed OTT only with low TG/TSH ratios. Seven of 20 cases had high or expected high TG/TSH ratios accompanying both OTT and ETT. Among cases with both OTT and ETT, total volumes averaged 3684.56 mm^3 in patients with high TG/TSH compared with 2601.50 mm^3 in patients with low TG/TSH; total counts averaged 13,973.25 in patients with high TG/TSH compared with 12,089.94 in patients with low TG/TSH.

CONCLUSION

All patients with high TG/TSH ratios had both ETT and OTT. Overall, high TG/TSH ratios were associated with higher total lesion volumes and total lesion counts per patient.

CLINICAL RELEVANCE/APPLICATION

ETT may cause subjective airway obstruction post-I-131 therapy, affect the dose for remnant ablation, or increase the risk of recurrent cancer; its recognition may impact thyroid cancer management.

SST07-07 Salivary Gland Damages After rhTSH-Aided Remnant Tissue Ablation with Low Dose I-131 in Patients with Thyroid Cancer

Friday, Dec. 2 11:30AM - 11:40AM Room: E353C

Participants

Kunihiro Nakada, Sapporo, Japan (*Presenter*) Nothing to Disclose

Keiichi Kamijo, MD, PhD, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose

Masayuki Sakurai, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose

Ysushi Furuta, MD, PhD, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose

Noriyoshi Kato, MD, PhD, Sapporo, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Salivary gland damages are a common adverse effect of high dose radioiodine therapy for thyroid cancer. So far, less is known about possible salivary gland damages after remnant tissue ablation low dose (30mCi) I-131. The aim of this study was to investigate whether salivary gland damages is induced by low dose I-131 ablation for thyroid cancer.

METHOD AND MATERIALS

56 patients with post-surgical papillary thyroid cancer, who were to undergo first radioiodine ablation with 30mCi of I-131, were enrolled. None of the patients had previous history of salivary gland disorders, diabetes, or collagen tissue diseases. TSH stimulation was achieved by i.m. injection of rhTSH for 2 consecutive days. On the next day of 2nd rhTSH, 30 mCi of I-131 was administered. Low iodine diet was applied from 7 days before to 3 days after I-131 administration. Salivary gland scintigraphy (SGS) using Tc-99m was performed within one month before and 4 to 5 months after ablation. Dynamic data(10 sec/F) were acquired in 128 x 128 matrix with or 30min. Lemon juice was administered at 20 min after Tc i.v. to stimulate salivary excretion. Both scan images and time activity curves for major salivary glands were evaluated. Clinical symptoms were assessed using a visual analogue scale. 41 out of 56 patients underwent follow-up SGS 2 to 3 years after ablation. I-131 uptake in the major salivary glands (RIU) was visually graded on the post therapy scan imaged 3 days after administration of I-131 in a 4 point scale; (-), (±), (+), and (++).

RESULTS

All patients had normal findings on the pre-ablation SGS. RIU was (-) in 46 glands, (±) in 104 glands, (+) in 50 glands, and (++) in 28 glands, respectively. Acute salivary injury was not observed in any of the patients. However, 3 of 56 patients (5%) showed abnormal findings on the post-ablation SGS. 2 patients showed adverse events in the unilateral PTG 4 months after ablation. One showed sialadenitis and another showed impaired patency salivary duct. In the remaining one, non-functioning in the left PTG was observed 3 years later. RIU was (+) or (±) in the affected PTG in those patients.

CONCLUSION

Although frequency of the events seems fewer than that with high-dose therapy, low dose I-131 ablation may induce subsequent salivary gland damage.

CLINICAL RELEVANCE/APPLICATION

Performance of SGS at regular interval is important in early detecting of I-131 induced salivary gland dysfunction after low dose remnant ablation.

SST07-08 (11)C-Choline PET/CT for Detection and Localization of Parathyroid Adenomas

Friday, Dec. 2 11:40AM - 11:50AM Room: E353C

Awards

Trainee Research Prize - Resident

Participants

Ahmad Parvinian, MD, Rochester, MN (*Presenter*) Nothing to Disclose
Erica L. Martin-Macintosh, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Ajit H. Goenka, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Jolanta M. Durski, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Brian Mullan, MBBCh, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Geoffrey B. Johnson, MD, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Currently, multiple imaging modalities are used to identify suspected parathyroid adenomas. 11C-choline PET/CT is a validated technique for restaging biochemically recurrent prostate cancer (PRCA), with reports highlighting its utility in other disease processes. We investigated the efficacy of this technique in detecting parathyroid adenomas.

METHOD AND MATERIALS

In this single-institution retrospective study, 7088 11C-choline PET/CT scans performed in 2933 males with PRCA from 1/2005-2/2016 were evaluated. Patients with suspected parathyroid adenomas were identified through a review of the electronic medical record and relevant imaging. Patient demographics, laboratory results, and lesion characteristics were noted. Pathologically proven parathyroid adenomas and lesions in patients with imaging and/or laboratory findings consistent with the diagnosis were considered positive.

RESULTS

Thirteen male patients (mean age 72 +/- 7 years) with pathologic and/or laboratory proven parathyroid adenomas were identified. All had abnormally elevated serum calcium and parathyroid hormone (PTH) levels. All adenomas were tracer-avid on choline PET/CT (SUV max 5.6 +/- 3.0), with activity averaging 4.2 times blood pool and 2.1 times adjacent thyroid. Adenomas measured 9 +/- 3 mm by 6 +/- 2 mm (mean long axis by short axis diameter), with an estimated volume of 262 +/- 170 mg. One case of an ectopic adenoma was identified. Of the six pathologically confirmed cases, none displayed high-grade features such as capsular, vascular, or adjacent tissue invasion. Other imaging modalities included dual isotope scans (6/13), CT (4/13), ultrasound (11/13), and magnetic resonance imaging (1/13). Three patients with possible adenomas on choline PET/CT went on to have thyroid pathology; however, none of these patients had abnormal calcium or PTH levels. Nine patients with possible adenomas on choline PET/CT did not undergo laboratory testing or surgery, presumably due to their PRCA and other comorbidities.

CONCLUSION

In our patient population, 11C-choline PET/CT identified parathyroid adenomas with high specificity. Prospective investigation is warranted to validate this result and delineate the utility of choline PET/CT relative to other modalities.

CLINICAL RELEVANCE/APPLICATION

11C-choline PET/CT shows promise in identifying parathyroid adenomas and may be a useful adjunct to established imaging modalities.

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:

Geoffrey B. Johnson, MD, PhD - 2015 Honored Educator

SST07-09 124I-mIBG PET/MRI versus PET/CT for Staging Patients with Metastasized Malignant Pheochromocytoma

Friday, Dec. 2 11:50AM - 12:00PM Room: E353C

Participants

Lale Umutlu, MD, Essen, Germany (*Presenter*) Consultant, Bayer AG
Markus Ruhlmann, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Walter Jentzen, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Andreas Bockisch, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Verena Ruhlmann, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of this study is to compare the diagnostic potential of 124I-mIBG (metaiodobenzylguanidine) PET/MRI to PET/CT for staging patients with metastasized malignant pheochromocytoma.

METHOD AND MATERIALS

10 patients (5 male, 5 female, age 53 ±20 years) with histopathologically confirmed malignant pheochromocytoma underwent a whole-body contrast-enhanced PET/CT (Biograph mCT 128, Siemens) and thereafter a whole-body contrast-enhanced PET/MR examination approximately 24 hours after injection of 40-50 MBq 124I-mIBG (Biograph mMR, Siemens). The MR protocol comprised the following sequences: 1) T1w VIBE ax. post contrast, 2) T2 HASTE ax., 3) DWI ax. and 4) TIRM cor. The datasets (PET/CT, PET/MRI) were read by a radiologist and a nuclear medicine specialist regarding lesion conspicuity (4 point ordinal scale) and lesion localization. Maximum and mean standardized uptake values (SUVmax and SUVmean) using volume of interest (VOI) technique were assessed from the PET(CT) and PET(MR) datasets. Statistical analysis included comparison of mean values using Mann-Whitney U test and correlation of SUVmax and SUVmean using Pearson`s correlation

RESULTS

44 malignant mIBG-positive lesions were detected with both PET/CT and PET/MRI with strongly positive correlated mean SUVmax (Pearson`s correlation $r=0.88$) and SUVmean (Pearson`s correlation $r=0.95$). Comparably high lesion conspicuity in the PET component of PET/CT (2.8 ± 0.5) and PET/MRI (2.9 ± 0.4 ; $p=0.45$) could be assessed with significant higher lesion conspicuity in MRI (2.8 ± 0.7) compared to CT (2.5 ± 0.8 ; $p=0.03$). Two small lung lesions were not visible on MRI and three predominantly osteolytic bone lesions could not be assessed on CT, but showed an easily definable hyperintense signal on MRI.

CONCLUSION

Integrated 124I-mIBG-PET/MRI shows high potential as a diagnostic procedure in metastasized malignant pheochromocytoma with in comparison to PET/CT comparable detection rate and high lesion conspicuity in PET, but significant higher lesion conspicuity in MRI compared to CT.

CLINICAL RELEVANCE/APPLICATION

PET/MRI may serve as a powerful alternative to PET/CT for staging of patients with malignant pheochromocytoma, particularly for pretherapeutic dosimetry prior to 131I-mIBG-therapy.

SST08

Neuroradiology (Diffusion, Perfusion and Structural Neuroimaging)

Friday, Dec. 2 10:30AM - 12:00PM Room: E353A



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Discussions may include off-label uses.

Participants

Tammie S. Benzinger, MD, PhD, Saint Louis, MO (*Moderator*) Research Grant, Eli Lilly and Company Investigator, Eli Lilly and Company Investigator, F. Hoffmann-La Roche Ltd
Anant Krishnan, MD, Royal Oak, MI (*Moderator*) Nothing to Disclose

Sub-Events

SST08-01 Diffusion Weighted Arterial Spin Labeling MRI for APOE4 Induced Cerebrovascular Leakiness in Alzheimer's Disease

Friday, Dec. 2 10:30AM - 10:40AM Room: E353A

Participants

Frederick C. Damen, PhD, Chicago, IL (*Presenter*) Nothing to Disclose
Rongwen Tain, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Riya Thomas, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Leon Tai, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Kejia Cai, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

APOE4 is the greatest genetic risk for sporadic Alzheimer disease (AD), increasing risk up to 12-fold compared to *APOE3*. Current data are conflicted on whether *APOE4* induces cerebrovascular (CV) leakiness. Diffusion weighted arterial spin labeling (DW-ASL) MRI extends conventional ASL by incorporating motion sensitizing gradients in order to attenuate blood water signal from the microvasculature. CV leakiness is derived from the difference between the ASL cerebral blood flow (CBF) maps with and without blood water attenuation. This study determined the effect of *APOE* genotype on CV leakiness using DW-ASL.

METHOD AND MATERIALS

DW-ASL MRI was performed on male E3FAD (express *APOE3*, and overproduce the proposed proximal AD neurotoxin, amyloid beta ($A\beta$); $n=6$) and E4FAD (express *APOE4* and overproduce $A\beta$, $n=11$) mice, on a 9.4T animal scanner using a fast spin-echo ASL-STAR (signal targeting with alternating radio frequency) sequence. A midbrain slice was scanned with imaging parameters: 30 mm tag width, 10 mm tag gap, diffusion gradients on and off (b -values = 0 or 50 ms/mm^2). $b = 50 ms/mm^2$ is strong enough to eliminate the flowing blood water signal in the capillaries yet weak enough to insignificantly attenuate the diffusing water signal that leaked into the interstitium. Other parameters include TR/TE = 2000/29.4 ms, 64x64 matrix, FOV 25x25 mm^2 , slice thickness 1.5 mm, 2 averages, and 6 repetition, 13 min scan per mouse.

Relative Cerebral Blood Flow (rCBF) maps were calculated and CV leakiness was calculated as the percentage reduction in rCBF due to diffusion gradient.

RESULTS

Diffusion gradient was found to reduce the detectable rCBF in the brain. The reduction of CBF was significantly higher in E4FAD mice than E3FAD mice (67%±8% vs. 22%±8%, $p<0.01$), indicating much higher CV leakage due to *APOE4* genotype.

CONCLUSION

CV leakiness was higher in mice expressing *APOE4* compared to *APOE3* when assessed with DW-ASL. DW-ASL, by measuring endogenous water leakage, is a novel technique to assess CV dysfunction in AD. Indeed, DW-ASL has the potential to be adopted in biomarker studies and as a pharmacodynamics read-out to assess preclinical and clinical therapeutic activity.

CLINICAL RELEVANCE/APPLICATION

APOE4 exerts a strong influence on cerebral vascular dysfunction. Identifying APOE-modulated cerebral vascular specific mechanistic pathways via preclinical imaging may lead to prevention and treatment options.

SST08-02 Measuring Cerebral Blood Flow and Cerebrovascular Reactivity Using Arterial Spin Labeling MRI in Neurologically-Asymptomatic, Community-Dwelling Subjects, Aged 50 Years and Older

Friday, Dec. 2 10:40AM - 10:50AM Room: E353A

Participants

Caoilfhionn Ni Leidhin, MBBCh, Dublin, Ireland (*Presenter*) Nothing to Disclose
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Alison Toomey, BSc, MSc, Dublin, Ireland (*Abstract Co-Author*) Nothing to Disclose
Josephine Byrne, BSc, Dublin, Ireland (*Abstract Co-Author*) Nothing to Disclose
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agreement, Nemoto Kyorindo Co, Ltd License agreement, Hitachi, Ltd License agreement, Toshiba Corporation

PURPOSE

The purpose of this study was to non-invasively and quantitatively assess cerebral blood flow (CBF) and thus cerebrovascular reactivity (CVR) in a cohort of nationally-representative subjects, aged 50 years and older, using pseudocontinuous Arterial Spin Labeling (pCASL) Magnetic Resonance Imaging (MRI) and carbon dioxide (CO₂).

METHOD AND MATERIALS

This research was carried out on a subset of participants enrolled in a national longitudinal study of ageing. 108 subjects underwent pCASL MRI at 3T (Achieva, Philips The Netherlands) during normo- and hypercapnia to assess CBF and CVR. Baseline CBF was determined using ASL during normocapnia; this provided an indication as to the overall metabolic health of brain tissue. Hypercapnia was induced via a MRI-compatible non-rebreather mask set up for gas delivery with a mixture of 5% CO₂/95% medical air; this determined CBF change in response to vasodilation. End-tidal (ET) CO₂ values were recorded. CVR was determined by calculating the percentage change in CBF per mmHg change in ETCO₂ due to hypercapnia. CBF and CVR maps were generated using AFNI (afni.nimh.nih.gov/afni), while linear regressions were carried out using Stata (12.1, StataCorp, USA).

RESULTS

56 of 108 participants were female. The mean cohort age was 69.6 years (min. 54, max. 83). CBF values ranged from a mean of 36.0/min/100g brain tissue during normocapnia (min. 2.2, max. 102.9) to a mean of 58.4ml/min/100g brain tissue (min. 14.4, max. 114.2) during hypercapnia. CVR values averaged 4.9 (SD ±3.9). Significantly, women had an increased baseline CBF of 5.5mmHg compared to men ($p \leq 0.044$). Similarly, women had an increased hypercapnic CBF of 7.9mmHg compared to men, which approached statistical significance ($p \leq 0.051$). No significant association was identified between CBF and age. There was no notable association between CVR and age, sex, blood pressure or heart rate.

CONCLUSION

This study mapped normocapnic and hypercapnic CBF as well as CVR, using pCASL in a group of neurologically-asymptomatic, nationally-representative, community-dwelling subjects, aged 50 years and older. Although no association with age was found, sex differences in CBF did exist.

CLINICAL RELEVANCE/APPLICATION

ASL quantitatively measures cerebral blood flow and in conjunction with a hypercapnic challenge, allows assessment of CVR and cerebrovascular reserve, thus identifying subjects who are at risk of cerebral ischaemia and who may benefit from intervention.

SST08-03 Utility of CT-Perfusion for Distinction Between Benign and Malignant Lymph Nodes in Primary Head and Neck Cancer - Preliminary Results from a Prospective, Blinded Feasibility Study Comparing CT-Perfusion Findings to Histopathology

Friday, Dec. 2 10:50AM - 11:00AM Room: E353A

Awards

Student Travel Stipend Award

Participants

Benjamin Kwan, MD, London, ON (*Presenter*) Nothing to Disclose
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Bret Wehrli, London, ON (*Abstract Co-Author*) Nothing to Disclose
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Anthony Nichols, MD, London, ON (*Abstract Co-Author*) Nothing to Disclose
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John Yoo, MD, London, ON (*Abstract Co-Author*) Shareholder, Critical Outcome Technologies Inc; Board of Directors, Critical Outcome Technologies Inc; Shareholder, BioMark Diagnostics Inc; Advisor, BioMark Diagnostics Inc;
Ting-Yim Lee, MSc, PhD, London, ON (*Abstract Co-Author*) License agreement, General Electric Company
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PURPOSE

Previous studies by our group examining N-staging in rectal cancer, have shown that CT-Perfusion (CTP) distinguishes between benign and malignant nodes with higher sensitivity and specificity over visual interpretation. This study evaluates whether these initial results may be extrapolated to patients with primary head and neck malignancies.

METHOD AND MATERIALS

12 patients with head and neck cancer were evaluated preoperatively with standard of care, diagnostic contrast-enhanced CT, followed by dynamic CTP of the neck. Analysis of the lymph nodes included: (1) Visual CT interpretation by the radiologist, (2) CTP, and (3) Histopathology (standard of reference). The Visual and CTP analysis were done independently, by different blinded reviewers. All visible neck lymph nodes were categorized qualitatively by the radiologist as being positive or negative for malignancy. Nodes identified by the radiologist were qualitatively evaluated using CTP. Nodes with peripheral vascularization were classified as malignant, whereas nodes with uniform perfusion were classified as non-malignant. The lymph nodes were also assessed for blood flow, blood volume, mean transit time and capillary permeability. Patients were treated surgically with neck lymph node dissections as per standard protocol. The nodes were resected by anatomic level, labelled, and sent to pathology in separate containers. The pathologist was blinded to the imaging and perfusion results.

RESULTS

63 nodes were identified in total. Visual interpretation yielded 17 abnormal and 46 normal nodes; Sensitivity was 69% and specificity was 84%. Similar to our earlier work in rectal cancer, CTP demonstrated a unique pattern of peripheral vascularization in malignant nodes, and homogeneous perfusion in benign nodes. CTP interpretation yielded 17 abnormal and 46 normal nodes; Sensitivity was 73% and specificity was 88%. The smallest lymph node analyzed by CTP measured 3 mm.

CONCLUSION

In head and neck cancer patients, visual CT inspection and CTP show comparable sensitivity and specificity for identification of benign and malignant lymph nodes. CTP may have a role as a complementary modality to visual CT interpretation for N-staging of head and neck malignancies.

CLINICAL RELEVANCE/APPLICATION

Although preliminary results in rectal cancer have shown early promise, further work needs to be done to determine whether CTP can be a robust tool for accurate N-staging in other malignancies.

SST08-04 Optimal Labeling Plane Selection for Pseudo Continuous Arterial Spin Labeling

Friday, Dec. 2 11:00AM - 11:10AM Room: E353A

Awards

Student Travel Stipend Award

Participants

Li Zhao, PhD, Boston, MA (*Presenter*) Nothing to Disclose

Saliil Soman, MD, MS, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

David C. Alsop, PhD, Boston, MA (*Abstract Co-Author*) Research support, General Electric Company Royalties, General Electric Company

PURPOSE

Pseudo continuous arterial spin labeling (PCASL) is a non-contrast MR perfusion imaging method, which provides insights into a variety of brain pathologies. The signal level of PCASL may be dependent on patient specific factors, such as tortuous flow, abnormal flow velocity, and magnetic field variations near the labeling plane, the location of which is optimized in this work.

METHOD AND MATERIALS

Four healthy volunteers were scanned with a GE 3T HDxt scanner. A Three-plane localizer was performed to locate the region of interest. Time of flight angiography was used to identify arterial anatomy to specify labeling planes. Three locations were chosen: L1: on the inferior border of the cerebellum; L2: above the carotid bifurcation and below the V3 segment (below C2) and L3: below the carotid bifurcation. Two PCASLs were tested at each location: one used parameters recommended in a recent consensus document and the other was optimized for off-resonance robustness and velocity independence.

RESULTS

Relatively poor off-resonance response was observed at L1 for both PCASLs. The optimized PCASL parameters, however, produced an asymmetric response. Since L1 is close to the skull and optimal PCASL used pulses that affect a wider slab around the labeling plane, the susceptibility of adjacent air-bone interfaces may limit the performance of PCASL. At L2 and L3, the optimized PCASL showed superior off-resonance robustness as designed. But at L3, the on-resonance signal was reduced by 20% (recommended/optimized $0.82 \pm 0.02 / 0.86 \pm 0.05$), compared with that of L1 ($1.06 \pm 0.07 / 0.99 \pm 0.05$), and L2 ($1 / 0.99 \pm 0.03$). A longer transit time and the turbulence near the bifurcation may have reduced the signal. With recommended PCASL parameters, the off-resonance response at L3 was narrower than that of L1 and L2. One possible explanation is that the higher common carotid artery velocities attenuated the labeling efficiency further. Consistent with its design, optimized PCASL images remained robust to off-resonance at L3.

CONCLUSION

After comparing off-resonance robustness, velocity dependence, and on-resonance SNR, labeling was best at L2: above the carotid bifurcation and below V3 (below C2) based on MR angiography or between the second and third cervical vertebrae.

CLINICAL RELEVANCE/APPLICATION

Our results should improve the reproducibility and accuracy of PCASL MRI for clinical studies and clinical research applications.

SST08-05 Optimized Image Acquisition and Leakage Correction Post-Processing of Dynamic Susceptibility Contrast (DSC) MRI for Highest Accuracy of Relative Cerebral Blood Volume (rCBV) Quantification in Human Brain Tumors

Friday, Dec. 2 11:10AM - 11:20AM Room: E353A

Participants

Kevin Leu, Los Angeles, CA (*Presenter*) Nothing to Disclose

Jerrold L. Boxerman, MD, PhD, Providence, RI (*Abstract Co-Author*) Medical Advisor, Imaging Biometrics, LLC

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PURPOSE

Various strategies have been employed to combat T1 or T2* leakage artifacts resulting from contrast agent extravasation in brain tumors, including adjusting the flip angle, use of a preload, and diverse post-processing leakage correction algorithms. The current study uses DSC simulations and experimental testing to optimize the image acquisition parameters and leakage correction algorithms to obtain rCBV measurements with the highest accuracy.

METHOD AND MATERIALS

DSC data was simulated using developments from Quarles *et al.*(1). Flip angle, TE, TR, and preload dosages were varied to simulate various MRI protocols. Monte Carlo simulation of 100 tumors, with varying K_{trans} , v_e , and T10, was used to test each protocol. Uncorrected rCBV, unidirectional leakage correction, and bidirectional leakage correction(2) estimates were compared to a gold standard (tumor without contrast extravasation).

RESULTS

Low flip angles, high TE, high TR, and preload dosage increase T2*-weighting. The smaller the deviation of the uncorrected

Low flip angles, high TE, high TR, and preload dosage increase T2*-weighting. The smaller the deviation of the uncorrected deltaR2* curve from the gold standard, as measured by uncorrected rCBV error, the smaller the residual error was after leakage correction. Furthermore, rCBV estimates with bidirectional correction had lower percentage error than those with unidirectional correction both with and without preload by a factor of 2.0±0.2. Optimal protocols had flip angle 60 degrees with TE = 35 ms, TR ranging from 1.5-2 s, and preload dosage varying from 0 to 1/2, with the DSC-MRI injection using the remaining portion of a full dose.

CONCLUSION

Results suggest that the best performance occurs when the acquisition protocol yields approximately equal T1 and T2* contributions from contrast agent extravasation, rather than a DSC-MRI signal with dominant T1- or T2*-weighting. The bidirectional rCBV estimates consistently outperform the unidirectional and uncorrected rCBV estimates.

CLINICAL RELEVANCE/APPLICATION

Clinical trials using DSC-MRI perfusion should focus on using protocols that minimize errors for the uncorrected rCBV to best recover "true" rCBV.1) Quarles et al., Phys Med Biol, 2009; 2) Leu et al., JMRI, 2016

SST08-07 Ultra-high-field DTI of the Visual Pathway at 7T: Preliminary Results in Normal Tension Glaucoma

Friday, Dec. 2 11:30AM - 11:40AM Room: E353A

Awards

Student Travel Stipend Award

Participants

Manuel Schmidt, MD, Erlangen, Germany (*Presenter*) Nothing to Disclose
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Stephan P. Kloska, MD, Muenster, Germany (*Abstract Co-Author*) Nothing to Disclose
Ralph Kimmlingen, Erlangen, Germany (*Abstract Co-Author*) Siemens employee
Tobias Engelhorn, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Arnd R. Doerfler, MD, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

There is evidence that glaucoma is rather a neurodegenerative than a merely ocular disease. MRI points to a primarily cerebral etiopathology of distinct subtypes of glaucoma, namely normal-tension glaucoma (NTG). With DTI, the visual pathway from the optic nerves and the lateral geniculate nucleus (LGN) to the optic radiation, can be evaluated morphologically and functionally. In this preliminary study, we examined the potential benefits of ultra-high-field-MRI at 7T compared with conventional imaging at 3T.

METHOD AND MATERIALS

We examined 7 Patients with advanced stages of NDG and 10 healthy control individuals at 7T (Siemens planned 7T system) and at 3T (Siemens Magnetom Trio). The examination protocol included a high-resolution T1-weighted MP2RAGE, DTI, FLAIR TSE as well as SWI covering the visual pathway. Total acquisition time was less than 45 minutes. Segmentation and volumetry of the LGN was performed using the T1w MP2RAGE. We evaluated the fractional anisotropy by performing selective, deterministic tractography of the optic radiation from the LGN to the visual cortex.

RESULTS

LGN can be superiorly delineated at 7T compared to standard imaging. There was a significantly reduced volume of the LGN in NTG. Degeneration of axonal structures of the optic radiation as well significantly reduced fractional anisotropy were revealed by selective tractography of the optic radiation. With SWI at 7T, even smallest microbleeds can be detected in the optic radiation as a possible cause of retrograde degeneration.

CONCLUSION

Ultra-high-field-MRI of the visual pathway at 7T outperforms standard imaging protocols regarding morphological and functional imaging. High-resolution imaging allows easy and reliable delineation of the LGN on T1w images to perform selective tractography of the optic radiation to unveil axonal and neuronal degeneration in glaucoma in reasonable scanning time in a clinical setting.

CLINICAL RELEVANCE/APPLICATION

Early detection of NTG as well as early treatment and prevention of irreversible visual field defects. Differentiation of glaucoma subtypes.

SST08-08 Endogenous and Non-radiative Imaging Marker of Neuroinflammation Accurately Reflects Disease Progression in Alzheimer Disease

Friday, Dec. 2 11:40AM - 11:50AM Room: E353A

Participants

Qing Wang, PhD, St. Louis, MO (*Presenter*) Nothing to Disclose
Yong Wang, PhD, St. Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Jon J. Christensen, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Anne Fagan, PhD, Saint Louis, MO (*Abstract Co-Author*) Consultant, F. Hoffmann-La Roche Ltd Consultant, IBL International Corp
John Morris, Saint Louis, MO (*Abstract Co-Author*) Research support, Eli Lilly and Company Consultant, Eli Lilly and Company
Tammie S. Benzinger, MD, PhD, Saint Louis, MO (*Abstract Co-Author*) Research Grant, Eli Lilly and Company Investigator, Eli Lilly and Company Investigator, F. Hoffmann-La Roche Ltd

PURPOSE

Mounting evidence suggests that neuroinflammation (characterized by activation of microglia and astrocytes) may contribute as much (or more) to Alzheimer disease (AD) pathogenesis and progression. In comparison to the initial PK11195 PET images, we conducted longitudinal studies using a novel diffusion MRI method, diffusion basis spectrum imaging (DBSI), to quantify

neuroinflammation and predict AD progression without using contrast-agent or radioactive tracer.

METHOD AND MATERIALS

DBSI was implemented on 44 healthy control (HC) [amyloid-, neuronal injury-] and 18 preclinical AD stage 1 [amyloid+, neuronal injury-] with CSF YKL40 (proposed biomarker of gliosis/inflammation) measure. Correlation were calculated between YKL40 and DBSI derived cellularity. Twenty four participants were included in a PET PK11195 study in 2006. Four interesting cases were demonstrated here. PK11195 images were normalized to a whole brain mean value to compute standardized uptake value ratio (SUVR). Longitudinal diffusion MRI scans on a 3T scanner were collected in participants following their initial PET scan. The T1 image was used to register the PK11195 image with DBSI neuroinflammation images.

RESULTS

We observed a significant correlation between levels of YKL40 and DBSI-cellularity (Fig. 1), suggesting DBSI being a non-invasive measure of neuroinflammation. In one amyloid-negative participant who progressed into MCI in 2013, DBSI-detected neuroinflammation increased over the course of the follow-up visits, consistent with the participant's clinical outcome (Fig. 2). In contrast, the severity of DBSI-detected inflammation did not change from 2008 to 2015 in an amyloid-positive participant who remains cognitive normal (CN). Two other amyloid-positive CN participants who later converted to very mild AD were also examined. Excitingly, we found the longitudinal neuroinflammation rate of change, not the baseline DBSI neuroinflammation severity, related strongly to disease progression (Fig. 3).

CONCLUSION

DBSI provides a noninvasive, non-radiative means to quantify neuroinflammation. Additionally, we demonstrate that a 3T clinical MRI scanner running FDA-approved diffusion sequences could reliably generate DBSI neuroinflammation images.

CLINICAL RELEVANCE/APPLICATION

With DBSI, neuroinflammation can be not only detected and quantified noninvasively in preclinical AD, but also can be tracked longitudinally without radiation.

SST08-09 Definition of New Anatomical Rules for Preterm and Adults Brain Tractography: From Literature Review to Application

Friday, Dec. 2 11:50AM - 12:00PM Room: E353A

Participants

Louis-Marie Terrier, Tours, France (*Presenter*) Nothing to Disclose
Frederic Andersson, Tours, France (*Abstract Co-Author*) Nothing to Disclose
Lila Robin, Tours, France (*Abstract Co-Author*) Nothing to Disclose
Helen Clery, Tours, France (*Abstract Co-Author*) Nothing to Disclose
Christophe Destrieux, MD, PhD, Tours, France (*Abstract Co-Author*) Nothing to Disclose
Elie Saliba, Tours, France (*Abstract Co-Author*) Nothing to Disclose
Isabelle Filippiak, Nouzilly, France (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Our work consisted to provide new guidelines for delineation of ROIs with good anatomic tracts reconstruction usable for preterm and adult WM tracts.

METHOD AND MATERIALS

Adults study was performed on a 3T MRI (Siemens Verio, Erlangen, Germany); DTI sequence (resolution=2.5x2.5x2.5 mm² ; number gradient directions = 30 ; b-value= 1000 mm²/s) and high spatial resolution T1-weighted were acquired for anatomic guidance. Specific WM tracks were performed on 6 adults subjects using a multiple ROIs according to anatomic knowledge and rules existing in literature to measure similarity, we used DICE coefficient by 10 experts on the same 6 subjects to establish the new rules. We investigated the new rules on Preterm (born between 26 to 39 weeks of gestation), from a prospective, multi-centric, observational registry, Epirmex's cohort. 149 MRI were analysis. All WM fasciculus were delineated with tractography (FACT algorithm, FA threshold 45°, length limited with our rules) from whole brain tractogram and mean FA and MD were extracted along tract.

RESULTS

We identified, tested and evaluated different anatomical rules of delineation of ROIs proposed from the literature review for the reconstruction of tracts of white matter. Result showed that tractography atlas emerged were no accurate or homogenous rules for delineation of these ROIs. New guidelines, fast, simple and reproducible for delineation of ROIs were defined for 8 main tracts - corpus callosum (CC), cingulate, superior longitudinal fasciculus, corticospinal tract (CST), fornix, uncinata fasciculus, inferior longitudinal fasciculus, inferior fronto-occipital fasciculus. Reproducibility is good with an average degree of similarity of 82.6% between 2 operators for the same tract. These new rules were also performed on preterm cohort. Delineation of fasciculus was possible and consistent with anatomical description. We have also showed that an injury of CC or CST (ie. Lower FA values) was observed and should revealed a neurodevelopmental delay.

CONCLUSION

New rules for delineation of ROIs appear simple, reproducible and usable for preterm and adults WM tracts.

CLINICAL RELEVANCE/APPLICATION

This study will permit to use tractography with these new rules in clinical or neurosciences studies more easily and consistently: for exemple to perform analysis comparison or to predict preterm outcome.

SST09

Pediatrics (Neuroradiology)

Friday, Dec. 2 10:30AM - 12:00PM Room: E264



AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50

Participants

Michael J. Paldino, MD, Houston, TX (*Moderator*) Nothing to Disclose

Sub-Events

SST09-02 **Advanced Virtual Monochromatic Reconstruction of Dual-Energy Unenhanced Head CT in Children: Image Quality Comparison with Standard Monoenergetic Images and Conventional Polychromatic CT**

Friday, Dec. 2 10:40AM - 10:50AM Room: E264

Awards

Student Travel Stipend Award

Participants

Juil I. Park, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
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Woo Sun Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
In-One Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the most effective advanced virtual monochromatic imaging (VMI) energy level for maximizing the brain parenchymal image quality in dual-energy unenhanced brain computed tomography (CT) of children and to assess the improvement with this technique compared with conventional monochromatic reconstruction and polychromatic scanning

METHOD AND MATERIALS

Institutional review board approval was obtained with no informed consent required for this retrospective analysis. 23 consecutive dual-energy unenhanced brain CT scans (7 boys and 16 girls; mean age 7.8 years; range, 9 months to 18 years) acquired in a dual-source dual-energy CT scanner were retrospectively reconstructed at 13 VMI energy levels from 40 to 100keV in 5-keV increments using both conventional (Mono) and advanced monochromatic reconstruction (Monoplus) techniques. The following six quality indexes were analyzed: gray matter (GM) noise and signal-to-noise ratio (SNR), white matter (WM) noise and SNR, GM-WM contrast-to-noise ratio (CNR) and posterior fossa artifact index (PFAI). The VMI series with the best CNR were chosen from each monochromatic reconstruction technique and were compared with 28consecutive scans obtained with the same scanner in 80 or 120-kVp single-energy mode.

RESULTS

The maximal GM SNR, WM SNR, and GM-WM CNR values were observed at 60keV (Monoplus), and 65keV (Mono). The CNR of Monoplus was significantly better than that of Mono and polychromatic CT (3.38, 3.18, and 2.69, respectively $p<0.01$), while GM and WM SNR from Monoplus showed no significant difference compared to those of Mono and was significantly better than those of the polychromatic CT ($p<0.01$). The minimal PFAI was obtained at 70keV (Monoplus) and 75keV (Mono). The PFAI of former was significantly lower than that of latter and conventional polychromatic CT ($p<0.01$). Quality index improvement ratios ranged from 8% to 34%.

CONCLUSION

The advanced virtual monochromatic reconstruction of dual-energy unenhanced brain CT scans at 60keV (optimal energy levels) maximize image quality compared with scans obtained with conventional monoenergetic and polychromatic CT.

CLINICAL RELEVANCE/APPLICATION

Reconstruction of dual-energy unenhanced brain CT at 60keV optimizes the brain image quality as well as reduces the radiation exposure in pediatric brain CT. Application of advanced virtual monochromatic imaging further improves the image quality compared with the conventional virtual monochromatic imaging.

SST09-03 **A Voxel Based Morphometry MRI Study of Altered Gray Matter Volume and the Preliminary Application of 3D-ASL in Attention Deficit Hyperactivity Disorder(ADHD) Children**

Friday, Dec. 2 10:50AM - 11:00AM Room: E264

Participants

Jian Wang, Wuhan, China (*Presenter*) Nothing to Disclose
Jingjing Shi, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Linying Guo, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Wenzhen Zhu, MD, PhD, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the altered volume of gray matter and preliminary evaluation of aberrant cerebral perfusion in ADHD children.

METHOD AND MATERIALS

This study was approved by the ethics committee and written informed parental consent was obtained for each children prior to

examination. In the first part of this research, 18 ADHD and 15 healthy children were enrolled, these two groups were well-matched to each other with reference to age, gender, handedness and intelligence quotient, respectively. 3D-T1BRAVO scanning was performed and voxel-based morphometry analysis was used to assess the variation of whole-brain gray matter volume. In addition, 14 ADHD and 15 healthy children were enrolled as the second part of this study. Then 3D-ASL scanning was performed. The ASL data were transferred to an off-line workstation (General Electric, Advantage workstation, edition 4.5). CBF-map was constructed automatically from ASL data by the workstation's function software. ROIs were placed in bilateral caudate nucleus head, globus pallidus, putamen, thalamus and splenium of corpus callosum to detect the perfusion differences between these two groups. Furthermore, the relationships between ASL-CBF and age in the selected ROIs were analyzed using Pearson's correlation analysis.

RESULTS

The gray matter volume of the right cerebellum, left superior temporal gyrus, left lingualis gyrus, right thalamus and left cuneus in ADHD group was significantly lower than that in the control group. The CBF of the bilateral caudate nucleus head, bilateral thalamus and left globus pallidus in ADHD group was significantly elevated compared to that in the control group. The CBF of bilateral caudate nucleus head and right thalamus in control group was positively correlated with age ($R=0.4767, 0.4671, 0.299$, respectively; $p < 0.05$), while there were no significant correlation between CBF and age in ADHD group.

CONCLUSION

The altered gray matter volume and perfusion in ADHD children suggest malfunction of advanced cognitive neural circuits. Furthermore, the correlation between CBF and age in several cerebral regions indicate the aberrant trajectory of ADHD children, which is helpful for further detecting the neural pathology of ADHD.

CLINICAL RELEVANCE/APPLICATION

These alterations about the gray matter volume and perfusion of ADHD children may help better account for the neural pathology and symptoms of attention deficit hyperactivity disorder.

SST09-04 Effect of ICA-based Denoising on Performance of Network-Based Intelligence Prediction in the Pediatric Epileptic Brain

Friday, Dec. 2 11:00AM - 11:10AM Room: E264

Participants

Zili David Chu, PhD, Houston, TX (*Presenter*) Nothing to Disclose
Wei Zhang, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Farahnaz Golriz, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Lynn Chapieski, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Michael J. Paldino, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Resting functional MRI (r-fMRI) has become a major tool to evaluate the cerebral network toward understanding brain development and pathology. The inherent low signal to noise ratio in fMRI renders the network susceptible to noise contributed from multiple sources, including machine, non-neural physiology and motion. Recently independent component (IC) analysis (ICA) that separates a multivariate signal into additive subcomponents, found a role in the noise reduction of fMRI data. The noise components can be identified through their temporal and spatial features and removed from the 4D r-fMRI data. In this work, we sought to investigate the impact of such denoising on performance of brain network-based prediction of intelligence.

METHOD AND MATERIALS

28 epilepsy patients were identified for this IRB approved study. Full scale intelligence quotient (IQ) was measured by a pediatric neuropsychologist. Network nodes were defined based on subdivision of brain gray matter into approximately 350 volumes of interest. Edges were defined as the absolute value of the pairwise correlation of BOLD time series between nodes. A series of metrics were derived for each patient from the brain network and formed a feature vector for a machine learning algorithm to predict IQ. ICA was performed on the r-fMRI data using FSL Melodic software. Noise components were identified manually and removed. Those cases with few neuronal signal ICs were identified using threshold of signal-ICs/all-ICs $< 7\%$. The percent variance explained was computed for three denoising levels: 1. without denoising (raw time series); 2. ICA denoising (denoised time series); 3. excluding cases with few neuronal signal ICs.

RESULTS

Network construction based on denoised time series did not outperform raw time series for the purposes of IQ prediction. However, datasets not previously identified as poor quality were successfully excluded based on ICA denoising. This method resulted in marked improvement in IQ prediction by the machine learning algorithm.

CONCLUSION

ICA-based denoising identified data too noisy to make any inference, resulting in better IQ prediction.

CLINICAL RELEVANCE/APPLICATION

The prediction of IQ from brain network will be very useful in clinical diagnosis and management. In this work, we found the IQ predictability is significantly improved after ICA denoising.

SST09-05 Accuracy of Patient-Level Prediction of Global Intelligence using Metrics of Network Architecture in Children with Epilepsy

Friday, Dec. 2 11:10AM - 11:20AM Room: E264

Participants

Michael J. Paldino, MD, Houston, TX (*Presenter*) Nothing to Disclose
Wei Zhang, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Farahnaz Golriz, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Lynn Chapieski, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Zili David Chu, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Architecture of the cerebral network has been shown to associate with IQ in children with epilepsy. However, subject-level prediction on this basis, a crucial step toward harnessing such analyses for the benefit of epilepsy patients, has yet to be achieved. We aimed to optimize network metric computation with regard to the capacity for patient-level IQ prediction.

METHOD AND MATERIALS

Patients were retrospectively identified: 1. Localization-related epilepsy; 2. Resting state fMRI; 3. Full scale IQ by a neuropsychologist. Brain network nodes were defined by anatomic parcellation, first in patient space (nodes defined for each patient) and again in template space (same nodes for all patients). Node parcellation in both spaces was performed at three different sizes, resulting in networks containing approximately 350, 750, or 1500 nodes. Whole-brain, weighted graphs were constructed according to pair-wise correlation of BOLD-signal time courses between nodes. A range of thresholds was applied to each graph (range: 0-0.9) on the basis of correlation coefficient. The following metrics were calculated: clustering coefficient, transitivity, modularity, path length, and global efficiency. Metrics computed on graphs in patient space were normalized to the same metric computed on a random network of identical size. A machine learning algorithm was trained on a subset of the cohort; we then assessed the ability of the algorithm to predict IQ of the remaining individuals based on their network metrics.

RESULTS

Twenty-six patients met criteria (age: 4-18 yrs). Percent variance explained for each condition is presented in Table 1. Accounting for differences in network size inherent to a pediatric cohort was a dominant factor in accurate IQ prediction. In this regard, network construction in patient space with normalization of metrics to a random network of identical size outperformed use of a standard template. Node size was also an important factor; larger networks had greater accuracy. There was an inverse relationship between accuracy and graph threshold.

CONCLUSION

Optimal patient-level prediction was achieved with: networks constructed in patient space; smallest nodes; no graph threshold.

CLINICAL RELEVANCE/APPLICATION

Our results provide preliminary guidelines for optimal construction of whole-brain networks based on resting state fMRI for the purpose of patient-level prediction of global brain function.

SST09-06 Altered Regional Brain Activities in Children with Non-syndromic Cleft and/or Lip Palate (CL/P): A Resting-State Functional MRI Study

Friday, Dec. 2 11:20AM - 11:30AM Room: E264

Participants

Hua Cheng, MD, Beijing, China (*Presenter*) Nothing to Disclose
Yingzi Gao, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Yang Fan, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Wenjing Zhang, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Yun Peng, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Significant cortical structural alterations were found in patients with CL/P. These structural alterations may lead to brain functional abnormality. The purpose of this study was to detect the abnormal regional brain activity of children with CL/P using rs-fMRI

METHOD AND MATERIALS

Eight children (6-12yrs) with nonsyndromic CL/P and eight age- and gender-matched healthy controls (HCs) were involved in this study. rs-fMRI data were acquired for all subjects using a 3.0 T MR scanner. To detect differences of regional brain activity between two groups, Regional Homogeneity (ReHo), amplitude of low frequency fluctuations (ALFF) and fractional ALFF were computed. Then, statistical differences of those parameters between two groups were detected using two-sample t-test. Besides, assessments including IQ, auditory brainstem response (ABR) and Chinese language clear degree scale (CLCDS) were performed in CL/P group. The correlation between values of rs-fMRI indices and results of these assessments were analyzed

RESULTS

Only ReHo from those three indices revealed significant difference between two groups of children. Compared with HC, the CL/P group showed increased ReHo values in three cortical regions of the right temporal lobe (see Fig. 1), including the superior/middle temporal gyrus, the inferior temporal gyrus, and temporal pole. The superior/middle temporal gyrus was involved in auditory processing and language reception. The inferior temporal gyrus was a crucial area to analyze visual information. Temporal pole is related to brain network that governs personal and social behavior, emotion and decision making. Besides, there was one cortical area with reduced ReHo value in the left superior frontal gyrus. In addition, CLCDS was associated with increased ReHo in the right superior/middle temporal gyrus ($r=-0.868$, $p=0.017$). It indicates the relationship between increased ReHo and abnormal pronunciation

CONCLUSION

This study found abnormal spontaneous brain activities in multiple brain regions, especially in verbal and cognitive areas, in nonsyndromic CL/P children. It might contribute to understanding the abnormality of functional architecture of CL/P

CLINICAL RELEVANCE/APPLICATION

Altered regional brain activities were found in children with nonsyndromic CL/P using resting-state fMRI. It may offer great help in understanding the abnormality of functional architecture of CL/P

SST09-07 Image Quality Assessment of Synthetic Brain MRI in Children: Comparison with Conventional MR Imaging

Friday, Dec. 2 11:30AM - 11:40AM Room: E264

Participants

So Mi Lee, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Young Hun Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Seung Hyun Cho, MD, Daegu, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyung Min Shin, Daegu, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Won Hwa Kim, MD, PhD, Daegu, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Gab Chul Kim, PhD, Daegu, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hye Jung Kim, Daegu, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyejin Cheon, Daegu, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jongmin J. Lee, MD, PhD, Daegu, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the image quality and acquisition time of synthetic brain MR imaging in children and to compare with conventional brain MRI.

METHOD AND MATERIALS

Institutional review board approval and written informed consent were obtained for this prospective study. Synthetic MR imaging was implemented in addition to routine brain MR scanning in twenty-nine children (mean age, 5.7 years, age range, 0-16 years) on a 32-channel GE 3T scanner. Synthetic T2-, T1-weighted and FLAIR images matching conventional sequence settings were generated and were compared with conventional images. Overall image quality was rated on a 5-point scale (1=non-diagnostic, 2=poor, 3=average, 4=good, 5=excellent). Image noise, gray-white matter differentiation, flow-related artifact and lesion conspicuity were evaluated on each sequence using a 5-point scoring system. The synthetic MR imaging acquisition time and total acquisition time for all 3 conventional MR sequences were compared.

RESULTS

Synthetic T2-, T1-weighted images were of average or good quality (mean score, 3.4 and 3.3, respectively). Synthetic FLAIR images were rated below average (mean score 2.8). Synthetic MR images were assessed to be of inferior image quality than conventional MR images. Image noise and flow-related artifacts were more prominent on synthetic MR images. GM-WM differentiation was similar on T2- and T1-weighted images, while synthetic FLAIR images showed significantly poor GM-WM differentiation than conventional FLAIR. Lesion conspicuity showed no significant difference between two images. The acquisition time of synthetic MR imaging was significantly shorter than conventional MR imaging (6 minutes vs. 9 minutes 15 seconds).

CONCLUSION

Synthetic T2-, T1-weighted images were diagnostically acceptable, while synthetic FLAIR images were suboptimal. The acquisition time of synthetic MR imaging was about 30% shorter than conventional MR imaging.

CLINICAL RELEVANCE/APPLICATION

Synthetic brain MR images seem to be diagnostically acceptable, even though artifacts significantly degraded synthetic FLAIR images. Considering that synthetic MR imaging enables quantitative MR analysis and reduces the scanning time, synthetic MR imaging could be a useful alternative to conventional MR sequences.

SST09-08 Imaging Characteristics of Pediatric Diffuse Midline Gliomas Based on the Presence of a Poor Prognostic Marker Histone H3 K27M Mutation

Friday, Dec. 2 11:40AM - 11:50AM Room: E264

Awards

Student Travel Stipend Award

Participants

Mariam S. Aboian, MD, PhD, San Francisco, CA (*Presenter*) Nothing to Disclose
David Solomon, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Erin Felton, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Marc C. Mabray, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Sabine Mueller, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Soonmee Cha, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The molecular basis underlying pediatric gliomas is distinct from adult gliomas. One unique molecular alteration that has been identified in pediatric gliomas is K27M missense mutation in histone H3 variants and presence of this mutation correlates with poor prognosis. The forthcoming 2016 WHO Classification will include "diffuse midline gliomas with histone H3 K27M mutation" as a new diagnostic entity. We identify imaging characteristics of these diffuse midline gliomas in pediatric patients based on the presence of histone H3 K27M mutation.

METHOD AND MATERIALS

We identified 42 pediatric patients (<20 yrs old) with diffuse gliomas with available MRI imaging. Histopathologic subtypes included diffuse astrocytoma, anaplastic astrocytoma, and glioblastoma. We evaluated the imaging patterns of these diffuse gliomas based on their location, enhancement pattern, and necrosis.

RESULTS

In these 42 patients, tumors were supratentorial in origin in 48.8% of cases, infratentorial in 46.5%, and cervical spine in 4.7%. 74.4% of the tumors were midline (thalamus, pons, or spinal cord) with 71.9% of these had K27M mutation. All tumors in cerebral hemispheres were histone H3 WT and were associated with high amount of necrosis ($p < 0.003$). All cervical spine tumors were K27M mutant and had distal subependymal metastases within the lateral ventricles on follow up at 5-13 months. Majority of the infratentorial tumors were K27M mutant (83%), while only 67% of the thalamus tumors had K27M mutation. When comparing histone H3 mutant to WT midline gliomas, there was no statistically significant correlation between enhancement or border characteristics, infiltrative appearance, or presence of edema.

CONCLUSION

Majority of diffuse midline gliomas originating in the thalamus, pons, or spinal cord were found to harbor histone H3 K27M mutation. Tumors arising in the cervical cord showed propensity for distal metastatic spread. In contrast, diffuse gliomas in the cerebral hemispheres were uniformly negative for K27M mutation and were more likely to demonstrate necrosis.

CLINICAL RELEVANCE/APPLICATION

We describe imaging features of a new 2016 World Health Organization (WHO) class of diffuse gliomas, Histone H3 K27M mutant gliomas.

SST09-09 Automatic Ventricular Volume Estimation (AVVE) from MRI/CT Data Using Statistical Learning

Friday, Dec. 2 11:50AM - 12:00PM Room: E264

Participants

Fernando Y. Calderon, Los Angeles, CA (*Presenter*) Nothing to Disclose
Edward Melamed, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Stefan Bluml, PhD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Marvin D. Nelson Jr, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
J G. McComb, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To automatically quantify CSF ventricular volume from MRI/CT generated data.

METHOD AND MATERIALS

Using the currently available clinical imaging platform, Picture Administration and Communications System (PACS), data obtained from MRI/CT studies were analyzed using a newly developed algorithm - named AVVE- to automatically determine ventricular CSF volume. The calculated volumes were compared with those manually extracted in the same subjects. The similarity was quantified using the Jaccard index. The algorithm uses four parameters: 1) The normalized distances (ND) measured from every voxel to the Scanner Central Voxel (SCV). 2) The Histogram Classified Intensities (HCI) using intensity distribution to effect separation. 3) Neighboring (NAB) to determine the number of intensity based partners that a given voxel (V) has. Another voxel N is considered a neighbor of V if the difference between their intensities is lower than the one between the N and the second order neighbor NN in the direction of view. 4) Cardinality (CARD) which dissolves the ambiguity of the ND feature regarding its radial equality to a given distance in space and consists of dividing the 3D space into sub-units that are in turn labeled sequentially. See the companion figure for clarity.

RESULTS

The most exigent estimations corresponding to pathogenic cases are listed here following this format: Subject | Manual Ventricular Volume extraction | AVVE | Jaccard index. All volumes are given in milliliters. Mild hydrocephalus | 28.2 | 26.8 | 0.94
Moderate hydrocephalus | 258.9 | 245.9 | 0.92 Severe hydrocephalus | 585.1 | 550.8 | 0.94

CONCLUSION

Using the method described above, it was possible to automatically segment the CSF in the ventricles from the surrounding brain and calculate the CSF volume which was 92% to 94% concordant to that determined manually. The solution is fully automatic so it can be incorporated into PACS networks. Additionally, by changing the masks the algorithm would learn to segment other structures.

CLINICAL RELEVANCE/APPLICATION

One of the most common clinical problems in pediatric neurosurgery is that of hydrocephalus. Being able to accurately determine ventricular CSF volume will be valuable for clinical decision-making.



Participants

Patrick J. La Riviere, PhD, Chicago, IL (*Moderator*) Research funded, Toshiba Corporation; Research Consultant, MetriTrack, Inc
 Maryellen L. Giger, PhD, Chicago, IL (*Moderator*) Stockholder, Hologic, Inc; Stockholder, Quantitative Insights, Inc; Co-founder, Quantitative Insights, Inc; Royalties, Hologic, Inc; Royalties, General Electric Company; Royalties, MEDIAN Technologies; Royalties, Riverain Technologies, LLC; Royalties, Mitsubishi Corporation; Royalties, Toshiba Corporation;

Sub-Events

SST10-01 Adaptive Frustum Fly-Over Visualization Enables Robust 3D CT Colonography

Friday, Dec. 2 10:30AM - 10:40AM Room: E350

Participants

Amal Farag, PhD, Louisville, KY (*Presenter*) Nothing to Disclose
 Salwa Elshazly, BSc, Louisville, KY (*Abstract Co-Author*) Nothing to Disclose
 Abraham H. Dachman, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
 Perry J. Pickhardt, MD, Madison, WI (*Abstract Co-Author*) Co-founder, VirtuoCTC, LLC; Stockholder, Collectar Biosciences, Inc; Stockholder, SHINE Medical Technologies, Inc; Research Grant, Koninklijke Philips NV
 Albert Seow, MD, Louisville, KY (*Abstract Co-Author*) Nothing to Disclose
 Robert L. Falk, MD, Louisville, KY (*Abstract Co-Author*) Founder, 3DR Inc Managing Director, 3DR Inc Officer, 3DR Inc
 Gerald Dryden, Louisville, KY (*Abstract Co-Author*) Nothing to Disclose
 Aly A. Farag, MS, PhD, Louisville, KY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

CTC enables virtual visualization of colon surface by various methods (Fig. a): Endoluminal **Fly-through (FT)**, mimicking optical colonoscopy (OC), typically requires antegrade and retrograde viewing. On average, 20% of small polyps (6-9mm) and up to 10% of polyps $\geq 1\text{cm}$ are missed, causing erroneous diagnosis. **Flattening** maps the 3D colon into a cylindrical representation and then into a 2D image/filet. It induces lumen distortion and causes imprecise definition of polyps. **Panoramic** and **Unfolded Cube** represent the 3D colon by combining virtual camera views for complete visualization, but generate lumen distortion and many false positives. This work promotes **"Fly-over" (FO)**, where the 3D colon is sliced into two overlapping halves, each visualized by a virtual camera with field of view (FOV) perpendicular to 3D colon centerline, enabling lumen visualization without distortion.

METHOD AND MATERIALS

Theory: Visualization in FT and FO with respect to polyp characteristics was quantified by analyzing the FOV using computer vision (Fig b). In FT, the virtual camera is parallel to colon centerline, FOV is restricted and incapable of seeing small-size polyps behind haustral folds. In FO, camera is set perpendicular to the centerline without restriction on FOV angle; thus, FO carries no perspective distortion and polyps hidden by haustral folds are visible. **Evaluation:** A CTC system was established to evaluate FO vs FT on 60 patients (40 males and 20 females). *Group 1:* 20 patients from ACRIN study and 3 from Walter Reed study and 7 patients with synthetic polyps added. *Group 2:* 6 patients from ACRIN, 13 cases from Walter Reed, 7 patients with synthetic polyps, and 4 recurring patients with added synthetic polyps. CT scans were acquired on GE scanners. Clinicians choose reading order (FT/FO) and sequences of cases were randomized. FT and FO had same pre-visualization data (Fig. a).

RESULTS

In readings of 4 expert radiologists, FO had average of 22.3% higher sensitivity than FT (Fig. c); 22.5% for $<1\text{cm}$ and 9.2% for $\geq 1\text{cm}$ (Fig. d). FO has nearly 30% less navigation time.

CONCLUSION

CTC using FO provides state-of-the-art performance for visualization of colonic polyps $<1\text{cm}$ over FT and induces no distortion, leading to improved polyp detection and reduced interpretation time.

CLINICAL RELEVANCE/APPLICATION

This fly-over based CTC system enables accurate and efficient colon visualization, which could have a positive benefit on both patients and healthcare costs.

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

SST10-02 Spectral CT Imaging in the Differential Diagnosis of Small Bowel Adenocarcinoma from Small Intestinal Lymphoma

Friday, Dec. 2 10:40AM - 10:50AM Room: E350

Participants

Chuangbo Yang, MMed, Xianyang City, China (*Presenter*) Nothing to Disclose
 Yongjun Jia, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
 Chenglong Ren, Shanxi, China (*Abstract Co-Author*) Nothing to Disclose
 Yong Yu, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
 Xirong Zhang, Xianyang, China (*Abstract Co-Author*) Nothing to Disclose
 Haifeng Duan, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
 Ma Guangming, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
 Tian Xin, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the value of gemstone spectral CT imaging in the differential diagnosis of small bowel adenocarcinoma (SBA) from primary small intestinal lymphoma (PSIL).

METHOD AND MATERIALS

This retrospective study was institutional review board-approved, and written informed consent was waived. We retrospectively analyzed the images of 17 cases of small intestinal carcinoma (SBA) and 11 cases of primary small intestinal lymphoma (PSIL). These patient

RESULTS

There were significant differences between SBA and PSIL in IC (2.09 ± 0.71 vs. $1.33 \pm 0.15\text{mg/ml}$), NIC (0.20 ± 0.06 vs. 0.13 ± 0.02) and slope (AHU) (2.78 ± 1.06 vs. 1.86 ± 0.30) in AP and (1.86 ± 0.68 vs. $1.37 \pm 0.18\text{mg/ml}$ 60keV energy range ($p < 0.05$), but not in the 70-140keV range ($p > 0.05$) (Table 1). Using 1.38mg/ml as a threshold value for iodine concentration at AP, one could obtain the area-under-curve (AUC) for ROC study of 0.93 and sensitivity of 94% and specificity of 85% for differentiating small bowel adenocarcinoma from primary small intestinal lymphoma. These values were significantly higher than th

RESULTS

There were significant differences between SBA and PSIL in IC (2.09 ± 0.71 vs. $1.33 \pm 0.15\text{mg/ml}$), NIC (0.20 ± 0.06 vs. 0.13 ± 0.02) and slope (AHU) (2.78 ± 1.06 vs. 1.86 ± 0.30) in AP and (1.86 ± 0.68 vs. $1.37 \pm 0.18\text{mg/ml}$ 60keV energy range ($p < 0.05$), but not in the 70-140keV range ($p > 0.05$) (Table 1). Using 1.38mg/ml as a threshold value for iodine concentration at AP, one could obtain the area-under-curve (AUC) for ROC study of 0.93 and sensitivity of 94% and specificity of 85% for differentiating small bowel adenocarcinoma from primary small intestinal lymphoma. These values were significantly higher than th

CONCLUSION

Quantitative parameters obtained in spectral CT, especially iodine concentration in the arterial phase, provide high accuracy for differentiating small bowel adenocarcinoma from primary small intestinal lymphoma.

CLINICAL RELEVANCE/APPLICATION

Spectral CT imaging with its many quantitative parameters may provide a new method for the differential diagnosis of small bowel adenocarcinoma from primary small intestinal lymphoma.

SST10-03 Feasibility of Material Suppressed Iodine Images Derived from Spectral CT in Detecting and Displaying Gastric Tumors

Friday, Dec. 2 10:50AM - 11:00AM Room: E350

Participants

Yaru Chai, MD, Zhengzhou, China (*Presenter*) Nothing to Disclose
 Jianbo Gao, MD, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the feasibility of material suppressed iodine (MSI) images derived from spectral CT in detecting and displaying gastric tumors, and to calculate the potential radiation dose reduction by omitting true no

METHOD AND MATERIALS

This study received institutional review board approval, and all participants provided written informed consent. 103 patients (63 men, 40 women; age range 20-87, median age 54) with gastric tumors underwent TNE scan with 120kVp mode, arterial phase and venous phase with GSI mode. MSI images were reconstructed in ADW4.6 of GE Healthcare. The subjective image quality test.

RESULTS

The diagnoses of these 103 patients were confirmed by endoscopic biopsy or surgical pathology (gastric cancer, n=86; gastric stromal tumor, n=9; gastric lymphoma, n=6; gastric schwannoma, n=2). Interobserver

CONCLUSION

MSI images derived from spectral CT can provide good image quality to TNE images and reliable diagnostic information for evaluating gastric tumors, and can reduce radiation dose and scanning time by omitting TNE

CLINICAL RELEVANCE/APPLICATION

In gastric tumors patients, MSI images can replace TNE images to reduce radiation dose and scanning time.

SST10-04 Texture-preserving Bayesian Reconstruction of Low-dose CT Images for Lung Nodule Detection

Friday, Dec. 2 11:00AM - 11:10AM Room: E350

Participants

Hao Zhang, Stony Brook, NY (*Abstract Co-Author*) Nothing to Disclose
Jerome Z. Liang, PhD, Stony Brook, NY (*Presenter*) Nothing to Disclose
Hao Han, Stony Brook, NY (*Abstract Co-Author*) Nothing to Disclose
William H. Moore, MD, Port Washington, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Lung cancer remains the leading cause of cancer-related deaths in the US. Screening lung nodules by noise-smoothing low-dose CT (LdCT) image reconstruction has shown 25% cancer incidence reduction. We hypothesize that texture-preserving Bayesian reconstruction of LdCT images can further reduce the incident rate by improving the detection of lung nodules.

METHOD AND MATERIALS

Image textures of the major tissues across the chest, e.g. muscle, fat, lung and bone, which are readily available from full-dose diagnostic CT images, are extracted from corresponding segmented tissue regions. Each tissue type's textures are converted into a set of parameters for the Markov random field (MRF) model as a priori probability for maximum a posteriori or Bayesian reconstruction of the LdCT image. Each set of tissue type model parameters is applied to a corresponding tissue region in the LdCT image domain after a fast segmentation is applied in that domain. Since the a priori tissue model is only specific to the region in the LdCT image domain, the segmentation can be less exact on the tissue borders for high speed. The MRF-Texture method was evaluated using 136 patients' sinograms acquired at full-dose (100mAs) as reference, low-dose (40mAs) and ultralow-dose (20mAs) with comparison to the widely cited noise-smoothing MRF-Huber method as well as the well-known FBP method.

RESULTS

The FBP method detected 161 nodules at 100mAs (the reference), 152 at 40mAs and 147 at 20mAs. The MRF-Huber detected 156 at 40mAs and 151 at 20mAs. The MRF-Texture detected 159 at 40mAs and 156 at 20mAs. The MRF-Texture achieved the detection of 159 at 40% of the full dose FBP with detection of 161 nodules.

CONCLUSION

The presented texture-preserving Bayesian LdCT image reconstruction reduced the dose by nearly a half, while retaining the detection of nodules of size as small as 3mm compared to the current gold standard FBP method at the full-dose level. The gain of MRF-Texture over the state-of-the-art statistical MRF-Huber method is similar to the gain of MRF-Huber over the FBP, indicating a noticeable image reconstruction methodology advancement from noising-smoothing paradigm to texture-preserving paradigm.

CLINICAL RELEVANCE/APPLICATION

CT image textures have been shown as useful for various clinical tasks. The presented texture-preserving Bayesian LdCT image reconstruction has demonstrated the potential to improve the detection of lung nodules of size as small as 3mm.

SST10-07 Clinical Application of Dual Energy Spectral CT in Detecting Cholesterol Gallstones from Surrounding Bile

Friday, Dec. 2 11:30AM - 11:40AM Room: E350

Participants

Chuangbo Yang, MMed, Xianyang City, China (*Presenter*) 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
Ma Chunling, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
Lei Yuxin, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
Xirong Zhang, Xianyang, China (*Abstract Co-Author*) Nothing to Disclose
Ma Guangming, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
Chenglong Ren, Shanxi, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the clinical value of spectral CT in the detection of cholesterol gallstones from surrounding bile.

METHOD AND MATERIALS

This study was institutional review board approved. The un-enhanced spectral CT data of 24 patients who had surgically confirmed cholesterol gallstones were analyzed. Lipid concentrations and CT numbers were measured from fat-based material decomposition image and virtual monochromatic image sets (40-140keV), respectively. The difference in lipid concentration and CT number between cholesterol gallstones and surrounding bile were statistically analyzed. Receiver operating characteristic curve was generated to establish threshold value of the lipid concentration required for significant differentiation of cholesterol gallstones from bile.

RESULTS

Cholesterol gallstones were bright on fat-based material decomposition images yielding a 92% detection rate (22/24). Its lipid concentrations (552.65±262.36mg/ml), CT number at 40keV (-31.57±16.88HU) and 140keV (24.30±5.85HU) were significantly different from those of bile (-13.94±105.12mg/ml, 12.99±9.39HU and 6.19±4.97HU, respectively). Using 182.59mg/ml as the threshold value for lipid concentration, one could obtain sensitivity of 95.5% and specificity of 100% with accuracy of 0.994 for differentiating cholesterol gallstones from bile.

CONCLUSION

Virtual monochromatic spectral CT images at 40keV and 140keV provide significant CT number difference between cholesterol gallstones and surrounding bile. Spectral CT provides an excellent detection rate for cholesterol gallstones.

CLINICAL RELEVANCE/APPLICATION

virtual monochromatic images in spectral CT imaging at 40keV and 140keV provide significant CT number difference between cholesterol gallstones and surrounding bile. The combination of virtual monochromatic image and fat-based material decomposition image in spectral CT provides an excellent detection rate for cholesterol gallstones.

SST10-09 Detector-Based Spectral CT Evaluation of In-Stent Occlusions in Small Cardiac and Vascular Stent Phantoms

Friday, Dec. 2 11:50AM - 12:00PM Room: E350

Participants

Richard W. Ahn, MD, PhD, Dallas, TX (*Presenter*) Co-founder, ViXa LLC; Stockholder, ViXa LLC
Xinhui Duan, PhD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Christopher Maroules, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Dharam J. Kumbhani, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Anil K. Pillai, MD, Coppell, TX (*Abstract Co-Author*) Nothing to Disclose
Suhny Abbara, MD, Dallas, TX (*Abstract Co-Author*) Author, Reed Elsevier; Editor, Reed Elsevier; Institutional research agreement, Koninklijke Philips NV; Institutional research agreement, Siemens AG

PURPOSE

To assess the performance of a novel detector-based spectral CT (SCT) scanner for evaluation of occlusions in cardiovascular stents. Evaluation of stents <3 mm is difficult due to artificial luminal narrowing secondary to partial volume averaging. SCT has the potential to improve evaluation of these stents and in-stent stenosis through the generation of monochromatic images that can be selected to reduce artifact and optimize contrast conspicuity.

METHOD AND MATERIALS

Stents (2, 2.5, 3, 4 mm) were deployed into 3D printed tubes with inner diameters 0.2 mm larger than the stent. Stents were filled with either 15 or 7.5 mg/ml of elemental iodine to simulate an optimal and more realistic bolus, respectively. Occlusions were simulated with paraffin wax. Stent phantoms were scanned on a SCT scanner (IQon, Phillips Healthcare) using a cardiac protocol at 120 kVp. Images were reconstructed at a 0.67 mm thickness using a cardiac kernel. Multiple monochromatic images were generated. Regions of interest were drawn along the long axis of the vessel in the occluded and non-occluded areas of the stent.

RESULTS

For all stents the non-occluded areas of the stent had increased attenuation compared with occluded areas in conventional and monochromatic images. With a 15 mg/ml bolus, the attenuation difference between occluded and non-occluded areas of the stent was 612±52 HU on conventional 120 kVp images, 1000±70 HU at 50 keV, 559±51 HU at 70 keV, 341±68 HU at 100 keV and 242±77 HU at 150 keV. A similar trend was seen with the 7.5 mg/ml bolus but with decreased HU differences. Attenuation differences held for all stent sizes but absolute HU of the smaller stents were higher due to blooming.

CONCLUSION

The increased attenuation difference between occluded and non-occluded areas of the stents achieved on lower keV images irrespective of stent size suggests an advantage of monochromatic images over conventional images.

CLINICAL RELEVANCE/APPLICATION

Non-invasive evaluation of small cardiac and vascular stents using CT angiography has the potential to avoid diagnostic invasive angiography and its associated risks. Spectral detector CT has the potential to expand CT evaluation to smaller stents and situations where vascular enhancement is sub-optimal.

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/>

Suhny Abbara, MD - 2014 Honored Educator

SPHT63

Novel Concepts in Hepatobiliary Tumor Imaging Symposium: Management Issues (In Conjunction with Society of Abdominal Radiology (SAR), Japanese Society of Abdominal Radiology (JSAR), Korean Society of Abdominal Radiology (KSAR), and French Society of Abdominal Radiology (SIAD))

Friday, Dec. 2 11:00AM - 12:00PM Room: E253BCD



AMA PRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants

Marc Zins, MD, Paris, France, (mzins@hpsj.fr) (*Moderator*) Nothing to Disclose
Won Jae Lee, MD, Seoul, Korea, Republic Of (*Director*) Research Grant, Samsung Electronics Co, Ltd
Takamichi Murakami, MD, PhD, Osakasayama, Japan (*Director*) Nothing to Disclose
Judy Yee, MD, Clayton, CA, (judy.yee@ucsf.edu) (*Director*) Research Grant, EchoPixel, Inc
Marc Zins, MD, Paris, France, (mzins@hpsj.fr) (*Director*) Nothing to Disclose

LEARNING OBJECTIVES

ABSTRACT

URL

Sub-Events

SPHT63A Abbreviated MRI for HCC Screening and Surveillance: An Accurate Alternative to US

Participants

Bachir Taouli, MD, New York, NY, (bachir.taouli@mountsinai.org) (*Presenter*) Consultant, MEDIAN Technologies ; Grant, Guerbet SA

LEARNING OBJECTIVES

1) Review scientific evidence behind HCC screening and surveillance. 2) Review current AASLD/EASL guidelines for HCC screening/surveillance. 3) Introduce the concept of abbreviated MRI (AMRI) for HCC screening and surveillance. 4) Review early results and future directions of AMRI for HCC screening.

ABSTRACT

URL

SPHT63B Imaging-based Management Guidelines for HCC

Participants

Cynthia S. Santillan, MD, San Diego, CA, (csantillan@mail.ucsd.edu) (*Presenter*) Consultant, Robarts Clinical Trials, Inc

LEARNING OBJECTIVES

1) Review imaging guidelines for diagnosis of hepatocellular carcinoma, including AASLD, LI-RADS, and OPTN. 2) Discuss differences in intended users and patient population for these guidelines. 3) Emphasize how management options influence the desired specificity of imaging diagnosis for HCC.

ABSTRACT

URL

SPHT63C Hypovascular and Hypointense Nodule in Gadoteric Acid-Enhanced Liver MRI: Outcome and Management

Participants

Utaroh Motosugi, MD, Yamanashi, Japan (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize a pathological category called early HCCs or hypovascular HCCs. 2) Understand the concept of hypovascular hypointense nodule in gadoteric acid-enhanced MRI.

ABSTRACT

In a typical case, the imaging-based diagnosis of HCC is simple. However, we often encounter atypical cases: hypo vascular HCCs or early HCCs. Gadoteric acid has advantage in hepatobiliary phase imaging, which helps distinguish HCC from pre-malignant lesion. "Hypovascular hypointense nodule in gadoteric acid-enhanced MRI" is a new concept observed in cirrhotic patients, which is supposed to be an early HCC and will develop hypervascular (typical) HCC subsequently. According to the published articles, hypovascular hypointense nodule at high risk of hypervascularization shows large size, high signal intensity on T2WI/DWI, fat deposition in the lesion, and size increase on follow-up examination. If we treat these lesions, the cirrhotic patients can get extended HCC-free period. The hypovascular hypointense nodule is also an indicator of the carcinogenesis of the background liver. We can define imaging-based de novo development of HCC, by assessing previous MR examination with hepatobiliary phase images,

i.g. HCC develops in a place where no hypovascular hypointense nodule was observed in the previous MRI. Interestingly, de novo-type HCC also develops more frequently in the liver with hypovascular hypointense nodule (non-clean liver) than in the liver without them (clean liver).

URL

SPHT63D New Concepts in Monitoring Tumor Treatment

Participants

Yves M. Menu, MD, Paris, France, (yves.menu@sat.aphp.fr) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To learn the recent development of new treatments of HCC, including systemic chemotherapy and intervention. 2) To understand the rationale for an relevant follow-up of treatment efficacy. 3) To become familiar with the different standards for imaging follow-up.

ABSTRACT

Modern treatment of HCC include OLT, surgery, intervention, either percutaneous or endovascular, and systemic chemotherapy. The role of imaging is essential, whatever is the treatment goal. Imaging looks for recurrence after curative treatment, tumour response after palliation. CT still is the work horse of evaluation, due to its capability to evaluation tumour vascularization and whole body survey. However, MRI is increasingly associated in order to improve sensitivity for the detection of small tumours. Concerning systemic chemotherapy, it appear that RECIST is unreliable, and should be replaced with mRECIST, due to the specific modification in tumour viability that are induced by targeted agents. To a certain extent, this standard also applies to the follow-up of chemoembolization. Concerning percutaneous ablation, knowledge of short and long-term post-procedural appearance is important in order to detect early recurrence. Overall, imaging is the cornerstone of treatment evaluation of HCC

URL

SPFR61

Friday Imaging Symposium: Common Symptoms for Head and Neck Imaging: What the Clinician Is Asking and How You Should Answer

Friday, Dec. 2 12:30PM - 3:00PM Room: E353C



AMA PRA Category 1 Credits™: 2.50
ARRT Category A+ Credits: 3.00

Participants

Deborah R. Shatzkes, MD, New York, NY, (shatzkes@hotmail.com) (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) To review the differential diagnosis for frequently encountered symptomatology in the head and neck. 2) To understand the information that referring physicians hope to obtain from imaging studies ordered for these presenting symptoms. 3) To describe the imaging findings of the most important entities resulting in these symptoms.

ABSTRACT

URL

Sub-Events

SPFR61A Hoarseness

Participants

Ashok Srinivasan, MD, Canton, MI, (ashoks@med.umich.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To discuss the role of imaging in the diagnosis and management of hoarseness.

ABSTRACT

The diagnosis of hoarseness is based on clinical criteria with evaluation needed in patients with significant voice change, or limited voice change but significant other symptoms. Since hoarseness is often self-limited and has an etiology that can be detected with laryngoscopy, imaging should be reserved for the assessment of specific pathology after the larynx has been visualized. In this presentation, the role of imaging in the diagnosis and management of hoarseness will be discussed.

URL

Active Handout: Ashok Srinivasan

[http://abstract.rsna.org/uploads/2016/16001529/SPFR61A_HOARSENESS_2016_FINAL_for handout.pdf](http://abstract.rsna.org/uploads/2016/16001529/SPFR61A_HOARSENESS_2016_FINAL_for%20handout.pdf)

SPFR61B Facial Palsy

Participants

Phillip R. Chapman, MD, Birmingham, AL, (pchapman@uabmc.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review and understand the practical anatomy of the facial nerve. 2) Identify the most common pathologies that affect the various anatomic subsets of the facial nerve and cause facial nerve paralysis. 3) Use CT and MRI to identify the abnormality and establish a differential diagnosis for lesions causing facial nerve paralysis.

ABSTRACT

The Facial Nerve has some unique characteristics in terms of both form and function. The functions are diverse. Most of the time radiologists are asked to evaluate the facial nerve because of facial nerve paralysis. The nerve provides innervation to the muscles of facial expression. But there are other functions that we need to remember. **Anatomy:** The facial nerve is composed of motor, sensory, and parasympathetic fibers. The motor fibers originate from cell bodies in the motor cortex of the frontal lobe. Fibers descend in a unique way to the lower pons where separate motor nuclei operate the lower and upper facial muscles. Injury to the cortex or descending fibers above the pontine nuclei result in central facial nerve paralysis. Peripheral facial nerve paralysis occurs when the the pontine nuclei or distal motor branches are affected. The facial nerve takes a very unique and complicated course through the CPA, internal auditory canal, temporal bone, and parotid gland to reach the end organ musculature of the face. Understanding the anatomic subsites is critical to CT and MRI evaluation of facial nerve paralysis. During this talk, the relevant anatomy of the facial nerve will be discussed. **Etiology:** There are variety of etiologies that can cause facial nerve dysfunction and paralysis. Disorders can be infectious, traumatic, post-surgical, neoplastic, congenital, vascular and idiopathic. The most common cause of facial paralysis is Bell's palsy, characterized by the acute onset of unilateral facial weakness. It is likely related to reactivation of herpes simplex virus, leading to inflammation of the facial nerve. CT or MRI studies are not typically indicated in the evaluation for Bell's palsy. However, MRI may demonstrate abnormal enhancement of the intracanalicular, labyrinthine, tympanic and mastoid segments of the nerve. This lecture will review a number of etiologies that affect the facial nerve and their imaging correlates. **Imaging:** MRI with gadolinium contrast enhancement is the preferred technique for evaluation of facial nerve paralysis in most cases, but CT also plays a significant role. In fact, many experts believe that MRI and CT can be complimentary in evaluation of difficult cases.

Active Handout: Phillip Randall Chapman

http://abstract.rsna.org/uploads/2016/16001530/SPFR61B_HANDOUT.pdf

SPFR61C Facial Pain

Participants

Deborah L. Reede, MD, Brooklyn, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1. Review the sensory innervation of the face 2. Learn common causes of facial pain 3. Understand the role of imaging in the diagnosis and management of patients with facial pain

ABSTRACT

Imaging can play a pivotal role in identifying the source of facial pain especially when clinical findings are ambiguous due to the overlap of symptoms from different pathologies or the inability to perform a proper clinical exam in patients with trismus and/or significant soft tissue swelling. After a review of the nerves that supply sensory innervation to the face, common neurologic and non-neurologic causes of facial pain are discussed. The role of imaging in the management and treatment of these conditions will be emphasized.

SPFR61D Diplopia

Participants

Asim F. Choudhri, MD, Memphis, TN (*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/>

Asim F. Choudhri, MD - 2016 Honored Educator

SPFR61E Hearing Loss

Participants

Gul Moonis, MD, Boston, MA (*Presenter*) Nothing to Disclose

SPFR61F Tinnitus

Participants

John L. Go, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose

Novel Concepts in Hepatobiliary Tumor Imaging Symposium: Benign Liver Tumors (In Conjunction with Society of Abdominal Radiology (SAR), Japanese Society of Abdominal Radiology (JSAR), Korean Society of Abdominal Radiology (KSAR), and French Society of Abdominal Radiology (SIAD))

Friday, Dec. 2 1:00PM - 2:00PM Room: E253BCD



AMA PRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: .50

Participants

Jean-Pierre Tasu, MD, PhD, Poitiers, France (*Moderator*) Nothing to Disclose
Won Jae Lee, MD, Seoul, Korea, Republic Of (*Director*) Research Grant, Samsung Electronics Co, Ltd
Takamichi Murakami, MD, PhD, Osakasayama, Japan (*Director*) Nothing to Disclose
Judy Yee, MD, Clayton, CA (*Director*) Research Grant, EchoPixel, Inc
Marc Zins, MD, Paris, France (*Director*) Nothing to Disclose

Sub-Events

SPHT64A Genotype-Phenotype Correlations and Management of Hepatic Adenoma

Participants

Valerie Vilgrain, MD, Clichy, France (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the different Genotypes of Hepatic Adenoma. 2) Correlate the MR imaging findings with the different genotypes. 3) Detail the most important factors involved in patient management of Hepatic Adenoma.

ABSTRACT

Hepatocellular adenomas (HCA) are a variety of solid hepatocellular lesions mostly found in the absence of underlying chronic liver disease in young patients especially women. HCA is no longer to be considered as a unique lesion but as a recollection of different entities sharing common points but most of all separated by different genotype-phenotype aspects. The best imaging technique for subtyping HCAs is magnetic resonance imaging, as specific combinations of imaging features have been associated with the different subtypes. The two most common complications of HCA are hemorrhage and malignant transformation. Large HCAs (exceeding 5 cm) are more exposed to these two complications than small HCAs. Malignant transformation is much more common in men than in women. Last, the different HCA subtypes expose to different risks of complication. Therefore patient management ranges from conservation treatment to surgical resection.

URL

SPHT64B Imaging of FNH: Role of CEUS and MRI

Participants

Olivier Lucidarme, MD, Paris, France (*Presenter*) Consultant, Bracco Group Consultant, F. Hoffmann-La Roche Ltd Consultant, Boehringer Ingelheim GmbH

SPHT64C Imaging Spectrum of Benign and Malignant Vascular Tumors: How to Avoid Misdiagnosis

Participants

Won Jae Lee, MD, Seoul, Korea, Republic Of, (wjlee@skku.edu) (*Presenter*) Research Grant, Samsung Electronics Co, Ltd

LEARNING OBJECTIVES

1) To described the imaging findings of benign and malignant vascular tumors of the liver including peliosis hepatis, hemangioma, epithelioid hemangioendothelioma and angiosarcoma, as well as the differential points among them. 2) To describe the differential points between hepatic hemangioma and non-vascular lesions or tumors of the liver mimicking a hemangioma using various imaging modalities.

ABSTRACT

Vascular tumors arising primarily from the liver encompass both benign and malignant tumors including peliosis hepatis, hemangioma, epithelioid hemangioendothelioma and angiosarcoma in the order from benignancy to malignancy. Imaging findings of hepatic hemangioma are well established, especially in terms of the enhancement pattern, though there are a wide range of its imaging spectrum. Imaging findings of other vascular tumors of the liver (e.g., peliosis hepatis, epithelioid hemangioendothelioma and angiosarcoma) are infrequently reported, revealing that some findings are characteristic and others are overlapped. Moreover, some hepatic lesions or tumors of non-vascular origin (e.g., such as cyst, hepatocellular carcinoma, cholangiocarcinoma, metastasis, etc) resemble hepatic hemangioma in some imaging modalities, necessitating further imaging evaluation. This lecture will firstly describe the imaging findings of above-mentioned vascular hepatic tumors, as well as the differential points among them so that we can avoid misdiagnosis. Secondly, non-vascular hepatic lesions or tumors mimicking a hemangioma in certain imaging modalities will be differentiated from hemangioma using other imaging modalities so that we can avoid misdiagnosis.

URL

SPHT65

Novel Concepts in Hepatobiliary Tumor Imaging Symposium: Bile Duct Tumors (In Conjunction with Society of Abdominal Radiology (SAR), Japanese Society of Abdominal Radiology (JSAR), Korean Society of Abdominal Radiology (KSAR), and French Society of Abdominal Radiology (SIAD))

Friday, Dec. 2 2:00PM - 3:00PM Room: E253BCD



AMA PRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: 1.00

Participants

Byung Ihn Choi, MD, PhD, Seoul, Korea, Republic Of (*Moderator*) Nothing to Disclose
Takamichi Murakami, MD, PhD, Osakasayama, Japan (*Director*) Nothing to Disclose
Judy Yee, MD, Clayton, CA, (judy.yee@ucsf.edu) (*Director*) Research Grant, EchoPixel, Inc
Marc Zins, MD, Paris, France (*Director*) Nothing to Disclose
Won Jae Lee, MD, Seoul, Korea, Republic Of (*Director*) Research Grant, Samsung Electronics Co, Ltd

Sub-Events

SPHT65A Prognostic Implications of Imaging Features in Hepatobiliary Carcinoma

Participants

Myeong-Jin Kim, MD, PhD, Seoul, Korea, Republic Of, (kimnex@yuhs.ac) (*Presenter*) Research Grant, Bayer AG

LEARNING OBJECTIVES

1) Identify imaging features for the diagnosis hepatobiliary carcinoma. 2) Illustrate the imaging features related with the prognosis of hepatobiliary carcinoma. 3) Define the independent imaging parameters to predict the outcome after the treatment.

ABSTRACT

URL

SPHT65B Intrahepatic Cholangiocarcinoma and Combined HCC/CCC in Cirrhotic Patient: How to Diagnose?

Participants

Akira Yamada, MD, Matsumoto, Japan, (a_yamada@shinshu-u.ac.jp) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the imaging features of intrahepatic cholangiocarcinoma (ICC) and combined hepatocellular carcinoma (HCC) and cholangiocellular carcinoma (CCC) in CT and MR imaging. 2) Differentiate ICC or mixed HCC/CCC from the other hepatic lesions in CT and MR imaging.

ABSTRACT

URL

Handout: Akira Yamada

http://abstract.rsna.org/uploads/2016/16002304/RSNA2016_1202.pptx

SPHT65C Intraductal Papillary Neoplasm of the Bile Duct: Radiologic and Pathologic Correlation

Participants

Jae Hoon Lim, Goyang-si, Korea, Republic Of (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the pathologic spectrum of intraductal papillary neoplasm of the bile duct (IPNB). 2) To become familiar with distinguishing image appearances of IPNB based on the pathologic types. 3) To recognize and differentiate IPNB from the more common cholangiocarcinomas and to emphasize the role of radiology in therapeutic decision making.