Thursday

SPDL50

RSNA Diagnosis Live™: Musculoskeletal and Emergency Department Imaging-From Sports to Trauma

Thursday, Dec. 1 7:15AM - 8:15AM Room: E451B

MK MR ER

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

Participants
Eric B. England, MD, Cincinnati, OH, (eric.england@uc.edu) (*Presenter*) Nothing to Disclose
Carl C. Flink, MD, Cincinnati, OH (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify a variety of common sports injuries utilizing MRI. 2) Review clinical presentations of sports injuries that present to orthopedic clinics and how these presentations can assist in the diagnosis when correlated with imaging. 3) Review a variety of typical and atypical musculoskeletal injuries that present to the Emergency Department. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

ABSTRACT

URL

SPSC50

Controversy Session: Is It Time to Put Whole Brain Radiotherapy to Pasture? What's New in the Treatment of Limited Brain Metastases

Thursday, Dec. 1 7:15AM - 8:15AM Room: E450B

NR RO

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

Participants
Simon S. Lo, MD, Seattle, WA, (simonslo@uw.edu) (*Moderator*) Research support, Elekta AB; Travel support, Accuray Incorporated; Speaker, Accuray Incorporated;
Arjun Sahgal, Toronto, ON (*Presenter*) Speaker, Medtronic, Inc; Speaker, Elekta AB; Medical Advisory Board, Varian Medical Systems, Inc; Speaker, Accuray Incorporated; Research Grant, Elekta AB
Andrew B. Lassman, MD, New York, NY (*Presenter*) Consultant, AstraZeneca PLC; Consultant, BioClinica, Inc; Consulente, F. Hoffmann-La Roche Ltd; Consultant, Mateon Therapeutics, Inc; Consultant, VBI Vaccines Inc; Consultant, Sapience Therapeutics, Inc; Consultant, Cortice Biosciences, Inc; Consultant, AbbVie Inc; Speaker, prIME Oncology
Simon S. Lo, MD, Seattle, WA, (simonslo@uw.edu) (*Presenter*) Research support, Elekta AB; Travel support, Accuray Incorporated; Speaker, Accuray Incorporated;

LEARNING OBJECTIVES

1) Review the role of stereotactic radiosurgery in the treatment of limited brain metastases. 2) Describe the benefits and risks of whole brain radiotherapy to treatment of patients with CNS metastatic disease. 3) Determine the optimal multidisciplinary approach for treatment of patients with single and multiple brain metastases.

ABSTRACT

The aim of this session is to review the evidence for radiosurgery for brain metastases and why whole brain radiation is less and less a treatment of choice. There are serious harms associated with whole brain radiation which will be discussed. Novel strategies with targeted therapy and SRS are also the future in particular with melanoma. Ultimately whole brain radiation will be phased out as a therapy of last resort.

SPSH50

Hot Topic Session: The Promise of Machine Learning (and Pattern Recognition) in Radiology

Thursday, Dec. 1 7:15AM - 8:15AM Room: E350

IN

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: 0

Participants

Eldad Elnekave, MD, Shefayim, Israel (*Presenter*) Nothing to Disclose
Eliot L. Siegel, MD, Baltimore, MD, (esiegel@umaryland.edu) (*Presenter*) Board of Directors, Brightfield Technologies; Board of Directors, McCoy; Board of Directors, Carestream Health, Inc; Founder, MedPerception, LLC; Founder, Topoderm; Founder, YYESIT, LLC; Medical Advisory Board, Bayer AG; Medical Advisory Board, Bracco Group; Medical Advisory Board, Carestream Health, Inc; Medical Advisory Board, Fovia, Inc; Medical Advisory Board, McKesson Corporation; Medical Advisory Board, Merge Healthcare Incorporated; Medical Advisory Board, Microsoft Corporation; Medical Advisory Board, Koninklijke Philips NV; Medical Advisory Board, Toshiba Corporation; Research Grant, Anatomical Travelogue, Inc; Research Grant, Anthro Corp; Research Grant, Barco nv; Research Grant, Dell Inc; Research Grant, Evolved Technologies Corporation; Research Grant, General Electric Company; Research Grant, Herman Miller, Inc; Research Grant, Intel Corporation; Research Grant, MModal IP LLC; Research Grant, McKesson Corporation; Research Grant, RedRick Technologies Inc; Research Grant, Steelcase, Inc; Research Grant, Virtual Radiology; Research Grant, XYBIX Systems, Inc; Research, TeraRecon, Inc ; Researcher, Bracco Group; Researcher, Microsoft Corporation; Speakers Bureau, Bayer AG; Speakers Bureau, Siemens AG;
Ronald M. Summers, MD, PhD, Bethesda, MD, (rms@nih.gov) (*Presenter*) Royalties, iCAD, Inc; ;

LEARNING OBJECTIVES

ABSTRACT

URL

http://www.cc.nih.gov/about/SeniorStaff/ronald_summers.htmlhttp://www.cc.nih.gov/drd/summers.html

MSRT51

ASRT@RSNA 2016: Education, Qualification, Certification: What's Next?

Thursday, Dec. 1 8:00AM - 9:00AM Room: N230B

ED

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

Participants
Kevin Rush, St. Paul, MN, (kevin.rush@arrt.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Comprehend and conceptualize the evolution of certification. 2) Comprehend the ARRT's evolving view of education's role in certification and registration as it is today. 3) Comprehend and conceptualize the changing dynamics of registration and certification and what will be expected of those certified and registrered by the ARRT in future.

ABSTRACT

The American Registry of Radiologic Technologists (ARRT) has instituted several changes involving education. Some of the changes have already begun and some will are slated to be phased in over the next four years. This presentation will discuss the rationale and benefits to the profession underlying these changes. It will also begin to address what R.T.s can expect from ARRT to help them successfully navigate what will be expected of them. This includes a database of academic courses and CE activities maintained by ARRT through a collaborative effort with Recognized Continuing Education Evaluation Mechanisms (RCEEMs), CE sponsors, and academic educators. The database is key to assisting R.T.s in finding education that appropriately aligns with an individual’s requirement whether it be structured education for pursuing post primary certification, content-specific CE as identified by a Continuing Qualifications Requirement’s assessment or discipline-specific biennial CE.

RCA51

Prostate MRI (Hands-on)

Thursday, Dec. 1 8:00AM - 10:00AM Room: S401AB

GU MR

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

Participants

Jelle O. Barentsz, MD, PhD, Nijmegen, Netherlands (*Presenter*) Research Consultant, SPL Medical
Jurgen J. Futterer, MD, PhD, Nijmegen, Netherlands, (jurgen.futterer@radboudumc.nl) (*Presenter*) Research Grant, Medtronic, Inc; Research Grant, Siemens AG
Roel D. Mus, MD, Nijmegen, Netherlands (*Presenter*) Nothing to Disclose
Geert M. Villeirs, MD, PhD, Ghent, Belgium (*Presenter*) Nothing to Disclose
Baris Turkbey, MD, Bethesda, MD (*Presenter*) Nothing to Disclose
Jeffrey C. Weinreb, MD, New Haven, CT (*Presenter*) Nothing to Disclose
Adam Froemming, MD, Rochester, MN (*Presenter*) Nothing to Disclose
Antonio C. Westphalen, MD, Mill Valley, CA, (antonio.westphalen@ucsf.edu) (*Presenter*) Scientific Advisory Board, 3DBiopsy LLC ; Research Grant, Verily Life Sciences LLC
Rianne R. Engels, Cuijk, Netherlands (*Presenter*) Nothing to Disclose
Joyce G. Bomers, Nijmegen, Netherlands (*Presenter*) Nothing to Disclose
Renske L. Van Delft, Nijmegen, Netherlands (*Presenter*) Nothing to Disclose
Laura I. Stoilescu, Nijmegen, Netherlands (*Presenter*) Nothing to Disclose
Daniel J. Margolis, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Patrik Zamecnik, MD, Heidelberg, Germany (*Presenter*) Officer, SPL Medical BV
Sadhna Verma, MD, Cincinnati, OH (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the Pi-RADS v2 Category assessment to detect and localize significant cancer for both peripheral zone and transitional zone lesions. 2) Recognize benign pathology like inflammation and BPH and to differentiate these from significant prostate cancers.

ABSTRACT

In this Hands-On Workshop, the participants will be able to review up to 40 multi-parametric MRI cases with various prostatic pathology using a dedicated workstation. Focus will be on the overall assessment of PI-RADS v2 category, which enables them to score the probability of the presence of a significant cancer in patients with elevated PSA and/or clinical suspicion. All cases are from daily non-academic practice, and have various levels of difficulty. The cases include: easy and difficult significant peripheral-transition- and central zone cancers, inflammation, BPH, and the most common pitfalls. Internationally renowned teachers will guide the participants during their PI-RADS v2 scoring. There will be 50 workstations available. Participants will be able to use their own laptops through a secure WiFi connection.

Active Handout:Renske Lian Van Delft

http://abstract.rsna.org/uploads/2016/16002006/RCA Coursebook Prostate hands on course.pdf

MSCN51

Case-based Review of Neuroradiology (An Interactive Session)

Thursday, Dec. 1 8:30AM - 10:00AM Room: S100AB

HN NR

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

Participants
Pina C. Sanelli, MD, Manhasset, NY (*Director*) Nothing to Disclose

LEARNING OBJECTIVES

1) Provide a brief review of CNS pathology highlighting the key diagnostic features. 2) Review pertinent differential diagnoses of neuroimaging cases. 3) Provide important imaging pearls for differentiating CNS pathology.

ABSTRACT

Learning Objectives:
1.Provide a brief review of CNS pathology highlighting the key diagnostic features.

2.Review pertinent differential diagnoses of neuroimaging cases.

3.Provide important imaging pearls for differentiating CNS pathology.

Sub-Events

MSCN51A Adult Brain

Participants
Gordon K. Sze, MD, New Haven, CT (*Presenter*) Investigator, Remedy Pharmaceuticals, Inc

LEARNING OBJECTIVES

1) Better analyze the relevant features of each case. 2) Be able to characterize findings into general diagnostic categories and apply knowledge of specific patterns to narrow down the differential diagnoses.

ABSTRACT

MSCN51B Adult Spine

Participants
Pamela W. Schaefer, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the key neuroimaging characteristics of various adult spine disease entities. 2) Use pertinent imaging features and key clinical factors to formulate a pertinent differential diagnosis for various adult spine pathologies. 3) Discuss the utility of various imaging techniques for evaluating various adult spine disorders. 4) Review pertinent anatomy as it pertains to common adult spine pathologies.

ABSTRACT

Numerous spinal cord and spine pathologies will be presented, key features of specific pathologies will be reviewed and pertinent differential diagnoses will be discussed in a case based review format.

MSCN51C Adult Head & Neck

Participants
Laurie A. Loevner, MD, Gladwyne, PA (*Presenter*) Nothing to Disclose

MSCS51

Case-based Review of Musculoskeletal Radiology (An Interactive Session)

Thursday, Dec. 1 8:30AM - 10:00AM Room: S406A

MK

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

FDA Discussions may include off-label uses.

Participants
Stacy E. Smith, MD, Weston, MA (*Director*) Nothing to Disclose

Sub-Events

MSCS51A Muscle

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

MSCS51B Shoulder

Participants
Kirkland W. Davis, MD, Madison, WI, (kdavis@uwhealth.org) (*Presenter*) Author with royalties, Reed Elsevier; Editor with royalties, Reed Elsevier

LEARNING OBJECTIVES

1) Differentiate types of tears of the glenoid labrum. 2) Distinguish radiographic findings of shoulder arthritides. 3) Describe the common types of calcifications that present about the shoulder.

ABSTRACT

MSCS51C Ankle and Foot

Participants
Stacy E. Smith, MD, Weston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review several disorders of the ankle using CR, CT, MR and US delineating advantages of each 2) Assess common tendon and ligament abnormalities of the ankle. 3) Describe types of internal derangement of the ankle and foot. .

ABSTRACT

Imaging features of ankle and foot abnormalities will be reviewed using several modalitie with key features presented that will help further delineate a differential or specific diagnosis

MSCS51D Wrist and Hand

Participants
Martin Torriani, MD, Boston, MA, (mtorriani@mgh.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe ligamentous abnormalities of the wrist and hand. 2) Describe common tendon abnormalities of the wrist and hand. 3) Describe common types of wrist internal derangement.

ABSTRACT

MSES51

Essentials of Cardiac Imaging

Thursday, Dec. 1 8:30AM - 10:00AM Room: S406B

CA CT MR

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

Participants

Sub-Events

MSES51A Acute Aortic Emergencies

Participants
Fabian Bamberg, MD, MPH, Tuebingen, Germany, (fbamberg@post.harvard.edu) (*Presenter*) Speakers Bureau, Bayer AG; Speakers Bureau, Siemens AG; Research Grant, Bayer AG; Research Grant, Siemens AG;

LEARNING OBJECTIVES

1) Review the disease entities relevant in the setting of acute aortic emergencies. 2) Update on recent CT technological advancements relevant to the setting. 3) Assess the value of CT imaging in the diagnosis of acute aortic emergencies.

ABSTRACT

CT represents the major diagnostic modality in the management of patients with suspected acute aortic emergency. The lecture will review the underlying disease entities and imaging protocols takinig into account recent technical developments in providing a straight-forward diagnosis. Clinical examples will be discussed.

MSES51B Pulmonary Hypertension: Imaging with CT and MRI

Participants
Eduardo J. Mortani Barbosa, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explain why the diagnosis of pulmonary hypertension, in and of itself, is not sufficient to guide patient management. 2) Describe the principles of the current mechanistic classification of pulmonary hypertension. 3) Assess how CT and MR can provide crucial information regarding not only the diagnosis but also the underlying pathophysiologic mechanism of pulmonary hypertension. 4) Develop a strategy for rational, evidence based utilization of CT and MR in a patient with suspected pulmonary hypertension.

ABSTRACT

Merely diagnosing the presence of pulmonary hypertension is hardly helpful for referring providers. Understanding the etiology of pulmonary hypertension is paramount to determine the prognosis and develop an effective management strategy. This lecture aims to provide a concise, evidence-based, mechanistic framework for etiologic diagnosis of pulmonary hypertension, emphasizing the central role of advanced imaging modalities, such as CT and MR.

MSES51C CT Angiography of Coronary Artery Disease

Participants
Jill E. Jacobs, MD, New York, NY, (jill.jacobs@nyumc.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

To understand the advantages and limitations of assessing coronary artery disease with coronary CT angiography.

ABSTRACT

MSES51D Ten Clinical Studies that will Convince Your Cardiologist to Refer to Cardiac MR and CT

Participants
Marc Dewey, MD, Berlin, Germany, (dewey@charite.de) (*Presenter*) Research Grant, General Electric Company; Research Grant, Bracco Group; Research Grant, Guerbet SA; Research Grant, Toshiba Corporation; Speakers Bureau, Toshiba Corporation; Speakers Bureau, Guerbet SA; Speakers Bureau, Bayer AG; Consultant, Guerbet SA; Author, Springer Science+Business Media Deutschland GmbH; Editor, Springer Science+Business Media Deutschland GmbH; Institutional research agreement, Siemens AG; Institutional research agreement, Koninklijke Philips NV; Institutional research agreement, Toshiba Corporation; ; ; ; ; ; ; ; ;

LEARNING OBJECTIVES

1) Get to know the major clinical studies showing the benefits of cardiac MR and CT. 2) Learn about important details from these studies that will convince referring physicians selecting the right patients at the right point in time for cardiac MR and CT.

ABSTRACT

Major clinical studies have shown advantageous of using cardiac CT and MR in certain patient populations. This practical talk about the pivotal facts from ten large clinical studies about cardiac CT and MR will provide the information required for shared decision making with referring physicians.

Handout:Marc Dewey

http://abstract.rsna.org/uploads/2016/16000867/essentials talk dewey.pdf

RC601

Imaging of Thoracic Neoplasms: Update 2016 (An Interactive Session)

Thursday, Dec. 1 8:30AM - 10:00AM Room: E353C

CH OI

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

Participants
Edith M. Marom, MD, Ramat Gan, Israel, (edith.marom@gmail.com) (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

ABSTRACT

Sub-Events

RC601A Thoracic Lymphoproliferative Disorders

Participants
Sam S. Hare, MBBS,FRCR, London, United Kingdom, (samhare@nhs.net) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe native pulmonary lymphoid tissue with emphasis on MDCT appearances of intrapulmonary lymph nodes.2) Provide a simple classification system for the pulmonary lymphoproliferative disorder spectrum.3) Identify the breadth of MDCT patterns associated with pulmonary lymphoproliferative disease.4) Contrast the imaging manifestations of LIP versus pulmonary lymphoma.5) Detect key MDCT patterns in secondary pulmonary lymphoma.6) Differentiate lymphoproliferative malignancy in the immunocompromised patient (eg AIDS-related lymphoma; PTLD).

ABSTRACT

Pulmonary lymphoproliferative disorders (LPD) comprise a complex group of focal or diffuse abnormalities: benign LPD and primary pulmonary lymphoma are relatively rare whereas secondary pulmonary lymphoma is far more common. Understanding the spectrum of LPD, coupled with the diversity of potential imaging findings, is crucial because the radiologist is often the first to suggest the diagnosis and is therefore pivotal in differentiating these entities. This presentation will discuss practical LPD concepts relevant to everyday chest imaging by reviewing the more commonly encountered CT patterns in this disorder spectrum.

RC601B Thoracic Oncologic Imaging: Treatment Effects and Complications

Participants
Brett W. Carter, MD, Houston, TX, (bcarter2@mdanderson.org) (*Presenter*) Editor, Reed Elsevier;

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/

Brett W. Carter, MD - 2015 Honored Educator

RC601C Imaging Thymic Epithelial Malignancies

Participants
Edith M. Marom, MD, Ramat Gan, Israel, (edith.marom@gmail.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify an incidental thymic epithelial malignancy. 2) Apply the most appropriate imaging modality for the evaluation of thymic epithelial malignancies. 3) Assign the newly proposed TNM stage to a newly diagnosed thymic epithelial malignancy.

ABSTRACT

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/

Edith M. Marom, MD - 2015 Honored Educator

RC601D Lung Cancer Staging: Update 2016

Participants
Travis S. Henry, MD, San Francisco, CA (*Presenter*) Research Consultant, Enlitic Inc; Spouse, Employee, F. Hoffmann-La Roche Ltd

LEARNING OBJECTIVES

1) Understand the pratical role of imaging in the staging of lung cancer. 2) Identify findings that should be part of an imager's search pattern for accurate staging of lung cancer. 3) Recognize upcoming changes to the 8th edition of the TNM lung cancer staging.

ABSTRACT

Active Handout:Travis S. Henry

http://abstract.rsna.org/uploads/2016/16000700/rc601d Handout - Henry - Lung Cancer Staging.pdf

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/

Travis S. Henry, MD - 2016 Honored Educator

RC602

International Radiology Outreach - Why? How? Who?

Thursday, Dec. 1 8:30AM - 10:00AM Room: E353A

ED

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

Participants
Dorothy I. Bulas, MD, Washington, DC, (dbulas@cnmc.org) (*Moderator*) Editor, Wolters Kluwer nv

ABSTRACT

Up to 2/3 of the world's population lacks adequate access to medical imaging. Participating in international outreach endeavers can be as rewarding to participants as to the patients being cared for and staff being trained. Many medical schools and residencies now offer rotations to interested trainees in underserved regions of the world. While opportunities to participate in radiology outreach rotations have been limited, the growing interest in global health radiology have encouraged trainees and program directors to create such rotations. This presentation will review the benefits in participating in global health radiology initiatives. Opportunities to develop programs as a trainee will be discussed. Rotations require careful planning .and must meet program requirements. Tips on how program directors can support these initiatives will be reviewedThe importance of developing safe sustainable initiatives that are beneficial to the international outreach communties will be discussed. Opportunites to participate in outreach endeavors beyond training years will be assessed as well.

Sub-Events

RC602A International Radiology Outreach - Why?

Participants
Dorothy I. Bulas, MD, Washington, DC, (dbulas@childrensnational.org) (*Presenter*) Editor, Wolters Kluwer nv

LEARNING OBJECTIVES

1) Discuss how international outreach is impacting the future of radiology. 2) Review methods of planning successful global radiology programs. 3) Describe how program directors can support global health radiology rotations.

ABSTRACT

RC602B Global Health Radiology Rotations - Program Director Perspective

Participants
Kristen K. DeStigter, MD, Burlington, VT (*Presenter*) Medical Advisory Board, Koninklijke Philips NV; Luminary, McKesson Corporation; Research collaboration, Koninklijke Philips NV;

LEARNING OBJECTIVES

1) Apply the ACGME Radiology RC Guidelines for International Rotations in Radiology. 2) Assess the various opportunities for resident and fellow involvement in global health. 3) Assess the role of the program director in global health rotations. 4) Assess some challenges, resolutions and best practices associated with global health rotations.

ABSTRACT

RC602C Global Health Radiology Rotations - Trainee Perspective

Participants
Joanna G. Escalon, MD, New York, NY, (jgb9001@nyp.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Provide a resident's perspective on creating a GME-approved international elective for radiology residents based on Cornell's experience working with Black Lion Hospital in Addis Ababa, Ethiopia. 2) Provide a step-by-step overview of how to create such an elective including necessary considerations, challenges, and benefits.

ABSTRACT

RC603

Imaging of Obstructive Coronary Artery Disease

Thursday, Dec. 1 8:30AM - 10:00AM Room: E351

CA CT MR

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

FDA Discussions may include off-label uses.

Participants
Suhny Abbara, MD, Dallas, TX (*Moderator*) Author, Reed Elsevier; Editor, Reed Elsevier; Institutional research agreement, Koninklijke Philips NV; Institutional research agreement, Siemens AG

Sub-Events

RC603A Cardiac CT for Management of Coronary Artery Disease-State of the Evidence

Participants
Leslee Shaw, PhD, Atlanta, GA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

To understand the latest clinical trial supporting the use of cardiac CT in stable chest pain patients.To comprehend evidence supporting effective detection of obstructive coronary disease with cardiac CT.

RC603B CT of Myocardial Perfusion, Scar and Viability Imaging

Participants
U. Joseph Schoepf, MD, Charleston, SC, (schoepf@musc.edu) (*Presenter*) Research Grant, Astellas Group; Research Grant, Bayer AG; Research Grant, General Electric Company; Research Grant, Siemens AG; Research support, Bayer AG; Consultant, Guerbet SA; ; ;

LEARNING OBJECTIVES

1) Discuss various approaches towards functional CT imaging of the heart. 2) Recognize manifestations of ischemic heart disease on functional CT. 3) Identify suitable future indications for CT myocardial perfusion imaging.

ABSTRACT

Coronary computed tomography angiography (CCTA) is an established imaging technique for the noninvasive assessment of coronary arteries. However, CCTA remains a morphologic technique with the same limitations as invasive coronary angiography in evaluating the hemodynamic significance of coronary stenosis. Different computed tomography (CT) techniques for the functional analysis of coronary lesions have recently emerged, including static and dynamic CT myocardial perfusion imaging and CT-based fractional flow reserve and transluminal attenuation gradient methods. These techniques hold promise for achieving a comprehensive appraisal of anatomic and functional aspects of coronary heart disease with a single modality.

RC603C MR Imaging of Coronary Ischemia (Coronary MRA, Stress Perfusion)

Participants
David A. Bluemke, MD, PhD, Bethesda, MD (*Presenter*) Research support, Siemens AG

LEARNING OBJECTIVES

1) Describe techniques used for evaluation myocardial ischemia with MRI. 2) Describe the use of MRI for evaluating myocardial viability. 3) Describe the use of MRI for evaluating stress induced ischemia.

ABSTRACT

Cardiac MRI (CMR) is an established modality for evaluation of ischemic myocardial disease; appropriateness criteria increasingly recognize the role of CMR in this role. CMR has outstanding temporal resolution allowing for accurate representation of myocardial volumes and function. Excellent soft issue contrast for myocardial ischemia evaluation is achieved with the use of a gadolinium contrast agent. Stress perfusion CMR during adenosine infusion compares favorably to nuclear medicine methods but can additionally assess volumes and mass very accurately. Stress CMR is used in combination with late gadolinium enhancement (LGE) techniques to depict viable myocardium to improve the specificity of the method. Coronary artery imaging with CMR is best performed at 1.5 T and is useful to assess for anomalous coronary artery imaging and confirm perfusion results. This session will describe the techniques, indications, results and interpretation of CMR for evaluation of ischemic disease of the myocardium.

RC603D Late Gadolinium Enhancement

Participants
Scott D. Flamm, MD, Cleveland, OH, (flamms@ccf.org) (*Presenter*) Medical Director, Precision Image Analysis, Inc; Board of Directors, Precision Image Analysis, Inc; Consultant, Bayer AG;

LEARNING OBJECTIVES

1) Understand the distinct advantages of LGE imaging by cardiac MRI. 2) Recognize the clinical situations appropriate for cardiac MRI LGE imaging. 3) Articulate the mechanisms responsible for the increased signal intensity in irreversibly damaged myocardium.

ABSTRACT

RC604

Musculoskeletal Series: Tumors

Thursday, Dec. 1 8:30AM - 12:00PM Room: E451B

MK

AMA PRA Category 1 Credits ™: 3.50
ARRT Category A+ Credits: 4.00

FDA Discussions may include off-label uses.

Participants
Mark D. Murphey, MD, Silver Spring, MD, (mmurphey@acr.org) (*Moderator*) Nothing to Disclose
Benjamin M. Howe, MD, Rochester, MN, (howe.benjamin@mayo.edu) (*Moderator*) Nothing to Disclose
Mark Davies, MBChB, Birmingham, United Kingdom (*Moderator*) Nothing to Disclose
Laura M. Fayad, MD, Baltimore, MD (*Moderator*) Nothing to Disclose
Hakan Ilaslan, MD, Pepper Pike, OH (*Moderator*) Nothing to Disclose

Sub-Events

RC604-01 Workup of Incidental Soft Tissue Lesions

Thursday, Dec. 1 8:30AM - 8:55AM Room: E451B

Participants
Mark J. Kransdorf, MD, Phoenix, AZ, (kransdorf.mark@mayo.edu) (*Presenter*) Nothing to Disclose

Active Handout:Mark J. Kransdorf

http://abstract.rsna.org/uploads/2016/16000544/rc604 01 RSNA 2016 - Incidental Soft Tissue.HO.pdf

RC604-02 Radiography,Ultrasound and MRI Features of Soft Tissue Tumours: Can a Simple Checklist of Imaging Features Identify Malignancy?

Thursday, Dec. 1 8:55AM - 9:05AM Room: E451B

Participants
Leonhard Gruber, Innsbruck, Austria (*Presenter*) Nothing to Disclose
Anna Luger, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Bernhard Glodny, MD, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Benjamin Henninger, MD, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Hannes Gruber, MD, PhD, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Alexander Loizides, MD, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To statistically quantify the diagnostic value of imaging features in soft tissue masses (STMs) and derive a focused checklist of imaging features.

METHOD AND MATERIALS

Diagnostic properties of a comprehensive set of 26 imaging features in 260 cases of STMs with known histology were assessed via Fisher's exact test/chi-square test and a random forest analysis: diagnostic values including sensitivity, specificity, positive and negative predictive values, likelihood/odds ratios (OR) and normalised variance (NV) were determined. The diagnostic value of an 8-item checklist consisting of the highest-ranked features was assessed as the area under the curve (AUC) in a receiver-operator-characteristics (ROC) analysis.

RESULTS

The most predictive features were inhomogeneous contrast-enhancement in ultrasound (297.9 NV/15.1 OR) and MRI (197.3 NV/11.9 OV), lesion roundness (209.8 NV/5.5 OR), diffusion restriction (175.8 NV/9.3 OR), cystic intralesional areas (167.1 NV/8.3 OR), higher patient age (159.0 NV/2.6), surrounding edema (155.4/6.5) and intralesional Doppler hypervascularity (134.4/5.1).Patient gender (-18.6 NV /1.1 OR), affected compartment (-16.7 NV /1.2 OR), fascial relationship (-2.7 NV /1.4 OR), T1- (19.7 NV /2.8 OR) or T2-weighted signal intensity (5.0 NV /2.1 OR), surrounding capsule (10.9 NV /0.4 OR), diffuse margins (28.1 NV /0.97 OR), lesion size (46.4 NV /2.8 OR), and localization (56.3 NV /2.2 OR) showed little diagnostic value.A simple 8-item checklist was highly predictive of malignancy in cases with at least 75% positive features (0.90 ROC AUC, 0.87 sensitivity, 0.84 specificity, 0.59 positive and 0.96 negative predictive value, 36.5 odds ratio). The method proved robust even in cases with missing information.

CONCLUSION

Features vary widely in their diagnostic value in STMs; a simple checklist based on the eight most decisive features can provide a reliable tool for the assessment of likelihood for malignancy in unknown STMs.

CLINICAL RELEVANCE/APPLICATION

A simple combined score based on the eight most decisive patient and imaging features can reliably identify low-risk and high-risk soft tissue masses.

RC604-03 Radiogenomics in Desmoid Tumors: Association of Semantic and Computational MR Image Features with CTNNB1 Mutation Status

Thursday, Dec. 1 9:05AM - 9:15AM Room: E451B

Participants
Tobias Sangers, BSC, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Edwin H. Oei, MD, PhD, Palo Alto, CA (*Presenter*) Nothing to Disclose
Christopher F. Beaulieu, MD, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Dirk J. Grunhagen, MD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Daniel L. Rubin, MD, MS, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Olivier Gevaert, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Jacob J. Visser, MD, PhD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Clinical outcomes of desmoid tumors are known to vary depending on mutations of the CTNBB1 gene. The purpose of this study was to identify prognostic image features in desmoid tumors by associating semantic and computational magnetic resonance (MR) imaging features with CTNNB1 mutation status.

METHOD AND MATERIALS

177 patients diagnosed with a desmoid tumor from 2003 until 2016 were evaluated for the availability of CTNNB1 molecular data and presurgical MR imaging data from the hospital Electronic Medical Record and the digital Picture Archiving Communication System (PACS). Patients who had undergone treatment for the desmoid tumor prior to MR imaging were excluded. Semantic and computational data of 18 patients were extracted from MR imaging using quantitative imaging extraction software after annotation by experienced musculoskeletal (MSK) radiologists who were blinded to the CTNNB1 mutation status to avoid bias. Univariate analyses were performed to assess correlations between semantic image features and CTNNB1 mutation status, using a Fisher exact test. A Random Forest using 20 trees was used as a multivariate model for prediction of CTNNB1 mutation status in terms of semantic image features.

RESULTS

Eight patients (44.4%) had no CTNNB1 gene mutation, 5 patients (27.8%) had a p.T41A mutation, 3 patients (16.6%) a p.S45F mutation, 1 patient (5.6%) a p.S45P mutation and 1 patient (5.6%) a p.S33L mutation. Univariate analysis showed desmoid tumors with CTNNB1 mutation were significantly associated with an intra-abdominal or upper extremity location (p=0.039). For the p.S45F mutation there was a trend towards significance for the association between tumor location (p=0.15) and neurovascular encasement (p=0.16). Semantic image features predicted the p.S45F mutation using a multivariate model with an accuracy of 77.8%.

CONCLUSION

In desmoid tumors, CTNNB1 mutation is significantly associated with an intra-abdominal or upper extremity location. Computational data analyses are in progress and may identify additional prognostic image features.

CLINICAL RELEVANCE/APPLICATION

Identifying image features correlated with specific CTNNB1 mutation status can accelerate the diagnostic process and predict clinical course noninvasively.

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/

Daniel L. Rubin, MD, MS - 2012 Honored Educator
Daniel L. Rubin, MD, MS - 2013 Honored Educator

RC604-04 Common Errors in Soft Tissue Tumor Evaluation

Thursday, Dec. 1 9:15AM - 9:40AM Room: E451B

Participants
Mark D. Murphey, MD, Silver Spring, MD, (mmurphey@acr.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the imaging differentiation of cystic lesions from myxoid neoplasms. 2) Understand the Imaging appearance that allows distinction of hematoma from hemorrhagic neoplasm. 3) Identify the imaging characteristic of myositis ossificans. 4) Improve recognition of the distinction of intramuscular tendon injury from neoplasm.

ABSTRACT

Radiologists are frequently requested to evaluate a soft tissue mass by imaging. Common diagnostic dilemmas in imaging assessment of soft masses include differentiation of a cystic lesion from myxoid neoplasm, distinction of hematoma from hemorrhagic neoplasm, misdiagnosis of myositis ossification on MR imaging and recognition intermuscular tender injury simulating a neoplastic process. This lecture emphasizes imaging features that usually allow differentiation of these diagnostic dilemmas in evaluation of a soft tissues tumor.

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/

Mark D. Murphey, MD - 2015 Honored Educator

RC604-05 MRI Appearance of Lipid-rich Myxoid Liposarcoma - An Imitator of Atypical Lipomatous Tumor

Thursday, Dec. 1 9:40AM - 9:50AM Room: E451B

Participants
I-Yuan J. Chang, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Jennifer Bullen, MSc, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Brian Rubin, MD,PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Murali Sundaram, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Hakan Ilaslan, MD, Pepper Pike, OH (*Presenter*) Nothing to Disclose

PURPOSE

To investigate the prevalence of lipid-rich myxoid liposarcoma and describe its MRI appearance.

METHOD AND MATERIALS

Retrospective review of 100 histologically proven myxoid liposarcoma cases from 60 patients archived in the Cleveland Clinic Anatomic Pathology database from January 1, 1980 to September 16, 2015. Recurrent and metastatic lesions, and cases where MRIs are not available for review were excluded. MRIs were reviewed independently by both a fellowship-trained MSK radiologist and an MSK fellow. Disagreements were resolved by consensus. Each MRI case was reviewed for intralesional fat content, fat pattern (lacy, linear, amorphous, nodular), T2 hyperintense component, enhancement and necrosis (if post-contrast image available). Pathology slides were reviewed by at least 1 pathologist with expertise in soft tissue pathology.

RESULTS

36 MRI examinations from 34 patients met the criteria for review. Quantification of intralesional fat by visual inspection of MRI found that 58.3% (21/36) of cases had negligible fat; 19.4% (7/36) had fat content of <5%; 11.1% (4/36) had 5-10% fat; 0% had 10-25% fat; 5.6% (2/36) had fat content of 25-50%; 5.6% (2/36) had fat content of more than 50%. Two cases had fat content approaching 80%.

CONCLUSION

A small percentage of lipid-rich myxoid liposarcomas can have high fat content, with an MRI appearance mimicking that of an atypical lipomatous tumor.

CLINICAL RELEVANCE/APPLICATION

Differentiation of lipid-rich myxoid liposarcoma from atypical lipomatous tumors can significantly affect patient treatment.

RC604-06 Tumor Margin Infiltration of Soft Tissue Sarcoma: Use of Additive Diffusion-weighted MR Imaging to Standard MR Imaging at 3 T

Thursday, Dec. 1 9:50AM - 10:00AM Room: E451B

Participants
Ji Hyun Hong, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Won-Hee Jee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Investigator, Bayer AG; Research support, Bayer AG ;
Joon-Yong Jung, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Chan-Kwon Jung, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Seung Han Shin, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yang-Guk Chung, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the added value of diffusion-weighted imaging (DWI) to standard magnetic resonance (MR) imaging to assess tumor margin infiltration in soft tissue sarcoma at 3 T.

METHOD AND MATERIALS

The institutional review board approved this retrospective study and informed consent was waived. Forty-five patients who underwent 3-T MR imaging including DWI and were pathologically confirmed as soft tissue sarcoma after surgery were included in this study. One experienced musculoskeletal radiologist and one musculoskeletal fellow retrospectively scored standard MR imaging. Then, they assessed a combination of standard MR imaging and DWI. Margin infiltration on pathology were retrospectively reviewed by one experienced pathologist blinded to MR findings. The receiver operating characteristic curve with areas under the curve (AUC) was obtained for diagnostic performance. Interobserver agreement for scoring of tumor margin infiltration of soft tissue sarcoma was assessed using kappa statistics.

RESULTS

Among 45 patients with soft tissue sarcoma, 33 soft tissue sarcomas had tumor margin infiltrations at pathology. Sensitivity, specificity, and accuracy of each reader were 100%, 17%, and 78%; 97%, 25%, and 78% on standard MRI alone and 94%, 67%, and 87%; 88%, 42%, and 76% on standard MR imaging combined with DWI. Specificity of standard MR imaging combined with DWI was significantly higher than that of standard MR imaging alone for reader 1 ($P = .0313$). AUCs of a combination of standard MR imaging and DWI were significantly higher than those of standard MR imaging alone: 0.890 vs 0.678 ($P = .0123$), and 0.780 vs 0.645 ($P = .1252$) for each reader, respectively. Interobserver agreements of standard MRI alone and standard MR imaging combined DWI were fair to good ($k = 0.646$, $k = 0.533$, respectively)

CONCLUSION

The addition of DWI to standard MR imaging improves the assessment of tumor margin infiltration in soft tissue sarcoma at 3 T.

CLINICAL RELEVANCE/APPLICATION

DWI should be added to standard MR imaging protocol to help assess the tumor margin infiltration of soft tissue sarcoma in preoperative imaging.

RC604-07 Workup of Incidental Bone Lesions

Thursday, Dec. 1 10:00AM - 10:25AM Room: E451B

Participants
Stephanie A. Bernard, MD, Hershey, PA, (sbernard@hmc.psu.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1. Be able to recognize features that indicate bone lesion benignity.2. Be able to apply appropriate imaging to the work up of chondroid, osteolytic, osteoblastic and focal marrow replacing lesions.

ABSTRACT

Unexpected bone lesions are a common diagnostic dilemma. When faced with an unexpected bone lesion, the goal is to be able to accurately assess which lesions can be safely ignored from those requiring additional workup or biopsy. As part of this process, understanding the strengths and limitations of the various imaging tests when applied to the commonly encountered scenarios for unexpected bone lesions is essential for selecting the most cost-effective and expeditious work up. This lecture will review imaging options, includinng helpful supplimental MR sequences and an generalized approach to the work up of unexpected bone lesions in 4 frequently encountered scenarios; 1) chondroid lesions, (2) sclerotic bone lesions, (3) osteolytic lesions and (4) areas of focal marrow replacement on MRI.

LEARNING OBJECTIVES

1) Recognize clinical features that stratify the risk of malignancy in bone lesions. 2) Understand the imaging features that raise a concern of chondrosarcomatous transformation in cartilage lesions. 3) Be able to select the appropriate next imaging for the work up of unexpected osteolytic bone lesions, osteosclerotic bone lesions and isolated marrow abnormalities.

ABSTRACT

RC604-08 Common Errors in Bone Tumor Evaluation

Thursday, Dec. 1 10:30AM - 10:55AM Room: E451B

Participants
Mark Davies, MBChB, Birmingham, United Kingdom (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

(1) Explain issues with detection of bone tumors (2) Explain impact of age on differential diagnosis (3) Explain importance of previous imaging studies (4) Explain relevance of prior non-osseous malignancy (5) Stress importance of the chest radiograph (6) Identify role of delayed/follow-up imaging

RC604-09 Improved MDCT Monitoring of Pelvic Myeloma Bone Disease through the Use of a Novel Longitudinal Bone Subtraction Post-processing Algorithm

Thursday, Dec. 1 10:55AM - 11:05AM Room: E451B

Participants
Christopher Kloth, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Wolfgang M. Thaiss, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Hendrik Ditt, Forchheim, Germany (*Abstract Co-Author*) Employee, Siemens AG
Katja Weisel, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Jan Fritz, MD, Baltimore, MD (*Abstract Co-Author*) Research Grant, Siemens AG; Scientific Advisor, Siemens AG; Scientific Advisor, Alexion Pharmaceuticals, Inc; Speaker, Siemens AG
Konstantin Nikolaou, MD, Tuebingen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Speakers Bureau, Bayer AG
Shu Liao, Chapel Hill, NC (*Abstract Co-Author*) Employee, Siemens AG
Marius Horger, MD, Tuebingen, Germany (*Presenter*) Nothing to Disclose

PURPOSE

To evaluate the diagnostic performance of a novel CT post-processing software that generates subtraction maps of baseline and follow-up CT exams in course of myeloma bone lesions.

METHOD AND MATERIALS

This study included 61 consecutive myeloma patients who underwent repeated whole-body reduced-dose MDCT at our institution between November 2013 and June 2015. CT subtraction maps were compared with hematological markers and classified a progressive disease (PD) vs. stable (SD)/remission. Bone lesions were categorized as new, enlarging osteolyses or sclerosis. Bone subtraction maps (BSM) only and in combination with 1 mm (BSM+) source images were compared with 5 mm axial and 2 mm MPR-scans. Statements of 1 mm axial CT images were considered the standard of reference if they were confirmed by CT-follow-up. For statistical purposes, we sub-grouped hematological response categories similarly to those applied for CT-imaging (progression vs. stable/response).

RESULTS

Hematological response categories at follow-up were: [complete remission-CRh(n=9), very good partial remission-VGPRh(n=2), partial remission-PRh (n=17), SDh(n=19)] vs. PDh(n=14). 5mm CT-scan yielded PD(n=14) and SD/remission (n=47) whereas bone subtraction + 1mm axial scans(BSM+) reading resulted in PD(n=18) and SD/remission(n=43). Sensitivity/ specificity/accuracy for 5mm/1mm/BSM(alone)/BSM+ in "lesion-by-lesion" reading was 89.4%/98.9%/98.3%/99.5%; 69.1%/96.9%/72%/92.1% and 83.8%/98.4%/92.1%/98.3%, respectively. The use of BSM+ resulted in a change of response classification in 9.8 % patients n=6) vs. 5mm image reading from SD to PD.BS+ results correlated strongly with hematological response categories (r=0.806, p=0.0001) whereas 5mm scans correlate to a lesser degree (r=0.356, p=0.05). Bone sclerosis lesions was detected in 39/61 patients.

CONCLUSION

BSM reading is more accurate for monitoring myeloma compared to axial scans whereas BSM+ yields similar results with 1mm reading (gold standard) but by significantly reduced reading time.

CLINICAL RELEVANCE/APPLICATION

The use of longitudinal bone subtraction maps can improve radiologists' accuracy of the therapy response diagnosis in patients with myeloma bone disease through improved and more efficient detection

RC604-10 The Natural Course of Incidental Enchondromas on Knee MRI in a Large Population-based Cohort of Middle-aged Females

Thursday, Dec. 1 11:05AM - 11:15AM Room: E451B

Participants
Stephan J. Breda, MD, Rotterdam, Netherlands (*Presenter*) Nothing to Disclose
J. H. J. M. Bessems, MD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Dieuiwke Schiphof, PhD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Abida Z. Ginai, MD, PhD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Jan Heeringa, MD, PhD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Gabriel P. Krestin, MD, PhD, Rotterdam, Netherlands (*Abstract Co-Author*) Research Grant, General Electric Company; Research Grant, Bayer AG; Research Grant, Siemens AG; Consultant, Bracco Group; Scientific Advisor, Zebra Medical Vision Ltd; Advisory Board, Quantib BV
Meike W. Vernooij, MD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Sita Bierma-Zeinstra, PhD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Edwin H. Oei, MD, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Although it is important to distinguish benign enchondromas from low-grade chondrosarcomas, no established criteria exist for the management of incidental enchondromas on knee MRI, partly due to lacking information on natural course. We therefore investigated the natural course of incidentally found enchondromas on knee MRI in females of a large population-based study of middle-aged and elderly.

METHOD AND MATERIALS

Of 891 female participants aged 45-60 (mean 55) from the Rotterdam Study who underwent non-contrast bilateral knee MRI (1.5 T) at baseline, 700 (79%) participants were re-scanned at 5 years follow-up and included in the analysis. All participants gave written informed consent, including a section on incidental findings. At baseline, incidentally found enchondromas were categorized into those that did not require referral (< 1cm, central metadiaphysial location, and no endosteal scalloping) and those that required referral to an orthopedic surgeon for further investigation with dynamic contrast-enhanced MRI (DCE-MRI) (all other). Of each enchondroma we determined the presence of interval progression (size increase, endosteal scalloping, or cortical disruption).

RESULTS

In 1782 MRI scans, we identified 52 incidental enchondromas (2.9%) at baseline, of which 15 were referred (28.8%) and 37 were not. In the absence of malignant features on clinical DCE-MRI, none of the referred enchondromas were treated. Mean follow-up duration was 4.6 years (SD 0.6, range 4-6). At follow-up, two enchondromas (4.3%), both of which had been referred, showed progression only in terms of increased size. None of the non-referred enchondromas demonstrated progression. One referred participant and 5 non-referred participants were lost to follow-up.

CONCLUSION

In a population of middle-aged women, incidental enchondromas are present on 2.9% of knee MR scans, and show size increase in 4.3% of cases over a period of 5 years. Our pre-defined criteria (< 1cm, central metadiaphysial location, and no endosteal scalloping) appear to be applicable for classifying incidental enchondromas as not requiring referral, since none of these demonstrated progression.

CLINICAL RELEVANCE/APPLICATION

Incidental enchondromas on knee MRI of middle-aged females < 1 cm, located in the metadiaphysis without endosteal scalloping don't require referral since they don't progress over a period of 5 years.

RC604-11 The Single Energy Metal Artifact Reduction Algorithm with a 320-MDCT Volume Scanner Improves the Quality of Images in Patients with Custom-made Tumor Prosthesis of Knee Joint

Thursday, Dec. 1 11:15AM - 11:25AM Room: E451B

Participants
Lei Ding, Guangzhou, China (*Presenter*) Nothing to Disclose
Ling Ma, MD, Canton, China (*Abstract Co-Author*) Nothing to Disclose
Fang-Ling Zhang, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the effect of single energy metal artifact reduction (SEMAR) algorithm with 320-MDCT volume scanners in patients with custom-made tumor prosthesis of knee joint.

METHOD AND MATERIALS

23 consecutive patients with a custom-made tumor prosthesis of knee joint underwent a 320-MDCT scan. And the images were reconstructed using two different methods: iterative reconstruction (IR) alone and IR associated with SEMAR. 10 periprosthetic structures at different orientations were selected at two planes (5 at each plane): the articular plane and osteotomy plane. Objective assessment including CT number and SD value was performed with paired sample t test. Two radiologists visually graded the influence of metallic artifacts on a 6-point scale from 0 (completely obscured) to 5 (recognition with high confidence), and paired sample t test and kappa analysis were used for the subjective scores of image quality.

RESULTS

Visualization of periprosthetic structures was significantly improved by the SEMAR algorithm ($p<0.05$). Objectively, SD values of the osteotomy plane decreased 44.8%~74.1% and that of the articular plane decreased 73%~95%. Subjectively, the scores of image quality of two planes increased 0.45~2.0 scores and 0.78~3.4 scores respectively. In the images with SEMAR, we found periprosthetic effusion in 4 patients, periprosthetic fracture in 2 patients, and tumor recurrence in 2 patients, which were partly or completely obscured by metallic artifacts in the images without SEMAR.

CONCLUSION

The SEMAR significantly improved the quality of images and diagnostic confidence in patients with custom-made tumor prosthesis of knee joint.

CLINICAL RELEVANCE/APPLICATION

The SEMAR significantly improved the quality of images and diagnostic confidence in patients with custom-made tumor prosthesis of knee joint.

RC604-12 Treatment of Aneurysmal Bone Cysts by Percutaneous CT-guided Injection of Calcitonin and Steroid

Thursday, Dec. 1 11:25AM - 11:35AM Room: E451B

Participants
Connie Y. Chang, MD, Boston, MA (*Presenter*) Nothing to Disclose
Susan V. Kattapuram, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Ambrose J. Huang, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Frank J. Simeone, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Martin Torriani, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Miriam A. Bredella, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the efficacy and safety of percutaneous calcitonin and steroid injection in the treatment of aneurysmal bone cysts (ABCs).

METHOD AND MATERIALS

Our study was IRB-approved and HIPAA-compliant. We reviewed pre- and post-procedural imaging studies and medical records of all CT-guided percutaneous injections of ABCs with calcitonin and steroid performed at our institution between 2003-2015. Treatment success based on imaging was categorized as complete/near complete (>80% filled-in), significant partial (50-80% filled-in), partial (20-49% filled-in), and little-to-no (<20% filled-in).

RESULTS

Our study group comprised eight patients (7 F, 1 M; mean age 19±5 (range12-25) years). ABCs were located in the pubis (n=3), femur (n=2), and humerus /ilium/sacrum (n=1 for each). Clinical and imaging follow-up ranged from 0.7 to 93 months (mean 16±29 months). One patient had two injections, and one patient had three injections. 6/8 patients (75%) had complete symptomatic relief and 2 (25%) patients had partial symptomatic relief after initial injection. Short-term imaging follow-up revealed complete/near complete imaging response in 2 (25%) patients and significant partial response in 2 (25%) patients. There was partial response in 2 (25%) patients and little-to-no response in 2 (25%) patients, and all four of these patients had local recurrence. The other four patients did not have local recurrence. There were no complications.

CONCLUSION

Percutaneous CT-guided injection of ABCs with calcitonin and steroid is a safe and effective alternative to surgery. Lack of imaging response may necessitate more aggressive treatment to minimize local recurrence.

CLINICAL RELEVANCE/APPLICATION

Calcitonin/steroid sclerotherapy is safe, effective, alternative, minimally invasive treatment for treatment of aneurysmal bone cysts and should be considered in the forefront of treatment options.

RC604-13 Pearls and Pitfalls of Bone and Soft Tissue Biopsies

Thursday, Dec. 1 11:35AM - 12:00PM Room: E451B

Participants
Travis J. Hillen, MD, Saint Louis, MO (*Presenter*) Consultant, Biomedical Systems; Instructor, DFine, Inc

LEARNING OBJECTIVES

1) Indications and relative contraindications to MSK biopsy. 2) Importance of compartmental anatomy and your referring surgical oncologist in biopsy planning. 3) Tricks to make the difficult biopsy relatively easy using case illustrations.

ABSTRACT

Musculoskeletal biopsies are commonly performed in the diagnosis and staging of malignancy or to evaluate for infection. Preprocedural planning is tantamount to a successful biopsy. As radiologists we must remember that we are physicians and not just technicians.In the biopsy of primary MSK malignancies, discussion of the biopsy with a surgical/orthopedic oncologist is very important as there are potential changes in morbidity related to biopsy of these primary lesions.The majority of MSK biopsies are straightforward. Occasionally challenging biopsies will arise and having some tricks up your sleeves to get the biopsy performed can make a big difference in patient management.

Active Handout:Travis J. Hillen

http://abstract.rsna.org/uploads/2016/16000546/RC604 13 rsna 2016 handout.pdf

LEARNING OBJECTIVES

1) Indications and relative contraindications to MSK biopsy. 2) Importance of compartmental anatomy and your referring surgical oncologist in biopsy planning. 3) Tricks to make the difficult biopsy relatively easy using case illustrations.

ABSTRACT

Musculoskeletal biopsies are commonly performed in the diagnosis and staging of malignancy or to evaluate for infection. Preprocedural planning is tantamount to a successful biopsy. As radiologists we must remember that we are physicians and not just technicians.In the biopsy of primary MSK malignancies, discussion of the biopsy with a surgical/orthopedic oncologist is very important as there are potential changes in morbidity related to biopsy of these primary lesions.The majority of MSK biopsies are straightforward. Occasionally challenging biopsies will arise and having some tricks up your sleeves to get the biopsy performed can make a big difference in patient management.

RC605

Evidence-based Neuroradiology

Thursday, Dec. 1 8:30AM - 10:00AM Room: N227B

NR

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

Participants
Pina C. Sanelli, MD, Manhasset, NY (*Moderator*) Nothing to Disclose

Sub-Events

RC605A Evidence Based Spine Imaging

Participants
Jeffrey G. Jarvik, MD, MPH, Seattle, WA, (jarvikj@uw.edu) (*Presenter*) Co-founder, PhysioSonics, Inc ; Stockholder, PhysioSonics, Inc; Consultant, HealthHelp, LLC; Consultant, UpToDate, Inc

LEARNING OBJECTIVES

1) The participant will understand the state of current literature relative to evidenced based guidelines. 2) The participant will appreciate the implications of following current evidenced based guidelines relative to current utilization. 3) The participant will develop a familiarity of the descriptive terminology regarding evidenced based care.

ABSTRACT

Low back pain, an Institute of Medicine priority condition for comparative effectiveness research, is of major public health importance. Imaging is frequently performed as part of the diagnostic evaluation and is an important contributor to the cost of back pain care. Even without back pain, magnetic resonance (MR) imaging of the lumbar spine frequently reveals findings such as disc desiccation or bulging. Patients and their providers may attribute greater importance to these findings, which are often age-related, than they should, because they do not have an appropriate frame of reference in which to interpret the findings. These "incidental" findings may initiate a cascade of events leading possibly even to surgery, without improving patient outcomes.Understanding evidence-based recommendations regarding when to obtain imaging can help to reduce inappropriate examinations that could lead to unnecessary additional procedures. Standardized nomenclature as well as inserting epidemiological benchmarks into imaging reports may also improve the process of care, reduce subsequent tests and treatments and possibly even improve patient outcomes.Inserting epidemiological benchmarks in lumbar spine imaging reports has been preliminarily shown to reduce subsequent diagnostic and therapeutic interventions, including MR and CT, opioid prescriptions, spinal injections and surgery. The rationale is that the epidemiologic data may provide a context for both physicians and patients to better interpret imaging findings. The long-term public health significance is high. Through simple, inexpensive interventions, radiologists may be able to substantially reduce unnecessary and expensive care for back pain. 1. Fardon DF et al: Lumbar disc nomenclature: version 2.0: Recommendations of the combined task forces of the North American Spine Society, the American Society of Spine Radiology and the American Society of Neuroradiology. Spine J 2014, 14(11):2525-2545.2. Jarvik JG, Deyo RA: Diagnostic evaluation of low back pain with emphasis on imaging. Ann Intern Med 2002, 137(7):586-597.3. Jarvik JG et al: Longitudinal assessment of imaging and disability of the back (LAIDBack) study: baseline data. Spine 2001, 26(10):1158-1156..4. McCullough BJ et al: Lumbar MR imaging and reporting epidemiology: do epidemiologic data in reports affect clinical management? Radiology 2012, 262(3):941-946.

RC605B Evidence Based Management of the Unruptured Brain Aneurysm

Participants
Robert Fahed, MD, MSc, Paris, France (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To review existing guidelines and studies regarding the management of unruptured brain aneurysms. 2) To review the conceptual and methodological problems with existing studies. 3) To review the trials we should do in the near future.

ABSTRACT

“Should we treat unruptured brain aneurysms?”This is a rather usual question that has been asked for several other pathologies. In fact, it probably should be asked for each and every pathology. A randomized trial comparing aneurysm treatment and conservative management should provide a straight answer. The problem is that we don't have this trial yet.Why this trial has not been done yet? One reason is that we have been distracted from doing our duty for decades by what we call "the wrong research", or the so-called natural history of aneurysms. We have been told that "the management of incidental intracranial aneurysm requires accurate knowledge of the natural history of these lesions" and comparisons with "precise definition of the risks of repairing them".This concept of “natural history” bears several flaws. First, it is important to remember that we are talking about an imaging finding, incidental in most cases. This imaging finding cannot have a natural history. It is the history of the multiplication and accessibility of sophisticated and expensive radiological equipment, which will vary in time and countries. Most importantly, the study will inevitably be affected with bias in treatment assignment: we can only end up studying the natural evolution of aneurysms we do not want to treat. The pertinent patients are not included in the study, because we want to treat them. We are then proposed to compare this "natural history" with "risks of repairing the aneurysm". Unfortunately, the literature ends up comparing two very different cohorts: the treated patients and the patients we don't want to treat. Moreover, systematic review on the risk of aneurysm treatment have shown poor reporting with publications bias and very little reliable data.What should we remember from all this? First of all, there is still no evidence that unruptured intracranial aneurysms should ne treated. There is no evidence supporting one treatment modality or another. There isn't even evidence that unruptured intracranial aneurysms should be looked for. There has been no real progress in the last 30 years, except for a significant increase in the apparent prevalence (or detection) of a problem for which no one knows what to do.The appropriate management of incidental intracranial aneurysms requires a reliable comparison between outcomes of patients managed conservatively versus patients managed with treatment X. We need a large trial to guide the care of patients with unruptured aneurysms.

RC605C Imaging Recommendations in TBI: An Evidence Based Review

Participants
Pina C. Sanelli, MD, Manhasset, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Provide a brief review of traumatic brain injury highlighting the key diagnostic features. 2) Review evidence for imaging traumatic brain injury patients. 3) Provide important guidelines for clinical practice.

ABSTRACT

Learning Objectives:
1.Provide a brief review of traumatic brain injury highlighting the key diagnostic features.

2.Review evidence for imaging traumatic brain injury patients.

3.Provide important guidelines for clinical practice.

RC606

The Temporal Bone: Trauma, Tumors, and Inflammation

Thursday, Dec. 1 8:30AM - 10:00AM Room: E451A

HN NR

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

Participants

Sub-Events

RC606A Temporal Bone Trauma

Participants
Tabassum A. Kennedy, MD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize patterns of temporal bone trauma. 2) Categorize fractures based on anatomy, fracture direction and otic capsule involvment. 3) Anticipate predictable complications of temporal bone trauma.

ABSTRACT

RC606B Temporal Bone Tumors

Participants
Amy F. Juliano, MD, Boston, MA, (amy_juliano@meei.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the location of a tumor within the temporal bone and generate a differential diagnosis based on the location. 2) Recognize imaging features of some temporal bone tumors that have distinct appearances on CT or MR. 3) Identify pertinent positives and negatives.

ABSTRACT

RC606C Temporal Bone Inflammation

Participants
Joel D. Swartz, MD, Gladwyne, PA, (swartzjd@aol.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) The learner will be able to understand and analyze the most common varieties of inflammation involving the external auditory canal, middle ear, mastoid and inner ear. 2) The learner will understand the appropriate use of computed tomography and MRI. 3) The learner will be able to differentiate cholesteatoma from other middle ear maladies and understand the pathophysiology of the entities discussed in the presentation. 4) The learner will understand the imaging approach to inner ear inflammation.

ABSTRACT

This presentation will follow an anatomically organized template. The external ear entities emphasize will include necrotizing external otitis, keratosis obturans, granulation tissue and EAC cholesteatoma. There will be special attention to middle ear cholesteatoma with a discussion of diffusion weighted imaging and differentiation of this lesion of granulation tissue and cholesterol granuloma. The pathophysiology of labyrinthitis will also be emphasized.

RC607

Genitourinary Series: Prostate MRI in the PI-RADS Era: Detection, Diagnosis and MRI Guided/Targeted Interventions

Thursday, Dec. 1 8:30AM - 12:00PM Room: E450B

GU BQ MR

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

Participants

Clare M. Tempany-Afdhal, MD, Boston, MA (*Moderator*) Research Grant, InSightec Ltd; Consultant, Profound Medical Inc; Advisory Board, Profound Medical Inc; Spouse, Employee, Spring Bank Pharmaceuticals, Inc; Spouse, Consultant, AbbVie Inc; Spouse, Consultant, Bristol-Myers Squibb Company; Spouse, Consultant, Gilead Sciences, Inc; Spouse, Consultant, Merck & Co, Inc; Spouse, Consultant, Vertex Pharmaceuticals Incorporated; Spouse, Consultant, Echosens SA; Spouse, Consultant, GlaxoSmithKline plc; Spouse, Consultant, Novartis AG; Spouse, Consultant, Boehringer Ingelheim GmbH; Spouse, Consultant, Ligand Pharmaceuticals, Inc; Spouse, Consultant, Medgenics, Inc; Spouse, Consultant, Kadmon Corporation, LLC; Spouse, Consultant, Johnson & Johnson; Spouse, Consultant, Achillion Pharmaceuticals, Inc; Spouse, Stock options, Spring Bank Pharmaceuticals, Inc; Spouse, Stock options, Medgenics, Inc; Spouse, Editor, John Wiley & Sons, Inc

LEARNING OBJECTIVES

1) Prostate MRI in the PI-RADS era: Detection, diagnosis and MRI guided/targeted interventions Overview- Current issues in Prostate cancer care MpMRI Interpretation and Reporting using PI-RADS v2 MR assessment and reporting will be reviewed and attendee will learn how to apply PI-RADS v2 MpMRI quantitative metrics- added value to PI-RADS? 2) To understand the complementary nature of quantitiative metrics MpMR and prostate biopsy: when to biopsy and how Cognitive, fusion and In boreapproaches will be outlined Impact of PI-RADS on outcomes of prostate biopsy and treatment. Meta-analytic and otherreviews of population studies will be presented

ABSTRACT

Sub-Events

RC607-01 Overview - Current Issues in Prostate Cancer Care

Thursday, Dec. 1 8:30AM - 8:55AM Room: E450B

Participants
Clare M. Tempany-Afdhal, MD, Boston, MA, (ctempany@bwh.harvard.edu) (*Coordinator*) Research Grant, InSightec Ltd; Consultant, Profound Medical Inc; Advisory Board, Profound Medical Inc; Spouse, Employee, Spring Bank Pharmaceuticals, Inc; Spouse, Consultant, AbbVie Inc; Spouse, Consultant, Bristol-Myers Squibb Company; Spouse, Consultant, Gilead Sciences, Inc; Spouse, Consultant, Merck & Co, Inc; Spouse, Consultant, Vertex Pharmaceuticals Incorporated; Spouse, Consultant, Echosens SA; Spouse, Consultant, GlaxoSmithKline plc; Spouse, Consultant, Novartis AG; Spouse, Consultant, Boehringer Ingelheim GmbH; Spouse, Consultant, Ligand Pharmaceuticals, Inc; Spouse, Consultant, Medgenics, Inc; Spouse, Consultant, Kadmon Corporation, LLC; Spouse, Consultant, Johnson & Johnson; Spouse, Consultant, Achillion Pharmaceuticals, Inc; Spouse, Stock options, Spring Bank Pharmaceuticals, Inc; Spouse, Stock options, Medgenics, Inc; Spouse, Editor, John Wiley & Sons, Inc

LEARNING OBJECTIVES

1) To understand the clinical issues and current concerns in Prostate Cancer care. 2) To learn and understand how to apply mpMRI PIRADSv2 in clinical practice. 3) To understand the potential of quantitative metrics from mpMRI which may help in interpretation. 4) To learn the role of mpMRI in prostate biopsy and understand the different approaches. 5) To Understand the role of MRI in prostate cancer therapy.

ABSTRACT

RC607-02 Mp MRI and PIRADS 2016 Update

Thursday, Dec. 1 8:55AM - 9:20AM Room: E450B

Participants
Katarzyna J. Macura, MD, PhD, Baltimore, MD, (kmacura@jhmi.edu) (*Presenter*) Author with royalties, Reed Elsevier

LEARNING OBJECTIVES

View learning objectives under the main course title.

Honored Educators

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

Katarzyna J. Macura, MD, PhD - 2012 Honored Educator
Katarzyna J. Macura, MD, PhD - 2014 Honored Educator

RC607-03 The PI-RADS Version 2 Lexicon: Application by Radiologists Inexperienced in Prostate MRI Interpretation

Thursday, Dec. 1 9:20AM - 9:30AM Room: E450B

Awards

Student Travel Stipend Award

Participants
Laura M. Leonards, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Nisha Alle, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Taylor J. Choy, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Daniel J. Margolis, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Patrick J. Pan, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Andrew B. Rosenkrantz, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Hyung J. Kim, PhD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

PI-RADS version 2 (v2) includes a detailed lexicon to guide scoring a lesion's level of suspicion. While the lexicon has been evaluated among experienced radiologists, a key intended benefit of PI-RADS v2 is to assist interpretation by radiologists without prostate MRI expertise. Thus, our aim was to evaluate the performance of radiologists inexperienced in prostate MRI interpretation in applying the PI-RADS v2 lexicon.

METHOD AND MATERIALS

Four radiology residents without prior prostate MRI training evaluated 40 prostate MRI exams. Readers were provided screen captures indicating the location of one specific lesion per case (20 in PZ; 20 in TZ), along with the PI-RADS v2 document. Readers scored the specified lesion for a wide array of lexicon components. These exams had previously been evaluated by six expert prostate MRI radiologists as part of a national multi-center reproducibility study; experts' consensus readings served as reference. Reader-averaged percent agreement with the reference was computed for the lexicon features (considered excellent when >80%).

RESULTS

In PZ, novice radiologists' agreement with the expert-derived reference was excellent (84%-90%) for features related to DWI (focal shape; marked high b-value hyperintensity; marked ADC hypointensity; DWI >3), though moderate (75%) for DCE (+). In TZ, agreement was excellent for T2 encapsulation (86%), though moderate (61%-78%) for other T2WI features (circumscribed shape; lenticular shape; heterogeneity; moderate hypointensity; T2 >3) and moderate (74%-81%) for DWI features. Agreement for PI-RADS >3 was 89% in PZ and 75% in TZ. Kappa values were also generally better for PZ than for TZ features (average kappa 0.57 and 0.32 respectively), with moderate to substantial agreement for all PZ features except DCE (fair), but nonsignificant slight agreement for heterogeneity, intensity, and invasiveness, and negative kappa for lenticular, in the PZ. For overall PI-RADS >3, kappa was 0.61 in PZ and 0.40 in TZ.

CONCLUSION

Novice radiologists performed reasonably well using the PI-RADS v2 lexicon, achieving excellent agreement with expert readers in PZ for DWI and overall PI-RADS >3. However, performance was weaker for DCE in PZ and for numerous TZ features.

CLINICAL RELEVANCE/APPLICATION

The results are encouraging regarding novice radiologists' ability to apply PI-RADS v2 lexicon in practice. Further education should target DCE in the PZ and textural T2-related features in the TZ.

RC607-04 Cancer Detection Rates of Category "4" Lesions for PI-RADSv2 on Prostate mpMRI

Thursday, Dec. 1 9:30AM - 9:40AM Room: E450B

Participants
Matthew Greer, BS, Cleveland Heights, OH (*Presenter*) Nothing to Disclose
Joanna Shih, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Nathan S. Lay, PhD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Tristan Barrett, MBBS, BSc, Guildford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Leonardo K. Bittencourt, MD, PhD, Rio De Janeiro, Brazil (*Abstract Co-Author*) Nothing to Disclose
Samuel Borofsky, MD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Ismail M. Kabakus, MD, PhD, Ankara, Turkey (*Abstract Co-Author*) Nothing to Disclose
Yan Mee Law, MBBS, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose
Jamie Marko, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Haytham M. Shebel, MD, Mansoura, Egypt (*Abstract Co-Author*) Nothing to Disclose
Francesca Mertan, BS, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Maria Merino, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Peter Pinto, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Peter L. Choyke, MD, Rockville, MD (*Abstract Co-Author*) Researcher, Koninklijke Philips NV; Researcher, General Electric Company; Researcher, Siemens AG; Researcher, iCAD, Inc; Researcher, Aspyrian Therapeutics, Inc; Researcher, ImaginAb, Inc; Researcher, Aura Biosciences, Inc
Ronald M. Summers, MD, PhD, Bethesda, MD (*Abstract Co-Author*) Royalties, iCAD, Inc; ;
Baris Turkbey, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

PIRADSv2 was proposed to standardize the interpretation of multi-parametric MRI (mpMRI) for prostate cancer. PIRADS=4 lesions have been disputed as this category contains diverse definitions. From data collected from a multi-reader study, we sought to characterize PIRADS=4 lesions based on T2W or DWI imaging alone and PIRADS=4 based on PIRADS =3 with DCE positivity.

METHOD AND MATERIALS

9 radiologists from 8 institutions participated in a multi-reader study. Patients were consecutive treatment-naïve patients who had ERC 3T MRI (T2W, ADC, b2000, and DCE). 163 patients were evaluated; 110 cases with prostatectomy after mpMRI, 53 controls with no lesions on MRI or positive biopsies. Readers were blinded to all outcomes. Lesions were prospectively detected and scored with PI-RADSv2 on mpMRI. Readers were instructed to detect lesions that would be included in a clinical report. Screen shots of detected lesions, and PIRADS scoring for T2W, DWI, and DCE sequences were recorded. All lesions were correlated between readers and to whole mount prostatectomy. Cancer detection rate (CDR) was determined as the proportion of true positive lesions

detected. Clinically significant (CS) cancers were defined as lesions Gleason≥3+4.

RESULTS

Among all readers a total of 654 lesions were detected. There were 3, 70, 115, 212, 305, and 161 lesions at PIRADS =1, 2, 3, 4, and 5, respectively. Of the 305 PIRADS=4 lesions, 79.7% were in the peripheral zone (PZ) and 20.3% were in the transition zone (TZ). Of the PZ lesions, 89 lesions were scored PIRADS=3 on DWI and positive in DCE (3+1) to be overall PIRADS=4. Of the TZ lesions, 4 were graded PIRADS=3 on T2W and PIRADS=5 on DWI. The CDR for PIRADS=3 was 33.3% for CS lesions. For all PIRADS=4 lesions the CDR was 80.1% and 72.9% for all and CS lesions. PIRADS=3+1 had a CDR of 67.1% for all tumors and 56.9% for CS tumors. With the PIRADS=3+1 lesions removed, the CDR for PIRADS=4 improved to 87.7% and 82.2% for all and CS lesions. This was similar to the CDR for PIRADS=5 of 90.4% and 89.7% for all and CS lesions.

CONCLUSION

On PI-RADSv2 the category of PIRADS=4 represents a diverse subset of lesions. PIRADS=3+1 lesions decrease the CDR of PIRADS=4 and may be better represented as a separate category.

CLINICAL RELEVANCE/APPLICATION

PIRADSv2 characterizes prostate cancer on MRI. Further refinement to optimize its utility as a reporting tool, especially for PIRADS=4 lesions, may improve cancer detection rates on MRI.

RC607-05 Evaluating the Additional Utility of ADC Values to PI-RADS v2

Thursday, Dec. 1 9:40AM - 9:50AM Room: E450B

Awards
Student Travel Stipend Award

Participants
Eric J. Jordan, MD, San Francisco, CA (*Presenter*) Nothing to Disclose
Charles E. Fiske, MD, Moraga, CA (*Abstract Co-Author*) Nothing to Disclose
Ronald J. Zagoria, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Antonio C. Westphalen, MD, Mill Valley, CA (*Abstract Co-Author*) Scientific Advisory Board, 3DBiopsy LLC ; Research Grant, Verily Life Sciences LLC

PURPOSE

To evaluate the combination of ADC values with PI-RADS v2 for the diagnosis of clinically significant prostate cancer (CS-PCa).

METHOD AND MATERIALS

This retrospective IRB approved study included 170 men whom underwent 3-Tesla prostate MRI and subsequent MR/US fusion biopsies at a single non-academic center from 11/2014 to 3/2016. All scans were performed with a surface coil and included T2, diffusion-weighted (b-values of 10, 400, 800 and 1200) and dynamic contrast enhanced sequences. Suspicious findings were classified using Prostate Imaging Reporting and Data System (PI-RADS) v2, and all were targeted using MR/US fusion biopsies. Mixed effect logistic regression analyses were used to determine the ability of PIRADS v2 alone and combined with ADC values to predict CS-PCa (Gleason score ≥7). Performances of PIRADS v2 alone and combined with ADC values were compared utilizing he area under receiver-operating characteristic curves (Az ROC) derived from the logistic models. As categories are more practical in clinical situations than numeric values, an additional model with ADC categories of ≤800, 800-1000 and ≥1000 was performed.

RESULTS

A total of 282 suspicious lesions were detected, 71 of which were CS-PCa, 33 were Gleason score 3+3 PCa, and 168 were negative. The overall PIRADS v2 score is a statistically significant predictor of CS-PCa ($p<0.001$). The area under the ROC curve for PI-RADS v2 to discriminate between patients with and without CS-PCa was 0.69 (95% CI=0.63-0.76). ADC values and ADC categories were both independent predictors on univariate models ($P<0.001$), Az ROC curve=0.77, 95% CI=0.71-0.83, and 0.74, 95% CI=0.68-0.79, respectively). Both PIRADS v2 and ADC value categories are significant predictors of CS-PCa in a multivariate analysis ($P< 0.05$, Az ROC = 0.76, 95% CI=0.69-0.82). The Az ROC of PIRADS v2 alone and PIRADS v2 with ADC categories are significantly different ($P=0.005$). Further analysis of the ROC curves also shows the main benefit of utilizing ADC values is better discrimination of PI-RADS 4 lesions.

CONCLUSION

ADC values improve the PI-RADS v2 prediction of clinical significant prostate cancer.

CLINICAL RELEVANCE/APPLICATION

Our study suggests that a PI-RADS v2 4 lesion should perhaps be upgraded to PI-RADS v2 5 when associated with an ADC value ≤ 800.

RC607-06 Comparison of Subjective and Quantitative Imaging features of Extra-prostatic Extension in Prostatic Carcinoma Using Multi-parametric (mp) MRI

Thursday, Dec. 1 9:50AM - 10:00AM Room: E450B

Awards
Student Travel Stipend Award

Participants
Satheesh Krishna, MD, Ottawa, ON (*Presenter*) Nothing to Disclose
Nicola Schieda, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Christopher Lim, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Robert Lim, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Trevor A. Flood, MD, FRCPC, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Robert K. Moreland, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose

Matthew D. McInnes, MD, FRCPC, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Wael M. Shabana, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Extraprostatic extesion (EPE) of prostatic carcinoma is a critical prognostic outcome; however, pre-operative diagnosis of EPE remains challenging.This study compares previoulsy described subjective and quantitative imaging features of EPE using mp-MRI.

METHOD AND MATERIALS

With IRB approval, 115 men underwent mp-MRI and radical prostatectomy (RP) between 2012-2015. Gleason scores were: 3+3=6 (N=3), 3+4=7 (48), 4+3=7 (49), 4+4=8 (N=5) and 4+5=9 (N=10). Two blinded radiologists evaluated mp-MRI for: 1) EPE (using the PI-RADS v1.0 scoring sysem) and 2) length of capsular contact. Dominant tumor foci were co-registered from RP to ADC map and 1) mean, 50th, 25th and 10th centile ADC histogram values and 2) first order ADC texture features (Skewness, Kurtosis, Entropy) were calculated. Outcomes were studied using chi-square, logistic regressioin and ROC analysis.

RESULTS

Mean age and PSA were 63.4 ± 4.8 years and 8.0 ± 11.7 ng/mL with no difference between groups (p>0.05). At histopathology, 71.3% (82/115) of patients had EPE.PI-RADS version 1.0 score of ≥3 yielded ROC-AUC of 0.62 (CI 0.47-0.79) with sensitivity/specificity (SENS/SPEC) of 71.4%/53.8% for diagnosis of EPE. Length of capsular contact was greater with EPE (22.4 ± 15.2 vs 14.2 ± 7.0 mm), although the difference was not significant (p=0.06). ROC-AUC was 0.69 (CI 0.54-0.86) with ≥ 19 mm yielding SENS/SPEC of 57.1%/76.9% for EPE.There was no difference in mean ADC, 10th, 25th or 50th centile ADC values between groups (p>0.05).ADC kurtosis and skewness did not differ between groups (p>0.05); however, ADC entropy was larger with EPE (7.67 ± 1.26 vs 6.48 ± 1.10), (p=0.01). ADC Entropy yielded an ROC-AUC of 0.78 (CI 0.64-0.91) with SENS/SPEC of 57.1%/92.3% for diagnosis of EPE using a threshold of ≥7.83.There was no difference comparing ROC-AUC between subjective and quantitative metrics, (p=0.20).

CONCLUSION

ADC entropy was the most useful quantitative metric for evaluation of EPE. Length of capsular contact also showed some value; however, skewness, kurtosis and ADC histogram values were not useful. Compared to subjective assessment, quantitative metrics had higher specificity but lower sensitivity for diagnosis of EPE, although the difference in accuracy was not significant.

CLINICAL RELEVANCE/APPLICATION

Diagnosis of EPE in prostate cancer using mp-MRI is challenging, ADC Entropy and length of capsular contact may improve specificity compared to subjective analysis alone.

RC607-07 Mp MRI Quantitative Metrics - Added Value to PIRADS?

Thursday, Dec. 1 10:00AM - 10:25AM Room: E450B

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

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC607-08 Mp MR and Prostate Biopsy: When to Biopsy and How

Thursday, Dec. 1 10:40AM - 11:05AM Room: E450B

Participants
Clare M. Allen, MBBCh, London, United Kingdom (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC607-09 Is Standard Systematic Prostate Biopsy Necessary in Patients with Elevated PSA, Negative mp-MRI and no Prior Prostate Biopsy?

Thursday, Dec. 1 11:05AM - 11:15AM Room: E450B

Participants
Jinxing Yu, MD, Richmond, VA (*Presenter*) Nothing to Disclose
Ann S. Fulcher, MD, Midlothian, VA (*Abstract Co-Author*) Nothing to Disclose
Mary A. Turner, MD, Richmond, VA (*Abstract Co-Author*) Nothing to Disclose
William C. Behl, MS, Richmond, VA (*Abstract Co-Author*) Nothing to Disclose
Sarah G. Winks, MD, Richmond, VA (*Abstract Co-Author*) Nothing to Disclose
Anna L. Ware, Richmond, VA (*Abstract Co-Author*) Nothing to Disclose
Meagan Sok, Richmond, VA (*Abstract Co-Author*) Nothing to Disclose
Baruch Grob, Richmond, VA (*Abstract Co-Author*) Nothing to Disclose
Lance Hampton, Richmond, VA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Purpose: To determine the detection rate of prostate cancer by TRUS guided biopsy in patients with elevated PSA, negative mp-MRI and no prior prostate biopsy and to determine the necessity of performing a baseline standard systematic prostate biopsy if mp-MRI is negative.

METHOD AND MATERIALS

Materials and Methods: A total of 102 consecutive men with elevated PSA, negative mp-MRI, and no prior TRUS guided prostate biopsy underwent standard systematic prostate biopsy (12 cores). Histopathology results including presence of prostate cancer

(PCa), Gleason score (GS), and percentage of positive core, as well as patients' clinical information including age, PSA, PSA density (PSAD), and prostate volume were recorded. Two experienced GU radiologists retrospectively reviewed all mp-MRI studies in consensus without knowledge of the TRUS biopsy results. Cancer suspicious regions (CSR) by mp-MRI were assigned PI-RADS scores based on PI-RADS v2. The imaging findings were correlated with the histopathology findings.

RESULTS

Results: On 12-core TRUS guided prostate biopsy, 9 of 102 patients had biopsy-proven PCa with GS ≥ 7 (9%). Among them, 7 patients had PCa GS 7 with a mean positive specimen of 20% and cores per patient of 1.3, and 2 had PCa GS 8 with positive specimen of 15%. Retrospective review of the mp-MRI studies detected 3 corresponding CSRs with PI-RADS score 3 (3/9, 33%). There was no corresponding abnormality identified in the remaining 6 patients with PCa GS 7. Prostate cancer GS 6 was detected in 22 of 102 patients (22%) with a mean positive specimen of 15% and a mean number of positive cores per patient of 2.3.

CONCLUSION

Conclusions: A baseline TRUS guided prostate biopsy may be necessary in order to avoid missing PCa GS ≥7 (9% in our study) in patients with elevated PSA, negative mp-MRI and no prior prostate biopsy.

CLINICAL RELEVANCE/APPLICATION

A baseline TRUS prostate biopsy may be necessary because some significant prostate cancers may be sparsely distributed in the gland, resulting in negative mp-MRI study in patients with elevated PSA.

RC607-10 In-Bore Magnetic Resonance-Guided Transrectal Biopsy for the Detection of Clinically Significant Prostate Cancer

Thursday, Dec. 1 11:15AM - 11:25AM Room: E450B

Participants
Ely R. Felker, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Stephanie A. Lee-Felker, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
John F. Feller, MD, Indian Wells, CA (*Abstract Co-Author*) Consultant, Koninklijke Philips NV; Consultant, Visualase, Inc ; Consultant, Hitachi, Ltd; Speaker, Hitachi, Ltd
Daniel J. Margolis, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
David S. Lu, MD, Los Angeles, CA (*Abstract Co-Author*) Consultant, Medtronic, Inc Speaker, Medtronic, Inc Consultant, Johnson & Johnson Research Grant, Johnson & Johnson Consultant, Bayer AG Research Grant, Bayer AG Speaker, Bayer AG
Robert A. Princenthal, MD, Thousand Oaks, CA (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Stuart T. May Sr, MD, Indian Wells, CA (*Abstract Co-Author*) Nothing to Disclose
Martin I. Cohen, MD, Thousand Oaks, CA (*Abstract Co-Author*) Nothing to Disclose
Jiaoti Huang, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Bernadette M. Greenwood, BS, RT, Indian Wells, CA (*Abstract Co-Author*) Speakers Bureau, GenomeDx Biosciences Inc
Jeffrey Yoshida, Newport Beach, CA (*Abstract Co-Author*) Nothing to Disclose
Hyung J. Kim, PhD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Steven S. Raman, MD, Santa Monica, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the safety and efficacy of in-bore magnetic resonance-guided prostate biopsy (MRGB) for detection of clinically significant disease (CSD) in untreated men with known or suspected prostate cancer (PCa), and to compare MRGB results by Mp-MRI assessment grade.

METHOD AND MATERIALS

512 patients underwent multiparametric magnetic resonance imaging (Mp-MRI) followed by MRGB at one of three centers in this IRB-approved, HIPAA-compliant, retrospective study. Exclusion criteria were prior prostate cancer therapy and incomplete Mp-MRI (n = 51). Patients (n = 461) were analyzed in two subcohorts: no prior PCa (NP) (n = 381) and active surveillance (AS) (n = 80). Detection rates of PCa and CSD (Gleason Score at least 3 + 4) were calculated and compared among subcohorts and by Mp-MRI assessment grade (PI-RADS v1 or previously published modified PI-RADS score). Logistic regression was performed to identify predictors for detection of PCa and CSD.

RESULTS

Mean patient age was 66 years, median prostate-specific antigen (PSA) was 7.5 ng/mL, and median prostate volume was 54 cc. A mean of 1.7 targets was sampled per gland. Significant adverse events (urosepsis and hematuria with obstruction) occurred in 1% (5/461). Overall PCa detection rates were 51% per patient (233/461) and 37% per lesion (282/757). 65% (151/233) of men with detected PCa had CSD. Per patient PCa detection rates in the NP and AS subcohorts were: 47% (178/381) and 69% (55/80), respectively, significantly higher in the AS group ($p < 0.001$). CSD was detected in 10% (47/451), 43% (96/225) and 84% (68/81) of lesions with Mp-MRI assessment grades of 3, 4 and 5, respectively. Older age, higher PSA, and lower prostate volume predicted MRGB detection of CSD (OR=1.07 and $p = 0.003$, OR=1.1 and p=0.014, and OR=0.98 and p=0.032, respectively).

CONCLUSION

In-bore MRGB is safe and high-yield for detection of CSD among men with high and very high suspicion targets (grades 4 and 5). The yield of MRGB for CSD among men with intermediate suspicion targets (grade 3) is lower, such that it may be reasonable to defer biopsy in select cases.

CLINICAL RELEVANCE/APPLICATION

MRGB is a safe and high-yield technique for detecting clinically significant PCa and may be useful in men with suspected PCa but no prior definitive diagnosis and those on AS.

RC607-11 The Predictive Value of Significant Cancer for Prostate Imaging Reporting and Data System version 2 (PI-RADS v2)

Thursday, Dec. 1 11:25AM - 11:35AM Room: E450B

Awards
Student Travel Stipend Award

Participants
Huihui Wang, MD, Beijing, China (*Presenter*) Nothing to Disclose
Xiaoying Wang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To retrospectively evaluate whether Prostate Imaging Reporting and Data System version 2 (PI-RADS v2) is helpful for the detection of clinically significant prostate cancer.

METHOD AND MATERIALS

Consecutive patients whose PSA level elevated underwent mpMRI (T2WI, DWI and DCE, at 1.5 or 3 Tesla scanner) and transrectal US-guided biopsy between January 2014 and December 2015. An experienced radiologist blinded to any clinical information was assigned to score each patient according PI-RADS v2. Six to 14 biopsy cores were sampled per patient depending on MR detection and operator. Significant prostate cancer was defined as no less than grade 2 according to 2014 International Society of Urological Pathology (ISUP) grading system. The Cochran-Armitage trend test was used to analyze the association between PI-RADS score and significant cancer at biopsy.

RESULTS

A total of 529 patients were included in the analysis. Patients' mean (±sd) age, prostate-specific antigen were 67.2 (±8.9) years and 51.32 (±194.22) ng/mL, respectively. Overall, biopsies were negative, clinically insignificant and clinically significant in 224 (42.3%), 71 (13.4%) and 234 (44.2%) patients, respectively. Twelve of 173 (6.9%) men with PI-RADS scores of 1 and 2 had significant prostate cancer. The negative predictive value of PI-RADS scores of 1 and 2 for clinically significant prostate cancer was 93.1%. PI-RADS scores of 3 to 5 gave a sensitivity of 94.9% and a specificity of 54.8%. Receiver-operator curve analysis gave an area under the curve of 0.850.

CONCLUSION

PI-RADS v2 is helpful in predicting significant prostate cancer and can be used in the decision-making process for prostate biopsy. However, a small amount of significant cancer is misdiagnosed among PI-RADS score of 1 and 2.

CLINICAL RELEVANCE/APPLICATION

MpMRI provides extensive anatomical and functional imaging of the prostate. PI-RADS is useful in predicting clinically significant prostate cancer which would be important for guiding biopsy and treatment.

RC607-12 Impact of PIRADS on Outcomes of Prostate Biopsy and Treatment

Thursday, Dec. 1 11:35AM - 12:00PM Room: E450B

Participants
Jurgen J. Futterer, MD, PhD, Nijmegen, Netherlands (*Presenter*) Research Grant, Medtronic, Inc; Research Grant, Siemens AG

LEARNING OBJECTIVES

View learning objectives under the main course title.

ABSTRACT

RC608

Updating Your Emergency Radiology Practice

Thursday, Dec. 1 8:30AM - 10:00AM Room: E353B

CT MR ER

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

FDA Discussions may include off-label uses.

Participants

Sub-Events

RC608A Improving Imaging Appropriateness

Participants
Bruce E. Lehnert, MD, Seattle, WA (*Presenter*) Research support, Koninklijke Philips NV

LEARNING OBJECTIVES

1) Discuss the variability in and appropriateness of advanced imaging utilization and address potential sources of variability in practice. 2) Review utilization control strategies and their effectiveness in improving imaging appropriateness, including Clinical Decision Support. 3) Discuss PAMA legislation and its implications for radiology.

RC608B Optimizing Emergency Cardiothoracic CT and MR Imaging Protocols

Participants
Constantine A. Raptis, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the key components of CT protocols which are appropriate for thoracic imaging in the emergency department setting. 2) Review indications and protocols for MRI of the thorax in the emergency department setting. 3) Identify potential pitfalls and artifacts which may be encountered on CT and MRI of the thorax which are relevant to imaging in the emergency department.

ABSTRACT

RC608C Update on Dual-energy CT in the Emergency Department

Participants
Savvas Nicolaou, MD, Vancouver, BC (*Presenter*) Institutional research agreement, Siemens AG

LEARNING OBJECTIVES

1) Review the basic principles of dual energy CT/Spectral imaging. 2) Discuss novel techniques implemented using dual energy CT in the acute setting including: material characterization/decomposition, bone subtraction, virtual non-contrast, iodine distribution maps, and monoenergetic spectral imaging. 3) To explain the utility of dual energy/spectral imaging in the acute care setting with examples in cardiopulmonary imaging, vascular imaging, intracranial aneurysms and stroke imaging, blunt vascular neck injuries, abdominal imaging and musculoskeletal applications.

ABSTRACT

RC608D Optimizing Emergency Musculoskeletal CT and MR Protocols

Participants
Meir H. Scheinfeld, MD, PhD, Bronx, NY, (mscheinf@montefiore.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify clinical scenarios where MR or CT would be appropriate for the evaluation of emergency musculoskeletal conditions. 2) Optimize emergency department musculoskeletal CT protocols for detection of pathology. 3) Optimize emergency department musculoskeletal MR protocols for detection of pathology.

ABSTRACT

RC609

Imaging Pancreatic Diseases

Thursday, Dec. 1 8:30AM - 10:00AM Room: N228

GI

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

Participants

Sub-Events

RC609A Pancreatic Cancer

Participants
Eric P. Tamm, MD, Houston, TX, (etamm@mdanderson.org) (*Presenter*) Institutional Research Grant, General Electric Company

LEARNING OBJECTIVES

1) Understand the current status of staging pancreatic cancer, the impact of cross-sectional imaging on staging, and understand the category of "borderline resectable pancreatic cancer." 2) Appreciate the impact of advances in vascular reconstruction surgery on staging and surgical planning. 3) Have a basic understanding of neoadjuvant therapy, and its impact on staging.

ABSTRACT

Because of recent advances in surgical trechnique and preoperative therapy, it has become useful for clinicians to group pancreatic cancer into categories useful for clinical trials and treatment management. Besides the clearly resectable, and clearly unresectable tumors, there has emerged the category of "borderline" resectable pancreatic cancer. Classifying patients into these three categories is dependent on precise descriptions of the extent of tumor, particularly vascular involvement, as seen on cross sectional imaging. These descriptions also depend on the use of commonly understood terminology. Understanding and appreciating new surgical techniques, advances in preoperative therapy and how this has impacted margin positivity, and therefore why it is important to describe accurately and clearly tumor involvement and how best to do that will be the focus of this lecture.

RC609B Cystic Pancreatic Tumors

Participants
Temel Tirkes, MD, Indianapolis, IN, (atirkes@iupui.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Classify cystic pancreatic tumors. 2) Describe the common and uncommon imaging patterns that allow differentiation of cystic pancreatic tumors. 3) Debate the role of imaging modalities in determining options for patient management.

ABSTRACT

MRI with MRCP has high sensitivity and moderate specificity for diagnosis of cystic neoplasms. Due to overlapping imaging features, specificity and inter-observer agreement is not very high. MRCP is useful for differentiating side-branch IPMNs from other pancreatic cysts such as MCNs which carries a higher malignant potential. Making this distinction can be very helpful in the management of the cystic neoplasms.

Honored Educators

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

Temel Tirkes, MD - 2013 Honored Educator
Temel Tirkes, MD - 2014 Honored Educator

RC609C Acute Pancreatitis

Participants
Riccardo Manfredi, MD, Verona, Italy, (riccardo.manfredi@univr.it) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the working party classification of acute pancreatitis. 2) Appreciate the difference between peripancreatic and pancreatic necrosis. 3) Have an understanding of how imaging findings affect endoscopic and surgical management of severe acute pancreatitis.

ABSTRACT

Acute pancreatitis is an inflammatory disease of the pancreas. The diagnosis is achieved by means of clinical symptoms and confirmed by increased levels (X≥3) of amylase and lipase. Pancreatic injury is mild in 80% of patients, who recover without complications. The remaining patients have a severe disease with local and systemic complications. Gallstone migration, into the common bile duct, and alcohol abuse are the most frequent causes of pancreatitis in adults.The role of diagnostic imaging is to assess the severity of the disease, both in the early and the late phase, according to the revised criteria of Atlanta Classification, and According. Diagnostic imaging is also helpful in treatment planning: in mild forms supportive therapy is sufficient, whereas in

severe episodes management need to be decided by a multidisciplinary team including gastroenterologists, interventional radiologists, intensivists, and surgeons.

Handout:Riccardo Manfredi

http://abstract.rsna.org/uploads/2016/15001862/Acute Pancreatitis RSNA 2016.pdf

RC609D Autoimmune Pancreatitis

Participants
Joel G. Fletcher, MD, Rochester, MN (*Presenter*) Grant, Siemens AG; ;

LEARNING OBJECTIVES

1) To review the diagnostic criteria for autoimmune pancreatitis. 2) To discuss the differences between Type 1 and Type 2 autoimmune pancreatitis. 3) To understand the temporal changes and morphologic patterns of contrast enhancement in autoimmune pancreatitis. 4) To describe imaging features relating to the pancreatic and intrahepatic ducts, and periductal parenchyma, in autoimmune pancreatitis that may distinguish it from cancer, chronic pancreatitis, or PSC. 5) To describe non-diagnostic but other frequently seen imaging findings of autoimmune pancreatitis. 6) To illustrate imaging findings demonstrating response to treatment in autoimmune pancreatitis, as well as recurrence after initial remission.

RC610

Vascular Doppler

Thursday, Dec. 1 8:30AM - 10:00AM Room: S405AB

VA US

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

FDA Discussions may include off-label uses.

Participants

Sub-Events

RC610A Beyond Peak Velocities: Waveform Interpretation in Carotid Doppler

Participants
Mark A. Kliewer, MD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Be familiar with how carotid waveforms change with systemic, regional and local vascular disease. 2) Be able to recognize common waveform variants and their attendant clinical significance.

ABSTRACT

At the conclusion of the refresher course, the learners should be familiar with how carotid waveforms change with systemic, regional and local vascular disease. They should also be able to recognize common waveform variants and their attendant clinical significance.

RC610B Upper Extremity Arterial and Venous Doppler: Beyond the Basics

Participants
Gowthaman Gunabushanam, MD, New Haven, CT (*Presenter*) Editor, WebMD Health Corp ;

LEARNING OBJECTIVES

1) Review qualitative and quantitative criteria for diagnosing arterial abnormalities in the upper extremity. 2) Describe the technique for dynamic testing using provocative maneuvers. 3) Describe the pitfalls and limitations of Doppler ultrasound in diagnosing arterial and venous diseases of the upper extremity.

ABSTRACT

RC610C Leg Pain and Swelling : The Usual and Unusual Suspects

Participants
Leslie M. Scoutt, MD, New Haven, CT, (leslie.scoutt@yale.edu) (*Presenter*) Consultant, Koninklijke Philips NV

Honored Educators

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

Leslie M. Scoutt, MD - 2014 Honored Educator

RC611

PET/CT and SPECT/CT in Movement Disorders and Epilepsy

Thursday, Dec. 1 8:30AM - 10:00AM Room: S505AB

NR CT NM

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

FDA Discussions may include off-label uses.

Participants

Sub-Events

RC611A DAT Scans and Movement Disorders

Participants
Vani Vijayakumar, MD, Ridgeland, MS, (vvijayakumar@umc.edu) (*Presenter*) Grant, General Electric Company

LEARNING OBJECTIVES

1) Apply basic knowledge and skills relevant to clinical practice of Movement Disorders. 2) Assess the potential of emerging technological innovations and advances to enhance clinical practice and problem-solving. 3) Develop new ideas from experts and peers in the nuclear imaging sciences. 4) Differentiate Essential Tremor and Presynaptic Parkinson Diseases on DATscans. 5) Compare different image findings for interpretation of Movement Disorders.

ABSTRACT

Introduction: Parkinson Disease (PD) is the most common movement disorder affecting 1-2 % of the general population over the age of 65 years and the second most common neurodegenerative disorder after Alzheimer´s disease (AD)
PD presents with 3 most common symptoms.
1. Resting tremor: Most common first symptom, usually asymmetric and most evident in one hand with the arm at rest.
2.Bradykinesia: Difficulty with daily activities such as writing, shaving, using a knife and fork, and opening buttons; decreased blinking, masked facies, slowed chewing and swallowing.
3.Rigidity: Muscle tone increased in both flexor and extensor muscles providing a constant resistance to passive movements of the joints; stooped posture, anteroflexed head, and flexed knees and elbows.**Nuclear Imaging Diagnosis:** Datscan: (123I-ioflupane)**Patient preparation:** Thyroid blockade with Lugols- 3 drops one hour before
Stop medicines that bind to the dopamine transporter 7 days prior to study, e.g. SSRIs, amphetamine, benzotropine, cocaine, mazindol,methylphenidate and phentermine and sertraline**Radiopharmaceutical:**(123I-ioflupane) is a molecular imaging agent 3-5 mCi IV and Brain SPECT in 3 hours
Used to demonstrate the location and concentration of dopamine transporters (DaTs) in the synapses of striatal dopaminergic neurons.**Interpretation**: Normal: comma shaped striatumAbnormal: dot, asymmetric caudate or putamen, high background**Summary:**

A highly sensitive marker for accurate assessment of striatal dopaminergic function to differentiate EssentialTremor from PDEarly diagnosis of presynaptic Parkinsonian syndromesDifferentiation of presynaptic Parkinsonian syndromes from parkinsonism without presynaptic dopaminergic loss, such as drug-induced parkinsonism or psychogenic parkinsonismA straightforward one-day protocol An objective adjunct to the differentiation of PD syndromes from ET in clinically uncertain patientsA diagnostic tool helping differentiate between probable DLB and ADVisualizing DaT distribution is useful as a novel diagnostic adjunct in movement disorders and dementia

Handout:Vani Vijayakumar

http://abstract.rsna.org/uploads/2016/16002149/UMMC_template PPS- Datscan Refresher Course RSNA 2016.ppt

RC611B Imaging for Epilepsy

Participants
Anson L. Thaggard, MD, Jackson, MS, (athaggard@umc.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define the components of a multidisciplinary evaluation for the surgical treatment of epilepsy. 2) Compare brain SPECT with FDG PET for evaluation of an epileptogenic focus. 3) Discuss barriers to the use of ictal SPECT imaging and functional MRI. 4) Appraise the added value of fusion imaging in epilepsy evaluation.

ABSTRACT

Active Handout:Anson Lee Thaggard

http://abstract.rsna.org/uploads/2016/16002150/RC611B Imaging for Epilepsy Handout.pdf

RC611C Neurologist's Perspective on Functional Imaging for Epilepsy and Movement Disorders

Participants
Juebin Huang, MD, Jackson, MS (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize challenges to the accurate and timely diagnosis of tremor and Parkinson syndrome in clinical practice. 2) Learn how DaTscan-SPECT can improve Neurologist’s diagnosis and management of clinically uncertain Parkinsonian and tremor syndromes. 3) Outline when functional neuroimaging is appropriate in the diagnostic workup of patients with movement disorders. 4) Increase knowledge of functional imaging's role in localization and surgically treatment of epilepsy. 5) Understand how newly developed functional imaging techniques can change Neurologists’ practice now and in the future.

ABSTRACT

RC612

Vascular Series: CT Angiography: New Techniques and Their Application

Thursday, Dec. 1 8:30AM - 12:00PM Room: E352

VA CT

AMA PRA Category 1 Credits ™: 3.25
ARRT Category A+ Credits: 4.00

FDA Discussions may include off-label uses.

Participants
Dominik Fleischmann, MD, Palo Alto, CA (*Moderator*) Research support, Siemens AG;

Sub-Events

RC612-01 Iterative Image Reconstruction

Thursday, Dec. 1 8:30AM - 8:55AM Room: E352

Participants
Norbert J. Pelc, ScD, Stanford, CA (*Presenter*) Research support, General Electric Company; Research support, Koninklijke Philips NV; Consultant, Varian Medical Systems, Inc; Consultant, NanoX; Scientific Advisory Board, RefleXion Medical Inc; Scientific Advisory Board, Prismatic Sensors AB; Medical Advisory Board, OurCrowd, LP ;

LEARNING OBJECTIVES

1) Understand the basic concepts behind iterative reconstruction algorithms. 2) Understand the differences between these methods and conventional reconstruction. 3) Appreciate the potential advantages and disadvantages of iterative methods.

ABSTRACT

For many decades, essentially all CT images have been reconstructed using an "analytic" algorithm, such as filtered backprojection. These methods are computationally efficient, allowing fast image reconstruction, and if the raw data are of high quality the images can be exact. As the dose is reduced or if there are deterministic errors in the data, analytic reconstruction may produce lower image quality than may be possible. Iterative reconstruction methods can build in knowledge of measurement noise and other errors and yield higher image quality. They can produce lower noise images in low dose settings and in some cases higher spatial resolution. Iterative methods are generally nonlinear, meaning that the image quality depends on the object being scanned. They also produce images whose properties are "non-stationary", meaning that the image quality can vary significantly across the image. Understanding these allows the user to best evaluate their performance and appropriately use them in clinical settings.

RC612-02 Comparison of Image Quality and Radiation Dose between CT Venography Using 80 kVp with Model Based Iterative Reconstruction and Automatic Tube Current Modulation and Conventional CT Venography Using 120 kVp with Filtered Back Projection and Fixed mA

Thursday, Dec. 1 8:55AM - 9:05AM Room: E352

Participants
Ki Seok Choo, MD, Yangsan, Korea, Republic Of (*Presenter*) Nothing to Disclose
Chan Hyuk Park, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare image quality and radiation dose of CT venography (CTV) between a setting of 80 kVp with model based iterative reconstruction (MBIR) automatic tube current modulation and a setting of 120 kVp with filtered back projection (FBP) and fixed 120 mA and at the same contrast medium (CM) concentration and volume

METHOD AND MATERIALS

A total of 60 patients (mean age: 55.1 ± 16.1) who underwent CT venography (CTV) after receiving the CM of 2.0 mL/kg for the evaluation of deep vein thrombosis (DVT) and varicose vein were enrolled in this retrospective study. The patients were divided into two groups: Group 1 [30 patients, 80 kVp, MBIR, automatic tube current modulation (CT noise index=21)] and Group 2 [30 patients, 120 kVp, FBP, 120 fixed mA]. Two radiologists, who were blinded to the image protocol, assessed vascular enhancement, image noise, contrast to noise ratio (CNR) in the inferior vena cava (IVC), femoral vein, and popliteal vein in each group and recorded radiation doses in each group. In addition, subjective image parameters (image quality, image noise, and confidence of detecting DVT) were assessed using a 3-5 point scale system independently by these two radiologists.

RESULTS

Mean vascular enhancement and CNR of the IVC, femoral vein, and popliteal vein were significantly higher in group 1 than in group 2, and images in group 2 had significantly higher image noise ($P < 0.01$) and group 1 were better than group 2 in comparison of subjective image quality scores of the IVC, femoral vein, and popliteal vein ($P < 0.05$). The mean dose length product (DLP) in group 1 (335.15±74.8 mGy cm) was significantly lower than that in group 2 (751.49±33.8 mGy cm) ($P < 0.01$).

CONCLUSION

CTV with 80 kVp using MBIR and automatic tube current modulation and were superior to a setting of 120 kVp with FBP and fixed 120 mA in objective and subjective image quality with significant radiation dose reduction at the same contrast medium (CM) concentration and volume

CLINICAL RELEVANCE/APPLICATION

CTV with 80 kVp using automatic tube current modulation and MBIR can provide acceptable image quality with significant radiation

dose reduction

RC612-03 Virtual Single Source CT Using Dual Source Acquisition: Radiation Dose Verification of Run-off CT-angiography Using Intra-individual Comparison of Different Scan Protocols

Thursday, Dec. 1 9:05AM - 9:15AM Room: E352

Participants
Thomas Werncke, MD, Dipl Phys, Hannover, Germany (*Presenter*) Nothing to Disclose
Jan Hinrichs, MD, 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;
Bernhard C. Meyer, Hannover, Germany (*Abstract Co-Author*) Research Consultant, Pro Medicus Limited

PURPOSE

Aim of this study was to verify the radiation exposure for CT-angiography of the lower extremities (run-off CTA) recommended by manufacturer using the intra-individual comparison of different scan protocols acquired with the dose-neutral virtual single source technique.

METHOD AND MATERIALS

50 patients with indication for run-off CTA were included in this IRB-approved prospective study between 06/2012-06/2013. Image acquisition was conducted after intravenous injection of 100ml Iomeprol 400 and a 50ml salin flush using a dual source CT (Somatom Definition, Siemens Healthcare) with the following parameters: 120kVp, collimation: 0,6mm, slice thickness 1.0 mm, effective tube current: tube A: 80mAs, B: 40mAs). 3 image datasets representing a 40-, 80-, and a composed virtual v120-mAs radiation dose level (RDL) were reconstructed and assessed in terms of image Quality (IQ) and agreement of stenosis quantification. IQ was assessed level-wise (abdominal, pelvic, thigh, calf, foot) using image noise and contrast-to-noise ratio. Agreement of stenosis quantification was assessed level-wise between the stenosis grading of 2 blinded radiologists and the reference standard obtained by the 2 radiologists in consensus using the v120mAs dataset, and the Friedmann-test.

RESULTS

DLP was: 590±130; 390±90; 200±40mGycm for the v120-, 80- and 40-mAs RDL. IQ was best for the v120-mAs RDL and decreased ($p<0.001$) to the 80 and 40-mAs RDL regardless the anatomic level. Interobserver agreement of stenosis quantification was good (v120/80/40-mAs: 0.81, 0.78, 0.73; $p<0.001$) and decreased between v120 and 80mAs ($p>0.16$), and 80 and 40-mAs ($p=0.014$). The level-wise stenosis grading showed for both observers a non-significant decrease of agreement with lower RDL for the adominopelvic and thigh. For the calf observer 1 noted significant and observer 2 non-significant differences of grading for the different RDL. At the foot-level a non-dose dependend stenosis grading was observed.

CONCLUSION

Large differences for quantitative and low differences of stenosis grading indicate a high potential for radiation dose reduction in run-off CTA without a significant loss of agreement of stenosis quantification.

CLINICAL RELEVANCE/APPLICATION

Virtual single source CT using dual source acquisition identified a strong radiation dose reduction potential for run-off CTA as a radiation dose reduction of 1/3 as compared to the vendor recommendations seems to be feasible.

RC612-04 Pros and Cons of Dual-Energy CT Metal Artifact Reduction Algorithm in Patients after Endovascular Aortic Repair

Thursday, Dec. 1 9:15AM - 9:25AM Room: E352

Participants
Johannes Boos, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jieming Fang, Boston, MA (*Presenter*) Nothing to Disclose
Benedikt H. Heidinger, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Vassilios D. Raptopoulos, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Olga R. Brook, MD, Boston, MA (*Abstract Co-Author*) Research Grant, Toshiba Medical Systems Corporation

PURPOSE

To evaluate dual-energy computed tomography (DECT) monochromatic reconstructions with and without metal artifact reduction (MAR) algorithm after endovascular aortic repair (EVAR).

METHOD AND MATERIALS

Twenty-four consecutive patients (22 males and 2 females; mean age 76±9years; mean weight 83±15kg) with a total of 61 metallic objects who underwent DECT angiography after EVAR from 06/2015 to 02/2016 were included in this HIPAA-compliant, IRB-approved retrospective study. Monochromatic reconstructions from DECT included 55, 60, 65, 70 and 75 keV with and without MAR algorithm. Artifacts were assessed subjectively by 2 independent readers on a 5-point scale (1: none, 5: severe) and objectively by measuring ROI standard deviations. All artifacts were assessed in near field, far field and vessel. Visibility of endoleaks was evaluated using a 5-point scale (1: not visible, 5: optimal depiction of endoleak). ANOVA was used for objective and Friedman test for subjective results.

RESULTS

Objectively, the MAR algorithm decreased artifacts from EVAR stents in the near field (60.7±25.4HU vs. 70.1±34.2, $p=.002$) but not the far field (24.6±7.5 vs 25.6±10.2HU, $p=.06$) nor the vessel (74.0±33.2 vs 77.3±28.9, $p=.27$). Subjectively, it increased artifacts in the near field (3.2±0.9 vs 2.8±0.6, $p<.001$), far field (2.2±0.6 vs 1.6±0.6 $p<.001$) and vessel (3.1±1.1 vs 2.5±0.9, $p<.001$) by introducing new artifacts. In seven patients who had undergone coiling intervention, near field artifacts were reduced by the MAR algorithm objectively (72.4±24.8 vs. 182.7±57.3HU, $p < .001$) and subjectively (65 keV: 4.5±0.5 vs 4.9±0.4, $p=.02$). Artifacts were more severe with nitinol than with steel stents (2.6±0.9 vs 2.3±0.7, $p=.04$). Contrast-to-noise ratio was optimal at 60 keV (38.3±16.8) and decreased with increasing keV (75 keV: 29.5±13.2). Endoleaks were better visualized without than with MAR

algorithm (4.4±1.0 vs 3.5±1.2, p<.001).

CONCLUSION

MAR post processing of monochromatic images from DECT may impair endoleak detection and should always be combined with native reconstructions in EVAR patients. The MAR reduces artifacts associated with coiling. Reconstructions at 60 keV appear to be optimal for DECT angiography after EVAR.

CLINICAL RELEVANCE/APPLICATION

DECT with MAR post processing may impair endoleak visualization after EVAR but reduces artifacts from coils. Images with MAR post processing should be combined with native 60 keV reconstructions.

RC612-06 Clinical Value of Dual Energy Spectral Imaging with Adaptive Statistical Iterative Reconstruction for Reducing Contrast Medium Dose in CT Portal Venography: In Comparison with Standard 120kVp Imaging Protocol

Thursday, Dec. 1 9:35AM - 9:45AM Room: E352

Participants
Ma Chunling, MMed, Xianyang City, China (*Presenter*) Nothing to Disclose
Xiaoxia Chen, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
Qi Yang, Xianyang, China (*Abstract Co-Author*) Nothing to Disclose
Zhanli Ren, Xianyang, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the clinical value of combining 60keV images in spectral CT with lower contrast dose protocol of 350mgI/kg in portal venography.

METHOD AND MATERIALS

44 abdominal CT patients were randomized to 2 groups: group A (n=21) using spectral CT with 350mgI/kg contrast injection protocol; group B (n=23) using 120kVp with 500mgI/kg. The injection rate was adjusted to have the total injection time of 25s for both groups. For 120kVp scan, tube current (m A) was automatically adjusted for noise index (NI) of 10. For spectral CT, a m A was selected based on the average of the min and max m A from the 120kVp m A table for NI=10. CT effective dose was calculated. Images were reconstructed with 1.25mm thickness and 50%ASIR in portal venous phase. CT number and standard deviation (SD) of the portal vein, left and right branches, liver parenchyma and erector spinae on the 120kVp and 60keV spectral CT images were measured. Contrast-noise-ratio (CNR) for intra-hepatic and extra-hepatic portal veins was calculated. Image quality was evaluated using 5-point scores.

RESULTS

BMI between 2 groups showed no difference (p=0.20). Spectral CT images had lower SD and higher CT values of (16.54±3.29, 187.16±16.23HU) for portal vein, (15.90±3.04, 190.00±14.71HU) for left branch and (15.97±3.74, 193.49±16.93HU) for right branch than the respective values for 120kVp images of (19.85±2.53, 152.82±19.18HU), (18.19±2.65, 156.01±21.30HU) and (19.03±3.32, 155.59±19.31HU)(Table 1). CNR value for the intrahepatic portal vein was 4.21±1.07 with 60keV spectral images, higher than the 2.97±2.07 with 120kVp images (p<0.05). CNR values for the extrahepatic portal vein were the same (5.90±1.36 vs. 5.93±1.58) (P=0.98). Image quality scores were 4.20±0.85 and 3.61±0.88 for spectral CT and 120kVp group, respectively (p>0.05). The effective dose was 5.81±1.93mSv for spectral CT and 6.15±2.13mSv for 120kVp CT with no difference (p>0.05)(Table 2). However, spectral CT group(1a and 1b) achieved 30% contrast dose reduction at 350mgI/kg compared with 120kVp group(2a and 2b) .

CONCLUSION

The 60keV spectral images provide better or equal image quality as the 120kVp images in portal venography with similar radiation dose but 30% lower contrast dose.

CLINICAL RELEVANCE/APPLICATION

Spectral CT imaging provides better or equal image quality as the conventional 120kVp images in portal venography with similar radiation dose but 30% lower contrast dose.

RC612-07 Dual-energy and Low kVp CTA

Thursday, Dec. 1 9:45AM - 10:10AM Room: E352

Participants
Thomas Henzler, MD, Mannheim, Germany, (thomas.henzler@umm.de) (*Presenter*) Research support, Siemens AG; Speaker, Siemens AG

LEARNING OBJECTIVES

1) The lecture will review the technical background behind dual-energy CT and primarily acquired low kVp single energy CT angiography. 2) Advantages and disadvantages between dual energy CT angiography and low kVp CT angiography are discussed. 3) Practical advices for different CTA protocols are given. 4) The clinical impact of the techniques regarding radiation dose reduction as well as contrast medium reduction will be discussed.

ABSTRACT

LEARNING OBJECTIVES

1) The lecture will review the technical background behind dual-energy CT and primarily acquired low kVp single energy CT angiography. 2) Advantages and disadvantages between dual energy CT angiography and low kVp CT angiography are discussed. 3) Practical advices for different CTA protocols are given. 4) The clinical impact of the techniques regarding radiation dose reduction as well as contrast medium reduction will be discussed.

ABSTRACT

Nowadays the concept of personalized medicine is evolving and is starting to replace standardized CT protocols. Given the fact that our patient collective varies widely from young children to elderly with acute and chronic diseases individual CT angiography (CTA) protocols are mandatory. Consequently, radiologists, physicists and manufacturers are trying to decrease both contrast media amount and radiation exposure in order minimize contrast media related issues as well as to fulfill the principle of keeping radiation dose according to the ALARA principle. CT data acquisition strategies continue to evolve with technique refinements in CT hardware and software including wider detector coverage, increased rotation speed, and iterative reconstruction (IR). The combination of high-pitch acquisition with low (70-90kVp) tube voltage allows for examinations with a low effective radiation dose and less contrast material. Decreasing tube voltage reduces the mean energy of photons interacting with the detector array leading to a rapid attenuation increase of elements with high atomic number such as iodine due to higher photoelectric interactions. An average enhancement increase of ≈50% occurs when reducing the tube voltage from 100 KpV to 70 KpV while the effective radiation dose is reduced in parallel by approximately 60% on average. Using this higher average enhancement at lower tube voltage settings allow to decrease the total amount of contrast material as well a dilution of contrast material towards lower concentrations.Dual-energy CT (DECT) angiography is a valuable alternative to primarily acquired single energy CTA acquisition with low kVp settings. DECT allows image-based calculation of monochromatic low keV images from a single dataset. With recently introduced software techniques DECT datasets can be reconstructed down to 40 keV as well as high kVp datasets that can be used for metal artifact reduction.

RC612-08 Implications for Contrast Medium Delivery

Thursday, Dec. 1 10:20AM - 10:45AM Room: E352

Participants
Eric E. Williamson, MD, Rochester, MN (*Presenter*) Research Grant, General Electric Company

RC612-09 Optimizing Pulmonary Embolism CT (OptiPECT) for the Individual Patient: Preliminary Results

Thursday, Dec. 1 10:45AM - 10:55AM Room: E352

Participants
Babs Hendriks, MD, Maastricht, Netherlands (*Presenter*) Nothing to Disclose
Madeleine Kok, MD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Nienke Eijsvoogel, MD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Casper Mihl, MD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Joachim E. Wildberger, MD, PhD, Maastricht, Netherlands (*Abstract Co-Author*) Institutional Grant, Agfa-Gevaert Group; Institutional Grant, Bayer AG; Institutional Grant, Koninklijke Philips NV; Institutional Grant, Siemens AG; Speakers Bureau, Bayer AG; Speakers Bureau, Siemens AG
Marco Das, MD, Maastricht, Netherlands (*Abstract Co-Author*) Research Consultant, Bayer AG Research Grant, Siemens AG Speakers Bureau, Siemens AG Research Grant, Koninklijke Philips NV

PURPOSE

The aim of the study was to simultaneously optimize contrast media (CM) injections and scan parameters for the individual patient during CT pulmonary angiography (CTPA).

METHOD AND MATERIALS

In this interim analysis of the OptiPECT study (NCT02611115) 85 consecutive patients suspected for pulmonary embolism were prospectively enrolled in one of six study arms: 70kV, 80kV, 90kV, 100kV, 110kV and 120kV- by automated kV selection software on a 3rd generation MDCT (SOMATOM Force), based on the scout scans (ap/lateral). Injection protocol was simultaneously adapted to both patient body weight and kV-setting selection via a predefined formula obtained through previous research. Attenuation was measured in Hounsfield units (HU) in the pulmonary trunk and attenuation ≥180HU was considered diagnostic. Injection data was collected from a contrast media and radiation dose monitoring software (RadimetricsTM, Bayer). Results between groups were analyzed using one way ANOVA with a post hoc Scheffe and reported as mean ± standard deviation (SD).

RESULTS

Thus far only one patient was included in the 110kV group and therefore excluded from statistical analysis. Mean vascular attenuation ± SD in the pulmonary trunk for each kV group was: 414±128HU for 70kV (n=5), 403±101HU for 80kV (n=49), 372±108HU for 90kV (n=22), 293±22HU for 100kV (n=3) and 280±35HU for 120kV (n=5), p-value was 0.045.
Mean flow rate and iodine delivery rate (IDR; in grams of iodine/s) were 2.5±0ml/s and 0.76gI/s (70kV), 3.2±0ml/s and 0.95gI/s (80kV), 4.4±0ml/s and 1.33gI/s (90kV), 5.3±0ml/s and 1.60gI/s (100kV), 6.3±1ml/s and 1.9gI/s (120kV).
Mean CM bolus volume and total iodine load (in grams of iodine; gI) for 70-120kV was: 21±2ml and 6.4±1gI (70kV), 27±2ml and 8.2±1gI (80kV), 38±4ml and 11.3±1gI (90kV), 46±4ml and 13.7±1gI (100kV), 55±6ml and 16.6±2gI (120kV).

CONCLUSION

Simultaneously optimizing both CM injections and kV settings to the individual patient in CTPA is feasible in clinical practice, results in diagnostic attenuation and creates an opportunity for CM dose reduction in a broad range of patients.

CLINICAL RELEVANCE/APPLICATION

This preliminary data shows how individually optimized CTPA -in terms of CM and scan parameters- for each patient is feasible and may result in very low iodine doses for the average patient.

RC612-10 Dual Energy CT Evaluation of Deep Inferior Epigastric Perforators (DIEP)

Thursday, Dec. 1 10:55AM - 11:05AM Room: E352

Participants
Chenchan Huang, MD, New York, NY (*Presenter*) Nothing to Disclose
Ankur Doshi, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Chika C. Obele, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Justin M. Ream, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare low energy (50 keV) virtual monoenergetic images with standard high energy (100 keV) images for assessment of small caliber DIEP vessels.

METHOD AND MATERIALS

In this IRB-approved, HIPAA-compliant study, 36 consecutive patients underwent dual source dual energy CTA studies for preoperative assessment of DIEP anatomy. Virtual monoenergetic datasets were retrospectively reconstructed at both low energy (50 keV; near the iodine k-edge of 33 keV) and high energy (100 keV; simulating standard single energy acquisition), for all 36 patients. A radiologist determined the maximum attenuation within the intramuscular portion of the dominant DIEP vessel on each side (HUDIEP)and recorded the mean attenuation of a region of interest in the adjacent rectus muscle (HUmuscle) to derive a modified relative attenuation index (mRA) at both energy levels (mRA=HUDIEP/HUmuscle). Two additional radiologists independently assessed the number of perforators visualized on each side as well as multiple qualitative parameters (1-5 scale), such as clarity of intramuscular (IM) course and separation of the artery and paired vein. Wilcoxon signed rank test was used to compare results from 50 keV and 100 keV reconstructions.

RESULTS

Relative to the standard 100 keV dataset, the low energy 50 keV reconstruction showed significantly greater mRA (9.2 vs 3.1; $p<0.0001$). Readers identified a greater number of perforator vessels at the low energy reconstruction (R1:3.1 vs 1.9; R2: 6.1 vs 5.5; both $p<0.0001$). Low energy reconstruction significantly improved vessel conspicuity (R1:4.8 vs 3.0; R2:4.8 vs 4.0; both $p<0.0001$), clarity of the IM course (R1:4.7 vs 3.0; R2:4.6 vs 3.3; both $p<0.0001$), separation of the artery and paired vein (R1:4.8 vs 2.9; R2:3.7 vs 3.0; both $p<0.0001$), and reader confidence (R1:4.7 vs 3.1; R2:4.7 vs 3.4; both $p<0.0001$).

CONCLUSION

Using low energy virtual monoenergetic datasets derived from dual energy acquisition allows for better separation of small DIEP vessels from the surrounding muscle, allows for identification of more perforator vessels, and improves several qualitative measures of vessel assessment.

CLINICAL RELEVANCE/APPLICATION

Low keV monoenergetic reconstructions from dual energy CTA improve detection of small perforator vessels, which may aid preoperative planning in patients undergoing DIEP free flap reconstruction.

RC612-11 Evaluation of Two Injection Protocols with Low-iodine Dose (16g) for Dual Energy CT Angiography of the Aortoiliac System

Thursday, Dec. 1 11:05AM - 11:15AM Room: E352

Participants
Manuel Patino, MD, Boston, MA (*Presenter*) Nothing to Disclose
Diana Murcia, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Dushyant V. Sahani, MD, Boston, MA (*Abstract Co-Author*) Research support, General Electric Company; Medical Advisory Board, Allena Pharmaceuticals, Inc

PURPOSE

To assess the variation of intravascular attenuation along the aorto-iliac system on DE-CTA performed using two injection protocols of low-iodine dose (16g), compared to SE-CTA with standard-iodine dose (33-35g).

METHOD AND MATERIALS

This IRB approved study was a prospective randomized clinical trial. Fifty (50) patients with AAA had a standard-iodine dose (33-35g), 120kVp SE-CTA and a follow-up DE-CTA (Discovery CT750 HD; GE) with 55%-reduced iodine dose (16g; Iodixanol). Patients were randomly assigned to one of two groups of low-iodine-dose administration on the follow-up. Group A (n=25) received 60ml of Iodixanol 270mgI/ml injected at 3ml/sec; and group B (n=25) received 50ml of iodixanol 320mgI/ml injected at 2.8ml/sec. VMC images (40, 50, 60 and 70keV) were generated from arterial-phase DE-CTA acquisitions. The intravascular attenuation was measured in five consecutive axial images at four levels of the aortoiliac system in VMC images, and SE-CTA images. The average attenuation was calculated for each level and compared using ANOVA. The mean intravascular attenuation was compared between SE-CTA and VMC from groups A and B with DE-CTA. Statistical analysis was conducted with t-test.

RESULTS

The mean intravascular attenuation on 40-60keV images with low-iodine-dose was higher (339-730HU) compared to that on standard-iodine-dose SE-CTA (303HU) ($p<0.001$). Mean intravascular attenuation on 70keV was lower (246 HU) than that on standard-iodine-dose SE-CTA ($p<0.001$). There was no difference in mean attenuation between groups A (721, 481, 335, 243) and B (739, 494, 343, 250) on 40, 50,60 and 70 keV, respectively ($p>0.05$). In addition, no significant difference in intravascular attenuation was observed at the different levels within each group on 40-70keV images ($p>0.05$).

CONCLUSION

VMC images from DE-CTA generated with different injection protocols with 16g of iodine yield homogeneous, and higher intravascular attenuation along the aorto-iliac system, in comparison with standard-iodine dose SE-CTA.

CLINICAL RELEVANCE/APPLICATION

High intravascular attenuation and CNR obtained with low KeV VMC images from DECT enable substantial reduction of iodine dose. This reduction demands adjustments of IV contrast protocols, maintaining injection duration for desirable intravascular attenuation.

Honored Educators

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

Dushyant V. Sahani, MD - 2012 Honored Educator
Dushyant V. Sahani, MD - 2015 Honored Educator
Dushyant V. Sahani, MD - 2016 Honored Educator

RC612-12 Low-contrast Dose and Low-kVp CTA is Feasible for the Evaluation of Iliac Access Vessels for TAVR Planning in Patients with Chronic Kidney Disease

Thursday, Dec. 1 11:15AM - 11:25AM Room: E352

Awards
Student Travel Stipend Award

Participants
Dominika Sucha, MD,PhD, Stanford, CA (*Presenter*) Nothing to Disclose
Aya Kino, MD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose
Virginia Hinostroza, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Shannon Walters, RT, MS, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Kristen K. Bogart, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Heiko Schmiedeskamp, PhD, Malvern, PA (*Abstract Co-Author*) Employee, Siemens AG
Jia Wang, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Lior Molvin, Stanford, CA (*Abstract Co-Author*) Speakers Bureau, General Electric Company
Hans-Christoph R. Becker, MD, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Dominik Fleischmann, MD, Palo Alto, CA (*Abstract Co-Author*) Research support, Siemens AG;

PURPOSE

To evaluate low contrast medium dose with low kVp computed tomography angiography (CTA) for the assessment of iliac access vessels in transcatheter aortic valve replacement (TAVR) candidates with chronic kidney disease (CKD).

METHOD AND MATERIALS

All patients undergoing pre-TAVR CTA on a 3rd generation dual-source CT scanner between July 2015 and March 2016 were retrospectively identified. Patients with a serum creatinin (SCr) >1.5mg/dL were included in the low contrast dose cohort and matched based on weight, age and gender to patients with normal renal function undergoing a standard contrast dose CTA. Objective image quality (attenuation, signal-to-noise ratio; SNR) and subjective image quality (IQ; 4-point Likert scale: 1=non-diagnostic, 4=excellent) of the iliac vessels were assessed. Per patient, two observers measured the minimal and maximal iliac vessel diameters at 8 locations. Intraclass-correlation coefficients and Bland-Altman plots with limits of agreement (LoA) were obtained as measures of reproducibility.

RESULTS

Of 150 patients, 18 patients with CKD (mean: age 83±12, weight 68±16kg, females N=9, SCr 2±0.6mg/dL) underwent a low contrast dose CTA (mean contrast 53±25mL, 70-100kVp). The 18 matched patients without CKD (mean: age 84±7, weight 69±15kg, females N=11, SCr 1±0.2mg/dL) received mean 97±26mL of contrast for CTA at 80-120kVp. The mean subjective IQ score was 3.1 [range 1-4] for low contrast and 3.7 [range 3-4] for standard dose CTA. The mean attenuation and SNR at the external iliac arteries was 356.7±137.5 HU and 15.2±6.4 for low dose, and 544.6±126.4 HU and 23.6±8.0 for standard dose CTA, respectively. Low contrast dose CTA showed excellent reliability (ICC 0.927) and a mean agreement for vessel diameter measurements of -0.22mm [LoA: -2.18-1.74]. Standard dose CTA had excellent reliability (ICC 0.896) and a mean agreement of -0.19mm [LoA -1.70-1.32].

CONCLUSION

Low-contrast dose low-kVp CTA provides diagnostic image quality and reproducible iliac vessel diameter measurements and is hence feasible in TAVR candidates with chronic kidney disease.

CLINICAL RELEVANCE/APPLICATION

In TAVR candidates with renal impairment, low-contrast dose low-kVp CTA is a feasible method for reducing iodine contrast load while maintaining diagnostic image quality.

RC612-13 Thoracic Aortic Diameter Measurement: Comparison Across Computed Tomography (CT) Techniques in TAVR Patients

Thursday, Dec. 1 11:25AM - 11:35AM Room: E352

Participants
Elaine W. Zhong, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Anna Rozenshtein, MD, Valhalla, NY (*Presenter*) Nothing to Disclose
Gregory D. Pearson, MD, PhD, Stamford, CT (*Abstract Co-Author*) Nothing to Disclose
Omar Khalique, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Todd Pulerwitz, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare systolic vs. diastolic, gated vs. non-gated, contrast- vs. non-contrast enhanced measurements of the thoracic aorta

METHOD AND MATERIALS

CT images of 100 consecutive patients evaluated for transcatheter aortic valve replacement (TAVR) with gated volumetric and non-gated helical images acquired on a 320 detector row CT were analyzed using an Aquarius iNtuition workstation. A semiautomated centerline was generated to obtain maximal luminal diameter, orthogonal diameter and cross sectional area of the ascending and descending aorta in systole, diastole, and on non-gated CT. Studies with poor contrast opacification precluding semiautomated centerline were excluded. Luminal thrombi and intramural calcifications were included within the luminal diameter. For non-contrast CT, manual measurements were obtained in a double-oblique plane orthogonal to the long axis of the vessel. Interobserver agreement was assessed using intraclass correlation coefficients (ICC).

RESULTS

The differences between gated systolic and diastolic, non-gated, and non-contrast measurements were 0.48±0.12 mm (mean±SE, p<0.001), 0.39±0.11 mm (p<0.001), and 0.78±0.18 mm (p<0.001) respectively for the maximal ascending aortic diameter (AAD); 0.44±0.05 mm (p<0.001), 0.052±0.079 mm (p=0.51), and 1.1±0.32 mm (p<0.001) respectively for the mean AAD; 0.27±0.071 mm (p<0.001), 0.23±0.10 mm (p=0.027), and 1.08±0.13 mm (p<0.001) respectively for the maximal descending aortic diameter (DAD); and 0.33±0.079 mm (p<0.001), 0.17±0.084 mm (p<0.05), and 2.1±0.12 mm (p<0.001) respectively for the mean DAD. The differences between the non-gated and non-contrast measurements were 0.39±0.20 mm (p=0.052) for the maximal AAD, 1.2±0.33 mm (p<0.001) for the mean AAD, 0.85±0.14 mm (p<0.001) for the maximal DAD, and 1.9±0.12 mm (p<0.001) for the mean DAD. Interobserver agreement was excellent (ICC= 0.88-0.99) in a subset of patients that were dual read.

CONCLUSION

There are statistically significant but not clinically relevant differences in aortic diameters in patients with AS as measured on ECG-gated (both during systole and diastole) and non-gated CT with or without intravenous contrast. Diameters from any of the studied techniques can be used for clinical decision making.

CLINICAL RELEVANCE/APPLICATION

Measurements of the thoracic aorta in AS patients scanned on a 320 detector row CT scanner are not subject to clinically significant variability based on gated vs. non-gated CT technique or contrast administration

RC612-14 Post Processing and Workflow

Thursday, Dec. 1 11:35AM - 12:00PM Room: E352

Participants
Michael L. Steigner, MD, Boston, MA, (msteigner@bwh.harvard.edu) (*Presenter*) Speaker, Toshiba Corporation

LEARNING OBJECTIVES

1) Define post-processing principles. 2) Apply post-processing techniques to CTA. 3) Implement post-processing in the clinical workflow including reimbursement considerations.

ABSTRACT

RC613

Pediatric: MSK

Thursday, Dec. 1 8:30AM - 10:00AM Room: S102AB

MK PD

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

Participants

Sub-Events

RC613A Imaging of Musculoskeletal Soft Tissue Masses

Participants
Michele M. Walters, MD, Boston, MA (*Presenter*) Nothing to Disclose

RC613B Imaging of Pediatric Vascular Anomalies

Participants
Oscar M. Navarro, MD, Toronto, ON, (oscar.navarro@sickkids.ca) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Classify vascular malformations and hemangiomas. 2) Explain the importance of clinical information in the diagnosis of pediatric vascular anomalies. 3) Describe most relevant sonographic and MR imaging features of pediatric vascular anomalies.

RC613C Imaging of SCFE

Participants
Delma Y. Jarrett, MD, Boston, MA (*Presenter*) Nothing to Disclose

RC613D Imaging of Pediatric Scoliosis

Participants
Nancy A. Chauvin, MD, Philadelphia, PA, (chauvinn@email.chop.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the types and patterns of scoliosis in children. 2) Develop an evidence based approach to imaging scoliosis in children. 3) Identify key imaging findings in pediatric scoliosis.

ABSTRACT

RC614

Interventional Series: Embolotherapy

Thursday, Dec. 1 8:30AM - 12:00PM Room: N226

IR

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

FDA Discussions may include off-label uses.

Participants
Robert A. Morgan, MD, London, United Kingdom, (Robert.morgan@stgeorges.nhs.uk) (*Moderator*) Proctor, Medtronic, Inc
Matthew S. Johnson, MD, Indianapolis, IN (*Moderator*) Research Consultant, Boston Scientific Corporation; Research Consultant, Cook Group Incorporated; Research Consultant, CeloNova BioSciences, Inc; Research Consultant, BTG International Ltd; Research support, BTG International Ltd; ;

LEARNING OBJECTIVES

1) Describe rationale of bariatric embolization. 2) Explain the rationale and treatment of high flow malformations. 3) Describe the preparation of cyanoacrylates for embolization. 4) List two complications related to embolization. 5) Recognize the significance of Type III endoleaks. 6) Describe approach to treatment of visceral aneurysms.

ABSTRACT

Sub-Events

RC614-01 Iatrogenic Injuries: I Can Fix That!

Thursday, Dec. 1 8:30AM - 8:45AM Room: N226

Participants
Robert A. Morgan, MD, London, United Kingdom, (Robert.morgan@stgeorges.nhs.uk) (*Presenter*) Proctor, Medtronic, Inc

LEARNING OBJECTIVES

View Learning Objectives under the Main Course Title.

LEARNING OBJECTIVES

View learning objectives under the main course title.

ABSTRACT

RC614-02 Advanced Endoleak Treatment

Thursday, Dec. 1 8:45AM - 9:00AM Room: N226

Participants
William S. Rilling, MD, Milwaukee, WI (*Presenter*) Research support, B. Braun Melsungen AG; Research support, Sirtex Medical Ltd; Research support, Siemens AG; Consultant, B. Braun Melsungen AG; Consultant, Cook Group Incorporated ; Consultant, Terumo Corporation; Advisory Board, Terumo Corporation

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC614-03 AVM Embolization

Thursday, Dec. 1 9:00AM - 9:15AM Room: N226

Participants
Brian S. Funaki, MD, Riverside, IL (*Presenter*) Data Safety Monitoring Board, Novate Medical Ltd

LEARNING OBJECTIVES

1) Describe the rationale for treating arteriovenous malformatoins from a venous approach.

ABSTRACT

This short lecture will review treatment of AVMs

RC614-04 Bariatric Embolization

Thursday, Dec. 1 9:15AM - 9:30AM Room: N226

Participants
Jafar Golzarian, MD, Minneapolis, MN (*Presenter*) Chief Medical Officer, EmboMedics Inc

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC614-06 Efficacy, Predictive Factors, and Time Course of Partial Splenic Artery Embolization for Cancer Patients with Thrombocytopenia

Thursday, Dec. 1 9:40AM - 9:50AM Room: N226

Participants
Ashley R. Hill, Houston, TX (*Presenter*) Nothing to Disclose
Ahmed Elakkad, MBBCh,MSc, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Joshua D. Kuban, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Sanjay Gupta, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Rahul A. Sheth, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate demographic, volumetric, and procedural risk factors for long term treatment failure following partial splenic artery embolization for thrombocytopenia in cancer patients.

METHOD AND MATERIALS

A single institution, IRB-approved retrospective review of all partial splenic artery embolizations for thrombocytopenia between 2008 – 2015 was performed. Treatment success was defined as platelet count > 100 thou/uL at 180 days post-procedure. Splenic volumes were measured at multiple time points prior to and following embolization. Univariate, multivariate, and linear mixed model analysis was performed.

RESULTS

A total of 164 patients underwent partial splenic embolization, most commonly with Gelfoam mixed with gentamicin 80mg. The most common risk factor for thrombocytopenia was chemotherapy (93%); cirrhosis was present in 9.5% of patients. Treatment success rate was 81%, with a median follow up duration of 394 days. Major complication rate was 4%. Greater baseline splenic volume (p=0.006) and lower baseline platelet levels (p=0.03) were associated with treatment failure, while age (p=0.64), gender (p=1.0), follow-up duration (p=0.13), immediate post-treatment splenic volume (p=0.1), cancer type (p=0.76), distal vs proximal embolization (p=0.28), and percent change in splenic volume (p=0.4) were not. On longitudinal analysis, treatment responders demonstrated persistently elevated platelet counts, while non-responders demonstrated, on aggregate, an initial increase followed by a decrease in platelet count, with the point of inflection at approximately 180 days. Treatment responders exhibited persistently decreased splenic volumes, while non-responders exhibited regrowth of splenic parenchyma, also beginning at approximately 180 days.

CONCLUSION

Partial splenic artery embolization exhibits a high success rate, with sustained effects, for cancer patients with thrombocytopenia. Elevated baseline splenic volumes and severe thrombocytopenia increase the risk for treatment failure.

CLINICAL RELEVANCE/APPLICATION

In cancer patients with thrombocytopenia, partial splenic artery embolization is a safe technique with long-term efficacy for improving platelet counts.

RC614-07 Splenic Artery Embolization in Blunt Splenic Injury: Outcomes of Temporary versus Permanent Embolization

Thursday, Dec. 1 9:50AM - 10:00AM Room: N226

Awards
Student Travel Stipend Award

Participants
Bardia Moosavi, MD, Ottawa, ON (*Presenter*) Nothing to Disclose
William Petrcich, MSc, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Pasteur Rasuli, MD, FRCPC, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the efficacy, complication rates, procedure time and splenic volume changes following temporary versus permanent splenic artery embolization (SAE).

METHOD AND MATERIALS

This retrospective study compared the results of SAE with Gelfoam (30 [torpedoes 15, slurry 15]) versus metallic coils (33 [proximal 13, distal 12, combined 8]) in 63 consecutive patients who underwent SAE for blunt splenic injury between 2005 and 2014 in a tertiary care hospital. All patients had contrast-enhanced CT before embolization and 19 patients (temporary 9, permanent 10) had median CT follow up of 150 days (range 21-1825) after embolization. Failure rates, defined as requiring repeat embolization or splenectomy, and rates of major and minor complications were compared. Procedure times and pre- and post-embolization volumes, calculated by using a volume-rendering software, were also compared.

RESULTS

There was no significant difference in age, sex, injury severity score, splenic injury score (AAST grade) and mean time to embolization between the groups (P >0.05 in every category). Eight patients died of other injuries and were excluded. There was no significant difference in failure rates between the two groups (4.3% for temporary vs 6.2% for permanent; P=1.0 [95% CI, -13.73–9.92%]). Major complication rates were comparable (26.1% vs 18.7%; P=0.52 [95% CI, -29.81%–15.13%]). Minor complication rates were also comparable (13% vs 21.9%; P=0.49 [95% CI, -11.03%–28.7%]). Procedure time was shorter in the temporary group (33 vs 53 minutes; P= 0.02, [95% CI, -34 – -2]). Pre-embolization splenic volumes were not significantly different between the two groups (P=0.72; [95% CI, -108– 102]). There was no significant difference in post-embolization splenic volume expansion in the two groups with the temporary group showing an increase in size from 171.5 cm3 to 179 cm3 (P=0.41, [95% CI, -9– 85.2]) and the permanent group showing an increase from 174 cm3 to 243 cm3 (P=0.92, [95% CI, -74– 70.9]).

CONCLUSION

Temporary SAE had similar efficacy and complication rates compared to permanent embolization but was achieved with a

significantly shorter procedure time.

CLINICAL RELEVANCE/APPLICATION

Temporary splenic artery embolization with Gelfoam is as effective and safe as permanent embolization with coils, but can be achieved quicker which is critical in hypotensive patients.

RC614-08 Splenic Artery Embolization

Thursday, Dec. 1 10:00AM - 10:15AM Room: N226

Participants
Andrew J. Lipnik, MD, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define splenic artery anatomy and collateral pathways. 2) Describe how the clinical indication influences the choice of embolic material. 3) Explain the rationale of proximal vs. distal embolization for splenic trauma. 4) Identify and manage complications after splenic artery embolization.

RC614-09 Prophylactic Embolization Pre-Y90

Thursday, Dec. 1 10:30AM - 10:45AM Room: N226

Participants
Matthew S. Johnson, MD, Indianapolis, IN (*Presenter*) Research Consultant, Boston Scientific Corporation; Research Consultant, Cook Group Incorporated; Research Consultant, CeloNova BioSciences, Inc; Research Consultant, BTG International Ltd; Research support, BTG International Ltd; ;

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC614-10 Prostate Embolization: Lessons Learned

Thursday, Dec. 1 10:45AM - 11:00AM Room: N226

Participants
James B. Spies, MD, Washington, DC (*Presenter*) Advisory Board, Boston Scientific Corporation;

LEARNING OBJECTIVES

1) To understand the rationale for prostate artery embolization (PAE) for benign prostatic hypertrophy. 2) To understand how PAE is performed, including understanding the vascular anatomy of the prostate and adjacent structures. 3) To understand current outcomes from PAE.

ABSTRACT

RC614-11 Prostate Artery Embolization for the Treatment of Benign Prostatic Hyperplasia: A Prospective Single-center Study

Thursday, Dec. 1 11:00AM - 11:10AM Room: N226

Awards
Student Travel Stipend Award

Participants
Marco Salsano, MD, Rome, Italy (*Presenter*) Nothing to Disclose
Vincent G. Helyar, MBBS, MSc, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Narayanan Thulasidasan, MRCS, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Shahzad Ilyas, MBBS, MRCS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Rick Popert, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Tarun Sabharwal, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the clinical efficacy and safety of prostatic artery embolization (PAE) in patients with acute urinary retention caused by benign prostatic hyperplasia (BPH).

METHOD AND MATERIALS

Between January 2014 and November 2015, PAE was performed in 106 consecutive patients affected by BPH using 100 and 200 polyvinyl alcohol particles. Inclusion criteria were moderate to severe lower urinary tract symptoms refractory to ≥ 6 months of medical therapy; prostate volume ≥40cc; International Prostate Symptom Score ≥ 19 or quality of life (QoL) score ≥ 3 or peak urinary flow rate (Q max) < 12ml/sec or acute urinary retention. Patients with bladder diverticula or calculi, urethral stenosis, neurogenic bladder, eGFR < 40 ml/min, Prostatic malignancy were excluded. Mean patient age was 69 years (range 49-98 y). Magnetic resonance imaging, uroflowmetry, and the international prostate symptom score (IPSS) were used to assess clinical and functional outcomes.

RESULTS

Defined as reduction in IPSS of ≥4 points, clinical success was of 81.3% at 3 months and of 78.6% at 12 months. Twelve patients underwent further treatment due to inadequate clinical response to PAE (11 patients) and technical failure (1 patient). Mean IPSS reduced from 21.67 to 10.13 at 3 months and 9.79 at 12 months ($p<0.0001$); mean QoL decreased from 4.45 to 1.775 at 3 months and 1.556 at 12 months ($p<0.0001$). The international index of erectile function did not show significant change over the whole study period. Mean prostate volume (PV) reduced from 142.5cc to 106.1cc (25% average loss of volume; $p=0.04$). Mean post-void

residual (PVR) reduced from 187.4 ml to 149.7 ml at 3 months (p=0.22), rebounding to 159.8 ml at 12 months (p=0.54). Mean peak of urine flow rate increased from 15.7 ml/sec to 19 ml at 3 months (p=0.25), rebounding to 15.9 ml/sec at 12 months (p=0.96).

CONCLUSION

PAE is an effective, safe and feasible procedure, with preliminary results and short-term follow-up suggesting good symptom control without sexual dysfunction, associated with prostate volume reduction. PAE improves urinary flow and QoL reducing IPSS, PVR and PV.

CLINICAL RELEVANCE/APPLICATION

PAE is suitable for the treatment of BPH and may play an important role in patients with unsuccessful medical therapy, high anesthetic/surgical risk or who refuse standard invasive treatments.

RC614-12 Evaluation of Cerebrovascular Embolism after Catheter Embolization of Pulmonary AVMs in HHT Patients (Hereditary Hemorrhagic Telangiectasia / Osler disease) by Pre- and Post Interventional MRI

Thursday, Dec. 1 11:10AM - 11:20AM Room: N226

Participants
Guenther K. Schneider, MD, PhD, Homburg, Germany (*Presenter*) Research Grant, Siemens AG; Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Research Grant, Bracco Group;
Paul S. Raczeck, MD, Homburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Philippe Jagoda, MD, Homburg/Saar, 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;
Lisa Fenzl, MD, Homburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Alexander Massmann, MD, Homburg/Saar, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The recommended treatment of PAVMs in HHT patients is catheter embolization either with coils or by the use of vascular plugs. Until now no prospective MRI based studies to detect perinterventional brain emboli in a larger patient cohort that underwent embolization of PAVM were performed. We prospectively evaluated patients undergoing embolization therapy of pulmonary AVMs by MRI for detection of clinically silent cerebral infarctions, like they have been shown previously after carotid artery stent placement.

METHOD AND MATERIALS

94 HHT patients (male/female=40/54; mean age 45.7+/-16.7 (range 5-86)) with pre-diagnosed PAVMs on CE-MRA underwent embolization therapy (1 to 8 PAVMs/patient/session). Depending on the size of feeding vessels and morphology either Nester-Embolization Coils (Cook Medical) or Amplatzer vascular plugs (St. Jude Medical) were used for embolization therapy. During the procedure, each patient received iv injection of 2500 units heparin. MRI was performed immediately before, 4 hours and 3 month post embolization. To detect peri-interventional cerebral emboli a T2w-sequence, a FLAIR-sequence and DWI using 3 different B-values and calculation of ADC maps was performed.

RESULTS

DWI post interventional therapy only showed small, diffuse acute emboli in one patient (1%). This patient underwent re-embolization of a vessel that was previously treated with tungsten coils. These corroded over time leading to a reperfused PAVM. This patient had had several episodes of brain emboli before our treatment. Due to anatomical reasons re-embolization had to be performed by placing additional platinum coils within the already placed tungsten coils. During this procedure most likely small particles of the corroded tungsten coils or preexisting thrombotic material embolized. After successful re-embolization the patient did not experience any further brain emboli over a follow-up period of 8 years. No other patient, showed any post interventional newly developed ischemic lesion in the brain at any time point of follow up; obviously independent of the use of coils or vascular plugs.

CONCLUSION

This prospective study in 94 patients undergoing interventional treatment of PAVMs shows that catheter embolization is safe and does not even result in clinical inconspicuous cerebral ischemia.

CLINICAL RELEVANCE/APPLICATION

Catheter embolization of PAVMs is safe and does not even result in clinical inconspicuous cerebral ischemia.

RC614-13 Embolotherapy for Bleeding Gestational Trophoblastic Neoplasia is Effective and Safe and Does not Adversely Impact Chemotherapeutic Clinical Outcomes

Thursday, Dec. 1 11:20AM - 11:30AM Room: N226

Participants
Zhiwei Wang, MD, Beijing, China (*Presenter*) Nothing to Disclose
Zheng Yu Jin, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To retrospectively evaluate the impact of selective arterial embolization (SAE) on the prognosis of patients with gestational trophoblastic neoplasias (GTN).

METHOD AND MATERIALS

A retrospective analysis of the records of all patients with GTN between January 2005 and January 2014 was performed. 41 patients (mean age, 28.9±7.6 years) with massive vaginal hemorrhage from GTN (including 27 cases of choriocarcinoma and 14 cases of invasive mole) were treated with SAE. The complications, control of hemorrhage and outcome of chemotherapy were retrospectively reviewed.

RESULTS

Based on the FIGO staging system, 3 patients (7.3%) were diagnosed as FIGO stage I, 6 (14.6%) stage II, 22 (53.7%) stage III, and 10 (24.4%) stage IV. Angiography showed arteriovenous communication in the tumor nidus in 31 patients and contrast extravasation in the uterine cavities in 8 patients. All patients underwent bilateral uterine arteries embolizations. Tumors were supplied by branches of internal iliac artery other than uterine artery in nine patients and these arteries were underwent embolization. The technical success rate of embolization was 100%. SAE successfully controlled the hemorrhage for 38 patients (92.7%). No major complications occurred. All patients with successful SAE received systemic chemotherapy. The average number of post-embolization chemotherapy cycles was 9.8 for every patient. The embolization controlled bleeding for 38 patients without recurrent massive bleeding during the period of chemotherapy. The complete remission (CR) was achieved in 34 patients (89.5%), whereas 2 patients had partial remission (PR) and transferred to other hospital for further therapy. 2 died due to cerebral hemorrhage and lung infection respectively. The median follow-up time was 45 months (range 7–114 months) for 32 patients, and two cases had recurrence. Two patients with CR required repeated embolizations for recurrence of massive bleeding 30 and 47 months after the first embolization procedure due to uterine arteriovenous malformation.

CONCLUSION

Our experience shows that SAE can effectively control the hemorrhage from GTN and the response rate of GTN with massive vaginal hemorrhage is high when systemic chemotherapy is applied following successful SAE. The uterine bleeding may recur due to uterine AVMs, even following complete embolization and CR of GTN.

CLINICAL RELEVANCE/APPLICATION

SAE should be the first line therapy for bleeding GTN.

RC614-14 Embolization: New Tools and Techniques

Thursday, Dec. 1 11:30AM - 11:45AM Room: N226

Participants
Thorsten R. Johnson, MD, Munich, Germany (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC614-15 5 Most Important Embolization Papers, 2015-2016

Thursday, Dec. 1 11:45AM - 12:00PM Room: N226

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 the results and conclusion of a recent publication presented on a randomized control trial comparison of bland embolization with Doxorubicin loaded drug eluting bead2. List methods to improve the short-term management after Uterine Fibroid Embolization (UFE)3. Describe a new IR technique for the treatment of gastric varices4. List new embolization indications that are being studied5. Discuss potential benefits of using new imageable embolic microspheres for embolization procedures

Active Handout:Robert Joseph Abraham

http://abstract.rsna.org/uploads/2016/16001198/5 Most Important Embolization Papers Handout_Robert Abraham (1).pdf

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC615

BI-RADS (An Interactive Session)

Thursday, Dec. 1 8:30AM - 10:00AM Room: E450A

BR MR US

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

1) Improve basic knowledge of the descriptive terms in the updated BI-RADS mammography lexicon. 2) Develop an understanding of the BI-RADS management terminology and explanations for each assessment category. 3) Apply the mammography lexicon descriptors appropriately and assign the most appropriate BI-RADS assessment category to various mammographic breast lesions. 4) Review updated BI-RADS ultrasound lexicon terms and assessment categories. 5) Provide a case-based illustration of BI-RADS ultrasound lexicon descriptors and assessment categories. 6) Test knowledge of concepts with challenging unknown cases. 7) Be able to apply a systematic approach to using MRI BI-RADS. 8) Recognize the similarities between BI-RADS for MRI and mammography. 9) Recognize situations where a BI-RADS assessment is not used for MRI.

ABSTRACT

Sub-Events

RC615A Mammography

Participants
Cecilia L. Mercado, MD, New York, NY, (cecilia.mercado@nyumc.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Improve basic knowledge of the descriptive terms in the updated BI-RADS mammography lexicon. 2) Develop an understanding of the BI-RADS management terminology and explanations for each assessment category. 3) Apply the mammography lexicon descriptors appropriately and assign the most appropriate BI-RADS assessment category to various mammographic breast lesions.

ABSTRACT

RC615B Ultrasound

Participants
Eun L. Langman, MD, Chapel Hill, NC, (EJL@med.unc.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review updated BI-RADS ultrasound lexicon terms and assessment categories. 2) Provide a case-based illustration of BI-RADS ultrasound lexicon descriptors and assessment categories.3) Test knowledge of concepts with challenging unknown cases.

ABSTRACT

RC615C Breast MRI

Participants
Bonnie N. Joe, MD, PhD, San Francisco, CA, (bonnie.joe@ucsf.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Be able to apply a systematic approach to using MRI BI-RADS. 2) Recognize the similarities between BI-RADS for MRI and mammography. 3) Recognize situations where a BI-RADS assessment is not used for MRI.

ABSTRACT

Breast MRI BI-RADS follows a systematic approach analogous to mammography BI-RADS. BI-RADS includes three important components: (a) a lexicon of descriptors, (b) a reporting structure to include final assessment categories and management recommendations,and (c) a framework for data collection
and auditing. This session will use an interactive format (audience response system) to review appropriate use of BI-RADS for breast MRI interpretation including scenarios where BI-RADS assessments are not appropriate.

RC616

Communicating Effectively with Patients (Sponsored by the RSNA Public Information Committee)

Thursday, Dec. 1 8:30AM - 10:00AM Room: N229

PR

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

Participants
Max Wintermark, MD, Lausanne, Switzerland, (max.wintermark@gmail.com) (*Moderator*) Advisory Board, General Electric Company;
Stephen D. Brown, MD, Boston, MA, (stephen.brown@childrens.harvard.edu) (*Presenter*) Nothing to Disclose
Michael J. Callahan, MD, Boston, MA (*Presenter*) Nothing to Disclose
Beth A. Ripley, MD, PhD, Seattle, WA, (bar23@uw.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Answer patient questions about radiation dose and address concerns about risk. 2) Apply a standardized checklist to the informed consent conversation that is patient centered, quality driven, and legally sound. 3) Effectively deliver good and bad results and disclose medical errors.

ABSTRACT

Patients are becoming increasingly involved in their healthcare. Frequently, they turn to the Internet for information on their conditions, diagnosis and treatment options. With the vast amount of information available—both reliable and unreliable—to patients, it is critical that radiologists be able to provide context, help patients to be better informed decision makers in their healthcare, and educate patients on benefits versus risks of the procedures they may undergo. This course will provide specific examples and a strategy for communicating honestly and directly with patients.

RC617

Emerging Technology: High Intensity Focused Ultrasound - Opportunities and Challenges

Thursday, Dec. 1 8:30AM - 10:00AM Room: S504CD

IR US

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

FDA Discussions may include off-label uses.

Participants
Alessandro Napoli, MD, Rome, Italy (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) To become familiar with high intensity focused ultrasound principles, different image guidance and clinical applications. 2) To understand clinical applications of different HIFU systems with both US and MRI guidance. 3) To integrate essential knowledge for radiologists facing new opportunities with a totally non-invasive IR tool.

ABSTRACT

The concept of ideal tumor surgery is toremove the neoplastic tissue without damaging adjacentnormal structures. High-intensity focused ultrasound(HIFU) was developed in the 1940s as a viable thermaltissue ablation approach. In clinical practice, HIFU hasbeen applied to treat a variety of solid benign and malignantlesions, including pancreas, liver, prostate, and breastcarcinomas, soft tissue sarcomas, and uterine fibroids.More recently, magnetic resonance guidance has beenapplied for treatment monitoring during focused ultrasoundprocedures (magnetic resonance–guided focused ultrasound,MRgFUS). Intraoperative magnetic resonanceimaging provides the best possible tumor extension anddynamic control of energy deposition using real-timemagnetic resonance imaging thermometry. This course will introducethe fundamental principles and the most attractive clinical indications of high intensity focused ultrasoundtechnique in practice.

Sub-Events

RC617A From Technology to HIFU Clinic

Participants
Pejman Ghanouni, MD, PhD, Stanford, CA, (ghanouni@stanford.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Technical aspects of focused ultrasound, including introduction to the physics of the technology, and to MR thermometry. 2) Advantages of MR guidance during focused ultrasound therapy. 3) Keys to successful clinical utilization of the technology.

ABSTRACT

Focused ultrasound can be used to non-invasively treat structures deep within the body, using ultrasound or magnetic resonance imaging for guidance. A large area ultrasound transducer array is focused geometrically and electronically, with energy focused to achieve high intensity deep within the body, while sparing intervening tissues. With MR guided focused ultrasound (MRgFUS), treatment can be precisely monitored intra-operatively using proton resonant shift thermometry, and results can be evaluated with immediate post-operative imaging. MRgFUS is used clinically in the United States for the treatment of uterine fibroids, benign and malignant bone tumors, soft tissue tumors, and movement disorders. Translating this technology to a robust clinical service involves close collaboration between radiologists and the clinicians that directly manage these patients, with centralized, dispersed, and center of excellence options as models for these clinical relationships.

RC617B High Intensity Focused Ultrasound - Uterine Fibroid

Participants
Young-Sun Kim, MD, Seoul, Korea, Republic Of, (jeants.kim@gmail.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explain pros and cons of HIFU (high-intensity focused ultrasound) ablation in the treatment of uterine fibroids as compared to other therapeutic modalities. 2) Assess important factors in screening MR exams for HIFU therapy of uterine fibroids. 3) Explain treatment strategy of HIFU ablation for uterine fibroids to improve therapeutic outcomes. 4) Describe the current limitations of HIFU of uterine fibroids and explain how to overcome them including a hormone pretreatment.

ABSTRACT

Uterine fibroid is the most popular clinical applications of HIFU (high-intensity focused ultrasound) therapy. As a totally non-invasive interventional therapeutic modality using small foci of hyperthermia (65-70°C), HIFU has pros and cons as compared to other therapeutic modalities. However, owing to its greatest merit of complete non-invasiveness, its clinical adoptions are increasing worldwide.HIFU therapy has certain inborn limitations, therefore, appropriate screening for uterine fibroids is extremely important to improve overall therapeutic outcomes. In order to do so, the cases which will be benefited from this therapy should be chosen well, and then, the properties of the target fibroids, safe pathway of sonications, complication-related factors should be well analyzed in screening MR exams. Furthermore, the symptom-relevant fibroid or the portion of fibroid should be recognized and completely ablated.As accumulations of clinical experiences of HIFU therapy, the evidences of therapeutic efficacy and safety of HIFU ablation of uterine fibroids are incrreasing and there have been several techniques or strategies developed to overcome the limitations or to improve therapeutic efficacy, which will be covered in this presentation.

RC617C High Intensity Focused Ultrasound - Bone

Participants
Alessandro Napoli, MD, Rome, Italy, (alessandro.napoli@uniroma1.it) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Patient selection for MR guided focused ultrasound palliation of painful bone metastases and benign bone lesions. 2) Results of MR guided focused ultrasound for palliation of painful bone metastases and Osteoid Osteoma. 3) Technical aspects of successful patient treatment. 4) Immediate post-treatment imaging-based assessment of results.

ABSTRACT

Magnetic resonance imaging-guided focused ultrasound (MRgFUS) is an alternative noninvasive method for reducing pain in skeletal metastases. The concentration of acoustic energy on the intact surface of the cortical bone produces a rapid temperature increase that mediates critical thermal damage to the adjacent periosteum—the most innervated component of mature bone tissue. Such thermal ablation has been shown to be an extremely effective approach for pain management. This technique has also a potential role in achieving local tumor control, allowing de-novo mineralization of trabecular bone or reduction in lesion size. In our department, we are evaluating the safety and efficacy of MRgFUS treatment for pain palliation in patients with malignant (bone metastases) as well as benign (osteoid osteoma) lesions. Local tumor control was demonstrated by a reduction of lesion viability following MRgFUS procedure and by remineralization of spongy bone. Regarding the ablation of osteoid osteoma, MRgFUS was proposed as an alternative treatment option among other consolidated modalities, including radiofrequency ablation. At present, radiofrequency ablation is the most popular percutaneous technique, but it requires some degree of intervention. Our preliminary study demonstrates that MRgFUS for osteoid osteoma seems to be safe with good success and without treatment-related morbidity. Unlike other ablative techniques, MRgFUS is totally noninvasive and can be performed relatively fast in a single session with limited amount of energy deposition. In conclusion, MRgFUS is a completely noninvasive modality that allows effective and durable pain palliation in a single session even if a specific anesthesia protocol is needed. In bone metastasis, focused ultrasound energy may also detect metastasis necrosis, thus having potential future role for local tumor control. Furthermore, MRgFUS can be performed safely and effectively in patients with symptomatic osteoid osteoma. Describe patient selection for MR guided focused ultrasound palliation of painful bone metastases.

RC617D High Intensity Focused Ultrasound - Brain

Participants
Pejman Ghanouni, MD, PhD, Stanford, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC617E Clinician Perspective in the Management of Prostate Cancer

Participants
Alessandro Napoli, MD, Rome, Italy (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC618

Interactive Game: Challenging Cases in Body Oncologic Imaging

Thursday, Dec. 1 8:30AM - 10:00AM Room: S103AB

CT MR NM OI US

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

Participants

Sub-Events

RC618A Ultrasound

Participants
Deborah J. Rubens, MD, Rochester, NY, (Deborah_rubens@urmc.rochester.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the technical parameters to optimize to improve ultrasound diagnosis. 2) Identify discrete ultrasound features to discriminate between various pathologic entities. 3) Characterize disease processes in solid organs, vessels and soft tissues using the unique features of ultrasound and appreciate how ultrasound is complementary to CT, MRI and PET in the oncology patient.

ABSTRACT

This session will highlight a variety of disease processes in the oncology patient using grayscale, color and spectral Doppler ultrasound. Technique and potential pitfalls will be highlighted as they contribute to diagnostic acumen of the sonologist. Cases will include neoplastic, infectious and vascular processes in multiple organs. Differential diagnosis will be stressed with companion case examples, as well as when to use comparative imaging such as CT, MRI or PET/CT

RC618B Magnetic Resonance Imaging

Participants
Alexander R. Guimaraes, MD, PhD, Portland, OR, (guimaraa@ohsu.edu) (*Presenter*) Speakers Bureau, Siemens AG;

LEARNING OBJECTIVES

This course is designed to update the attendee on novel MRI techniques and the benefits of MRI in diagnosing challenging cases within the abdomen and pelvis. Multiparametric MRI offers the unique ability to monitor the tumor microenvironment. Increasingly, multiparametric MRI is used for diagnosis and grading of malignancy in various organ systems (e.g. prostate cancer). At the end of this course the attendee through case studies will demonstrate a greater understanding of the following:1) Updated understanding of soft tissue contrast mechanisms inherent in MRI including T1rho, diffusion weighted imaging, DCE-MRI.2) Updated protocols for each organ site.3) Potential benefits of PET/MRI in diagnosing disease.

ABSTRACT

RC618C PET/CT

Participants
Gary A. Ulaner, MD, PhD, New York, NY, (ulanerg@mskcc.org) (*Presenter*) Research support, General Electric Company; Research support, F. Hoffmann-La Roche Ltd

LEARNING OBJECTIVES

1) Learn where CT findings can improve FDG PET interpretation and where FDG PET findings can improve CT interpretation.

ABSTRACT

FDG PET/CT has become an indispensible modality in the treatment of cancer. While proven to be of great clinical benefit in the management of a wide array of malignancies, there are many potential pitfalls which may be detrimental if not properly identified and explained. In particular, FDG-avidity may be incorrectly ascribed to malignancy when corresponding CT findings demonstrate the FDG-avidity to be benign. In other cases, the presence of FDG avidity correctly deterimes the presence of malignancy despite to lack of correlate findings on CT. In this presentation, challenging FDG PET/CT cases will be used to demonstrate how correlation of FDG PET and CT findings leads to optimal FDG PET/CT interpretation.

RC621

Advances in CT: Technologies, Applications, Operations-Spectral CT

Thursday, Dec. 1 8:30AM - 10:00AM Room: S105AB

CT PH

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

Participants
Ehsan Samei, PhD, Durham, NC (*Coordinator*) Research Grant, General Electric Company; Research Grant, Siemens AG
Norbert J. Pelc, ScD, Stanford, CA (*Coordinator*) Research support, General Electric Company; Research support, Koninklijke Philips NV; Consultant, Varian Medical Systems, Inc; Consultant, NanoX; Scientific Advisory Board, RefleXion Medical Inc; Scientific Advisory Board, Prismatic Sensors AB; Medical Advisory Board, OurCrowd, LP ;

Sub-Events

RC621A Data Acquisition and Image Formation Methods for Multi-Energy CT

Participants
Cynthia H. McCollough, PhD, Rochester, MN, (mccollough.cynthia@mayo.edu) (*Presenter*) Research Grant, Siemens AG

LEARNING OBJECTIVES

1) Understand the various methods used to acquire multi-energy CT data. 2) Comprehend the different methods used to present the information obtained with multi-energy CT.

ABSTRACT

RC621B Applications

Participants
Sebastian T. Schindera, MD, Basel, Switzerland, (sschindera@aol.com) (*Presenter*) Research Grant, Siemens AG; Research Grant, Ulrich GmbH & Co KG; Research Grant, Bayer AG; Speakers Bureau, Bayer AG

LEARNING OBJECTIVES

1) Describe the various clinical applications of multi-energy CT. 2) Discuss the most important challenges of multi-energy CT in clinical routine. 3) Identify future opportunities of multi-energy CT.

ABSTRACT

RC621C Future Prospects-Photon Counting

Participants
Taly G. Schmidt, PhD, Milwaukee, WI, (tal.gilat-schmidt@marquette.edu) (*Presenter*) Research Grant, General Electric Company

LEARNING OBJECTIVES

1) Understand the potential benefits of photon-counting detection for Spectral CT. 2) Understand the current challenges of photon-counting Spectral CT.

RC622

MRI: Imaging for Radiation Treatment Guidance and Verification

Thursday, Dec. 1 8:30AM - 10:00AM Room: S102D

MR RO PH

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

Participants
Rojano Kashani, Saint Louis, MO (*Moderator*) Investigator, Koninklijke Philips NV; Investigator, ViewRay, Inc

LEARNING OBJECTIVES

1) Understand the main concepts of MRI-guided radiation therapy. 2) Understand the advantages and limitations of MRI-guided radiotherapy systems currently in use or under development. 3) Understand the use of in-room MRI guidance for management of intr- and inter-fraction variations in anatomy.

ABSTRACT

Sub-Events

RC622A In-Room MRI for Treatment Guidance

Participants
Rojano Kashani, Saint Louis, MO (*Presenter*) Investigator, Koninklijke Philips NV; Investigator, ViewRay, Inc

LEARNING OBJECTIVES

1) Understand the main concepts of MRI-guided radiation therapy. 2) Understand the advantages and limitations of MRI-guided radiotherapy systems currently in use or under development. 3) Understand the use of in-room MRI guidance for management of intr- and inter-fraction variations in anatomy.

RC622B Integrating MRI, The Clinician Perspective

Participants
Mary U. Feng, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the clinical benefits associated with the integration of MRI into Radiotherapy. 2) Describe the uncertainties and challenges that exist in MR for radiotherapy.

RC623

Molecular Imaging Mini-Course: Advanced Molecular Imaging

Thursday, Dec. 1 8:30AM - 10:00AM Room: S404CD

MI MR NM PH

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

FDA Discussions may include off-label uses.

Participants

Sub-Events

RC623A Novel Tracers

Participants
Timothy R. DeGrado, PhD, Rochester, MN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the major considerations when developing a novel molecular imaging probe. 2) Compare the strengths and weaknesses of the various imaging modalities with regard to probe development and implementation. 3) Define appropriate experiments for probe validation. 4) Gain an understanding of the process of translation of a probe to clinical practice.

ABSTRACT

Molecular imaging is rapidly advancing as new imaging biomarkers are invented to allow noninvasive assessment of biochemical function. Those who embark on the process of developing novel probes come to know the excitement of imaging biological processes for the first time, but are also well aware of the great effort and many pitfalls that can impede progress. This introductory lecture will provide an overview of the process of molecular imaging probe conception, development, preclinical validation, and translation. Specific examples will be used to illustrate the presenter's experience with meeting these challenges.

RC623B Novel Instrumentation (PET/MR)

Participants
Ciprian Catana, MD, PhD, Charlestown, MA, (ccatana@nmr.mgh.harvard.edu) (*Presenter*) Research Consultant, Cubresa Inc

LEARNING OBJECTIVES

1) Distinguish the technical approaches that have been proposed for integrating PET and MRI for the purpose of simultaneous data acquisition. 2) Evaluate the latest methodological developments in PET/MRI for improving PET data quantification. 3) Incorporate simultaneous PET/MRI techniques into research and clinical projects.

ABSTRACT

RC624

Forensic Radiology: Preparing Cases for the Court Room (An Interactive Session)

Thursday, Dec. 1 8:30AM - 10:00AM Room: S502AB

OT

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

Participants
Angela D. Levy, MD, Washington, DC (*Moderator*) Nothing to Disclose
Howard T. Harcke, MD, Dover AFB, DE, (howard.harcke@gmail.com) (*Presenter*) Nothing to Disclose
Barry D. Daly, MD, Baltimore, MD, (bdaly@umm.edu) (*Presenter*) Nothing to Disclose
David Fowler, MD, Baltimore, MD (*Presenter*) Nothing to Disclose
Edward L. Mazuchowski, MD, PhD, Dover AFB, DE (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the strengths and limitations of the imaging techniques used in forensic radiology. 2) Explain how the courtroom use of imaging findings assists expert witnesses such as forensic pathologists or radiologists. 3) Compare the role of the radiologist and forensic pathologist in preparing cases for the courtroom. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

ABSTRACT

Radiography, CT, CT angiography, and MRI are routinely used in forensic radiology. These are widely accepted imaging techniques that are becoming important diagnostic tools for forensic pathologists. Increasingly, CT and MRI images are being used to provide evidence in the courtroom and the radiologist and pathologist must appreciate how imaging findings may be complementary to or more sensitive than autopsy findings. Imaging findings provide additional objective evidence that can be easily displayed. In some cases, forensic imaging may support evidence from accident or crime scene investigations or may be the sole finding to support a theory for the mechanism and cause of injury or death. Such studies may influence jury members and contribute in securing either a criminal conviction or acquittal where appropriate. In this course, radiologists are paired with a forensic pathologist to discuss cases that they typically encounter in practice. The cases will be presented to the audience in a systematic manner with imaging and autopsy findings to teach the audience how imaging is used in the court to supplement the testimony of the medical examiner or expert radiologist. Examples include the meaning of hyoid fracture in strangulation; assessment of perforating gunshot wounds; the significance of intravascular air; and, the appearance of stillbirth versus live birth in infant death.

RC625

Radiologic Expertise-Incorporating Perception into Training

Thursday, Dec. 1 8:30AM - 10:00AM Room: S103CD

ED PH RS

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

Participants

Sub-Events

RC625A On the Development of Expertise in Image Interpretation

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

LEARNING OBJECTIVES

1) Summarize evidence for changes in visual search as a function of expertise. 2) Describe other specialties where similar trends have been documented. 3) Provide an overview of attempts to predict who will make a good radiologist.

ABSTRACT

The nature of expertise is of great interest in many fields including radiology. What does it take to become an expert in one's field? Can e predict who will make a good radiologist? These are just a couple of the questions that guide research on the development of expertise in radiology image interpretation. There have been a number of studies conducted over the years to explore this issue, including those that study the visual search patterns of radiologists. These studies have noted how search patterns change with expertise, becoming more streamlined and more efficient. Through improved understanding of what characterizes the expert, we can develop better and more efficient training methods, thereby reducing error and variation in radiologic interpretation.

Active Handout:Elizabeth Anne Krupinski

http://abstract.rsna.org/uploads/2016/16001182/ACTIVE RC625A.pdf

RC625B Using Expert Interpretation Strategies to Teach Trainees

Participants
William Auffermann, MD, PhD, Atlanta, GA, (wauffer@emory.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Summarize current training paradigms in medical imaging. 2) List the common sources of error in medical image perception. 3) Differentiate focused perceptual training methods from conventional training for image interpretation. 4) Examine areas where focused training may be useful for decreasing perceptual errors.

ABSTRACT

Radiologists learn how to interpret images during a multi year residency, where they work with senior faculty radiologists on a one-to-one basis. The fundamental principles by which we teach medical trainees skills for image interpretation have not changed appreciably over the past several decades. The goal of this presentation is to demonstrate new tools for radiology education based on our knowledge of human image perception, and examine how these tools may change the way we teach skills related to image interpretation.

RC625C Formal Assessment of Practicing Radiologists

Participants
Alastair G. Gale, PhD, Loughborough, United Kingdom, (a.g.gale@lboro.ac.uk) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the importance of self & group interpretation assessment. 2) Provide an overview of the PERFORMS project goals & methods. 3) Summarize PERFORMS progress & results to date.

RC627

Radiology in a New Payment Model Environment

Thursday, Dec. 1 8:30AM - 10:00AM Room: S404AB

HP

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

Participants
Clifford J. Belden, MD, Philadelphia, PA, (Clifford.belden@tuhs.temple.edu) (*Moderator*) Nothing to Disclose
Clifford J. Belden, MD, Philadelphia, PA, (Clifford.belden@tuhs.temple.edu) (*Coordinator*) Nothing to Disclose
David A. Rosman, MD, Boston, MA (*Presenter*) Nothing to Disclose
Suresh K. Mukherji, MD, Northville, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify 7 things radiology can and should own in value based health economy.

ABSTRACT

There numerous "megatrends" that are currently affecting radiology. These trends include declining reimbursements, expanded service expectations, higher productivity and demands for higher quality. The challenge is to determine how we can continue to grow our subspecialty while maintaining our educational and research mission.This presentation will discuss the "current state" of Radiology but will also focus on future reimbursement trends that will define our subspecialty for the next 10 years. The talk will discuss reimbursement trends, population health, and most recent information on the job market.We will discuss the concept of "technological determinism" and the impact on neuroradiology. Finally, we will discuss a growing level of cognitive dissonance and the need to develop more consistent and realistic expectations to help instill more stability in our field.

RC629

Hepatocellular Carcinoma in the Cirrhotic Liver and LI-RADS (An Interactive Session)

Thursday, Dec. 1 8:30AM - 10:00AM Room: S402AB

GI MR OI

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

Participants

Sub-Events

RC629A LI-RADS Overview: Current Status and Future Directions

Participants
Cynthia S. Santillan, MD, San Diego, CA, (csantillan@mail.ucsd.edu) (*Presenter*) Consultant, Robarts Clinical Trials, Inc

LEARNING OBJECTIVES

1) To teach participants how to apply the Liver Imaging Reporting and Data System (LI-RADS) to their interpretation of imaging studies for the evaluation of hepatocellular carcinoma in at-risk patients. 2) To inform radiologists about the various online resources available via the ACR LI-RADS website, including an atlas, lexicon, reporting templates, and flashcards. 3) To update radiologists about future content in LI-RADS, including ultrasound and treatment response assessment guidelines.

ABSTRACT

RC629B LI-RADS Imaging Features: What´s the Evidence?

Participants
An Tang, MD, Montreal, QC, (an.tang@umontreal.ca) (*Presenter*) Advisory Board, Imagia Cybernetics Inc

LEARNING OBJECTIVES

1) To review the major and ancillary CT and MRI features used in LI-RADS categorization for assessment of hepatocellular carcinoma (HCC). 2) To highlight the scientific literature supporting the major imaging features and criteria. 3) To summarize the evidence supporting ancillary features.

ABSTRACT

The Liver Imaging Reporting and Data System (LI-RADS) relies on major and ancillary CT and MRI features to categorize observations for assessment of hepatocellular carcinoma (HCC). The major features include arterial phase enhancement, diameter, "washout" appearance, "capsule" appearance and threshold growth. In this course, we will discuss the scientific literature supporting the major imaging features. This will include estimates of diagnostic performance, and intra- and inter-reader agreement. LI-RADS also includes ancillary imaging features that modify the likelihood of HCC. We will provide a brief overview of the evidence supporting these ancillary features. We will summarize the current literature on probability of HCC for each LI-RADS observation category.

RC629C LI-RADS and Hepatobiliary Agents

Participants
Kathryn J. Fowler, MD, Chesterfield, MO (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To provide an overview of LI-RADS content that refers to hepatobiliary contrast agents. 2) To review the ancillary features that are described with hepatobiliary contrast agents. 3) To present case examples to illustrate the role of hepatobiliary contrast agents in the diagnosis of hepatocellular carcinoma.

ABSTRACT

Hepatobiliary contrast agents are routinely used in practice for diagnosing and staging HCC. Despite the potential diagnostic benefits, the role of hepatobiliary phase imaging has not been well defined in diagnostic algorithms. LI-RADS provides information on the use of these agents, their role in diagnosis, and potential pitfalls. The aim of this presentation is to provide an overview of hepatobiliary content included in the current version of LI-RADS.

RC629D Interactive Cases

Participants
Thomas A. Hope, MD, San Francisco, CA, (thomas.hope@ucsf.edu) (*Presenter*) Research Grant, Consultant, GE Healtcare

LEARNING OBJECTIVES

1) To understand how to apply LI-RADS major criteria for the diagnosis of HCC. 2) To review the role of LI-RADS M and LI-RADS 5V in the LI-RADS algorithm 3) To reinforce the use of LI-RADS through a series of multiple case examples.

ABSTRACT

RC632

Payment Reform and Getting Paid: A Focus on Value Activities and Metrics

Thursday, Dec. 1 8:30AM - 10:00AM Room: E350

HP LM

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

Participants
Geraldine B. McGinty, MD, MBA, New York, NY, (gbm9002@med.cornell.edu) (*Presenter*) Nothing to Disclose
Richard Duszak JR, MD, Atlanta, GA, (richard.duszak@emory.edu) (*Presenter*) Nothing to Disclose
Giles W. Boland, MD, Boston, MA (*Presenter*) Principal, Radiology Consulting Group; Royalties, Reed Elsevier

LEARNING OBJECTIVES

1) To understand value-focused healthcare imperatives in the evolution of healthcare delivery systems and how they impact medical imaging. 2) To implement practice changes aligned with Imaging 3.0 so as to maximize the relevance of radiology and radiologists in ongoing health system changes. 3) To improve the delivery of imaging care by focusing on value chain opportunities. (This course is part of the Leadership Track)

ABSTRACT

Although radiology's dramatic evolution over the last century has profoundly affected patient care for the better, our current system is fragmented with many providers focusing more on technology and physician needs rather than what really matters to patients: better value and outcomes. This latter dynamic is aligned with current national health care reform initiatives and creates both challenges and opportunities for radiologists to find ways to deliver new value for patients. The American College of Radiology has responded to this challenge with the introduction of Imaging 3.0, which represents a call to action to all radiologists to assume leadership roles in shaping America's future health care system through 5 key pillars: imaging appropriateness, quality, safety, efficiency, and satisfaction. That enhanced value will require modulation of imaging work processes best understood through the concept of the imaging value chain, which will be the focus of this course.

RC650

Vertebral Augmentation (Hands-on)

Thursday, Dec. 1 8:30AM - 10:00AM Room: E260

MK IR

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

Participants
A. Orlando Ortiz, MD, MBA, Mineola, NY (*Presenter*) Nothing to Disclose
Bassem A. Georgy, MD, MSc, San Diego, CA (*Presenter*) Consultant, Johnson & Johnson; Consultant, DFINE, Inc; Stockholder, DFINE, Inc ; Stockholder, Spine Solutions, Inc; ;
Allan L. Brook, MD, Bronx, NY (*Presenter*) Nothing to Disclose
Todd S. Miller, MD, Bronx, NY, (tmiller@montfiore.org) (*Presenter*) Nothing to Disclose
Afshin Gangi, MD, PhD, Strasbourg, France (*Presenter*) Proctor, Galil Medical Ltd

LEARNING OBJECTIVES

1) Discuss appropriate algorithms for patient selection. 2) Review anatomic and technical considerations for vertebral augmentation. 3) Present an update of the recent advances in vertebral augmentation including sacroplasty. 4) Emphasize safety issues and how to avoid complications. 5) Understand the applications of vertebral augmentation in osteoporotic and neoplastic spine pathology. 6) Update participants with respect to advances in equipment and biomaterials.

ABSTRACT

1. Patient selection for vertebral augmentation Indications and Contraindications 2. New devices and techniques in vertebral augmentation 3. Vertebral augmentation for osteoporotic and pathologic vertebral compression fractures 4. Sacroplasty (sacral augmentation) 5. Complications avoidance 6. Efficacy Vertebral augmentation is an image-guided (fluoroscopy or CT) percutaneous procedure in which a bone needle is inserted into a painful osteoporotic or pathologic fracture within the spinal axis. Biopsy, cavity creation or lesion ablation may then be performed under imaging guidance depending on the nature of the pathology that is being treated. Subsequently a radioopaque implant, usually an acrylic bone cement, is carefully injected into the vertebra or sacral ala under imagining guidance, These procedures have been shown to provide pain relief by stabilizing the fractured vertebra or sacrum. As with any other invasive procedure, they carry a small risk (<<1%) of complication including bleeding, infection, neurovacular injury, or cement embolus. Appropriate patient seleciton and a detailed understanding of the technical aspects of the procedure along with active clinical patient follow-up are paramount to a successful outcome. This workshop will utilize short lectures, case examples and interactive audience participation in order to further explore critical topics in vertebral augmentation.

RC652

Techniques for Interventional Sonography and Thermal Ablation (Hands-on)

Thursday, Dec. 1 8:30AM - 10:00AM Room: E264

US IR

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

FDA Discussions may include off-label uses.

Participants

Patrick Warren, MD, Columbus, OH (*Presenter*) Nothing to Disclose
Stephen C. O'Connor, MD, Boston, MA (*Presenter*) Nothing to Disclose
Veronica J. Rooks, MD, Honolulu, HI (*Presenter*) Nothing to Disclose
Corrie M. Yablon, MD, Ann Arbor, MI, (cyablon@med.umich.edu) (*Presenter*) Nothing to Disclose
Kristin M. Dittmar, MD, Columbus, OH (*Presenter*) Nothing to Disclose
Kal Dulaimy, MD, Springfield, MA (*Presenter*) Nothing to Disclose
Mahesh M. Thapa, MD, Seattle, WA (*Presenter*) Nothing to Disclose
John M. Racadio, MD, Cincinnati, OH (*Presenter*) Nothing to Disclose
Andrew J. Rabe, DO, Columbus, OH (*Presenter*) Nothing to Disclose
Hisham A. Tchelepi, MD, Los Angeles, CA (*Presenter*) Research Grant, General Electric Company; Research Grant, Roper Industries, Inc
Christian L. Carlson, MD, MS, Jbsa Ft Sam Houston, TX (*Presenter*) Nothing to Disclose
Adam S. Young, MD, MBA, Boston, MA (*Presenter*) Nothing to Disclose
Linda J. Warren, MD, Vancouver, BC, (lwarren@vancouverbreastcentre.com) (*Presenter*) Shareholder, Hologic, Inc
Andrada R. Popescu, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Christopher A. Molvar, MD, Chicago, IL, (cmolvar@lumc.edu) (*Presenter*) Nothing to Disclose
Allison S. Aguado, MD, Cincinnati, OH (*Presenter*) Nothing to Disclose
Jeremiah J. Sabado, MD, Columbus, OH (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify basic skills, techniques, and pitfalls of freehand invasive sonography. 2) Discuss and perform basic skills involved in thermal tumor ablation in a live learning model. 3) Perform specific US-guided procedures to include core biopsy, abscess drainage, vascular access, cyst aspiration, soft tissue foreign body removal, and radiofrequency tumor ablation. 4) Incorporate these component skill sets into further life-long learning for expansion of competency and preparation for more advanced interventional sonographic learning opportunities.

ABSTRACT

Ultrasound Guided Foreign Body Removal: Simulation Training and Clinical implementation Outcomes ; Purpose: USFBR can be taught to radiologists to generate competency, and radiologists can apply the technique in the patient setting to remove foreign bodies. ; Materials and Methods: Proof of concept was performed by a radiologist and surgeon removing nine 1-cm foreign bodies using the USFBR method (P) and traditional surgery (S) with and without wire guidance (W) on the cadaver model. ; Next, USFBR was taught to 48 radiologists at 4 hospitals. Training included didactic and hands-on instruction covering 7 components: instrument alignment, hand/transducer position, forceps use, foreign body definition, forceps grasp, recognition of volume averaging, and oblique cross cut artifact. Pre-training testing assessed single toothpick removal from turkey breast in 15 minutes.; Post-training evaluation consisted of 5 toothpick removals. ; Ongoing clinical implementation data of USFBR by trained radiologists are being collected. Parameters including age of patient, which radiologist, removal success, type and size of foreign body, incision size, foreign body retention time, reason for removal, symptoms, modalities used in detection, wound closure, and sedation are recorded. Data analyzed using chi-squared and Fisher#39;s exact tests for categorical outcomes and analysis of variance for continuous outcomes. ; Results: USFBR technique shows a higher success rate and smaller incision size in comparison to surgical technique alone in the cadaver. Removal success: P 100%, S 78%, and W 89%. ; With USFBR training, radiologists; scores improved from 21-52% pre-training to 90-100% post-training (p;0.001 for each component). In the clinical setting to date, USFBR has been 100% successful in 7 (of 25 expected) patients, ages 9-73 years, by four radiologists. Parameters included; length 4 to 30 mm, retention 2 to 864 days, incision, 2 to 8 mm. 1 suture closure. 1 sedation. ;

RC653

Practical Informatics for the Practicing Radiologist: Part Two (In conjunction with the Society for Imaging Informatics in Medicine)

Thursday, Dec. 1 8:30AM - 10:00AM Room: S403B

IN

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

Participants
Adam E. Flanders, MD, Narberth, PA, (adam.flanders@jefferson.edu) (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

ABSTRACT

Sub-Events

RC653A Saving Body and Mind in the Reading Room

Participants
Eliot L. Siegel, MD, Baltimore, MD (*Presenter*) Board of Directors, Brightfield Technologies; Board of Directors, McCoy; Board of Directors, Carestream Health, Inc; Founder, MedPerception, LLC; Founder, Topoderm; Founder, YYESIT, LLC; Medical Advisory Board, Bayer AG; Medical Advisory Board, Bracco Group; Medical Advisory Board, Carestream Health, Inc; Medical Advisory Board, Fovia, Inc; Medical Advisory Board, McKesson Corporation; Medical Advisory Board, Merge Healthcare Incorporated; Medical Advisory Board, Microsoft Corporation; Medical Advisory Board, Koninklijke Philips NV; Medical Advisory Board, Toshiba Corporation; Research Grant, Anatomical Travelogue, Inc; Research Grant, Anthro Corp; Research Grant, Barco nv; Research Grant, Dell Inc; Research Grant, Evolved Technologies Corporation; Research Grant, General Electric Company; Research Grant, Herman Miller, Inc; Research Grant, Intel Corporation; Research Grant, MModal IP LLC; Research Grant, McKesson Corporation; Research Grant, RedRick Technologies Inc; Research Grant, Steelcase, Inc; Research Grant, Virtual Radiology; Research Grant, XYBIX Systems, Inc; Research, TeraRecon, Inc ; Researcher, Bracco Group; Researcher, Microsoft Corporation; Speakers Bureau, Bayer AG; Speakers Bureau, Siemens AG;

LEARNING OBJECTIVES

1) Describe three issues with human factors related to the modern reading room. 2) Indicate potential solutions for lighting, ambient noise, and ergonomic challenges.

RC653B Changing Information Systems: A Survival Guide

Participants
Steven C. Horii, MD, Philadelphia, PA (*Presenter*) Spouse, Employee, Cerner Corporation

LEARNING OBJECTIVES

1) Describe common issues facing departments changing vendors. 2) Explain the techniques that can be used at time of contracting to ensure future access to data. 3) List techniques used for image migration.

RC653C So Many Images, So Little Time: Advanced Imaging Techniques

Participants
Adam E. Flanders, MD, Narberth, PA, (adam.flanders@jefferson.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To appreciate the diversity of advanced visualization techniques.2) To understand how advanced visualization extends the value of medical imaging.3) To learn how advanced visualization has changed traditional workflow strategies.4) To appreciate some of the pitfalls of automation and the need for expert supervised assessment of advanced visualization output.

ABSTRACT

RC654

Using IHE Profiles to Plan for Medical Imaging

Thursday, Dec. 1 8:30AM - 10:00AM Room: S504AB

IN

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

Participants
David S. Mendelson, MD, Larchmont, NY, (david.mendelson@mountsinai.org) (*Moderator*) Spouse, Employee, Novartis AG; Advisory Board, Nuance Communications, Inc; Advisory Board, General Electric Company; Advisory Board, Toshiba Medical Systems Corporation; Advisory Board, Bayer AG
Kinson Ho, Richmond, BC, (kinson.ho@mckesson.com) (*Presenter*) Employee, McKesson Corporation
David A. Clunie, MBBS, Bangor, PA (*Presenter*) Owner, PixelMed Publishing LLC; Consultant, Carestream Health, Inc; Consultant, CureMetrix, Inc; Consultant, MDDX Research & Informatics; Consultant, General Electric Company; ;
Christopher Lindop, Waukesha, WI, (lindop.chris@gmail.com) (*Presenter*) Employee, General Electric Company
Donald Dennison, Waterloo, ON (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Value of IHE with content and vendor neutral integration. 2) How content neutral clinical information is managed with a Vendor Neutral Archive (VNA). 3) Planning for a Vendor Neutral Archive (VNA) or expand upon an existing VNA system to support both imaging and non-imaging content and systems. 4) The benefit of using IHE Imaging profiles for cross-enterprise and cross-community image sharing".

ABSTRACT

Integrating the Healthcare Enterprise (IHE) is a joint initiative of healthcare professionals and industry vendors to improve the way clinical systems in healthcare share information. IHE promotes the coordinated use of established standards such as webservices, DICOM and HL7 to address specific clinical need in support of optimal patient care. Established in 1997, the IHE Radiology Committee, a development domain of IHE, has profiled the clinical use cases to develop a framework of interoperability, known as the IHE Integration Profiles. Integration Profiles are developed specifically to be "Vendor Neutral". The first Integration Profile developed by IHE is known as Scheduled Workflow. It specifies how imaging departmental workflow can operate seamlessly between vendors. The Integration Profiles are maintained and published by IHE in the IHE Technical Framework. With the introduction of Cross-Enterprise Document Sharing (XDS) in 2005, IHE has extended the definition of "Neutral" to include non-imaging content storage in healthcare. This course will specifically deliver and review the IHE Integration Profiles developed by IHE Radiology and the other IHE domain committees profile which can be used by healthcare professionals and the industry for the interoperability specification, procurement and installation of a "Content" Vendor Neutral Archive (VNA).

RCB51

Hands-on Introduction to Social Media (Hands-on)

Thursday, Dec. 1 8:30AM - 10:00AM Room: S401CD

IN

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

Participants
Amy L. Kotsenas, MD, Rochester, MN (*Presenter*) Nothing to Disclose
Neil U Lall, MD, Cincinnati, OH, (NULall@gmail.com) (*Presenter*) Nothing to Disclose
Tirath Y. Patel, MD, Houston, TX (*Presenter*) Nothing to Disclose
Tessa S. Cook, MD, PhD, Philadelphia, PA, (tessa.cook@uphs.upenn.edu) (*Presenter*) Nothing to Disclose
Saad Ranginwala, MD, Cincinnati, OH, (sranginwala@gmail.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Appreciate the professional relevance of social media for radiologists. 2) Understand the differences between social media in personal and professional roles. 3) Understand the differences between and advantages/disadvantages of multiple social media networks. 4) Set up and use a Twitter account. 5) Understand the purpose of hashtags, lists, and DMs. 6) Get acquainted with other radiologists and radiology organizations on Twitter. 7) Use a variety of social media venues to share images for educational purposes. 8) Understand the difference between and utility of professionally oriented social networking sites such as Doximity and LinkedIn. 9) Understand how to safely /securely communicate via social media while maintaining HIPAA requirements.

ABSTRACT

URL

http://bit.ly/RSNASocialMediaIntro

Active Handout:Amy Louise Kotsenas

http://abstract.rsna.org/uploads/2016/11035017/ACTIVE RCB51 RSNA16 Hands On Social Media - Twitter Kotsenas (1).pdf

RCC51

Imaging Integration with Cancer Genomics/Proteomics: Methodologies Leveraging the Cancer Imaging Archive

Thursday, Dec. 1 8:30AM - 10:00AM Room: S501ABC

BQ IN

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

Participants

John B. Freymann, BS, Rockville, MD, (freymannj@mail.nih.gov) (*Presenter*) Nothing to Disclose
Justin Kirby, Bethesda, MD (*Presenter*) Stockholder, Myriad Genetics, Inc
C. Carl Jaffe, MD, Boston, MA (*Presenter*) Nothing to Disclose
Brenda Fevrier-Sullivan, BA, Bethesda, MD (*Presenter*) Nothing to Disclose
Evis Sala, MD, PhD, New York, NY, (salae@mskcc.org) (*Presenter*) Nothing to Disclose
Sandy Napel, PhD, Stanford, CA (*Presenter*) Medical Advisory Board, Fovia, Inc; Consultant, Carestream Health, Inc; Scientific Advisor, EchoPixel, Inc; Scientific Advisor, RADLogics, Inc
Erich Huang, PhD, Bethesda, MD (*Presenter*) Nothing to Disclose
Juan J. Ibarra-Rovira, MD, Houston, TX (*Presenter*) Nothing to Disclose
Maryellen L. Giger, PhD, Chicago, IL (*Presenter*) 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;

LEARNING OBJECTIVES

1) Learn the processes needed to develop reproducible image-genetic features from local or publicly available archives through presentations made by tumor specific clinical image-genetic clinician teams. 2) Learn from successful teams how clinical radiologists can use public archives to jump start integrative investigative efforts. 3) Learn from other radiology teams how to avoid missteps during development of image-genetic and radiomic research.

ABSTRACT

Diagnostic images analyzed by expert radiologists can offer reproducible data that connect them to tumor tissue genetics, proteomics and pathology images. But the methodology developed by clinician-based teams, and its potential pitfalls, are best demonstrated by presentations made by successful clinical image research teams. This didactic session will teach attendees a formal approach to the basic skills needed to navigate and utilize public image-genetic paired archives - for example NCI's The Cancer Imaging Archive of diagnostic radiology that also links genetic and pathology images on same patients. After a formal methodology overview, panelists will present lessons learned and best practices developed by volunteer clinician researcher teams who've already contributed much to the genetic-clinical imaging literature on breast, brain tumor, lung, renal, head-neck and bladder, illustrated with examples of completed analysis, findings and planned activities.

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/

Evis Sala, MD, PhD - 2013 Honored Educator

MSRT52

ASRT@RSNA 2016: Gadolinium: Helpful or Harmful?

Thursday, Dec. 1 9:15AM - 10:15AM Room: N230B

MR

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

Participants
Bartram J. Pierce, BS, RT, Albany, OR, (pierce.bart@gmail.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the history of gadolinium as a contrast agent and its differing molecular structures. 2) Be familiar with the usefulness of gadolinium in a clinical environment. 3) Recognize that gadolinium chelates may have harmful effects even when used appropriately. 4) Be able to discuss the clinical decision making process of contrast utlilzation.

ABSTRACT

Gadolinium has proven its clinical effectiveness as an MRI contrast agent for over 25+ years. Thought to be harmless it was used indiscriminately for many years until the discovery of NSF in 2006. This new disease seemed to affect only those patients with poor kidney function and resulted in appropriate screening of individuals receiving gadolinium. This change in practice helped dramatically decrease cases of NSF. Gadolinium was still felt to be harmless in patients with normal renal function. Recently gadolinium has been found in the brain and tissues of patients with normal renal function challenging that notion. This course will look at this history of gadolinium and review the current research surrounding the concept of retained gadolinium in the hopes of continuing the discussion of just how helpful or harmful gadolinium might be.

MSCN52

Case based Review of Neuroradiology (An Interactive Session)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S100AB

HN NR PD

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

Participants
Pina C. Sanelli, MD, Manhasset, NY (*Director*) Nothing to Disclose

LEARNING OBJECTIVES

1) Provide a brief review of CNS pathology highlighting the key diagnostic features. 2) Review pertinent differential diagnoses of neuroimaging cases. 3) Provide important imaging pearls for differentiating CNS pathology.

ABSTRACT

Learning Objectives:
1.Provide a brief review of CNS pathology highlighting the key diagnostic features.

2.Review pertinent differential diagnoses of neuroimaging cases.

3.Provide important imaging pearls for differentiating CNS pathology.

Sub-Events

MSCN52A Pediatric Brain

Participants
Pia C. Maly Sundgren, MD, PhD, Ann Arbor, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the key imaging features of various common pediatric brain diseases. 2) Identify the basic anatomic, physiologic and pathologic features of diseases affecting the pediatric brain. 3) Highlight primary imaging techniques used for the assessment, clinical practice, problem-solving and patient management.

ABSTRACT

Learning objectives:1. Identify the key imaging features of various common pediatric brain diseases2. identify the basic anatomic, physiologic and pathologic features of diseases affecting the pediatric brain3. Highlight primary imaging techniques used for assessment, clinical practice, problem-solving and patient management.

Active Handout:Pia C. Maly Sundgren

http://abstract.rsna.org/uploads/2016/16001032/ACTIVE MSCN52A.pdf

MSCN52B Pediatric Spine

Participants
Tina Y. Poussaint, MD, Boston, MA, (tinayoung.poussaint@childrens.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the key imaging features of various common pediatric spine diseases. 2) Identify the basic anatomic, physiologic and pathologic features of diseases affecting the pediatric spine. 3) Highlight primary imaging techniques used for assessment, clinical practice, problem-solving and patient management.

ABSTRACT

1) Identify the key imaging features of various common pediatric spine diseases. 2) Identify the basic anatomic, physiologic and pathologic features of diseases affecting the pediatric spine. 3) Highlight primary imaging techniques used for assessment, clinical practice, problem-solving and patient management.

MSCN52C Pediatric Head & Neck

Participants
Korgun Koral, MD,MBA, Dallas, TX, (korgun.koral@utsouthwestern.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Classify common vascular lesions of pediatric neck. 2) Detect normal variations of pediatric skull base. 3) Recommend appropriate imaging tests for common pediatric neck masses. 4) List clinically relevant observations on emergent pediatric neck CT.

ABSTRACT

n/a

MSCS52

Case-based Review of Musculoskeletal Radiology (An Interactive Session)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S406A

MK

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

FDA Discussions may include off-label uses.

Participants
Stacy E. Smith, MD, Weston, MA (*Director*) Nothing to Disclose

Sub-Events

MSCS52A Arthritis

Participants
Carl S. Winalski, MD, Cleveland, OH, (winalsc@ccf.org) (*Presenter*) Institutional service agreement, ACI Clinical; Institutional service agreement, Medical Metrics, Inc; Institutional service agreement, BioClinica, Inc; Institutional service Agreement, CartiHeal Ltd; Institutional Research Grant, The Procter & Gamble Company; Shareholder, Pfizer Inc; Spouse, Shareholder, General Electric Company

LEARNING OBJECTIVES

1) Recognize the patterns of arthritides and differentiate them from other entities. 2) Learn the features that help differentiate types of arthritides. 3) Select imaging modalities appropriate for specific clinical questions.

ABSTRACT

Inflammatory arthritides can have varied clinical presentations that simulate other diseases. Through the recognition of these image patterns, the radiologist can play an important role in diagnosis and management of these patients. Through case presentations, we will review the appearances of various arthritides and demonstrate the importance of imaging for these diseases.

Active Handout:Carl Scherman Winalski

http://abstract.rsna.org/uploads/2016/16000998/ArthritisCases_handout_Winalski (1).pdf

MSCS52B Pediatric MSK: What is Normal?

Participants
Kirsten Ecklund, MD, Boston, MA, (kirsten.ecklund@childrens.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn to recognize normal developmental patterns, age-dependent physiologic findings, and congenital lesions within the pediatric musculoskeleton. some of which persist into adulthood. Key features which differentiate these entities from pathology will be reviewed.

ABSTRACT

Important imaging appearances of normal, physiologic development within the pediatric musculoskeleton will be reviewed with an emphasis on epiphyseal and physeal cartilage, bone marrow, and vascular variation.

MSCS52C Knee

Participants
Donald L. Resnick, MD, San Diego, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review several disorders of the knee utilizing conventional radiography, CT scanning, and MR imaging. 2) Delineate important points that allow accurate diagnosis of these disorders.

ABSTRACT

The knee is commonly involved in many different disease processes, some localized to this joint (such as a variety of internal derangements and posttraumatic alterations) and others affecting other parts of the skeleton as well. In this presentation, several important derangements or disorders affecting the knee will be presented using conventional radiography, CT scanning, and MR imaging.

MSCS52D Tumor

Participants
Mark D. Murphey, MD, Silver Spring, MD, (mmurphey@acr.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To recognize imaging appearances of common soft tissue neoplasms. 2) To identify imaging features that suggest an aggressive

bone neoplasm. 3) To apply the imaging appearance of a musculoskeletal neoplasm to help guide biopsy and improve diagnostic performance.

ABSTRACT

Important imaging features in evaluation of both bone and soft tissue tumors will be reviewed with key features that may allow diagnostic differentiation emphasized.

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/

Mark D. Murphey, MD - 2015 Honored Educator

MSES52

Essentials of Non-interpretative Skills

Thursday, Dec. 1 10:30AM - 12:00PM Room: S406B

IN

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

Participants

Sub-Events

MSES52A Informatics: What is it and Why You Should Care

Participants
Marc D. Kohli, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define the study of informatics. 2) Describe how informatics relates to radiology practice and management. 3) Identify opportunities to apply informatics to your radiology practice.

ABSTRACT

When radiologists hear the word informatics, PACS and voice recognition both quickly come to mind. These two tools have transformed the practice of radiology, and are now largely commotized, so what is left for Informatics? This session will discuss the future of informatics in radiology including: analytics, radiology reporting, radiologist decision support, and machine learning.

MSES52B Business Intelligence and Analytics

Participants
Paul J. Chang, MD, Chicago, IL, (pchang@radiology.bsd.uchicago.edu) (*Presenter*) Co-founder, Stentor/Koninklijke Philips NV; Researcher, Koninklijke Philips NV; Medical Advisory Board, lifeIMAGE Inc; Advisory Board, Bayer AG

LEARNING OBJECTIVES

1) The technical steps required to develop and implement dashboards and scorecards (including data/state aggregation, semantic normalization, modeling, data mining, and presentation) will be discussed. 2) Specific strategies and technologies that can be used to create dashboards and scorecards (including HL7, DICOM, ETL, web services, and SOA) will be illustrated. 3) Strategies to create a sustainable and agile architecture to support advanced business intelligence and analytics (BIA) tools will be explored. (This course is part of the Leadership Track)

ABSTRACT

Current and near future requirements and constraints will require radiology practices to continuously improve and demonstrate the value they add to the enterprise. Merely "managing the practice" will not be sufficient; groups will be required to compete in an environment where the goal will be measurable improvements in efficiency, productivity, quality, and safety. Although the phrase "one cannot improve a process unless one can measure it" is a familiar platitude, it is an increasingly important and relevant concept. The proper leveraging of formal Business Intelligence and Analytics (BIA) is a critical, absolutely essential strategy for any radiology group. Although currently underutilized, concepts such as Key Performance Indicators (KPIs), tactical dashboards, and strategic scorecards, should be familiar tools for radiology groups attempting to "navigate disruption."

MSES52C Optimal Radiology Workflow

Participants
Benjamin W. Strong, MD, Eden Prairie, MN (*Presenter*) Nothing to Disclose

MSES52D Social Media for Health Care Leaders

Participants
C. Matthew Hawkins, MD, Decatur, GA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn basic fundamentals of the most common social media platforms. 2) Gain an understanding of how social media is changing consumer behavior. 3) Introduce the concept of social media authority and online brand.

ABSTRACT

The purpose of this course is to introduce radiologists to how social media has changed the way people communicate and make consumer choices. Thus, social media has fundamentally altered the way patients, patient-advocacy groups, and other physicians search for health-related information.This course will provide an overview as to how social media 1) influences the way people communicate, 2) shapes the brand of our profession, and 3) can potentially impact consumer/patient behavior. Furthermore, the fundamentals for building an online presence and social media authority will be presented, as well as tips for programmatically engaging others and sharing/creating content.

MSRT53

ASRT@RSNA 2016: Neglected Tropical Diseases in the Americas: The Role of Radiology

Thursday, Dec. 1 10:30AM - 11:30AM Room: N230B

OT

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

Participants
Nicole B. Dhanraj, PhD, RT, Mangilao, GU (*Presenter*)

LEARNING OBJECTIVES

1) Define the term neglected tropical diseases and provide insight into their societal impact. 2) Discuss neglected tropical diseases affecting the Americas and medical imaging's role in screening, diagnosis and follow-up evaluation. 3) Describe the radiology community's need to participate actively in containment and eradication of neglected tropical diseases within the resource-limited communities of the Americas.

ABSTRACT

Neglected tropical diseases are a diverse group of illnesses with distinct characteristics that thrive mainly among the poorest populations. The World Health Organization (WHO) prioritized 17 neglected tropical diseases that are endemic in 149 countries and affect more than 1.4 billion people, costing developing economies billions of dollars every year. Neglected tropical disease rates also are increasing in the U.S. Gulf States; however, many of these diseases are not new to the region. In May 2013, the 66th World Health Assembly adopted resolution WHA66.12, which calls for intensified, integrated measures and planned investments to improve the health and social well-being of affected populations. For many neglected tropical diseases, diagnostic tests are cumbersome or not widely available. Understanding the role that radiology plays in early diagnosis and disease monitoring, as well as radiologic manifestations of neglected tropical diseases, is critical for treating these conditions at the source and preventing further spread.

RCA52

3D Printing (Mimics) (Hands-on)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S401AB

IN

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

Participants

Adnan M. Sheikh, MD, Ottawa, ON, (asheikh@toh.on.ca) (*Moderator*) Nothing to Disclose
Adnan M. Sheikh, MD, Ottawa, ON, (asheikh@toh.on.ca) (*Presenter*) Nothing to Disclose
Frank J. Rybicki III, MD, PhD, Ottawa, ON, (frybicki@toh.ca) (*Presenter*) Nothing to Disclose
Dimitris Mitsouras, PhD, Boston, MA, (dmitsouras@alum.mit.edu) (*Presenter*) Research Grant, Toshiba Corporation;
Leonid Chepelev, MD, PhD, Ottawa, ON (*Presenter*) Nothing to Disclose
Taryn Hodgdon, MD, Ottawa, ON (*Presenter*) Nothing to Disclose
Carlos H. Torres, MD,FRCPC, Ottawa, ON (*Presenter*) Nothing to Disclose
Ai-Li Wang, Ottawa, ON (*Presenter*) Nothing to Disclose
Ekin P. Akyuz, BSc, Ottawa, ON (*Presenter*) Nothing to Disclose
Nicole Wake, MS, New York, NY (*Presenter*) Nothing to Disclose
Peter C. Liacouras, PhD, Bethesda, MD (*Presenter*) Nothing to Disclose
Gerald T. Grant, MD, MS, Louisville, KY (*Presenter*) Nothing to Disclose
Satheesh Krishna, MD, Ottawa, ON, (dr.satheeshkrishna@gmail.com) (*Presenter*) Nothing to Disclose
John P. Lichtenberger III, MD, Bethesda, MD, (john.lichtenberger@usuhs.edu) (*Presenter*) Author, Reed Elsevier
Ashish Gupta, MD, Ottawa, ON (*Presenter*) Grant, Medtronic plc
Elizabeth George, MD, Boston, MA (*Presenter*) Nothing to Disclose
Jane S. Matsumoto, MD, Rochester, MN (*Presenter*) Nothing to Disclose
Amy E. Alexander, BEng, Rochester, MN (*Presenter*) Nothing to Disclose
Jonathan M. Morris, MD, Rochester, MN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To become familiar with the computational processing of cross-sectional images required to enable 3D printing using practical examples. 2) To learn to use software to identify and extract anatomical parts from cross-sectional images using manual and semi-automated segmentation tools, including thresholding, region growing, and manual sculpting. 3) To gain exposure to techniques involving model manipulation, refinement, and addition of new elements to facilitate creation of customized models. 4) To learn the application of tools and techniques, including "wrapping" and "smoothing" to enable the accurate printing of the desired anatomy, pathology, and model customizations using Computer Aided Design (CAD) software. 5) To become exposed to Standard Tessellation Language (STL) file format and interfacing with a 3D printer.

ABSTRACT

"3D printing" refers to fabrication of a tangible object from a digital file by a 3D printer. Materials are deposited layer-by-layer and then fused to form the final object. There are several 3D printing technologies that share similarities but differ in speed, cost, and resolution of the product. Digital Imaging and Communications in Medicine (DICOM) image files cannot be used directly for 3D printing; further steps are necessary to make them readable by 3D printers. The purpose of this hands-on course is to convert a set of DICOM files into a 3D printed model through a series of simple steps. Some of the initial post-processing steps may be familiar to the radiologist, as they share common features with 3D visualization tools that are used for image post-processing tasks such as 3D volume rendering. However, some are relatively or completely new to radiologists, including the manipulation of files in Standard Tessellation Language (STL). It is the STL format that is read by the 3D printer and used to reproduce a part of the patient's anatomy. This 90 minute session will begin with a DICOM file and review the commonest tools and techniques required to create a customized printable STL model. An extensive training manual will be provided before the meeting. It is highly recommended that participants review the training manual to optimize the experience at the workstation.

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/

Frank J. Rybicki III, MD, PhD - 2016 Honored Educator

RCC52

Technologies for Creating Educational Content and Teaching Files

Thursday, Dec. 1 10:30AM - 12:00PM Room: S501ABC

ED IN

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

Participants

LEARNING OBJECTIVES

Sub-Events

RCC52A Podcasting and Screencasting for Teaching

Participants
Mahesh M. Thapa, MD, Seattle, WA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the utility of podcasts and screencasts. 2) List major software packages available for creating podcasts and screencasts. 3) Understand the steps required to create a podcast or screencast.

RCC52B e-Publishing

Participants
Michael L. Richardson, MD, Seattle, WA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Know the pros and cons of publishing electronic books. 2) Know the two main formats for publishing electronic books. 3) Be aware of several strategies for converting one's book to electronic form. 4) Know the pros and cons of several software packages used for electronic book conversion.

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/

Michael L. Richardson, MD - 2013 Honored Educator
Michael L. Richardson, MD - 2015 Honored Educator

RCC52C Incorporating the iPad in Resident Education: Using Mobile Technology to Improve the Way We Teach

Participants
Harprit S. Bedi, MD, Boston, MA, (hbedi@tuftsmedicalcenter.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify techniques to incorporate mobile technology into your teaching program. 2) Appraise your current teaching practices in light of the new pedagogical approaches introduced in the lecture.

ABSTRACT

SSQ01

Breast Imaging (MR Diagnostics)

Thursday, Dec. 1 10:30AM - 12:00PM Room: E450A

BR MR

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

Participants
Janice S. Sung, MD, New York, NY (*Moderator*) Nothing to Disclose
Christopher E. Comstock, MD, New York, NY (*Moderator*) Nothing to Disclose
Colleen H. Neal, MD, Ann Arbor, MI (*Moderator*) Nothing to Disclose

Sub-Events

SSQ01-01 A Multicenter Randomized Trial on Breast Cancer (BC) Screening in Women at Intermediate Risk Comparing Contrast-Enhanced MRI Alone Versus Mammography and Ultrasonography (Mam/US): Feasibility and Short-Term Results

Thursday, Dec. 1 10:30AM - 10:40AM Room: E450A

Participants
Rubina Manuela Trimboli, San Donato Milanese, Italy (*Presenter*) Nothing to Disclose
Luigina A. Bonelli, GENOVA, Italy (*Abstract Co-Author*) Nothing to Disclose
Massimo Calabrese, MD, Genova, Italy (*Abstract Co-Author*) Nothing to Disclose
Alberto S. Tagliafico, MD, Genova, Italy (*Abstract Co-Author*) Nothing to Disclose
Francesca Valdora, GENOVA, Italy (*Abstract Co-Author*) Nothing to Disclose
Stefano Corcione, MD, Ferrara, Italy (*Abstract Co-Author*) Nothing to Disclose
Stefania Montemezzi, MD, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose
Lucia Camera, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose
Luca A. Carbonaro, MD, San Donato Milanese, Italy (*Abstract Co-Author*) Nothing to Disclose
Claudio Losio, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Chiara Zuiani, MD, Udine, Italy (*Abstract Co-Author*) Nothing to Disclose
Sara Vigano, MD, San Donato Milanese, Italy (*Abstract Co-Author*) Nothing to Disclose
Antonella Petrillo, MD, Naples, Italy (*Abstract Co-Author*) Nothing to Disclose
Ilaria Poire, GENOVA, Italy (*Abstract Co-Author*) Nothing to Disclose
Paolo Bruzzi, Genova, Italy (*Abstract Co-Author*) Nothing to Disclose
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
Federica Pediconi, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Daniele De Falco Alfano, MD, Ferrara, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the performance of contrast-enhanced MRI imaging versus Mam/US for screening women at intermediate BC risk (study funded by the Italian Ministry of Health, Ricerca Finalizzata 2009-1539582).

METHOD AND MATERIALS

IRB approval at 10 centers and informed written consent by each enrolled woman were obtained. Asymptomatic women aged 40-59 were enrolled for a 15%-29% cumulative lifetime BC risk (Tyrer-Cuzick model, IBIS risk/evaluator), and/or a ≥ 75% density at mammography. Patients were randomly assigned to receive annual Mam/US or contrast-enhanced MRI (gadobenate dimeglumine, 0.1 mmol/kg). Two rounds per woman were planned.

RESULTS

A total of 1,302 women (median age 46, range 40-59) were enrolled from 07/2013 to 11/2015. Of them, 624 (48%) were assigned to Mam/US and 630 (48%) to MRI, while 48 (4%) were eligible but refused randomization. At 1st round, BC was found in 3 of 610 women (0.49%) for Mam/US (2 invasive ductal carcinoma [IDC], 1 invasive lobular carcinoma) and in 6 of 529 (1.13%) for MRI (4 IDC, 1cribriform, 1 mucinous, 1 ductal carcinoma in situ; one bilateral BC); at 2nd round, in 0 of 346 (0.0%) and in 2 of 217 (0.92%) (1 IDC, 1 tubular), respectively. At 1st round, the recall rate was 29/610 (4.8%) for Mam/US and 105/529 (19.8%) for MRI; at 2nd round, 10/346 (2.9%) and 33/217 (15.2%), respectively. Notably, the rate of invasive assessment for MRI was 41/529 (7.8%) at 1st round and 11/217 (5.1%) at 2nd round. The cumulative rate (1st and 2nd round) of invasive assessment was 7.6% for Mam/US and 12.2% for MRI. At 1st round, positive predictive value was 10.3% (2.2%-27.0%) for Mam/US and 14.6% (5%-29%) for MRI; at 2nd round, 18% (2%-51%) for MRI (no detection for Mam/US).

CONCLUSION

Randomized controlled trials exploring the value of screening MRI versus Mam/US are feasible. More invasive BCs were detected with MRI than with Mam/US. PPV of MRI resulted to be competitive with that of Mam/US; cumulative invasive assessment rate slightly increased for MRI but was balanced by a higher BC detection.

CLINICAL RELEVANCE/APPLICATION

If our results will be confirmed by other studies, women at intermediate risk of BC could benefit from screening with MRI as a stand-alone screening tool.

SSQ01-02 Revisiting Non-Mass Enhancement (NME) in Breast MRI: Analysis of Outcomes and Follow-up using the Updated BI-RADS Atlas

Thursday, Dec. 1 10:40AM - 10:50AM Room: E450A

Participants
Sona A. Chikarmane, MD, Boston, MA (*Presenter*) Nothing to Disclose
Aya Michaels, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Catherine S. Giess, MD, Wellesley, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To (1) determine positive predictive values (PPV) of non-mass enhancement (NME) descriptors using the revised BI-RADS atlas and (2) assess the frequency of re-classification of NME as background parenchymal enhancement (BPE)

METHOD AND MATERIALS

IRB-approved retrospective review of the MRI database from 1/1/2009-3/30/2012 identified 7332 contrast-enhanced breast MRIs. All findings prospectively assessed as NME and given BI-RADS 3, 4 and 5 (n=386) were re-reviewed by 2 radiologists in consensus, blinded to pathology. Findings considered post-surgical, associated with known cancers, BI-RADS 3 cases with initial assessments prior to study period, previously biopsied, and findings re-classified as BPE, focus or mass were excluded (n=181). The 1st finding reported was used (1 finding per patient). Fibroglandular tissue, BPE, distribution, internal enhancement patterns (IEP), and T2 signal were recorded. The medical record was reviewed for demographics and outcomes of imaging surveillance and biopsy.

RESULTS

205 cases (205 women) were included (ave 48.8, range 21-84 yrs). Of excluded cases, 77/386 (20%) were re-classified as BPE (ave 43.9, range 31-62 yrs), significantly younger than patients with NME (p=0.003). Pathology was available in 145/205 (70.7%) cases (50 malignant, 10 high risk [no upgrades], 85 benign). PPVs of distributions: segmental (10/29, 34.5%); linear (12/53, 22.6%); focal (22/102, 21.5%); regional (3/18, 16.6%); and diffuse (3/3, 100%). PPVs for IEP: clustered ring (10/30, 33.3%); clumped (11/40, 27.5%); heterogeneous (15/69, 21.7%) and homogenous (14/66, 21.2%). No difference for NME malignancy rate was noted by BPE (10/52 [19.2%] in marked/moderate; 40/113 [26.1%] in mild/minimal, p=0.35). 32% (16/50) of malignant NME had T2 signal.

CONCLUSION

Careful assessment of findings as BPE vs NME can improve PPVs, particularly in younger women, as 20% of prospectively assigned NME cases were re-classified BPE. Although clustered ring enhancement had one of the study's highest PPVs (33.3%), this number falls much below previously published rates. Reliance on T2 signal as a benign feature may be misleading, as slightly over 1/3 of malignancies had T2 signal.

CLINICAL RELEVANCE/APPLICATION

To improve PPVs of NME, assessment of findings as BPE vs NME must be carefully evaluated before recommending biopsy, particularly in younger women. The significance of high T2 signal in differentiating benign vs malignant lesions should be re-visited.

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

SSQ01-03 Are Mammographically Occult Additional Tumors Identified More Than 2cm Away From the Primary Breast Cancer on MRI Clinically Significant?

Thursday, Dec. 1 10:50AM - 11:00AM Room: E450A

Awards
Student Travel Stipend Award

Participants
Sarah Goodman, MD, New York, NY (*Presenter*) Nothing to Disclose
Victoria Mango, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Lauren C. Friedlander, MD, White Plains, NY (*Abstract Co-Author*) Nothing to Disclose
Elise Desperito, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Alexandra Pass, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Ralph T. Wynn, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Richard S. Ha, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the clinical significance of mammographically occult additional tumors identified more than 2 cm away from the primary breast cancer on pre-operative MRI.

METHOD AND MATERIALS

An IRB approved, HIPAA compliant review of breast MRIs from 1/1/08 to 12/31/14, yielded 256 mammographically occult breast tumors in 207 patients. Of these patients, 150 tumors were more than 2 cm away from the edge of the primary tumor in 129 patients. These patients underwent further assessment including MRI feature characterization and pathology review. Statistical analysis was performed.

RESULTS

112/129 (86.8%) patients had 1 additional tumor and 17/129 (13.2%) had 2 or more additional tumors. In 71/129(55.0%), additional tumors were located in a different quadrant and in 58/129 (45.0%) additional tumors were in the same quadrant but ≥2 cm away. Overall, primary tumor size was significantly larger (mean 1.87 cm, 95% CI: 1.48-2.26) than the additional tumors (mean 0.79cm,

95% CI:0.46-1.12, p=0.0023). However, in 20/129 (15.5%) the additional tumor was larger and in 26/129 (20.2%) the additional tumor was > 1 cm. The primary tumor was significantly more likely to be invasive (81.4%, 105/129) compared to additional tumors (70%, 105/150, p = 0.037). No significant difference in ERBB2/hormone receptor status or tumor grade was present between the two groups. In 9/129 (6.9%) patients, additional tumors yielded unsuspected invasive cancer or higher tumor grade. The primary tumors were more likely to be masses (75.2%, 97/129) than the additional tumors (52.6%, 79/150, p=0.0003). The additional tumor was more likely to be nonmass lesion type (37.3%, 56/150 vs 24%, 31/129, p=0.026) and focus lesion type (10%, 15/150 vs 0.08%, 1/129, p=0.0005). No statistical differences were present regarding initial and delayed enhancement pattern (p>0.05).

CONCLUSION

Mammographically occult additional tumors identified more than 2 cm away from the primary breast tumor are unlikely to be surgically treated if undiagnosed and may be clinically significant with 15.5% of additional tumors larger than the primary tumor, 20.2% greater than 1 cm in size and 6.9% more biologically significant.

CLINICAL RELEVANCE/APPLICATION

MRI detected additional breast tumors that are unlikely treated by surgery (>2cm away) may represent larger and biologically significant tumors with clinical management implications.

SSQ01-04 Effect of Background Parenchymal Enhancement on Diagnostic Performance of Breast MRI

Thursday, Dec. 1 11:00AM - 11:10AM Room: E450A

Participants
Kimberly M. Ray, MD, San Francisco, CA (*Presenter*) Nothing to Disclose
Iryna Lobach, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Heather I. Greenwood, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Vignesh A. Arasu, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Karla Kerlikowske, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Bonnie N. Joe, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Michael Hofman, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the effect of background parenchymal enhancement (BPE) on the diagnostic performance of breast MRI.

METHOD AND MATERIALS

This study is an IRB-approved, HIPAA-compliant prospective review of 3,602 contrast enhanced breast MRI exams recorded in a mammography registry among 6 breast imaging facilities in the San Francisco Bay Area, from 1/2010-10/2012. Data was collected on patient demographics, breast cancer risk factors and menopausal status. All breast MRI indications for examination were included that had a BPE classification. BIRADS final assessment was used to calculate performance measures. Biopsies performed within 180 days of MRI and pathology results were used to calculate PPV3. Breast cancers obtained by linkage to the state tumor registry within 12 months of MRI examinations were used to calculate cancer detection rate (CDR), sensitivity, and specificity. Performance measures were calculated and compared for exams with low BPE (mild or minimal) versus high BPE (moderate or marked) using binomial tests of proportions.

RESULTS

There were 2,656 (73.7%) exams classified as low BPE and 946 exams (26.3%) classified as high BPE. The abnormal interpretation rate was 350/2,656 (13.2%) vs. 223/946 (23.6%) for the low vs. high BPE groups, respectively (p<0.001). The biopsy rate was 276/2,656 (10.4%) vs. 169/946 (17.9%) for the low vs. high BPE groups, respectively (p<0.001). PPV3 was 0.49 (95% CI 0.43, 0.55) vs. 0.34 (95% CI 0.27, 0.42) for the low vs. high BPE groups, respectively (p=0.004). Cancer detection rates for the low vs. high BPE groups were 50 vs. 61 per 1000 examinations (p=0.23). Specificity was significantly lower for the high vs. low BPE groups for screening and diagnostic indications (p<0.001), but there was no significant difference in sensitivity.

CONCLUSION

Relative to MRI examinations with minimal or mild BPE, those with moderate or marked BPE were associated with higher abnormal interpretation and biopsy rates, lower PPV3, and lower specificity, but there was no significant difference in sensitivity for cancer detection between the cohorts.

CLINICAL RELEVANCE/APPLICATION

Moderate to marked BPE at breast MRI is associated with higher abnormal interpretation and false positive biopsy rates, with no additional cancer detection.

SSQ01-05 Is Background Parenchymal Enhancement Better Assessed on Axial or Sagittal Acquisition on Breast MRI?

Thursday, Dec. 1 11:10AM - 11:20AM Room: E450A

Awards
Student Travel Stipend Award

Participants
Alana A. Lewin, MD, New York, NY (*Presenter*) Nothing to Disclose
Laura Heacock, MD, MS, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Amy N. Melsaether, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Yiming Gao, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Samantha L. Heller, MD, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
James S. Babb, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Hildegard B. Toth, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Linda Moy, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

BPE may confound accurate interpretation of MR images. Since atypical patterns of BPE usually presents as asymmetric enhancement, the ability to simultaneously visualize both breasts may improve interpretive accuracy. We sought to determine if axial acquisition led to fewer follow-up exams and biopsies of enhancing lesions that were felt to represent BPE.

METHOD AND MATERIALS

An IRB-approved, retrospective review of 3468 consecutive breast MRI exams was performed from Jan 2013 – March 2016. Our practice routinely reported BPE and amount of fibroglandular tissue since 2010. MRI exams were acquired in the sagittal plane from Jan 2013 – June 2015 in 2653 (76.5%) exams. Since July 2015 – March 2016, the axial acquisition was utilized in 815 (23.5%) MRI exams. The final BI-RADS assessments, category of BPE, rate of follow-up and biopsy recommendations were recorded to determine the outcomes of NME and foci (single and multiple foci). Statistics included Fisher's exact tests.

RESULTS

Of 3468 exams, 2254 (65%) were assessed as BI-RADS 1 or 2, 104 (3%) as BI-RADS 0, 243 (7%) as BI-RADS 3, 659 (19%) as BI-RADS 4 or 5 and 208 (6%) as BI-RADS 6. We excluded 16 masses categorized as BI-RADS 3 and 102 masses categorized as BI-RADS 4 or 5. The remaining 227 NME and foci comprised our BI-RADS 3 lesions and 557 NME and foci comprised our BI-RADS 4 or 5 group.NME and foci were more likely to be categorized as BI-RADS 3 on sagittal acquisition 183/2653 (6.9%) than on axial imaging 34/815 (4%) (p=0.0048). Also, NME and foci were more likely to be categorized as BI-RADS 4 on sagittal acquisition 459/2653 (17.3%) than on axial imaging 98/815 (12%) on axial imaging (p=0.003). The PPV3 was 95/459 (20.7%) on sagittal imaging and 30/98 (30.6%) on axial imaging. Further findings that were classified as asymmetric BPE and, either biopsied and proven benign or being followed, trended toward significance of being more often detected on sagittal imaging [94/642 (14.6%) than on axial imaging 11/132 (8.3%) (p=0.0685).

CONCLUSION

Axial acquisition of breast MRI allows for direct comparison of asymmetric BPE in both breasts, with fewer BIRADS 3 lesions, decreased follow-up of benign findings and higher positive predictive value of NME/foci compared to sagittal MRI.

CLINICAL RELEVANCE/APPLICATION

Axial breast MRI has increased positive predictive value and decreased follow-up of NME compared to a sagittal acquisition.

SSQ01-06 Pre-operative MRI Predicts Recurrence after Primary Invasive Breast Cancer Diagnosis Independently of Histopathology: Results from 10 Years of Follow-up of a Multi-modality Imaging Trial Cohort

Thursday, Dec. 1 11:20AM - 11:30AM Room: E450A

Awards
Trainee Research Prize - Fellow

Participants
Jennifer Rowland, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Elizabeth S. McDonald, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Lauren Pantalone, BS, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Andrew Oustimov, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Rebecca Batiste, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Kathleen M. Thomas, BS, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Michael D. Feldman, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Advisory Board, Inspirata Inc Advisory Board, Koninklijke Philips NV Advisory Board, XIFIN, Inc
Mitchell D. Schnall, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Emily F. Conant, MD, Philadelphia, PA (*Abstract Co-Author*) Consultant, Hologic, Inc; Consultant, Siemens AG
Despina Kontos, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine whether imaging of invasive breast cancer at primary diagnosis can predict long-term recurrence independently of established histopathologic prognostic markers.

METHOD AND MATERIALS

We retrospectively analyzed data from a trial completed at our institution during 2002-2006, designed to determine the value of multi-modality imaging for breast cancer screening, detection, and staging. A total of 901 women were recruited and 231 were diagnosed with primary invasive breast cancer. All women received digital mammography, breast MRI, and whole-breast ultrasound at primary diagnosis and lesion features were interpreted using BI-RADS. Prognostic markers were assessed, including tumor histopathology, TNM stage, grade, lymph node status and IHC including ER, PR, and Her2. Women received standard "first-line" therapy and 10-year follow-up was tracked. Imaging and histopathology features were tested for univariate associations with recurrence free survival (RFS) using Kaplan-Meier analysis, and features with p-value below 0.20 were considered for multivariate analysis in Cox proportional hazards models. Imaging features were added one at a time to a baseline model with the histopathology markers, and were deemed significant at the a=0.05 level using the likelihood ratio test. Effect sizes were assessed via hazard ratios (HR) and model discriminatory capacity was evaluated with the C-statistic, adjusted for time-to-event data.

RESULTS

A total of 36 (16%) recurrences were observed. MRI lesion enhancement pattern (diffuse vs. non-diffuse) was significantly associated with RFS in both univariate (p=0.001, HR=4.20 (1.66-10.61)) and multivariate analysis (p=0.001, HR=5.90 (2.00-17.42)), with significant independent contribution of the MRI feature (p=0.004). The discriminatory capacity of the models with and without the MRI feature were 0.81 (0.69-0.92) and 0.77 (0.65-0.88), respectively, suggesting improved prognostic ability with the MRI feature.

CONCLUSION

Presence of diffuse MRI lesion enhancement has independent prognostic value and could be used to augment the assessment of a woman's risk of recurrence when incorporated with clinical and histopathologic markers.

CLINICAL RELEVANCE/APPLICATION

Pre-operative MRI imaging of invasive breast cancer may improve the prediction of 10-year recurrence free survival, therefore enabling more personalized treatment planning.

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/

Mitchell D. Schnall, MD, PhD - 2013 Honored Educator

SSQ01-07 Management of High-Risk Breast Lesions Found on Mammogram or US: Can MRI Identify Patients Who Do Not Need Excision?

Thursday, Dec. 1 11:30AM - 11:40AM Room: E450A

Participants
Jill Hammersley, MD, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose
Grace Blitzer, BS, Milwaukee, WI (*Presenter*) Nothing to Disclose
Savannah C. Partridge, PhD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Stephen A. Quinet, MD, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose
Habib Rahbar, MD, Seattle, WA (*Abstract Co-Author*) Research Grant, General Electric Company

PURPOSE

The purpose of this study is to evaluate the diagnostic performance of MRI to predict malignant upgrade of high-risk lesions prior to excisional biopsy.

METHOD AND MATERIALS

For this IRB-approved study, we retrospectively searched our database of all 4846 breast MRI reports performed at our institution between 1995-2016 for terms indicating the presence of a high-risk lesion, defined as ADH, LCIS, ALH, radial scar, papilloma, or FEA. Patients confirmed by medical record review to have a high-risk lesion first identified on mammogram and/or ultrasound and who had an MRI performed ≤6 months after the biopsy yielding high-risk pathology but prior to excision were included in this study. We retrospectively evaluated these MRIs for presence or absence of enhancement at the biopsy site. Final outcomes were determined by surgical excision or ≥24 months of negative imaging follow-up. The diagnostic performance of MRI for the detection of malignancy based on presence of enhancement was calculated. The number and results of additional biopsies prompted by suspicious MRI findings were also recorded.

RESULTS

Forty-eight lesions (18 ADH, 8 ALH, 12 LCIS, 9 papillomas, and 1 FEA) in 44 patients were included in the study. Forty lesions underwent definitive excision while 8 had negative follow-up imaging. Of the 48 high-risk lesions, 28 (58%) showed contrast enhancement on MRI and 20 (42%) did not. Eight of the 48 lesions (17%) upgraded to cancer on excision, all of which demonstrated enhancement on MRI. The sensitivity, specificity, negative predictive value, positive predictive value and accuracy of MRI based on presence of enhancement were 100%, 50%, 100%, 29% and 58%, respectively. MRI detected additional suspicious lesions prompting biopsy in 24/44 (55%) patients; 7/24 lesions (29%) were malignant and 17/24 (71%) were high risk or benign.

CONCLUSION

The absence of enhancement on MRI at the site of a known high-risk lesion predicted lack of upgrade to malignancy in this cohort. Although MRI prompted additional biopsies in a slight majority of patients, these biopsies confirmed the presence of malignancy in 17% of patients prior to surgery.

CLINICAL RELEVANCE/APPLICATION

Our study suggests that patients with a high-risk lesion that does not enhance on MRI may not require surgical excision and instead may be safely followed with imaging.

SSQ01-08 Impact of Background Parenchymal Enhancement on Cancer Risk Across a Diversity of High Risk Patient Populations Undergoing Screening Breast MRI

Thursday, Dec. 1 11:40AM - 11:50AM Room: E450A

Awards
Student Travel Stipend Award

Participants
Geoffrey M. Rutledge, MD, Boston, MA (*Presenter*) Nothing to Disclose
Dorothy A. Sippo, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Pragya A. Dang, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Ashley A. Roark, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Elkan F. Halpern, PhD, Boston, MA (*Abstract Co-Author*) Research Consultant, Hologic, Inc; Research Consultant, Real Imaging Ltd; Research Consultant, Gamma Medica, Inc; Research Consultant, K2M Group Holdings, Inc
Constance D. Lehman, MD, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, General Electric Company; Medical Advisory Board, General Electric Company

PURPOSE

To evaluate the impact of background parenchymal enhancement (BPE) on cancer risk across a diversity of high risk patient populations undergoing screening breast magnetic resonance imaging (MRI).

METHOD AND MATERIALS

Consecutive screening breast MRIs performed between February 7, 2011 and February 6, 2015 were reviewed with IRB approval. Multivariate logistic regression was used to assess the association of the following variables with cancer risk: age, clinical indication [grouped and prioritized as BRCA carrier > personal history (PH) of breast cancer > family history (FH) of breast cancer], qualitative BPE assessment (grouped into minimal, mild, or moderate/marked), and mammographic breast density [grouped into dense (heterogeneous or extreme) or non-dense (fatty or scattered)]. Cancer diagnosis was defined as a tissue diagnosis of invasive or in situ carcinoma within twelve months of the MRI or before the next screening MRI, whichever occurred first.

RESULTS

The study cohort included 4535 screening MRIs performed in 2338 women, grouped by BPE into minimal (1752/4535, 38.6%), mild (2122/4535, 46.8%), or moderate/marked (661/4535, 14.6%) and by clinical indication into BRCA (550/4535, 12.1%), PH (2664/4535, 58.7%), or FH (1321/4535, 29.1%). Seventy-three cancers were diagnosed overall (rate of 16.1 per 1000); BPE was assessed in these cases as minimal (17/73, 23.3%), mild (38/73, 52.1%), or moderate/marked (18/73, 24.7%), and clinical indication was BRCA (16/73, 21.9%), PH (44/73, 60.3%), or FH (13/73, 17.8%). BPE and clinical indication were independent predictors of cancer development (p=0.0004 and p=0.002, respectively), but age and mammographic breast density were not (p=0.21 and p=0.57, respectively). In comparison to minimal BPE, the odds ratios of mild and moderate/marked BPE were 2.1 (confidence interval 1.2-3.8, p=0.99) and 4.5 (2.1-9.4, p=0.0003), respectively. In comparison to FH, the odds ratios of PH and BRCA were 2.1 (1.1-4.0, p=0.94) and 4.1 (1.9-8.9, p=0.001), respectively. The effect of BPE was similar across all indications (p=0.66).

CONCLUSION

Increased BPE is an independent predictor of breast cancer in high risk patients undergoing screening MRI and its effect is similar across diverse high risk populations.

CLINICAL RELEVANCE/APPLICATION

BPE could be used as an imaging biomarker to improve risk assessment and inform decision-making in a diversity of high-risk patient populations undergoing screening MRI.

SSQ01-09 Preoperative Breast MRI for Patient Management: Preliminary Results from the MIPA Study

Thursday, Dec. 1 11:50AM - 12:00PM Room: E450A

Participants
Giovanni Di Leo, San Donato Milanese, Italy (*Abstract Co-Author*) Travel support, Bracco Group
Rubina Manuela Trimboli, San Donato Milanese, Italy (*Presenter*) Nothing to Disclose
Ritse M. Mann, MD, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Research agreement; Siemens AG; Research agreement, Seno Medical Instruments, Inc
Marina A. Benito, MD, PhD, Cordoba, Spain (*Abstract Co-Author*) Nothing to Disclose
Chiara Zuiani, MD, Udine, Italy (*Abstract Co-Author*) Nothing to Disclose
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
Evelyn Wenkel, MD, Erlangen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG
Katja C. Siegmann-Luz, Tubingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Marc Lobbes, MD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Corinne Balleyguier, MD,PhD, Villejuif, France (*Abstract Co-Author*) Nothing to Disclose
Katja Pinker-Domenig, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Massimo Calabrese, MD, Genova, Italy (*Abstract Co-Author*) Nothing to Disclose
Gianfranco Scaperrotta, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose
Jeroen Veltman, MD, Hengelo, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Umit A. Ozcan, MD, Istanbul, Turkey (*Abstract Co-Author*) Nothing to Disclose
Julia Camps Herrero, DIPLPHYS, Alzira, Spain (*Abstract Co-Author*) Nothing to Disclose
Gabor Forrai, MD, Budapest, Hungary (*Abstract Co-Author*) Nothing to Disclose
Steven E. Harms, MD, Fayetteville, AR (*Abstract Co-Author*) Consultant, Aurora Imaging Technology, Inc Consultant, Seno Medical Instruments, Inc
Inge-Marie Obdeijn, MD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Mireille Van Goethem, Edegem, Belgium (*Abstract Co-Author*) Nothing to Disclose
Marcos F. Docema, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
James E. Anderson, MBBCh, Perth, Australia (*Abstract Co-Author*) Nothing to Disclose
Claudio Losio, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Daniela Sacchetto, Turin, Italy (*Abstract Co-Author*) Researcher, im3D SpA
Fiona J. Gilbert, MD, Cambridge, United Kingdom (*Abstract Co-Author*) Research Grant, GlaxoSmithKline plc; Research Grant, General Electric Company; Research Grant, Hologic, Inc
Thomas H. Helbich, MD, Vienna, Austria (*Abstract Co-Author*) Research Grant, Medicor, Inc Research Grant, Siemens AG Research Grant, C. R. Bard, Inc
Nehmat Houssami, MBBS, Sydney, Australia (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

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

METHOD AND MATERIALS

In 2012, after an international call, 96 centers applied to the study and 34 were selected from 14 countries. Up to March 2016, 1st, 4,295 patients were enrolled, 1,926 (45%) having a complete case report form and suited for analysis. Indications and reasons for MRI as well as the ordering physician was recorded.

RESULTS

Of the 34 centers, 19 (56%) were academic. Up to now, 28 centers started the enrollment. Of 1,926 patients, 972 (50.5%) underwent MRI before surgery, 954 (49.5%) did not. Of 972 patients, 816 (84%) were studied adding diffusion weighted imaging (DWI) to the standard protocol. Gadobutrol at a dose of 0.1 mmol/kg bodyweight was used in 680/972 (70%) patients. In 155/972

patients (16%) the index cancer was diagnosed with MRI performed for screening (n=39, 4%) or problem solving (n=116, 12%). Considering the remaining 817 patients, preoperative MRI was performed as usual practice in 415 (51%) cases or for a specified indication in 402 (49%) cases, mainly ductal carcinoma in situ or invasive lobular carcinoma at needle biopsy, suspected multiple/ bilateral cancer at conventional imaging, or dense breasts. Preoperative MRI was ordered by a radiologist in 477/817 (58%), by a surgeon in 259/817 (32%), by a radiologist and a surgeon in 50/817 (6%), by an oncologist alone or in combination with other physicians in 31/817 (4%).

CONCLUSION

On the large scale of almost 2,000 patients in 34 centers, 50.5% of patients underwent MRI before surgery. In 12% of them, MRI was already performed for screening or problem solving. DWI was included in the protocol of 84% of MRI examinations. Preoperative MRI was mainly ordered by radiologists (64%). However, a surgeon was involved in 38% of the ordered MRI examinations.

CLINICAL RELEVANCE/APPLICATION

Screening or problem solving MRI is also "preoperative" in 10% of cases. Notwithstanding the opinions against the use of preoperative MRI, about one third of preoperative MRI are ordered by surgeons.

SSQ02

Cardiac (General Topics II)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S504AB

CA CT

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

Participants

Udo Hoffmann, MD, Boston, MA (*Moderator*) Nothing to Disclose
Dianna M. Bardo, MD, Phoenix, AZ (*Moderator*) Speaker, Koninklijke Philips NV; Consultant, Koninklijke Philips NV; Author, Thieme Medical Publishers, Inc

Sub-Events

SSQ02-01 A Correlative Study of Aortic Valve Rotation Angle and Thoracic Aortic Sizes Using ECG Gated CT Angiography

Thursday, Dec. 1 10:30AM - 10:40AM Room: S504AB

Participants
Ashley E. Prosper, MD, Pasadena, CA (*Presenter*) Nothing to Disclose
Arvin Saremi, BS, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Steven Cen, PhD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Alison Wilcox, MD, Los Angeles, CA (*Abstract Co-Author*) Speaker, Toshiba Corporation
Christopher Lee, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Leah M. Lin, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Farhood Saremi, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Various degrees of aortic valve rotation may be seen in individuals with no history of congenital cardiovascular malformations, but its association with aortic sizes has not been studied.

METHOD AND MATERIALS

Gated computed tomographic (CT angiograms in 217 patients were studied (66.7±15; 22-97 years old). Aortic diameters were determined at 5 anatomic locations. The length of the aorta from sinus to left subclavian artery was measured. The angle of valve rotation was recorded by measuring the angle between a line connecting the midpoint of the non-coronary sinus to the anterior commissure and another line along the interatrial septum. Rotation angles were correlated with aortic measurements. Patients were separated into two groups based on aortic sizes and into three groups based on age. The threshold for aortic dilatation was set at maximum ascending aorta diameter ≥40 mm (≥ 21 mm body surface area [BSA] indexed).

RESULTS

No significant difference in rotation angles was seen between the three age groups or between genders. Rotation angles were significantly correlated with maximal, average, and BSA adjustment of the aortic root and ascending aortic measurements. The aortic root angles were significantly different between the dilated versus nondilated aortas. There was no significant association between the rotation angles and age, length of ascending aorta, or diameters of descending aorta. Multivariate adaptive regression splines showed 25º of aortic root rotation as the diagnostic cut off for ascending aorta dilation. Above the 25º rotation, every 10º of increasing rotation was associated with a 3.78±0.87 mm increase in aortic diameter ($p<0.01$) and a 1.73±0.25 times increased risk for having a dilated aorta ($p<0.01$).

CONCLUSION

Our study indicates an independant positive association between the rotation angles of the aortic valve and the diameters of aorta and shows that above 25º rotation cut off, every 10º of increasing rotation almost doubles the risk for having a dilated aorta. Patients with increased rotation angle of the aortic valve may have a higher risk for future dilatation of the ascending aorta.

CLINICAL RELEVANCE/APPLICATION

Patients with increased rotation angle of the aortic valve may have a higher risk for future dilatation of the ascending aorta.

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/

Farhood Saremi, MD - 2015 Honored Educator

SSQ02-02 Impact of Non-invasive Mitral Calcium Quantification in Mitral Valve Surgery Outcomes

Thursday, Dec. 1 10:40AM - 10:50AM Room: S504AB

Participants
Mariana Diaz-Zamudio, MD, Mexico City, Mexico (*Presenter*) Nothing to Disclose
Francisco D. Romo Rosales, Mexico city, Mexico (*Abstract Co-Author*) Nothing to Disclose
Moises Jimenez, Mexico City, Mexico (*Abstract Co-Author*) Nothing to Disclose
Francisco Castillo-Castellon, MD, Mexico City, Mexico (*Abstract Co-Author*) Nothing to Disclose
Jose D. Dosal Banuelos, MD, Zapopan, Mexico (*Abstract Co-Author*) Nothing to Disclose

Sergio A. Criales Vera, MD, Mexico, Mexico (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate whether there is an association between mitral valve and mitral annulus calcification severity measured in unenhanced ECG-gated MDCT and surgical outcome.

METHOD AND MATERIALS

We included all consecutive patients referred to Coronary CTA for surgical risk assessment previous to mitral valve surgery. All studies were performed in either a 64-d or 256-d scanner. We measured calcium mass, volume and Agatston Score in both mitral valve leaflets and mitral annulus. Demographic data, risk factors and surgical outcome was obtained from clinical records. We search for surgical time, surgical bleed, arrhythmia, hours of intubation, days in critical care, hospitalization days and complications.

RESULTS

We included 66 patients, 56% females. Mean age was 52.4± 12.74. BMI was 25.5±3.54, smoke habit, systemic hypertension, diabetes and dyslipidemia were present in 10.6%, 13.6%, 12.1% and 12.3%, respectively. Mean valvular calcium volume (VCV) was 410.5±1174 mm3, valvular calcium mass (VCM) was 257.3±1111 mg, valvular calcium score (VCS) was 438±1267 AU. Mean annular calcium volume (ACV) was 21.69±85 mm3, annular calcium mass (ACM) was 15.6±93 mg and annular calcium score (ACS) 18.6±74 AU. Procedures were placement of mechanic valve in 80%, biologic valve in 17% and annular plasty in 4% patients. Mean surgical time was 282±88 minutes, surgical bleeding 754.6±693 ml, mean time to extubation was 1.21±1.18 days, days in critical care 3.86±1.9, hospitalization days 13±6.3. Arrhythmia and complications occured in 42.4 and 34.8% of the patients, respectively. Patients with higher surgical time (95th percentile) had higher VCV 885 vs. 260 cm3 (p=0.047) and VCM 788 vs. 89 (p=0.02), annular calcium was not significant. Patients with higher time in intubation (95th percentile) showed higher VCM 808 vs. 116 (p=0.032), annular calcium was not significant. Patients with longer times in critical care (95th percentile) had higher VCV 1583 vs. 316 (p=0.018), VCM 2202 vs. 102 (p=0.0001), ACV 90.7 vs. 16.8 (p=0.04) and ACS 79.7 vs. 14.2 (p=0.04).

CONCLUSION

Higher valvular calcification is associated with increased surgical time, time to extubation and days in critical care which might suggest complexity in surgical technique.

CLINICAL RELEVANCE/APPLICATION

The amount of calcification in the Mitral valve measured with unenhanced MDCT can potentially predict the technical complexity in Mitral valve surgery.

SSQ02-03 Automated and Manual Measurement of the Aortic Annulus with ECG-Gated Cardiac Tomography Prior to Percutaneous Aortic Valve Replacement (TAVR): Comparison with Three Dimensional Echocardiography

Thursday, Dec. 1 10:50AM - 11:00AM Room: S504AB

Awards
Student Travel Stipend Award

Participants
David Guez, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Gilda Boroumand, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Nicholas J. Ruggiero II, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Praveen Mehrotra, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Ethan J. Halpern, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Accurate measurement of the aortic annulus is critical for percutaneous aortic valve replacement (TAVR). We compared annular measurements on cardiac CT angiography (cCTA) by automated software to manual planimetry, and compared annular size derived from cCTA to that obtained with 3-dimensional transesophageal echocardiography (3D-TEE).

METHOD AND MATERIALS

A retrospective search identified 74 patients who underwent 3D-TEE and ECG-gated cCTA of the aortic annulus within 30 days for pre-operative TAVR planning. 3D-TEE measurements were obtained during mid-systole, while cCTA measurements were obtained at late-systole (40% of the R-R interval) and late-diastole (80% of the R-R interval). Annular area was measured independently by manual planimetry and with TAVI automated software (Intellispace Portal; Philips Medical Systems). Pearson correlation coefficients and paired t-tests were obtained to compare short axis and long axis diameters of the annulus, as well as annular area by echocardiography and cCTA.

RESULTS

Automated and manual cCTA annulus measurements were highly correlated in systole (r=0.94) and diastole (r=0.93). cCTA measurements in systole and diastole were highly correlated for short axis diameter (r=0.91), long axis diameter (r=0.92), and annular area (r=0.96). Good correlation was observed between 3D-TEE and cCTA for short axis diameter (r=0.84-0.90), long axis diameter (r=0.77-0.79) and annular area (r=0.89-0.90). Measurements by 3D-TEE were significantly smaller than cCTA during systole (p<0.001), but similar to cCTA during diastole: Short axis diameter – 3D-TEE: 22.1mm; cCTA systole: 22.6mm; cCTA diastole: 21.5mm Long axis diameter – 3D-TEE: 26.5mm; cCTA systole: 27.9mm; cCTA diastole: 27.2mm Annular area – 3D-TEE: 467sq mm; cCTA systole: 495sq mm; cCTA diastole: 466sq mm

CONCLUSION

Automated measurement of the aortic annulus is highly correlated with manual planimetry. Although all cCTA measurements are highly correlated with measurements by 3D-TEE, diastolic phase cCTA measurements tend to be closer to standard mid-systolic 3D-TTE measurements. This is especially true for measurement of aortic annular area which is over measured by an average of 28sq mm on systolic phase cCTA relative to 3D-TEE.

CLINICAL RELEVANCE/APPLICATION

cCTA measurements of the aortic annulus are highly correlated between systole and diastole, but diastolic phase measurements provide a better match with 3D-TEE, especially for annular area.

SSQ02-04 Coronary CTA Prior to Surgery for Infective Endocarditis: Clinical Efficacy, Safety and Cost-effectiveness. A Long-term Outcome Study

Thursday, Dec. 1 11:00AM - 11:10AM Room: S504AB

Participants
Florian Haug, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Fabian Plank, Innsbruck, Austria (*Presenter*) Nothing to Disclose
Thomas Schachner, MD, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Andrea Klauser, MD, Reith bei Seefeld, Austria (*Abstract Co-Author*) Nothing to Disclose
Werner R. Jaschke, MD, PhD, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Gudrun Feuchtner, MD, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Nikolaos Bonaros, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

to assess coronary computed tomography angiography (CTA) in patients with infective endocarditis prior to surgery for evaluation of coronary artery disease (CAD) regarding its influence on immediate clinical management, long-term outcome and cost-effectiveness

METHOD AND MATERIALS

32 patients (age 55.7±12.6y; females 21.9%) with infective endocarditis (IE) referred to cardiac ECG-gated CTA (64-or 128-slice dual source) prior to surgery for clinical indications between 2009 and 2015 were included. Coronary arteries were evaluated for stenosis>/=50%.The immediate clinical management decision based on CTA was recorded (downstream testing by invasive coronary angiography (ICA); CABG surgery). Outcome measures were major cardiovascular events (MACE); late coronary revascularization (CABG/PTCA)(>10days-max. 5,8 years.) Cost effectiveness was calculated (absolute costs: 250€ CTA vs 2250€ ICA)

RESULTS

32 patients (22 native, 10 prosthetic IE) were analyzed (30 prior unknown CAD, 2 post-CABG). 20/30 (66.6%) patients had no CAD or 50% stenosis by CTA, 1 intermediate 50% and 9 >50% stenosis. 5 CABG were performed based on CTA (no ICA due to "high-risk"). In 2 patients with prior CABG, grafts were patent (1 new graft/CX placed). Total CABG rate was 6/32 (18.7%). Only 1/32 (3.1%) patient underwent downstream testing with ICA after CTA (LM 60%->2xCABG). Overall in 4/32, ICA was performed (n=3 prior to CTA, all were negative for CAD (ICA->could have been avoided). There was no MACE (0%) and no late revascularization (0%) during F/U. Total absolute costs in our study cohort were 17.000 €, while potential costs would have been even lower with estimated 10.250 € if n=3 negative ICAs would have been avoided. Total cost savings compared to ICA strategy were 63.000 € (vs. 69.730€ potential). (76% absolute and 79.8% potential reduction) as compared to ICA.

CONCLUSION

The strategy using coronary CTA prior to IE surgery is safe and cost-effective (-76% absolute cost reduction). Downstream testing rate with ICA was low (3.1%) and CABG surgery rate 18.7%; while significant CAD (>50 % stenosis) was safely excluded in the majority (66.6%).

CLINICAL RELEVANCE/APPLICATION

Coronary CTA in patients with infective endocarditis prior to surgery is efficient for procedure planning, safe and cost-effective , and avoids invasive coronary angiography and the risk of embolization in the majority of patients.

SSQ02-05 Relative Value of Cardiac MRI and FDG-PET in the Initial Diagnosis of Cardiac Sarcoidosis

Thursday, Dec. 1 11:10AM - 11:20AM Room: S504AB

Participants
Richard A. Coulden, MD, Edmonton, AB (*Presenter*) Nothing to Disclose
Andrew M. Crean, MD, Toronto, ON (*Abstract Co-Author*) Research support, sanofi-aventis Group
Emer P. Sonnex, MPhil, Edmonton, AB (*Abstract Co-Author*) Nothing to Disclose
Jonathan T. Abele, MD, Edmonton, AB (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Sarcoidosis is a multisystem disorder with cardiac involvement in 25%. Diagnosis of cardiac sarcoidosis is difficult, with FDG-PET and cardiac MR (CMR) proving most reliable. We compare FDG-PET and CMR with late gadolinium enhancement (LGE) in patients with suspected cardiac sarcoidosis.

METHOD AND MATERIALS

89 patients with suspected cardiac sarcoidosis were investigated with FDG-PET and CMR within 2 weeks (82 same day). Patients undergoing FDG-PET followed a 24 hour low-carbohydrate diet and overnight fast. CMR included SSFP assessment of left ventricular (LV) function and LGE. Images were reviewed by 2 readers blinded to the results of the other examination. FDG-PET was considered positive if any segment (17 segment model) had an SUVmax>3.6. CMR was considered positive if any segment showed 'sarcoid-type' LGE. Patients with biopsy proven sarcoid or lung CT changes consistent with sarcoid were classified according to modified Japanese Ministry of Health & Welfare guidelines as JMHW +ve or -ve (Ohira. Eur J Nucl Med Mol Imaging 2016:43:259).

RESULTS

82 patients had biopsy proven or lung CT evidence of sarcoid. Of these, 13 met JMHW criteria and all showed myocardial FDG uptake. 10 also showed LGE on CMR. In 69 JMHW –ve patients, 20 showed myocardial FDG uptake with 8 also showing LGE. 5 patients had LGE with no myocardial FDG uptake and 44 showed neither FDG uptake nor LGE. In 7 patients with unexplained arrhythmia but no pathology or lung CT changes of sarcoid, 1 showed myocardial FDG uptake with LGE and 3 showed LGE alone. 3

showed neither FDG uptake nor LGE. 19 patients had LV impairment, 8 were JMHW +ve (62%) and 8 JMHW –ve (12%). Patients with arrhythmia but without known sarcoid were also more likely to have LV impairment (33%).

CONCLUSION

FDG-PET detects cardiac sarcoid in all JMHW +ve patients with LGE in 77%. In JMHW –ve patients, both techniques can be positive, either together or independently. In those who only show LGE, there is often no extracardiac FDG uptake to indicate active sarcoid elsewhere. In the heart, FDG appears to show active sarcoid whereas LGE shows more advanced disease that has gone on to scar. The presence of LGE is often associated with LV impairment.

CLINICAL RELEVANCE/APPLICATION

Current literature suggests FDG-PET and CMR are equivalent in detecting cardiac sarcoidosis. This is not our experience. FDG-PET and CMR are complimentary and should be used together whenever possible.

SSQ02-06 Correlation between Left Ventricular Insertion Points Delayed Enhancement and Right Ventricular Dilation with Cardiac Magnetic Resonance in Patients with Congenital Heart Disease

Thursday, Dec. 1 11:20AM - 11:30AM Room: S504AB

Participants
Francesco Secchi, MD, Milano, Italy (*Presenter*) Nothing to Disclose
Paola Maria Cannao, MD, San Donato Milanese, Italy (*Abstract Co-Author*) Nothing to Disclose
Marco Scarabello, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Marcello Petrini, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose
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

PURPOSE

The purpose of our study was the quantitative evaluation of left ventricular (LV) delayed enhancement (DE) in relation to right ventricular (RV) function with cardiac magnetic resonance (CMR) in congenital heart disease.

METHOD AND MATERIALS

Fifty-one consecutive patients (age mean±standard deviation 30.6±15 years) with congenital heart disease (17 had Tetralogy of Fallot, 8 had pulmonary insufficiency and 6 had RV dilation as main diagnosis) were studied. CMR was performed on a 1.5 T scanner to evaluate ventricular function and mass. Inversion recovery gradient-echo sequences were used 10 minutes after the IV injection of gadobenate dimeglumine 0.1 mmol/kg to produce DE images. Medis Qmass software (version 7.6) was used to quantitatively assess LV DE using 2 standard deviation(sd), 6 sd and automatic scar threshold methods to obtain the percentage, volume and mass of contrast-enhanced myocardial tissue.

RESULTS

The mean RV end-diastolic volume (EDV) was 140±47 ml and the mean contrast-enhanced LV myocardial volume was 3.8±2.8 ml using 6sd method. All DE was localize on inferior and/or superior ventricular insertion points. A significant correlation between LV DE and EDV was found using 6sd method (Rho = 0.477 P<.001).

CONCLUSION

The amount of contrast-enhanced LV myocardial tissue was significantly correlated with right ventricular end-diastolic volume in patients with congenital heart disease.

CLINICAL RELEVANCE/APPLICATION

LV insertion points delayed enhancement could be a clinical indicator of right ventricular dysfunction and a prognostic tool in patients with congenital heart diseases.

SSQ02-07 Pre-TAVI Evaluation of Aortic Root: Correlation of Manual and Semi-Automated Measurements

Thursday, Dec. 1 11:30AM - 11:40AM Room: S504AB

Awards
Student Travel Stipend Award

Participants
Barbora Horehledova, MD , Maastricht, Netherlands (*Presenter*) Nothing to Disclose
Babs Hendriks, MD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Nienke Eijsvoogel, MD, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Bastiaan Kietselaer, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Joachim E. Wildberger, MD, PhD, Maastricht, Netherlands (*Abstract Co-Author*) Institutional Grant, Agfa-Gevaert Group; Institutional Grant, Bayer AG; Institutional Grant, Koninklijke Philips NV; Institutional Grant, Siemens AG; Speakers Bureau, Bayer AG; Speakers Bureau, Siemens AG
Marco Das, MD, Maastricht, Netherlands (*Abstract Co-Author*) Research Consultant, Bayer AG Research Grant, Siemens AG Speakers Bureau, Siemens AG Research Grant, Koninklijke Philips NV

PURPOSE

Precise evaluation of aortic root with use of retrospectively ECG-gated CT scanning is a necessary part of pre-procedural TAVI planning. Highly sophisticated manual measurements require experienced readers and a lot of time for performing this tedious task. Semi-automatic software can assist with partial automation of assessment of multiple parameters. The aim was to evaluate differences between manual and semi-automated approach in terms of measurements and to compare time consumption of the assessment.

METHOD AND MATERIALS

150 pre-TAVI candidates who underwent retrospectively ECG-gated CT scan (2nd & 3rd gen. Dual Source CT) were evaluated.

Fully manual and semi-automated measurements of aortic root dimensions were assessed in 20% phase of cardiac cycle. Semi-automated assessment was performed with dedicated software (Syngo.via Valve Pilot, Siemens). Timing of both techniques was tracked with a measuring tool programmed in MS Excel. Measured values were correlated with Pearson's Correlation. Necessary reading time was compared using paired samples t-test.

RESULTS

Mean values (manual assessment; semi-automated assessment) were as follows: aortic annulus (AA) short axis (2,20 ± 0,23;2,21 ± 0,24) AA long axis (2,76± 0,28;2,78± 0,28), AA area (4,74 ± 0,95;4,89 ± 0,95), AA area derived perimeter (2,44 ± 0,25;2,49 ± 0,24), long axis at left coronary ostium (3,54 ± 0,42;3,45 ± 0,39), long axis at right coronary ostium RCO (3,29 ± 0,43;3,30 ± 0,40), widest portion of coronary sinuses (3,64 ± 0,41;3,52 ± 0,41), long axis at sinotubular junction (3,05 ± 0,43;3,16 ± 0,40).Strong positive linear correlation was found within all measured parameters (range: r=0,80 – 0,92, all p< 0,001). Time needed for aortic root evaluation was significantly lower (p< 0,001) using semi-automated approach (2 min 34 sec ± 48 sec) compared to fully manual assessment (4 min 51 sec ± 56 sec).

CONCLUSION

Using semi-automatic software for pre-TAVI evaluation significantly lowers necessary reading time while achieving comparable results in terms of measurements.

CLINICAL RELEVANCE/APPLICATION

Pre TAVI assessment is tedious and time consuming, using dedicated software reading time can be significantly reduced.

SSQ02-08 Myocardial Iodine Concentration Measurement Using Spectral-CT for Diagnosis of Cardiac Amyloidosis: A Pilot Study

Thursday, Dec. 1 11:40AM - 11:50AM Room: S504AB

Participants
virgile chevance, Creteil, France (*Presenter*) Nothing to Disclose
Jean-Francois Deux, Creteil, France (*Abstract Co-Author*) Nothing to Disclose
Francois Legou, MD, Creteil, France (*Abstract Co-Author*) Nothing to Disclose
Vania Tacher, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Alain Luciani, MD,PhD, Creteil, France (*Abstract Co-Author*) Nothing to Disclose
Alain Rahmouni, MD, Nogent Sur Marne, France (*Abstract Co-Author*) Nothing to Disclose
Hicham H. Kobeiter, MD, Creteil, France (*Abstract Co-Author*) Nothing to Disclose
Philippe Richard, Velizy Cedex, France (*Abstract Co-Author*) Employee, General Electric Company

PURPOSE

To evaluate iodine myocardial concentration in patients with cardiac amyloidosis (CA) using spectral-CT (multi-energy CT)

METHOD AND MATERIALS

Twenty two patients with CA, 13 with non-amyloid hypertrophic cardiomyopathies (CH) and 9control patients were explored with a multi-energy cardiac CT (HD 750; GE; USA). Images wereacquired 5 minutes after contrast medium injection (Iomeprol; 1,5 mL/kg). Interventricular septumthickness and myocardial iodine concentration (mg/mL) were calculated on enhanced images on adedicated platform (ADW 4.6).

RESULTS

Interventricular septum thickness was significantly (P<0.001) higher in CA (17 ± 4 mm) and CH (15 ±3 mm) patients than in control patients (10 ± 1 mm). CA patients exhibited significantly (P<0.005)higher iodine concentration within myocardium (2.69 ± 0.6 mg.mL-1) than CH (1.84 ± 0.5 mg.mL-1;P<0.001) and control patients (1.93 ± 0.4 mg.mL-1; P<0.005). CH and control patients did not exhibitsignificant difference each other (P=0.9). The Area Under Curve of mean iodine concentration fordiagnose CA patients as opposed to CH patients was 0.86 (0.73-1.0; P=0.001). With a cutoff value of2.22 mg.mL-1, the sensitivity and specificity of iodine concentration for diagnosis of CA were 82 % and77 %, respectively.

CONCLUSION

Spectral-CT reveals high myocardial iodine concentration in patients with CA and could be used toseparate CA and non-amyloid hypertrophic cardiomyopathies.

CLINICAL RELEVANCE/APPLICATION

Measurement of iodine concentration within myocardium using spectral-CT could be used as a newdiagnostic criteria for cardiac amyloidosis, especially in patients with MR contraindications

SSQ02-09 Relationship of Regional Myocardial Function with Myocardial Trabeculation: The Multi-Ethnic Study of Atherosclerosis

Thursday, Dec. 1 11:50AM - 12:00PM Room: S504AB

Participants
Nadine Kawel-Boehm, MD, Bethesda, MD (*Presenter*) Nothing to Disclose
Robyn McClelland, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Filip Zemrak, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Gabriella Captur, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Gregory Hundley, MD, Winston Salem, NC (*Abstract Co-Author*) Research Grant, Astellas Group; Speakers Bureau, Bracco Group; Stockholder, Prova Images
Chia-Ying Liu, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
James Moon, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Steffen E. Petersen, London, United Kingdom (*Abstract Co-Author*) Consultant, Circle Cardiovascular Imaging Inc; Consultant, GlaxoSmithKline plc
Bharath Ambale Venkatesh, PhD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

Joao A. Lima, MD, Baltimore, MD (*Abstract Co-Author*) Research Grant, Toshiba Corporation
David A. Bluemke, MD, PhD, Bethesda, MD (*Abstract Co-Author*) Research support, Siemens AG

PURPOSE

To determine if regional myocardial function assessed by cardiac MR (CMR) is associated with the degree of trabeculation of the left ventricular (LV) myocardium.

METHOD AND MATERIALS

Trabeculation was measured as the ratio of noncompacted versus compacted myocardium (NC/C) and as fractal dimension (FD), a novel index to assess endocardial complexity, on steady-state free precession cine images in subjects from the Multi-Ethnic Study of Atherosclerosis. Included were subjects with a complete CMR exam and without myocardial scar. Regional myocardial function was measured as peak regional systolic circumferential shortening (Ecc) derived from CMR tagging. Demographic characteristics, traditional cardiovascular risk factors and CMR measures of LV volume and function were stratified by quartiles of NC/C and FD. The association of NC/C and FD with strain (n=745 and n=1123, respectively) was assessed by linear regression in univariate and multivariable models.

RESULTS

Mean age was 67±9 years, 53% women. 34% of subjects had a NC/C >2.3, considered the cut-off for LV noncompaction cardiomyopathy (LVNC) in CMR. 8% of participants had a FD of >1.3, considered the threshold for a LVNC. Subjects with higher NC/C had a lower systolic blood pressure (SBP), a higher LV end-diastolic volume (EDV) and a lower ejection fraction (EF) ($p<0.05$, all comparisons). Participants with a higher FD had a higher SBP ($p<0.05$) and higher Ecc (indicating worse regional function) ($p<0.05$) while there were no differences in LVEDV and LVEF between quartiles of FD. In univariate analysis, a higher FD was associated with higher Ecc (indicating worse regional function) ($\beta=6.6\%$; $p<0.0001$). The association persisted after adjustment for demographic covariates ($\beta=4.0\%$; $p<0.0001$), traditional risk factors ($\beta=3.6\%$; $p<0.0001$) and CMR measures ($\beta=2.8\%$; $p=0.002$). There was no association between NC/C and myocardial strain (Ecc).

CONCLUSION

Greater LV myocardial trabeculation assessed by fractal dimension was associated with worse regional myocardial function in individuals without clinically apparent cardiovascular disease. FD, a measure of endocardial complexity, appears to be more sensitive than the NC/C ratio to define areas of regional myocardial dysfunction.

CLINICAL RELEVANCE/APPLICATION

Hypertrabeculation is difficult to quantify, and severe hypertrabeculation is thought to be associated with LV dysfunction.

SSQ03

Chest (Miscellaneous/Infection)

Thursday, Dec. 1 10:30AM - 12:00PM Room: E351

CH CT

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

FDA Discussions may include off-label uses.

Participants
Brett W. Carter, MD, Houston, TX (*Moderator*) Editor, Reed Elsevier;
John P. Lichtenberger III, MD, Bethesda, MD (*Moderator*) Author, Reed Elsevier

Sub-Events

SSQ03-01 Single Energy Scanning of Large Adult Patients: Can We Improve Image Quality with Spectral Shaping?

Thursday, Dec. 1 10:30AM - 10:40AM Room: E351

Participants
Martine J. Remy-Jardin, MD, PhD, Lille, France (*Abstract Co-Author*) Research Grant, Siemens AG
Rayyan A. Daghistani, MBBS, Lille, France (*Presenter*) Nothing to Disclose
Jean-Baptiste Faivre, MD, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Jessica Giordano, MD, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Suonita Khung, MD, Lille, France (*Abstract Co-Author*) Nothing to Disclose
Jacques Remy, MD, Mouvaux, France (*Abstract Co-Author*) Research Consultant, Siemens AG

PURPOSE

To evaluate the image quality of single-energy CT with tin filtration in routine chest CT examinations of large adult patients.

METHOD AND MATERIALS

50 consecutive patients with a BMI >25 kg/m2 (overweight patients : n=25 ; obese patients : n=25) underwent two successive non-contrast chest CT examinations for the follow-up of a chronic respiratory disease : (a) the first examination was obtained with a second-generation dual-source CT with an individually-adapted selection of the kilovoltage according to the patient's body weight (70-80 kg b.w.: 100 kV/65 mAs; 80-100kg b.w.: 120 kV/65 mAs; >100 kg: 140 kV/90 mAs) (Group 1) ; (b) the second examination was performed with a third-generation dual-source CT at 150 kV with tin filtration (150 Sn kV/200 mAs) (Group 2) to maintain the radiation exposure constant. In both groups, chest examinations were performed in single-energy, helical mode with a systematic use of milliamperage modulation; images were reconstructed with the same strength of iterative reconstruction (Group 1: SAFIRE; Group 2: ADMIRE; strength=3). Between T0 and T1, the patient's weight was stable (±5kg) and the severity of the underlying disease was not dramatically modified.

RESULTS

In Group 1: (a) CT examinations were obtained at 100 kV (n=4; 8%), 120 kV (n=30; 32%) and 140 kV (n=16; 32%) with a single X-ray tube; (b) the overall image quality was diagnostic with a subjective noise rated as mild to moderate on lung and mediastinal images; (c) the mean DLP was 168 ± 56.6 mGy.cm. Compared to Group 1, Group 2 examinations were characterized by (a) a significantly lower mean objective noise (14.51 ± 2.95 HU vs 19.5 ± 4.96 HU; p<0.0001) despite a non-significant difference in the mean DLP (167.3 ± 23.13 mGy.cm; p=0.89); (b) a better SNR (3.46 ± 0.91 vs 2.41 ± 0.67; p<0.0001); (c) a significantly lower score of subjective image noise (1.22 ± 0.16 vs 1.27 ± 0.19; p=0.008); (d) all but 4 examinations were acquired with a dual-source, high pitch mode.

CONCLUSION

Chest scanning at 150 Sn Kv improves the overall image quality in overweight and obese patients with no dose penalty.

CLINICAL RELEVANCE/APPLICATION

With third-generation DSCT, scanning large patients at 150 kV with tin pre-filtration improves the overall image quality of examinations without increasing the radiation exposure.

SSQ03-02 Age-Stratified Patterns of Thymic Involution on MDCT

Thursday, Dec. 1 10:40AM - 10:50AM Room: E351

Awards
Student Travel Stipend Award

Participants
Michael Drabkin, MD, East Meadow, NY (*Presenter*) Nothing to Disclose
John I. Meyer, MD, East Meadow, NY (*Abstract Co-Author*) Nothing to Disclose
Nalini Kanth, MD, Roslyn, NY (*Abstract Co-Author*) Nothing to Disclose
Shari Lobel, MD, Woodbury, NY (*Abstract Co-Author*) Nothing to Disclose
Julia Grossman, MD, East Meadow, NY (*Abstract Co-Author*) Nothing to Disclose
John H. Krumenacker JR, MD, East Meadow, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the prevalence and appearance of normal thymic tissue stratified by age via MDCT.

METHOD AND MATERIALS

After IRB approval, we prospectively reviewed CT scans of the thorax from 600 consecutive trauma patients, age 30 to 69, utilizing MDCT at our level-one trauma center.We systematically recorded the prevalence and characteristics of thymic tissue in all 600 patients. We documented thymic morphology, dimensions, and density. Thymic tissue was characterized as absent, mostly fatty, an even mixture of fatty tissue and stranding, predominantly stranding, or discrete thymus. Thymic tissue density measurements were then obtained utilizing a fixed area ROI. CT scans were interpreted by three body fellowship-trained attending radiologists.Patient demographic data and histories were thoroughly documented. Patients with CT findings of thoracic trauma or other major trauma were excluded to eliminate the possibility of confounding mediastinal hemorrhage. Any conditions known to cause an abnormal appearance of the thymus, including but not limited to myasthenia gravis, thyrotoxicosis, lymphoma, bone marrow hyperplasia, ulcerative colitis, chemotherapy, and HIV were also excluded from the study.

RESULTS

Six hundred patients were evaluated. Seventy-two were excluded. Of the 528 remaining patients, 276 (53%) were found to have some residual thymic tissue. Of these 276, 100 (36%) had predominantly fatty replacement, 88 (32%) had an even mixture of fat and soft tissue, 68 (25%) were predominantly composed of soft-tissue, and 20 (7%) had a discrete well-defined thymus. The average thymic ROI values for these subsets were -54, -26, +4, and +47 HU, respectively.Interestingly, 40% of patients over the age of 40 were found to have residual thymic tissue, including 25% of patients in their 7th decade.

CONCLUSION

Our results demonstrate that residual thymic tissue is present more frequently and at later ages than previously reported.

CLINICAL RELEVANCE/APPLICATION

Failure to recognize residual thymic tissue as a normal finding may result in misinterpretation as a mediastinal mass, hemorrhage or infection.

SSQ03-03 Thoracic Cavity Volume Change after Lung Transplantation according to the Underlying End-State Lung Disease

Thursday, Dec. 1 10:50AM - 11:00AM Room: E351

Participants
Chul Hwan Park, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Donghyun Hong, MS, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Da Hyun Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Tae Hoon Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

End stage lung diseases change the anatomy of the thoracic cavity, which is termed 'disease-related chest remodeling'. After lung transplantation (LTx), reverse remodeling to normal thoracic cavity volume might occur. However, clinical evidence in support of reverse remodeling is limited. Therefore, the aim of this study was to evaluate the change in thoracic cavity volume following LTx, in relation to the underlying end-stage lung disease.

METHOD AND MATERIALS

One hundred two patients, who underwent LTx between July 1996 and October 2014, were reviewed. In this retrospective study, 43 patients (Male:Female = 20:23, mean age = 45.5 ± 13.4 years) who underwent a pre-operative pulmonary function test (PFT), pre-operative chest computed tomography (CT), and a 1-year follow-up chest CT examination were enrolled. These patients were divided into three groups based on the pre-operative PFT results: Group I, obstructive disease (FEV1/FVC ratio < 70% and FVC ≥ 80%); Group II, restrictive disease (FEV1/FVC ratio ≥ 70% and FVC < 80%); Group III, mixed disease (FEV1/FVC ratio < 70% and FVC < 80%). Anatomical lung volumes were obtained from pre-operative CT and 1 year follow-up CT images using an auto-segmentation technique, with a default range from -200 to -1024 HU. The pre-operative and post-operative lung volumes were compared based on the underlying lung disease, and the change in the lung volumes was analyzed.

RESULTS

Among the 43 patients, 8 were assigned to group I, 23 to group II, and 12 to group III. In group I, post-LTx lung volume after 1 year was significantly smaller than pre-LTx lung volume (pre: 4032 ± 817 ml, post: 3086 ± 250 ml, p = 0.008). In group II, post-LTx lung volume was significantly larger than pre-LTx lung volume (pre: 2257 ± 764 ml, post: 3109 ± 1069 ml, p = 0.001). However, pre-LTx and post-LTx lung volumes were not significantly different in group III (pre: 3907 ± 1274 ml, post: 3710 ± 1056 ml, p = 0.365).

CONCLUSION

Following LTx, the change in thoracic cage volume is different and depends on the end-stage lung disease. This result supports the hypothesis of reverse remodeling of thoracic cavity following LTx, which reverses the effects of end-stage chest remodeling.

CLINICAL RELEVANCE/APPLICATION

Reverse remodeling could be one of the imaging biomarkers for assessing the prognosis after lung transplantation.

SSQ03-04 Incidence of Dendriform Pulmonary Ossification (DPO) in Usual Interstitial Pneumonia (UIP) on Chest Computed Tomography (CT)

Thursday, Dec. 1 11:00AM - 11:10AM Room: E351

Participants
Temphon Kruamak, Seattle, WA (*Presenter*) Nothing to Disclose
Stephanie Cheng, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Jitesh Ahuja, MD, MBBS, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Gregory Kicska, MD, PhD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Sudhakar N. Pipavath, MD, Mercer Island, WA (*Abstract Co-Author*) Consultant, Boehringer Ingelheim GmbH; Advisor, Boehringer

Ingelheim GmbH; Speaker, Boehringer Ingelheim GmbH
J. D. Godwin, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Eric J. Stern, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Dendriform pulmonary ossification (DPO) is an uncommon condition, characterized by mature bone formation in the lung parenchyma, typically in the clinical setting of pulmonary fibrosis. CT scan appearance is described as linear branching calcifications within areas of lung fibrosis. In our experience, the reported incidence of DPO with thin section chest CT scanning (6.7%) is more common than the literature suggests. The purpose of this study was to assess the utility of maximum intensity projection (MIP) images for improving detection of DPO.

METHOD AND MATERIALS

We retrospectively analyzed HRCT images obtained from 210 patients (125 males, 85 females; mean age, 66.8 years 10.2 ± [SD]; range, 20-93 years) with UIP features on HRCT. There were 152 (72.4%) patients with idiopathic UIP and 58 (27.6%) patients with non-idiopathic UIP. The standard thin-section chest CT imaging and MIP imaging were separately evaluated by two radiologists with regard to presence or absence of DPO.

RESULTS

DPO was identified in 61 of 210 (29.0%) patients on standard thin-section CT images and in 125 of 210 (59.5%) patients on MIP images. DPO was more common in men than woman, and occurred more frequently in patients older than 60 years of age. DPO was observed more frequently in lower lobes (68.0%) than upper lobes (3.2%) or diffusely (28.8%). The presence of DPO was more common in patients with idiopathic UIP than patients with non-idiopathic UIP ($p<.05$). Junior reader had more confidence in DPO detection by MIP images than standard thin-section CT images.

CONCLUSION

DPO is more common in patients with pulmonary fibrosis than previously described in the literature, noted in 59.5% of our patients with UIP. MIP images can greatly improve detection and confidence in diagnosis of DPO compared to standard thin-section CT images.

CLINICAL RELEVANCE/APPLICATION

DPO is more common in patients with pulmonary fibrosis than previously described in the literature. MIP images can improve detection of DPO compared to standard thin-section CT images.

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/

J. D. Godwin, MD - 2013 Honored Educator
Sudhakar N. Pipavath, MD - 2013 Honored Educator
Sudhakar N. Pipavath, MD - 2015 Honored Educator

SSQ03-05 CT and Pathology Correlation Predicts Survival in Interstitial Pneumonia with Autoimmune Features (IPAF)

Thursday, Dec. 1 11:10AM - 11:20AM Room: E351

Participants
Jonathan H. Chung, MD, Chicago, IL (*Presenter*) Royalties, Reed Elsevier; Consultant, F. Hoffmann-La Roche Ltd; Consultant, Boehringer Ingelheim GmbH; Consultant, Veracyte, Inc
Steven M. Montner, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Aliya N. Husain, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Justin Oldham, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Ayodeji Adegunsoye, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Cathryn Lee, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Heber MacMahon, MD, Chicago, IL (*Abstract Co-Author*) Consultant, Riverain Technologies, LLC; Stockholder, Hologic, Inc; Royalties, UCTech; Research support, Koninklijke Philips NV; Consultant, General Electric Company
Imre Noth, MD, Chicago, IL (*Abstract Co-Author*) Speakers Bureau, Sumitomo Dainippon Pharma Co, Ltd; Speakers Bureau, F. Hoffmann-La Roche Ltd ; Speakers Bureau, Boehringer Ingelheim GmbH; Consultant, ImmuneWorks, Inc; Consultant, Gilead Sciences, Inc; Research Grant, F. Hoffmann-La Roche Ltd; Research Grant, Boehringer Ingelheim GmbH
Rekha Vij, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Mary Strek, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

CT and pathology correlation has been shown to predict survival in well-defined connective tissue diseases. The purpose of the current study was to determine whether the same phenomenon is present in those with IPAF.

METHOD AND MATERIALS

The earliest HRCT-quality chest CT scans from subjects with IPAF were analyzed by 2 chest radiologists. The predominant distribution of lung disease as well as the extent of reticular abnormality, honeycombing, ground-glass opacity, air-trapping, and traction bronchiectasis were scored. The CT UIP pattern (inconsistent, possible, definite) was also determined as well as the single best diagnosis with level of confidence. Pathological samples were analyzed by a lung pathologist for UIP pattern as per guidelines. The survival in the 3 combinations of concordant and discordant CT and pathology scores for UIP diagnosis were assessed using a Cox model.

RESULTS

There were 78 subjects with both CT and pathology for review. In regard to pathology, there were 19 (24.4%) with a non-UIP

There were 78 subjects with both CT and pathology for review. In regard to pathology, there were 19 (24.4%) with a non-UIP pattern and 59 (75.6%) with a UIP pattern. CT UIP pattern was as follows: UIP (34, 43.6%), possible UIP (18, 23.1%), and inconsistent with UIP (26, 33.3%). CT UIP, CT possible UIP, and CT inconsistent with UIP were associated with pathological UIP in 91.2%, 83.3%, and 50% of subjects; respectively. Those with concordant not UIP/inconsistent with UIP patterns had significantly better survival than those with discordant UIP or concordant UIP diagnoses (p-value 0.02).

CONCLUSION

CT and pathology correlation has value as a predictor of survival in IPAF. Those with CT possible UIP have a high rate of UIP diagnosis on pathology.

CLINICAL RELEVANCE/APPLICATION

There is value of CT and pathology correlation beyond diagnosis. Those with CT possible UIP likely have UIP on pathology and may not require biopsy in the correct clinical setting.

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/

Jonathan H. Chung, MD - 2013 Honored Educator

SSQ03-06 Thermal Imaging as a Diagnostic Tool for Bacterial Pneumonia

Thursday, Dec. 1 11:20AM - 11:30AM Room: E351

Participants
Linda T. Wang, MD, Boston, MA (*Abstract Co-Author*) Employee, Vertex Pharmaceuticals Incorporated; Stockholder, Vertex Pharmaceuticals Incorporated
Robert H. Cleveland, MD, Boston, MA (*Presenter*) Research Consultant, Alexion Pharmaceuticals, Inc; Editor, Springer Science+Business Media Deutschland GmbH; Research Consultant, Biomedical Systems;
Robert G. Zwerdling, MD, Worcester, MA (*Abstract Co-Author*) Nothing to Disclose
Thomas Ptak, MD, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Mindy Sherman, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Kenan Haver, MD, Boston, MA (*Abstract Co-Author*) Spouse, Employee, Vertex Pharmaceuticals Incorporated;
William D. Binder, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Pallavi Sagar, MBBS, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Patricia Hibberd, MD,PhD, Boston, MA (*Abstract Co-Author*) Spouse, Employee, General Electric Company

PURPOSE

Assess feasibility of thermal imaging (TI) to diagnose bacterial pneumonia.

METHOD AND MATERIALS

Subjects were patients presenting to the hospital's emergency department with possible bacterial pneumonia who received a chest x-ray (CXR) during the evaluation. TI of the chest were obtained within 4 hours of the CXR. CXR and TI were separated and then assessed in blinded random order. Presence of a focal opacity on CXR and presence of an area of increased heat on TI were each considered consistent with bacterial pneumonia and recorded. CXR served as the outcome parameter against which the TI was compared.

RESULTS

47 patients were enrolled; 15 in a training set and 32 in a Test Set with 28M/3F (one excluded, having no usable TI), ages 10 months to 82 years, 23 adults, 8 children. There was one false negative TI. Sensitivity=0.8, specificity=0.58. False positive rate=0.42, false negative rate=0.20. Positive predictive value=0.29, negative predictive value=0.94. Statistical power=0.26. In order to achieve a power of 0.80 with the conditions encountered in this study, 138 patients would be required. The difference in proportion of positive TI and positive CXR was 32% for the adult (p=0.04), and 20% for the pediatric (p=0.50) subgroups, both favoring TI. A non-blinded review of cases where CXR/TI did not agree (this review was not included in the statistical analysis) suggests that TI may be able to detect bacterial pneumonia when the CXR is confounded by chronic disease, poor technique, atelectasis or early/late evolution of an opacity.

CONCLUSION

This feasibility study confirms the proof of concept that thermal imaging of the chest can demonstrate bacterial pneumonia. Although significantly underpowered, this study supports further investigation with larger trials of both adult and pediatric patients.

CLINICAL RELEVANCE/APPLICATION

This technology is potentially most useful in resource limited environments where pneumonia is the second most common cause of death in young children and where CXR equipment and expert readers are unavailable. It also could be of benefit in high throughput healthcare settings, such as emergency departments or busy doctors' offices and particularly in rural areas where access to CXR is limited.

SSQ03-07 Human Metapneumovirus Pneumonia: Clinical Characteristics and Computed Tomography Findings

Thursday, Dec. 1 11:30AM - 11:40AM Room: E351

Participants
Hyun Jung Koo, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Kyung-Hyun Do, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Ho Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Young Oh, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the clinical and computed tomography (CT) findings in adults who had proven human Metapneumovirus (HMPV) pneumonia

METHOD AND MATERIALS

We included 850 consecutive adults who had proven HMPV pneumonia between January 2010 and February 2016. Patients with co-infection or who had no evidence of pneumonia on CT were excluded. Clinical findings including monthly distribution of the number of patients, patients' immune status, and clinical course were recorded. CT findings were assessed for the distribution of parenchymal abnormalities, percent extent of centrilobular nodules, consolidation and ground-glass attenuation, presence of macronodules, bronchial wall thickening, bronchiectasis, lymphadenopathy and pleural effusion were reviewed. CT findings of patients with hospital stay over 7 days were compared to those with less than 7 days.

RESULTS

A total of 143 patients (M : F = 86 : 57, mean age 60.4 years) were included for analysis. Of these, 55 patients were immunocompromised condition. Nasopharyngeal specimen RT-PCR was performed in 137 patients, and six patients underwent bronchoscopic bronchoalveolar lavage (BAL) for testing respiratory viruses by BAL fluid RT-PCR. HMPV pneumonia predominated from March to May, and mean hospital stay was 11 days. Bilateral lung involvement was present in 105 (73%) patients. Dominant CT patterns were characteristic ill-defined small centrilobular nodules (75%) with bronchial wall thickening (87%) and ground-glass attenuation (86%). The patterns do not significantly differ between immunocompromised and immunocompetent patients. The extent of consolidation and ground-glass attenuation were larger and macronodules and pleural effusion were frequently noted in patients who need longer hospital stay. Six (4%) patients were died.

CONCLUSION

HMPV pneumonia usually presents ill-defined small centrilobular nodules with bronchial wall thickening and ground-glass attenuation. The extent of consolidation and ground-glass attenuation were the independent factors to affect longer hospital stay.

CLINICAL RELEVANCE/APPLICATION

This study provides characteristic CT findings of HMPV pneumonia using a large patient population. The detection of these findings will be useful for differentiating HMPV pneumonia from other viral pathogen or bacterial pneumonia to make an appropriate diagnosis and treatment.

SSQ03-08 Results of Quantitative Chest-CT in Chronic Pulmonary Graft-vs-Host Disease (cGvHD) Three Years after Allogeneic Stem Cell Transplantation

Thursday, Dec. 1 11:40AM - 11:50AM Room: E351

Participants
Christopher Kloth, Tuebingen, Germany (*Presenter*) Nothing to Disclose
Wolfgang M. Thaiss, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Juergen Hetzel, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Georg Bier, MD, Tubingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Stefan Wirths, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Konstantin Nikolaou, MD, Tuebingen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Speakers Bureau, Bayer AG
Marius Horger, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To quantify lung parenchymal changes in symptomatic patients with chronic pulmonary graft-versus-host disease three years after allogeneic stem cell transplantation (allo-SCT) by means of CT-densitometry [CTD] and to compare results with those of established pulmonary function tests (PFT).

METHOD AND MATERIALS

The study group consisted of 26 patients with pulmonary cGvHD (19 male, 7 female; mean age 49.29 ± 15.89; range 19-72 years). The diagnosis was based on clinical symptoms, PFT and chest-CT findings. CTD and PFT were performed both in the pre- and post-transplantation setting and results compared with each other. CT scans were obtained during suspended deep inspiration including the whole lungs. The mean lung attenuation (MLD), low attenuation values (LAV) and distribution of focal parenchymal abnormalities compatible with emphysema (HU<-950) were quantitatively calculated with histograms and graphics. On PFT, total lung capacity (TLC), residual volume (RV), vital capacity (VC), forced expiratory volume in 1s (FEV1s) and diffusion capacity for carbon monoxide (DLCOSB.) were registered.

RESULTS

Changes in end-inspiratory lung volume and density (MLD and LAV) in symptomatic cGvHD patients in mean three years after allo-SCT proved all not significant, but there was a clear trend towards an increase in lung volume and a decrease in lung attenuation. These results were similar throughout all classes of bronchiolitis obliterans (BO) by cGvHD.PFT showed a significant decrease in VC, FEV1s but only a minimal decrease in DLCOSB. Changes in FVC after stem cell transplantation correlated with changes in LAV ($r=0.649$, $p=0.031$). Predicted VC correlated with changes in LAV ($r = 0.771$, $p = 0.005$). There was a correlation between the absolute difference of FEV1 and DLCOSB. ($r = 0.64$, $p = 0.14$) before and after stem cell transplantation.

CONCLUSION

End-inspiratory phase CT lung parenchyma quantification in symptomatic patients with pulmonary cGvHD three years after allo-SCT shows discrete changes over the pre-transplantation setting representing airway obstruction, mirroring airflow limitation on PFT, with no significant abnormalities compatible with lung parenchymal destruction (emphysema).

CLINICAL RELEVANCE/APPLICATION

CT-quantification of lung volume and density (attenuation) in cGvHD is now available as a post-processing tool for most CT-scanners this additionally gained information might be helpful for diagnosis of cGvHD.

SSQ03-09 Critical Evaluation of Lung Ultrasound findings Compared with Dynamic Computed Tomography: Preliminary Data

Thursday, Dec. 1 11:50AM - 12:00PM Room: E351

Participants
Alice Wielandner, MD, Vienna, Austria (*Presenter*) Nothing to Disclose
Constanze Bardach, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Prerana P. Agarwal, DMRD, MBBS, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Florian Thuerk, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Frederic Tomboel, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Eugenijus Kaniusas, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Christina Braun, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Stefan Boehme, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Christian J. Herold, MD, Vienna, Austria (*Abstract Co-Author*) Research Grant, Siemens AG; Research Grant, Bayer AG; Research Grant, Agfa-Gevaert Group; Research Grant, Bracco Group; Research Grant, Guerbet SA; Speakers Bureau, Bayer AG; Speakers Bureau, Bracco Group; Stockholder, Hologic, Inc
Helmut Prosch, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Data on correlation of lung ultrasound (LUS) findings in critical ill patients such as "B-lines" and consolidations with the imaging gold standard Computed Tomography (CT) is scarce.
The aim of the study was to correlate B-line count and extent of consolidation in LUS with dynamic CT at predefined Positive End Expiratory Pressure (PEEP) levels in healthy and diseased piglets.

METHOD AND MATERIALS

After Ethic commetee´s approval, 6 piglets were studied during pressure controlled mechanical ventilation at PEEP level 0,5,15 before and after surfactant depletion injury. At each PEEP level inspiratory, expiratory and dynamic CT scans (Siemens E16) and ultrasound examinations (Mindray M7) were performed by the same radiologist on both sides (curved transducer 3.5 MHz, obliqu./transv.orientation, 5th/6th intercostal space ventral/ dorsal and transv.subcostal in the anterior axillary line).
In offline evaluation of the ultrasound clips, image quality, B-line count and if present consolidations were evaluated. Evaluation of the corresponding dynamic/ CTs was performed blinded to the LUS findings.

RESULTS

Excellent correlation of dynamic changes in lung consolidations between CT and ultrasound was shown (R= 0.9). Higher B-line counts were observed in the diseased lungs (compared with healthy). In the healthy and the diseased lungs, B-line count decreased with increase of PEEP and more B-lines were present dorsally. No distinct CT correlate for the B-lines could be found.

CONCLUSION

Ultrasound estimation of the consolidation volume has an excellent correlation with CT therefore proved also in comparison with the imaging gold standard to be a reliable tool to assess changes in consolidations during modification of the respiratory management. Evaluation of B-lines is increasingly used in emergency medicine and pediatrics. The relevance and origin of is still subject of debate. Our results show that B-lines are PEEP and position dependent and that there seems to be no correlate of this ultrasound artefacts in CT.

CLINICAL RELEVANCE/APPLICATION

CT correlation with LUS findings offers a new perspective in the understanding, application and interpretation of LUS. The results of this study might help to adapt the respiratory management of critically ill patients.

SSQ04

Chest (Thoracic Malignancy)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S402AB

CH CT MR

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

FDA Discussions may include off-label uses.

Participants
Patricia M. de Groot, MD, Houston, TX (*Moderator*) Nothing to Disclose
Jin Mo Goo, MD, PhD, Seoul, Korea, Republic Of (*Moderator*) Nothing to Disclose

Sub-Events

SSQ04-01 Clinicoradiological Implications of the New Proposals for TNM (8th Edition) of Non-small Cell Lung Cancer: Overall Stage and T Descriptor Migration in 202 Consecutive Patients

Thursday, Dec. 1 10:30AM - 10:40AM Room: S402AB

Participants
Sarah L. Sheard, MBBS, FRCR, London, United Kingdom (*Presenter*) Nothing to Disclose
Joanna Moser, MBChB, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Sisa Grubnic, MD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Siobhan J. Green, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Ioannis Vlahos, MRCP, FRCR, London, United Kingdom (*Abstract Co-Author*) Research Consultant, Siemens AG; Research Consultant, General Electric Company;

PURPOSE

To compare in a clinical setting the proposed TNM UICC 8th edition (UICC8) staging and the current TNM UICC 7th edition (UICC7), to determine:1. TNM reclassification patterns,2. Stage migration and3. Implications for management.

METHOD AND MATERIALS

202 consecutive prior cases of new lung cancer presentations and confirmed NSCLC were identified at a tertiary cancer center. Staging MDCT studies were re-interpreted by consensus by 3 expert thoracic radiologists in corroboration with other concurrent imaging modalities, cytopathological and clinical records to determine TNM staging under UICC8 and also classified according to the current UICC7. All TNM descriptors were recorded. Patterns of T and M descriptor migration, staging group changes and potential implications for previous operability thresholds (Stage IIIA/IIIB) were evaluated.

RESULTS

The distribution of T stage in UICC 8 v UICC7 would be as follows: Tx 1% v 1%; T1a 1% v 5%;T1b 4% v 3%;T1c 3% v N/A;T2a 20% v 28%;T2b 5% v 5%;T3 17% v 28%;T4 47% v 29%. UICC8 would result in a significant increase in T4 and reduction in T3 classified disease (both $p<0.01$, chi-square). M1 disease descriptors remain static in UICC8 (58% overall: M1a 21%, M1b 6%, M1c 30%).Stage distribution according to UICC8 v UICC 7 respectively would be as follows: IA 5% v 6% (new subgroups IA1:1%, IA2:3%, IA3:1%); IB 6 v 7%; IIA:0% v 7%; IIB:10% v 4%; IIIA:6% v 11%; IIIB:11% v 7%; IV:58% v 58% (new subgroups IVA:28%,IVB:30%). No significant changes in stage distribution ($p>0.05$).The proportion of patients with IIIA or better, potentially operable disease, decreases non-significantly from 35% to 28% ($p>0.05$).

CONCLUSION

In clinical practice IALSC UICC8 proposals would create migration of cases from T3 to T4 category, but this does not cause significant change in the overall staging distribution or potential eligibility for aggressive management.

CLINICAL RELEVANCE/APPLICATION

Unlike the clinically impacting stage migrations occurring from UICC6 to UICC7, new UICC8 changes appear more minor affecting T3-4 disease distribution but not overall stage prevalence significantly.

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/

Ioannis Vlahos, MRCP, FRCR - 2015 Honored Educator

SSQ04-02 Pretreatment FDG-PET Standardized Uptake Values and Tumor Size in Medically Inoperable NSCLC is Prognostic of Overall Two-Year Survival after Stereotactic Body Radiation Therapy

Thursday, Dec. 1 10:40AM - 10:50AM Room: S402AB

Awards
Trainee Research Prize - Medical Student

Participants
Madison Kocher, BS, Charleston, SC (*Presenter*) Nothing to Disclose
James G. Ravenel, MD, Charleston, SC (*Abstract Co-Author*) Consultant, Imbio, LLC

Elizabeth Garrett-Mayer, PhD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Anand K. Sharma, MD, Charleston, SC (*Abstract Co-Author*) Speakers Bureau, Bristol-Myers Squibb Company Speakers Bureau, sanofi-aventis Group

PURPOSE

To determine the prognostic value of initial tumor size and metabolic activity on overall two-year survival for patients with early stage lung cancer receiving stereotactic body radiotherapy (SBRT) with curative intent.

METHOD AND MATERIALS

We retrospectively reviewed 100 consecutive patients from 2008-2013 who underwent SBRT and underwent PET/CT at our institution within 2 months prior to treatment. FDG-PET scans were acquired after the patient had fasted for 6 hours and had a confirmed blood glucose of lower than 200 mg/dl. 18F-FDG 3.5 MBq/kg body weight was administered via intravenous injection. PET/CT (GE Discovery ST PET/CT, GE Health Care, Waukesha, WI) was acquired 45 minutes after FDG administration. For each tumor, tumor diameter, tumor volume, SUVmax, SUV average, and the SUV volume were obtained on a GE AW1 workstation. Survival was determined by the electronic medical record. For those without a definitive outcome at two years, vital status was confirmed through the National Death Index. Cox regression analyses with overall survival (OS) as the outcome were performed to estimate hazard ratios (HR) for tumor size and metabolic activity. A multiple regression model was used to evaluate interactions between size and metabolic parameters.

RESULTS

There were 37 females and 63 males with a median age of 75 (range 51-95). OS was improved for tumors < 2cm compared with > 2cm (HR 1.64; p=0.092) and for tumors with SUVmax < 5 compared with >5 (HR 1.95; p=0.041). Using multiple regression models, only tumors > 2 cm and > 5 SUVmax were shown to have inferior 2-year survival (Figure 1) compared to those with neither factor.

CONCLUSION

Early stage lung cancer patients treated with curative intent SBRT with large (>2cm) tumors and >5 SUVmax have poorer survival outcomes compared to patients with neither or only one of those factors.

CLINICAL RELEVANCE/APPLICATION

Combining size and metabolic parameters improves survival prediction in patients treated with curative intent SBRT and may allow selection of populations that would benefit from additional therapy.

SSQ04-04 Utility and Reproducibility of 3-Dimensional Printed Models in Pre-Operative Planning of Superior Sulcus Tumors

Thursday, Dec. 1 11:00AM - 11:10AM Room: S402AB

Awards
Trainee Research Prize - Resident

Participants
Elizabeth George, MD, Boston, MA (*Presenter*) Nothing to Disclose
Maria F. Barile, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Steven Mentzer, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Michael Jaklitsch, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Andetta R. Hunsaker, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Dimitris Mitsouras, PhD, Boston, MA (*Abstract Co-Author*) Research Grant, Toshiba Corporation;
Ory Wiesel, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Antonio Coppolino, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Andreas Giannopoulos, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the feasibility of 3D printing of superior sulcus (Pancoast) tumors for pre-operative planning using a radiology-centric workflow.

METHOD AND MATERIALS

Tumor, bones and systemic and pulmonary vasculature were 3D-printed from staging chest CT for two Pancoast tumor patients. Segmentation used a commercial 3D workstation (Vitrea 6.7, Vital Images). Post-processing to introduce connecting elements to allow isolated tissues to remain in one piece and maintain their spatial relationship after printing (Figure) used FDA-approved 3D-printing software (3-matic, Materialise). Models were provided to operating surgeons (n=4) prior to the procedure. Following the procedure, surgeons assessed aspects of model utility using the Gillespie score scale (1=inferior; 2=similar; 3=information assimilated more rapidly; 4=additional information provided). Inter-observer variability for one model generated by 2 independent readers was assessed using quantitative metrics (tumor volume, area of adjacent tissues 1 mm from the tumor, and the Dice similarity index for each tissue), and subjectively by the surgeons based on intra-operative findings.

RESULTS

Printed models were superior to cross-sectional imaging and 3D visualization for surgical planning (score=3.21). The highest scores were given for determining the surgical approach (=4), evaluating the relationship of tumor to vessels (=3.5), and assessing resectability (=3.5); the lowest score (=2) was given for guiding instrumentation selection. Model accuracy was deemed good to excellent compared to intra-operative findings. Interobserver variation was <15% in tumor volume and <1.8 cm2 in tissue areas within 1mm of the tumor. Dice similarity indices were >93.4% for vasculature and >86.5% for tumor and bone. Surgeons noted small differences in accuracy between the two models, with no difference in clinical utility.

CONCLUSION

Pancoast tumors are particularly challenging for surgeons due to the extensive involvement of adjacent vital structures. 3D-Printed models generated with a radiology-centric workflow have clinically negligible variability, are sufficiently accurate, and benefit surgical planning for Pancoast tumor patients.

CLINICAL RELEVANCE/APPLICATION

Juxtaposing the effort and cost of 3D-printing Pancoast tumor models versus surgeons' perceived enhancement to procedure planning, 3D printing should be considered for surgical planning.

SSQ04-05 Prognostic Value of CT Phenotype in Stage IV EGFR-Mutation-Positive Non-Small Cell Lung Cancer Undering Tyrosine Kinase Inhibitors

Thursday, Dec. 1 11:10AM - 11:20AM Room: S402AB

Awards
Student Travel Stipend Award

Participants
Jiangdian Song, PhD, Shenyang, China (*Presenter*) Nothing to Disclose
Di Dong, PhD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Jie Tian, PhD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

By a quantitative radiomics approach we provided a credible aided diagnosis for stage IV EGFR-mutation-positive NSCLC who undergo TKIs therapy. The phenotypic features selected from a predefined feature set can be conveniently used to facilitate the pre-therapy individualized decision of EGFR-TKIs in this disease.

METHOD AND MATERIALS

The proposed method has been evaluated on a clinical dataset including 80 stage IV NSCLC patients and a validation dataset including 72 stage IV EGFR-mutation-positive NSCLC patients. All patients have undergone the treatment of EGFR TKIs as the first-line or second-line treatment between Jan 1, 2012, and Dec 31, 2015.Patients who underwent resection for local advanced or metastatic disease were withdrawn from the study. The region of interest (ROI) was extracted manually by two radiologists. Progression-free survival (PFS) was used to evaluate the prognosis ability of the phenotypic features. PFS was defined as the time from the date of treatment to the date of confirmed tumour relapse.

RESULTS

The median PFS of all enrolled patients was 9.5 months (IQR 6.2–14.3). P values showed significantly difference between the low risk group and the high risk group patients according to the phenotypic features: "Root mean square of voxel (RMS)", "Contrast of co-occurrence (CO)" and "High gray level emphasis of run emphasis (HGLE)". Of these, Cox regression analysis indicated the risk of patients with higher RMS increased 1.69 times (primary set: HR: 1.69, 95%CI: 1.16-2.47, p=0.006; validation set: HR: 1.81, 95%CI: 1.50-3.16, p=0.001) compared with the lower patients. The higher HGLE indicated worse prognosis compared with the lower patients (primary set: HR: 1.58, 95% CI: 1.10-2.32, p = 0.015; validation set: HR: 2.30, 95%CI: 2.02-4.28, p=0.001). And the risk increased nearly 2 times of the lower CO group when compared with the patients with higher values(primary set: HR: 0.68, 95% CI: 0.47-0.88, p = 0.043; validation set: HR: 0.60, 95%CI: 0.41-0.90, p=0.012).

CONCLUSION

Our quantitative radiomics method could achieve the prognosis of EGFR-TKIs for the stage IV EGFR-mutation-positive NSCLC patients. The radiomics key features will be further expanded in larger data samples, which may provide more predictive information for clinical practice.

CLINICAL RELEVANCE/APPLICATION

Our findings potentially offer clinical value in directing personalized therapeutic regimen selection for stage IV EGFR-mutation-positive NSCLC patients.

SSQ04-06 Magnetic Resonance Elastography of the Primary Anterior Mediastinal Tumors: A Preliminary Study

Thursday, Dec. 1 11:20AM - 11:30AM Room: S402AB

Participants
Wei Tang, MD, Beijing, China (*Presenter*) Nothing to Disclose
Ning Wu, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Han Ouyang, MD, Bejing, China (*Abstract Co-Author*) Nothing to Disclose
Yao Huang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the feasibility of magnetic resonance (MR) elastography in characterizing stiffness of anterior mediastinal tumors.

METHOD AND MATERIALS

Institutional review board approval and informed consent were obtained. Twenty-one patients presenting with anterior mediastinal tumors were enrolled in the study. All the patients underwent MR examination consisting of diffusion-weighted imaging (DWI) and MR elastography on a 3.0 T whole body scanner. A circular or oval regions of interest (ROI) was placed on the tumor on DWI image shown its largest axial diameter, covering greater than 75% of the areas of the tumor. ROI then was copied to the corresponding elastogram at the same level for each lesion, and the measurement of stiffness value was automatically obtained and documented. Two-way ANOVA test was used to examine the difference of stiffness value with the correlation of pathological results.

RESULTS

In a total of 21 patients with anterior mediastinal tumors were pathologically confirmed with thymoma in 7, thymic carcinoma in 7, and primary lymphoma in 7. Higher average stiffness value of thymic carcinoma was measured as 6183.53 ± 2437.67 kPa, followed by 4506.49 ± 1234.56 kPa for thymoma, and 3586.04 ± 1084.80 kPa for lymphoma. Average stiffness value of thymic carcinoma was significantly higher than that of thymoma ($p = 0.006$) and lymphoma ($p = 0.000$). Meanwhile, average stiffness value of thymoma was significantly higher than that of lymphoma ($p = 0.018$).

CONCLUSION

This preliminary study demonstrates the feasibility of MR elastography in the evaluation of stiffness of anterior mediastinal tumors in various pathologies.

CLINICAL RELEVANCE/APPLICATION

MR elastography could be used to assess the characteristics of anterior mediastinal tumor as to its stiffness.

SSQ04-07 Diffusion-Weighted MR Imaging for Assessment of Mediastinal Masses

Thursday, Dec. 1 11:30AM - 11:40AM Room: S402AB

Participants
Marcelo K. Benveniste, MD, Houston, TX (*Presenter*) Nothing to Disclose
Brett W. Carter, MD, Houston, TX (*Abstract Co-Author*) Editor, Reed Elsevier;
Girish S. Shroff, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Mylene T. Truong, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Jia Sun, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Edith M. Marom, MD, Ramat Gan, Israel (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Although diffusion weighted MR imaging (DWI) has been accepted as a valuable tool for malignancies, its role in the evaluation of anterior mediastinal masses has not been elucidated. The aim of this study was to evaluate the accuracy of DWI in distinguishing benign from malignant diseases and its performance in assessing thymic epithelial neoplasms (TEN).

METHOD AND MATERIALS

After approval by our institutional review board, we retrospectively reviewed 38 patients with an anterior mediastinal mass who were referred for a chest MRI. DWI images were performed with low- and high-b-values (b =0, 800 s/mm2) as well ADC maps. MRI analysis was performed qualitatively by one chest radiologist using apparent diffusion coefficient (ADC) measurements. Summary of ADC were provided in mean, SD, median, and range by different groups for each test (Table 1). Anterior mediastinal mass diagnosis was classified according to pathology diagnosis, and TEN were classified according to WHO classification and Masaoka-Koga staging system.

RESULTS

Of the 38 study patients, 26 had malignant lesions and 12 had benign lesions. Malignant lesions included: thymoma (n=21), thymic carcinoma (n=2), and one of each: teratoma, lymphoma, and schwannoma. Benign lesions included: lymphangiona (n=1), thymic and pericardial cyst (n=7) and thymic hyperplasia (n=4). Of the patients with thymomas, 11 patients had early disease (stage I/II) and 10 had advanced disease (stage III/IV). We found that mean ADC value was statistically significant in differentiating benign from malignant masses (3.63 SD0.80 vs 2.30, SD=0.0.75, p<0.001), benign thymic masses from TEN (3.63, SD=0.80 vs 2.19, SD=0.66, p<0.0001) as well as in differentiating TEN from non-thymic mediastinal neoplasms (2.19, SD=0.66 vs 3.19, SD=0.93, p=0.0261). However, ADC values could not be used to differentiate low-grade thymomas, high-grade thymomas and thymic carcinomas according to WHO classification and early from late stage thymomas per Masaoka-Koga Staging System.

CONCLUSION

Our study shows that DWI is a valuable tool in differentiating benign from malignant lesions in the anterior mediastinum and is helpful in the evaluation of newly diagnosed mediastinal masses.

CLINICAL RELEVANCE/APPLICATION

DWI MRI is a noninvasive, reliable, and reproducible imaging tool that helps in the assessment and differentiation of benign from malignant mediastinal masses.

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/

Brett W. Carter, MD - 2015 Honored Educator
Mylene T. Truong, MD - 2015 Honored Educator
Edith M. Marom, MD - 2015 Honored Educator

SSQ04-08 A Simple Computed Tomography Scoring System to Predict Histological Malignancy of Solitary Fibrous Tumors of the Pleura

Thursday, Dec. 1 11:40AM - 11:50AM Room: S402AB

Participants
Siegfried Helage, Paris, France (*Presenter*) Nothing to Disclose

PURPOSE

The aim of the present study was to define the very first score enabling discrimination between benign and malignant solitary fibrous tumors of the pleura (SFTPs), on the basis of reliable preoperative CT features.

METHOD AND MATERIALS

Between December 2004 and November 2012, 56 patients underwent complete resection for SFTP at six institutes. CT scans were reviewed retrospectively, and a diagnostic scoring system for predicting malignant SFTP preoperatively was designed.

RESULTS

Univariate analysis revealed seven significant predictors of malignant SFTP: tumor size ≥ 10 cm (p=0.002), tumor heterogeneity

spontaneously (p=0.019) or after contrast medium injection (p=0.029), existence of intratumoral fluid density areas (p=0.011), a pleural effusion (p=0.01), measurable (diameter >1 mm) intratumoral vessels (p=0.019), a hypervascular character (visible intratumoral vessels and/or intense enhancement) (p=0.001). A scoring system based on these seven CT features, each assigned 1 point, and with a cut-off of 4 points, could predict malignant SFTP with a specificity of 85% and a sensitivity of 48%.

CONCLUSION

Our scoring system using seven CT features (tumor size ≥ 10 cm, tumor heterogeneity with or without contrast injection, intratumoral fluid density areas, pleural effusion, measurable intratumoral vessels, and a hypervascular character of the tumor) may be helpful for predicting histological malignancy of solitary fibrous tumors of the pleura.

CLINICAL RELEVANCE/APPLICATION

Solitary fibrous tumors of the pleura (SFTPs) are very rare, if not exceptional, primary pleural neoplasms. Because of the vagueness of histopathological diagnosis, the only recommended treatment is complete excision of the tumor burden for all patients, notwithstanding tumor grade. Two stumbling blocks for this unequivocal therapeutic approach remain. Surgeons need valid arguments to justify an aggressive treatment in patients with comorbidities that increase anesthetic risk. Besides, considering radiation protection, a continued monitoring with CT after surgery should be supported by such arguments in relatively young patients. These arguments could be provided by CT features suggestive of histological malignancy on preoperative chest imaging. These CT features allowed us to build the very first computed tomography scoring system to predict preoperatively the malignant character of SFTPs.

SSQ04-09 A Comparison between Free-breathing Radial VIBE Combined BLADE in 3T MR and Endoscopic Ultrasound for Preoperative T Staging of Potentially Resectable Esophageal Cancer, with Histopathological Correlation

Thursday, Dec. 1 11:50AM - 12:00PM Room: S402AB

Participants
Jinrong Qu, Zhengzhou, China (*Presenter*) Nothing to Disclose
Zhaoqi Wang, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose
Jia Guo, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the T staging of potentially resectable esophageal cancer (EC) using free-breathing radial VIBE (r-VIBE) combined BLADE and endoscopic ultrasound (EUS) with pathologic confirmation of the T stage.

METHOD AND MATERIALS

Patients with endoscopically proven EC and indeterminate T stage by CT and EUS were imaged on a 3T MR scanner, using post contrast r-VIBE with 1.0 mm spatial resolution combined BLADE. Two independent readers assessed image quality using a 5-point scale, and quantified the T-stage. One endoscopist assessed the T stage on EUS. The T stage for r-VIBE combined BLADE and EUS were compared with post-operative pathologic confirmation. Inter-reader agreement was also calculated.

RESULTS

40 patients were included. Inter-reader agreement of image quality and for T staging was good for both r-VIBE (Kappa=0.743 and Kappa=0.767, respectively; P<0.0001) and BLADE(Kappa=0.703 and Kappa=0.714, respectively; P<0.0001). Comparison between EUS and pathologic T staging had agreement of 80% (32/40). The T staging agreement between r-VIBE combined BLADE and pathologic T staging was 90.0% (36/40) for reader 1 and 95% (38/40) for reader 2, respectively. High accuracy for not only T1/T2 stage was obtained for both r-VIBE combined BLADE readers (92.5% and 100% for reader 1 and reader 2, respectively) and for EUS reader (100%), but also T3/T4, r-VIBE combined BLADE showed accuracy of 91.8% and 93.9% for reader 1 and reader 2, respectively, while for EUS, accuracy was 69.5% compared to pathologic T staging.

CONCLUSION

Contrast-enhanced free-breathing r-VIBE combined BLADE is comparable to EUS in T staging of potentially resectable EC.

CLINICAL RELEVANCE/APPLICATION

In patients with potentially resectable EC, contrast-enhanced free-breathing r-VIBE combined BLADE is able to depict the depth of tumor noninvasively, especially for patients with non-traversable lesions in which EUS is difficult to perform.

SSQ05

Emergency Radiology (Musculoskeletal and Spine Imaging)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S405AB

MK CT MR ER

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

FDA Discussions may include off-label uses.

Participants
Clint W. Sliker, MD, Ellicott City, MD (*Moderator*) Nothing to Disclose
Savvas Nicolaou, MD, Vancouver, BC (*Moderator*) Institutional research agreement, Siemens AG

Sub-Events

SSQ05-01 Evaluating the AAST Clinical Decision Rule for Thoracolumbar Spine Evaluation after Blunt Trauma in a Large Level 1 Trauma Center-Is it as Effective as Screening Imaging?

Thursday, Dec. 1 10:30AM - 10:40AM Room: S405AB

Participants
Enrique Rodriguez, MD, Detroit, MI (*Presenter*) Nothing to Disclose
Brent D. Griffith, MD, Troy, MI (*Abstract Co-Author*) Nothing to Disclose
Britton J. Carter, MD, Detroit, MI (*Abstract Co-Author*) Nothing to Disclose
Feras Mossa-Basha, MD, Detroit, MI (*Abstract Co-Author*) Nothing to Disclose
Stephen Zintsmaster, MD,MPH, Royal Oak, MI (*Abstract Co-Author*) Nothing to Disclose
Suresh C. Patel, MD, Detroit, MI (*Abstract Co-Author*) Nothing to Disclose
Todd Williams, MD, Detroit, MI (*Abstract Co-Author*) Nothing to Disclose
Phyllis Vallee, MD, Detroit, MI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Injuries to the thoracic and lumbar (TL) spine due to blunt trauma are a common cause for presentation to emergency departments (ED). In 2015, the American Association for the Surgery of Trauma (AAST) published a prospectively derived clinical decision rule for thoracolumbar spine evaluation after blunt trauma. The purpose of this study was to evaluate the accuracy of this decision rule and determine how many TL spine reformats would have been unnecessary had the rule been prospectively applied.

METHOD AND MATERIALS

1000 consecutive patients who underwent CT Chest, Abdomen, Pelvis (CT CAP) with TL spine reformatted images following blunt trauma were retrospectively reviewed. Patients with penetrating injury, age < 15 yrs, injury > 48 hrs prior to presentation, known TL spine fracture, and those not evaluated by an ED physician were excluded. Clinical and imaging records of the patients were reviewed to identify all AAST decision rule criteria (alert and evaluable, physical exam, high risk mechanism, age > 60 yrs) and determine the presence of TL spine fracture.

RESULTS

Of the 1000 patients, 900 met study inclusion criteria, of which 66 (7.3%) had TL spine fractures. Of the 900, 535 patients were not evaluable by the AAST decision rule (i.e., not alert and evaluable, C-spine or other distracting injury)(Fig 1). Of the remaining 365 patients, 20 (5.5%) had TL spine fractures. The decision rule correctly identified 17 of these 20 patients with fractures for a sensitivity of 85%, but with a100% sensitivity for fractures requiring surgical management or bracing. Of the 365 patients evaluable by the AAST decision rule, 102 (27.9%) would have met the criteria for not requiring imaging, of which 3 had fractures detected (Fig 2).

CONCLUSION

The AAST clinical decision rule for TL spine evaluation after blunt trauma identified all fractures of the TL spine requiring surgical management or bracing and would have resulted in a 27.9% reduction in the number of required TL spine reformats. However, the performance of the decision rule in detecting fractures not requiring surgical management or bracing was suboptimal for a screening tool and further evaluation of its accuracy is necessary prior to widespread implementation.

CLINICAL RELEVANCE/APPLICATION

Fractures not requiring surgical management or bracing can still alter patient management and clinicians utilizing this clinical decision rule must take this into consideration when forgoing imaging.

SSQ05-02 Revisiting the ACR Appropriateness Criteria for Acute Midfoot Fractures: 5-Year Study of Limitations of Radiography in 400 Patients

Thursday, Dec. 1 10:40AM - 10:50AM Room: S405AB

Awards
Student Travel Stipend Award

Participants
Mohammad Mansouri, MD, MPH, Boston, MA (*Presenter*) Nothing to Disclose
Renata R. Almeida, boston, MA (*Abstract Co-Author*) Nothing to Disclose
Michael H. Lev, MD, Boston, MA (*Abstract Co-Author*) Consulant, General Electric Company; Institutional Research Support, General Electric Company; Stockholder, General Electric Company; Consultant, MedyMatch Technology, Ltd; Consultant, Takeda Pharmaceutical Company Limited; Consultant, D-Pharm Ltd
Ajay K. Singh, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

Efren J. Flores, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Midfoot fractures are missed in 20%of initial visits.Missing midfoot fractures can cause pain, pseudoarthrosis,arthritis,deformity and amputation.Our aim is to analyze Lisfranc and Chopart fractures and to provide an evidence-based flowchart to reduce missed fractures.

METHOD AND MATERIALS

This is a HIPAA compliant,IRB approved,retrospective study conducted between 2010 and2014.PACS system of our institution was searched for Lisfranc and Chopart fractures.Diagnosis was made based on imaging modalities.Patients were divided into 2categories:high-energy(motor vehicle accidents,fall from height)and low-energy trauma(slips and twisting,simple fall,blunt trauma)based on medical records.

RESULTS

400 patients were analyzed(mean 46.5 years;54.3% male).Lisfranc fracture was diagnosed in 65.0%(260/400), Chopart in 33.3% (133/400) and 1.8%(7/400)had both.The most common associated fracture was fibular diaphysis (8.5%;34/400).CT had the highest overall sensitivity (98.5%;203/206),followed by MRI (98.3%;58/59),weight bearing radiography (81.3%;65/80)and plain radiography (79.7%;286/359).Overall, CT and MRI were significantly more sensitive than plain radiography and weight bearing radiography(all $p<0.001$). Fractures were missed in 19.2%(77/400)of first visits.In missed cases,MRI and CT were significantly more sensitive (97.7% and 92.9% respectively)comparing weight bearing radiography(42.9%)and plain radiography (18.1%)(all $p<0.05$).Most common trauma history was low-energy (66.0%;264/400).Low-energy trauma cases were significantly missed more than high-energy trauma ($p=0.04$). In low-energy trauma,plain radiography and weight bearing radiography had the sensitivity of 77.5%and 80.3%respectively.CT and MRI are next steps and significantly more sensitive (99.1% and 98.0%respectively;both $p<0.001$).In high-energy trauma,first step is plain radiography (82.9%sensitive)followed by CT which is significantly more sensitive(97.9%;$p<0.001$).

CONCLUSION

Lisfranc and Chopart fractures were missed in the first presentation in19.2%of patients.Overall,CT and MRI were more sensitive to detect these fractures.If radiographs are negative in the first visit and clinical suspicion remains for midfoot fracture,CT or MRI are both equally efficient for the diagnosis of midfoot fractures.

CLINICAL RELEVANCE/APPLICATION

This study provides an opportunity to reassess imaging appropriateness of acute midfoot fractures to reduce delayed diagnosis that negatively impact patient care

SSQ05-03 The (Lack of) Impact of Published Guidelines on Appropriate Imaging for Low Back Pain in the Emergency Department

Thursday, Dec. 1 10:50AM - 11:00AM Room: S405AB

Awards
Student Travel Stipend Award

Participants
Sarvenaz Pourjabbar, MD, New Haven, CT (*Presenter*) Nothing to Disclose
Ali Raja, MD, MBA, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Ivan Ip, MD, MPH, Brookline, MA (*Abstract Co-Author*) Nothing to Disclose
Ramin Khorasani, MD, Boston, MA (*Abstract Co-Author*) Consultant, Medicalis Corp

PURPOSE

To quantify the impact of a Clinical Practice Guideline for imaging of patients with low back pain (LBP) (published by the American College of Physicians and the American Pain Society in 2007) on imaging practices in the emergency department (ED).

METHOD AND MATERIALS

Informed consent was waived for this IRB-approved retrospective observational study. ICD-9 diagnosis codes were used to fetch ED visits related to low back pain in patients 18-64 years old in two 2-year periods: 2005/2006 (just before the guideline was published) and 2013/2014 (5 years after the guideline was published). Imaging performed within 24 hours of the ED admission was considered related to that visit. As per the guideline, each imaging indication was linked to specific diagnosis and procedure codes (ICD-9/CPT) which was used to confirm appropriateness of the imaging. In order to verify the accuracy of ICD-9/CPT method, 160 charts were randomly selected from the study cohort and manually reviewed. The primary outcome was the overall utility of imaging and the secondary outcome was the proportion of inappropriate imaging. Chi-square test was used to compare the pre and post guideline publication groups.

RESULTS

In 2005/2006, 3,221 unique ED visits (age: 40.4 ± 10, F:M 1235:1986) were due to low back pain, compared to 3,766 in 2013/2014 (age: 42.5 ± 12, F:M 1621:2145). Chart review of 160 charts showed a sensitivity and specificity of 89% & 96% using the ICD-9/CPT codes. The use of cross-sectional imaging for these patients increased from 46% to 58% over the two time periods ($p=0.0001$), however, the proportion of imaging not adherent to the guidelines remained the same (61%, p-value= 0.6). In patients with imaging indicated by the guideline, 29.8% (337/960) in 2005-2006 and 42% (412/986) in 2013-2014 had imaging performed ($p=0.002$).

CONCLUSION

The implementation of the guideline resulted in an overall increase in imaging, primarily due to an increase in the amount of imaging of patients who met appropriate guideline criteria. Inappropriate imaging did not decrease; suggesting that guideline publication alone is unlikely to change image-ordering behavior

CLINICAL RELEVANCE/APPLICATION

Publication of a Clinical Practice Guideline for low back pain imaging has not optimized imaging use.

SSQ05-04 Is MR of the C-spine in Acute Trauma Patients Indicated?

Thursday, Dec. 1 11:00AM - 11:10AM Room: S405AB

Participants
Marlen Pajcini, MD, San Jose, CA (*Presenter*) Nothing to Disclose
Mahesh R. Patel, MD, San Jose, CA (*Abstract Co-Author*) Nothing to Disclose
Rajul P. Pandit, MD, San Jose, CA (*Abstract Co-Author*) Nothing to Disclose
John Sherck, MD, San Jose, CA (*Abstract Co-Author*) Nothing to Disclose
Adella Garland, San Jose, CA (*Abstract Co-Author*) Nothing to Disclose
Young S. Kang, MD, San Jose, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

In recent years, MR of the cervical spine has become part of the routine imaging protocol for selected indications in many trauma centers. Because of the expense and complex operational requirements of MR, it is imperative to establish its effectiveness. While there is ample anecdotal evidence and some clinical series demonstrating the utility of MR, we set out to examine the spectrum and frequency of findings in MR performed on patients presenting to our Level I trauma center.

METHOD AND MATERIALS

A retrospective review of consecutive C-spine MR imaging studies over a two-year period ordered in the context of an acute trauma was performed. Each study was assessed for the presence of the following findings: cord injury, ligamentous injury, soft tissue/muscle injury, marrow/disc injury, and/or vascular injury. If none of these acute findings were present or if the MR study demonstrated only findings that were seen on prior imaging studies, the study was categorized as negative for the purposes of the analysis.

RESULTS

241 studies were identified. Indications included neurologic deficit or inability to perform clinical assessment. Cord injury was noted in 17% (41/241), ligamentous injury in 43% (104/241), soft tissue/muscle injury in 29% (69/241), marrow/disc injury in 28% (67/241), and vascular injury in 12% (28/241). 36% (86/241) of the analyzed studies were negative for acute findings or only demonstrated findings that were previously known from prior imaging.

CONCLUSION

Ligamentous injury is the most common pathological finding in MR. Cord injury, which can have the most severe clinical repercussions, was the least frequent finding at 17%. Slightly over one-third of analyzed cases were negative for any acute findings or demonstrated findings that had been previously described. This indicates that in the majority of trauma patients for which a C-spine MR study is ordered, an acute finding is generally present. While there may be variations in treatment protocols among trauma centers in response to specific findings on MR, the overall high frequency of positive findings found in our study validates the general concept of the use of MR in acutely injured patients who demonstrate neurologic deficit or cannot be assessed clinically.

CLINICAL RELEVANCE/APPLICATION

Understanding the frequency of findings on C-spine MR imaging studies on acute trauma patients can allow radiologists to guide ordering physicians in appropriate utilization.

SSQ05-05 The Impact of Total Spine MRI on Targeted Patient Selection for Surgical Therapy of Geriatric Vertebral Fractures

Thursday, Dec. 1 11:10AM - 11:20AM Room: S405AB

Participants
Christoph Weber, MD, Hamburg, Germany (*Presenter*) Nothing to Disclose
Corinna Ossadnik, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Theo Abel, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Jonas Hafner, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Hannah Hentschel, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Peter Bannas, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the diagnostic accuracy of total spine MRI in the diagnosis of vertebral fractures in comparison to conventional radiographs (CR) and to evaluate its effect on surgical therapy (vertebro-/kyphoplasty, spondylodesis etc.) in geriatric patients.

METHOD AND MATERIALS

The vertebral bodies (n=2736) of 114 "geriatric" patients, average age 84y (75-96y) were measured by the method of Genant on total spine MRI and CR performed on average within 2d (0-17d) before to determine morphology (normal, wedge, biconcave, crush) and to graduate deformity."Geriatric" was defined as age >75y. All patients suffered from back pain after mild trauma. Two radiologists independently evaluated the images (T1/T2/STIR sequences). Interobserver agreement was assessed by kappa statistics. Surgical treatment was indicated, when the fracture was fresh (fluid sign on edema sensitive STIR sequence, fracture line), the patient had <5 total fractures and the posterior border was involved.

RESULTS

Qualitatve analysis revealed n=520/2736 vertebral bodies fractured, quantitatve analysis by the method of Genant increased the amount of vertebral fractures/deformities to n=1062/2736. The presence of a fluid sign on STIR sequences and a fracture line indicated the recentness of the vertebral fracture in 7% (n=202/2736) of vertebral bodies measured. 38 % (n=78//202) of these recent fractures were missed on CR (p=0.019), 7 % (n=14/202) were distant from the location of pain and not imaged by CR. The method of Genant revealed a reduction of heights in deformed vertebral bodies of ~3 mm, either on CR and MRI. Surgical therapy was indicated in 53% (n=60/114) patients, 55% (n=33/60) rejected the recommended surgical intervention, 18% underwent

vertebro-/kphoplasty, 6% spondylodesis. Surgical therapy was predominantly indicated based on MRI data. κ-scores for interobserver agreement for existing fractures were as follows: MRI, κ = 0,754; CR, κ = 0,488; for posterior border involvement, respectively: MRI, κ = 0,718; CR, κ = 0,567.

CONCLUSION

Interobserver agreements were much better for MRI than for CR. For an accurate selection of patients with vertebral fractures for surgical therapy after mild trauma total spine MRI represents a significant improvement to detect recent vertebral fractures in geriatric patients.

CLINICAL RELEVANCE/APPLICATION

Total spine MRI is the method of choice to detect vertebral fractures and to select vertebral fractures for surgical therapy in geriatric patients.

SSQ05-07 140 kVp Spectral Filtration CT of the Lumbar Spine: Reduced Radiation Dose in the Emergency Setting

Thursday, Dec. 1 11:30AM - 11:40AM Room: S405AB

Awards
Student Travel Stipend Award

Participants
Sheldon J. Clark, MD, Vancouver, BC (*Presenter*) Nothing to Disclose
Bo Gong, MSc, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Patrick J. Slipp, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Michael E. O'Keeffe, MBBCh, Vancouver, BC (*Abstract Co-Author*) Speaker, Siemens AG
Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG
Patrick D. McLaughlin, FFRRCSI, Vancouver, BC (*Abstract Co-Author*) Speaker, Siemens AG

PURPOSE

Imaging of the lumbar spine is often indicated in symptomatic patients who have undergone low velocity trauma. The purpose of this study is to compare image quality and diagnostic accuracy of a conventional 120 kVp CT with a 140 kVp CT with tin filter in acute trauma patients. A 140 kVp with tin filter CT can be obtained at 1/3 of the dose of a conventional 120 kVp CT.

METHOD AND MATERIALS

Institutional review board approval was obtained, with no informed consent required, for this retrospective analysis. 97 consecutive trauma patients underwent abdominal scans using a dual source, dual energy 128-slice CT system (Definition FLASH; Siemens Healthcare, Forchheim, Germany). Image noise, spatial resolution, contrast resolution, diagnostic acceptability, and diagnostic accuracy for fractures/soft tissue injuries were compared between the conventional 120 kVp CT (mixed data set) and the 140 kVp with tin filter CT (single data set) using a 10 point scoring system (1=unacceptable, 5=acceptable, 10=excellent). These parameters were reviewed by two radiologists. Analysis between the two CT data sets were analyzed using one-way paired-t-tests.

RESULTS

The average radiation dose for the conventional 120 kVp CT was 6.1 +/- 2.3 mSv. The 140 kVp with tin filter CT is approximately 1/3 of the dose, and would be 2 mSv. Image noise, spatial resolution, contrast resolution, diagnostic acceptability, and diagnostic accuracy were well matched between the two readers. There were statistically significant ($p<0.05$) decreases in image noise (9.7+/-0.5 vs. 8.4 +/-0.9), spatial resolution (9.6+/-0.6 vs. 8.4+/-1.0), contrast resolution (9.3+/-0.8 vs. 8.0+/-1.0), and diagnostic acceptability (9.97 +/- 0.17 vs. 9.91+/-0.29). No fractures or soft tissue injuries were missed in either data sets.

CONCLUSION

No fractures or soft tissue injuries were missed on the 140 kVp with tin filter CT when compared with the conventional 120 kVp CT. While image quality was statistically decreased, all parameters were within the range of acceptability. These results suggest that in specific cases, an ultra low dose lumbar spine imaging protocol can be performed at 1/3 of the conventional dose.

CLINICAL RELEVANCE/APPLICATION

The ability to acquire a CT examination of the lumbar spine at approximately 1/3 of the conventional dose with no degradation in image quality or reduction in diagnostic accuracy for vertebral body fracture or soft tissue injury is a substantial benefit.

SSQ05-08 Is Tomosynthesis More Accurate than Radiography in Detecting Subtle Hip Fractures?

Thursday, Dec. 1 11:40AM - 11:50AM Room: S405AB

Participants
Naveen Parasu, MBBS, Hamilton, ON (*Presenter*) Nothing to Disclose
Jane Castelli, Hamilton, ON (*Abstract Co-Author*) Nothing to Disclose
Sandra Monteiro, PhD, Hamilton, ON (*Abstract Co-Author*) Nothing to Disclose
David A. Koff, MD,FRCPC, Hamilton, ON (*Abstract Co-Author*) Stockholder, Real Time Medical, Inc Spouse, President, Real Time Medical, Inc
Katelyn Nye, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company
John M. Sabol, PhD, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company

PURPOSE

Digital tomosynthesis with flat-panel detector radiography is a novel application that allows easy, swift volume data acquisition of any anatomical site of interest with arbitrary patient posture. A single sweep of the X-ray tube provides multiple tomographic images of high resolution giving superior anatomical detail, potentially demonstrating fractures not identified on radiographs. The purpose of this study is to demonstrate that using digital tomosynthesis, in conjunction with radiographs, is better at detecting subtle and occult hip fractures than radiographs alone.

METHOD AND MATERIALS

This was a prospective 8-month study that assessed adult patients presenting to ER with a suspected hip fracture following a fall. For study purposes, a hip fracture was defined as involving either proximal femur or pelvis. Patients with prior hip fractures or surgery were excluded from study. 62 patients (M=24; F=38; average age=79 yrs) without an obvious hip fracture on radiographs (as determined by the technologist) proceeded immediately to tomosynthesis. Images were reviewed by musculoskeletal radiologists.

RESULTS

Of the 62 patients, 15 had hip fractures confirmed by either surgery or medical treatment. CT confirmed fracture in 3 patients.The fracture location and corresponding patient numbers were as follows: Femoral neck/intertrochanteric region (5); acetabulum (5); pubic rami (4); sacral ala (1). 6 patients (5 femoral and 1 acetabular fracture) had surgical management.Radiographs showed fracture in 8 of the 15 patients with no false positive cases (sensitivity=53%; specificity=100%). Tomosynthesis detected all 15 fractures with no false positive cases (sensitivity and specificity were both 100%).Among the 47 patients with no fractures, 3 had CT while 2 had MRI, which confirmed no evidence of bony trauma. The remaining 42 patients had their medical records reviewed 30 days following their initial ER visit and discharge, which confirmed no further admissions from the initial hip injury.

CONCLUSION

The study shows that tomosynthesis is an accurate imaging modality in detecting subtle, nondisplaced hip fractures which may not be readily apparent on initial radiographs.

CLINICAL RELEVANCE/APPLICATION

Digital tomosynthesis provides an early and accurate diagnosis of hip fractures, particularly in centers where CT or MRI is not readily available and is also significantly less expensive.

SSQ05-09 Systematic Radiation Dose Reduction in Cervical Spine Computed Tomography of Human Cadaveric Specimens - How Low Can We Go?

Thursday, Dec. 1 11:50AM - 12:00PM Room: S405AB

Participants
Anna Hirschmann, MD, Basel, Switzerland (*Presenter*) Nothing to Disclose
Dorothee Harder, Basel, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Clemens Reisinger, MD, Basel, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Johanna Lieb, Basel, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Zsolt Szucs-Farkas, MD, PhD, Berne, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Sebastian T. Schindera, MD, Basel, Switzerland (*Abstract Co-Author*) Research Grant, Siemens AG; Research Grant, Ulrich GmbH & Co KG; Research Grant, Bayer AG; Speakers Bureau, Bayer AG
Magdalini Tozakidou, MD , Basel, Switzerland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare image quality of computed tomography (CT) images of the cervical spine of cadaveric specimens at different radiation dose levels reconstructed with a filtered back projection (FBP) and an iterative reconstruction (IR) algorithm.

METHOD AND MATERIALS

The cervical spine of four human formalin-fixated cadavers (mean BMI; 30.5 kg/m2 ± 5.2; range 24-36) was examined using a 128-MDCT scanner (DefinitionAS/Siemens) at nine different reference tube current-time products (45/ 75/ 105/ 135/ 150/ 165/ 195/ 275/ 355 mAs) and a tube voltage of 120 kVp. Automatic tube current modulation was applied (CareDose 4D). Data were reconstructed using both FBP and IR (SAFIRE/Siemens; strength 3). Morphological characteristics (vertebral cortex, anterior/posterior vertebral integrity, conspicuity of trabecular bone, posterior vertebral alignment, facet joint alignment) were quantified on a Likert-scale for each cervical segment by four independent and blinded radiologists. Subjective image noise was evaluated on a three-point scale. Signal-to-noise ratio (SNR) was measured. Statistical analysis included analysis of variance and Tukey's-test.

RESULTS

IR provided significantly better image quality than FBP (P<0,001); noise increased as radiation dose decreased. Subjective image noise at levels C1-C4 was rated as either "no noise" or as "acceptable noise" in all scans. At lower spine levels subjective image noise was not acceptable, even at 355 mAs. Shoulder position of all human cadaveric specimens was found to be at level C5. Analyzing all spinal levels, scores for morphological characteristics revealed no significant differences between 105 and 355 mAs (P=0,555), but were significantly worse in scans at lower 45 (P < 0,001) and 75 mAs (P=0,025).

CONCLUSION

Clinically acceptable image quality of the cervical spine of cadaveric specimens with different body habitus can be achieved with reference mAs of 105. High position of the shoulders is a limiting factor even with high radiation doses; therefore pulldown of both shoulders during acquisition is fundamental.

CLINICAL RELEVANCE/APPLICATION

Radiation dose for cervical spine CT may be significantly reduced in patients with a low shoulder position.

SSQ06

Gastrointestinal (MRI Techniques and Contrast Media)

Thursday, Dec. 1 10:30AM - 12:00PM Room: E350

GI MR SQ

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

FDA Discussions may include off-label uses.

Participants
Scott B. Reeder, MD, PhD, Madison, WI (*Moderator*) Institutional research support, General Electric Company Institutional research support, Bracco Group
Jason A. Pietryga, MD, Riverside, RI (*Moderator*) Nothing to Disclose

Sub-Events

SSQ06-01 The Value of Magnetic Resonance Elastography in Differential Diagnosis Between Benign Malignant Focal Liver Tumor

Thursday, Dec. 1 10:30AM - 10:40AM Room: E350

Participants
Kan Liu, MD, beijing, China (*Presenter*) Nothing to Disclose
Han Ouyang, MD, Bejing, China (*Abstract Co-Author*) Nothing to Disclose
Chunwu Zhou, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Xinming Zhao, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine magnetic resonance elastography for differentiating malignant and benign focal liver tumor.

METHOD AND MATERIALS

Imaging was performed on a 3.0-T clinical MR scanner equipped with a 32-element phased-array torso coil. Ninety patients were subjected to conventional plain scan and dynamic contrast-enhanced imaging (DCE) as well as magnetic resonance elastography (MRE). The MR elastography were acquired by using 60-Hz mechanical waves and two-dimensional Spin echo echo planar sequence (2D-SE-EPI). Elastogram was generated in an automated process consisting of an inversion algorithm. The stiffness value was measured in the elastogram of 86 tumors after exclusion of cyst, histopathologically undetermined or examination failed cases. Mann-Whitney U test and receiver-operating characteristic curve were performed on the stiffness values for differentiation of 41malignant tumors (24 hepatocellular carcinoma, 10 cholangiocarcinoma, 2 combined hepatocellular and cholangiocarcinoma,1 sarcomatoid carcinoma, 4 metastatic lesions) and 45 benign tumors(28 hemangiomas, 16 focal nodular hyperplasia, and 1 angiomyolipoma) .

RESULTS

Malignant focal liver tumors had significantly greater mean shear stiffness than benign focal liver tumor (7.64 ±2.4kPa vs 3.8 ±1.6kPa), they have statistically significant difference($p<0.01$).The area under the receiver-operating characteristic curve is 0.933.

CONCLUSION

MR elastography can help differentiating malignant and benign focal liver tumors

CLINICAL RELEVANCE/APPLICATION

In addition to conventional MRI techniques, MR elastography can iprove the ability of diagnosis of benign and malignant focal liver tumors.

SSQ06-02 Body Composition Profiling using MRI - Normative Data for Subjects with Diabetes Extracted from the UK Biobank Imaging Cohort

Thursday, Dec. 1 10:40AM - 10:50AM Room: E350

Participants
Olof Dahlqvist Leinhard, PhD, Linkoping, Sweden (*Presenter*) Stockholder, AMRA AB; Employee, AMRA AB
Jennifer Linge, Linkoping, Sweden (*Abstract Co-Author*) Employee, AMRA AB
Janne West, MSc, PhD, Linkoping, Sweden (*Abstract Co-Author*) Employee, AMRA AB; Stockholder, AMRA AB
Jimmy D. Bell, PhD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Magnus Borga, PhD, Linkoping, Sweden (*Abstract Co-Author*) Stockholder, AMRA AB

PURPOSE

To describe the distribution of MRI derived body composition measurements in subjects with diabetes mellitus (DM) compared to subjects without diabetes.

METHOD AND MATERIALS

3900 subjects (1864 males and 2036 females) from the UK Biobank imaging study were included in the study. The age range was 45 to 78 years. Visceral adipose tissue volume normalized with height^2 (VATi), total abdominal adipose tissue volume normalized with height^2 (ATATi), total lean thigh muscle volume normalized with body weight (muscle ratio) and liver proton density fat fraction (PDFF) were measured with a 6 minutes 2-point Dixon imaging protocol covering neck to knee and a 10-point Dixon single axial slice

protocol positioned within the liver using a 1.5T MR-scanner (Siemens, Germany). The MR-images were analyzed using AMRA® Profiler research (AMRA, Sweden). 194 subjects with clinically diagnosed DM (DM group) were age and gender matched to subjects without DM (control group). For each variable and group, the median, 25%-percentile and 75%-percentile was calculated. Mann-Whitney U test was used to test the observed differences.

RESULTS

VATi in the DM group was 2.13 (1.43-2.62) l/m^2 (median, 25% - 75% percentile) compared to 1.32 (0.86 - 1.79) l/m^2 in the control group. ATATi in the DM group was 4.94 (3.86-6.19) l/m^2 compared to 3.40 (2.56 - 4.70) l/m^2 in the control group. Muscle ratio in the DM group was 0.13 (0.11 - 0.14) l/kg compared to 0.14 (0.12 - 0.15) l/kg in the control group. Liver PDFF in the DM group was 7.23 (2.68 - 13.26) % compared to 2.49 (1.53 - 4.73) % in the control group. Mann-Whitney U test detected significant differences between the DM group and the control group for all variables (p<10-5).

CONCLUSION

DM is strongly associated with high visceral fat, liver fat, and total abdominal fat, and low muscle ratio.

CLINICAL RELEVANCE/APPLICATION

Body composition profiling shows high potential to provide direct biomarkers to improve characterization and early diagnosis of DM.

SSQ06-03 Evaluation of Different Contrast Agent Application Protocols in Relation to Respiratory Motion Artifacts at Gadoxetate Disodium-Enhanced MRI

Thursday, Dec. 1 10:50AM - 11:00AM Room: E350

Participants
Kristina I. Ringe, MD, Hannover, Germany (*Presenter*) Nothing to Disclose
Christian Von Falck, MD, Hannover, Germany (*Abstract Co-Author*) Research Grant, Pro Medicus Limited Research Grant, Siemens AG
Hans-Juergen Raatschen, MD, 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;
Jan Hinrichs, MD, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the influence of different contrast agent application parameters on the occurrence of respiratory motion artifacts after gadoxetate disodium injection.

METHOD AND MATERIALS

200 patients (m=129, f=71; mean age 51y) who underwent a clinical routine liver MRI including gadoxetate disodium injection were included in this retrospective IRB approved study. Contrast agent application protocols (n=4) differed with regards to injection rate (1 or 2ml/s), dose (0.1ml/kg or fixed dose of 10ml) and nasal oxygen application (no or yes). For quantitative analysis, two radiologists in consensus performed arterial phase SNR measurements in the aorta and portal vein. Two different readers separately assessed the degree of motion artifacts (5-point scale) as well as arterial phase image quality (4-point scale). Quantitative and qualitative results were compared (Kruskal-Wallis Test, Dunn's multiple comparison Test). The influence of different contrast agent application parameters on the occurrence of respiratory motion artifacts was assessed using univariate analysis (p<0.05 deemed significant).

RESULTS

Use of a lower contrast injection rate resulted in significantly higher SNRs in the aorta and portal vein (p<0.05). Severe motion artifacts were observed in 11.5% of examinations, with no significant difference between protocols. At univariate analysis, injection rate, dose and oxygen application had no significant influence on the incidence or degree of severe respiratory artifacts (p>0.05).

CONCLUSION

Severe respiratory motion artifact at gadoxetate disodium-enhanced MRI is a known adverse effect. Technique specific factors regarding the mode of contrast application do not seem to significantly reduce the incidence of this phenomenon.

CLINICAL RELEVANCE/APPLICATION

Contrast dose, injection rate and supporting transnasal application of oxygen do not seem to significantly reduce the occurrence of severe motion artifacts at gadoxetate disodium-enhanced MRI.

SSQ06-04 Usefulness of Oxygen Inhalation in Patients with a Prior Episode of Arterial Phase Motion Associated with Gadoxetate Disodium: Intraindividual Comparison of Sequential Studies

Thursday, Dec. 1 11:00AM - 11:10AM Room: E350

Participants
Tomohiro Namimoto, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Kie Shimizu, kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Masataka Nakagawa, Kumamoto, Japan (*Presenter*) Nothing to Disclose
Seitaro Oda, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Takeshi Nakaura, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Daisuke Utsunomiya, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Yasuyuki Yamashita, MD, Kumamoto, Japan (*Abstract Co-Author*) Consultant, DAIICHI SANKYO Group

PURPOSE

To determine whether the use of oxygen inhalation provides adequate image quality in patients with a prior episode of transient severe motion (TSM) , based on severe arterial phase motion, despite minimal motion in the other dynamic phases on liver magnetic resonance (MR) images obtained with gadoxetate disodium.

METHOD AND MATERIALS

This prospective study was approved by the institutional review board. The requirement to obtain informed consent was waived. Fifty-one consecutive patients with TSM at the previous study with bolus injection of gadoxetate disodium were evaluated. Qualitative evaluation of TSM in this examination with oxygen inhalation (2L/min) was compared between patients who had TSM in their previous examination. And qualitative evaluation of TSM in the examination before previous examination without oxygen inhalation was compared between patients who had TSM in their previous examination in 35 patients. Two radiologists independently evaluated for the contrast material rated motion on a scale of 1 (non-diagnostic images) to 4 (no motion) at the arterial phase of dynamic MR imaging. Motion scores were compared by using the Wilcoxon signed rank test. The kappa statistic was determined to evaluate the agreement between two readers.

RESULTS

Mean motion scores in latest examinations with oxygen inhalation were significantly higher for patients who had TSM in their previous examination at arterial phase: Reviewer 1 (R1) 2.51 ± 0.70 vs 1.80 ± 0.57 (P < .0001); Reviewer2 (R2) 2.51 ± 0.70 vs 1.84 ± 0.67 (P < .0001), kappa=0.84, 0.74, respectively. Mean motion scores in the examination before previous examination without oxygen inhalation were slightly higher for patients who had TSM in their previous examination: R1 2.03 ± 0.79 vs 1.80 ± 0.57 (P = .085); R2 1.97 ± 0.79 vs 1.84 ± 0.67 (P =.391) , kappa=0.90, 0.74, respectively.

CONCLUSION

Use of oxygen inhalation improved image quality in patients with a prior episode of arterial phase TSM in liver MR imaging with gadoxetate disodium.

CLINICAL RELEVANCE/APPLICATION

Use of oxygen inhalation improves image quality in patients with a prior episode of arterial phase transient severe motion in liver MR imaging with gadoxetate disodium.

SSQ06-05 Intravenous Gadoxetate Disodium Administration Reduces Breath-Holding Capacity in the Hepatic Arterial Phase - A Multi-Center Randomized Placebo-Controlled Trial

Thursday, Dec. 1 11:10AM - 11:20AM Room: E350

Participants
Taylor McClellan, BS, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Utaroh Motosugi, MD, Yamanashi, Japan (*Abstract Co-Author*) Nothing to Disclose
Michael S. Middleton, MD, PhD, San Diego, CA (*Abstract Co-Author*) 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
Brian C. Allen, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Tracy A. Jaffe, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Chad M. Miller, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Scott B. Reeder, MD, PhD, Madison, WI (*Abstract Co-Author*) Institutional research support, General Electric Company Institutional research support, Bracco Group
Claude B. Sirlin, MD, San Diego, CA (*Abstract Co-Author*) Research Grant, General Electric Company; Research Grant, Siemens AG; Research Grant, Guerbet SA; ;
Mustafa R. Bashir, MD, Cary, NC (*Presenter*) Research support, Siemens AG; Research support, Guerbet SA; Research support, General Electric Company; Imaging Core Lab, NGM Biopharmaceuticals; Imaging Core Lab, TaiwanJ Pharma

PURPOSE

To determine, in a multi-center, double-blinded placebo-controlled trial, whether hepatic arterial phase breath-holding duration is affected by gadoxetate disodium administration.

METHOD AND MATERIALS

IRB approval was obtained for this prospective, multi-institutional HIPAA-compliant study; written informed consent was obtained from all subjects.At three sites, a total of forty-four volunteers each underwent an MRI examination in which images were acquired before and dynamically after bolus injection of gadoxetate disodium, normal saline, and gadoterate meglumine, administered in random order. The technologist and volunteer were blinded to the agent. Arterial phase breath-holding duration was timed after each injection, and volunteers reported subjective symptoms. Heart rate (HR) and oxygen saturation were monitored. Images were independently analyzed for motion artifacts by three radiologists. Arterial-phase breath-holding duration and motion artifacts after each agent were compared using the Mann-Whitney-U test and the McNemar test. Factors affecting the above outcomes were assessed using a multi-step linear modeling procedure.

RESULTS

Arterial-phase breath-holds were shorter after gadoxetate disodium (mean 32±19 sec) than after saline (mean 40±17 sec, p<0.001) or gadoterate meglumine (43±21 sec, p<0.001). In 80% (35/44) of subjects, arterial phase breath-holds were shorter after gadoxetate disodium than after both saline and gadoterate meglumine. 7% (3/44) of volunteers had severe arterial phase motion artifacts after gadoxetate disodium, 2% (1/44, p=0.62) after gadoterate meglumine, and none (0/44, p=0.25) after saline. HR and oxygen saturation changes were small and not significantly associated with contrast agent.

CONCLUSION

Hepatic arterial phase breath-holding duration is reduced following gadoxetate disodium administration in healthy volunteers.

CLINICAL RELEVANCE/APPLICATION

Hepatic arterial phase breath-holding duration is reduced following gadoxetate disodium administration in healthy volunteers. Despite prior controversies regarding whether hepatic arterial phase artifacts are due to motion or non-motion artifacts, this study shows that arterial phase breath holding is impaired and causes motion artifacts.

SSQ06-06 Initial Clinical Experience using An Abbreviated Hepatobiliary Phase-Based MR Protocol for HCC Screening in Cirrhotic Patients

Thursday, Dec. 1 11:20AM - 11:30AM Room: E350

Awards
Student Travel Stipend Award

Participants
Ryan L. Brunsing, MD, San Diego, CA (*Presenter*) Nothing to Disclose
Alexandra A. Schlein, BS, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Paul M. Murphy II, MD, PhD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Yuko Kono, MD, PhD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Rohit Loomba, MD, MSc, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Robert M. Marks, MD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Bachir Taouli, MD, New York, NY (*Abstract Co-Author*) Consultant, MEDIAN Technologies ; Grant, Guerbet SA
Claude B. Sirlin, MD, San Diego, CA (*Abstract Co-Author*) Research Grant, General Electric Company; Research Grant, Siemens AG; Research Grant, Guerbet SA; ;
Alexander L. Kuo, MD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Hepatocellular carcinoma (HCC) surveillance has been shown to improve survival in patients with cirrhosis. Multiphasic contrast-enhanced MRI has higher sensitivity than other surveillance modalities, however widespread adoption of MRI-based surveillance is limited by cost, acquisition time, and availability. A rapid acquisition MRI protocol could address two of these limitations as the cost of MRI is driven partly by scan time. Previous work has demonstrated that a gadoxetate-enhanced, hepatobiliary-phase (HBP) abbreviated MRI (AMRI) protocol has higher sensitivity than reported values for ultrasound and CT. Here we present our institution's initial clinical experience after implementing AMRI for HCC surveillance.

METHOD AND MATERIALS

Between August 2014 and March 2016, 284 patients (91% with cirrhosis, 58% male, age 19-83) underwent AMRI including T2-weighted SSFSE, T1-weighted gadoxetate-enhanced HBP, and diffusion weighted images (DWI); requiring approximately 5.5 minutes of nominal scan time and 15-20 minutes of actual time. Scans were acquired on 1.5T or 3T clinical scanners, read by the radiologists on the clinical service, and reported using standard templates. Positive AMRIs triggered multiphasic CT or MRI within 4 weeks, which were interpreted and reported using LI-RADS v2014. Further management was determined by the patient's physicians as informed by these imaging results. Data was collected retrospectively with IRB approval and informed consent waiver; descriptive summaries were prepared.

RESULTS

Of 378 total AMRI scans 36 (9.5%) were positive, including 30 in cirrhotic patients. 23 of 30 underwent multiphasic imaging: 5/23 (22%) had at least one LR-4 or -5 nodule on the initial multiphasic CT or MRI, 2/23 (9%) has at least one LR-4 or -5 nodule on the follow-up multiphasic CT or MRI, and 8/23 (36%) had no observations (false positives). In all, 2.7% of all cirrhotic patients were found to have a LI-RADS 4/5 nodule after positive AMRI. 20 AMRI exams (5.3%) were inadequate.

CONCLUSION

Our initial clinical experience shows the feasibility of applying AMRI-based surveillance clinically. Further research is needed to determine the performance and cost-effectiveness of this approach.

CLINICAL RELEVANCE/APPLICATION

Development of a rapid acquisition lower-cost MRI would broaden the use of MRI-based HCC surveillance, potentially offering higher sensitivity than current recommended surveillance methods.

SSQ06-07 Gadoxetic Acid-Enhanced High Temporal Resolution Hepatic Arterial Phase Imaging: Impact on the LI-RADS Category

Thursday, Dec. 1 11:30AM - 11:40AM Room: E350

Participants
Satoshi Goshima, MD, PhD, Gifu, Japan (*Abstract Co-Author*) Nothing to Disclose
Yoshifumi Noda, MD,PhD, Gifu, Japan (*Presenter*) Nothing to Disclose
Nobuyuki Kawai, MD, Gifu, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroshi Kawada, MD, Gifu, Japan (*Abstract Co-Author*) Nothing to Disclose
Kyongtae T. Bae, MD, PhD, Pittsburgh, PA (*Abstract Co-Author*) Patent agreement, Bayer AG; Patent agreement, Guerbet SA; Patent agreement, Nemoto Kyorindo Co, Ltd;
Masayuki Matsuo, Gifu, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the value of view-sharing multi-hepatic arterial phase (mHAP) imaging for the diagnosis of hypervascular hepatocellular carcinoma (HCC).

METHOD AND MATERIALS

This prospective study was approved our institutional review board and written informed consent was obtained. From May 2014 to December 2015, forty-seven consecutive high-risk patients for HCC underwent gadoxetic acid-enhanced magnetic resonance (MR) image followed by transcatheter arterial chemoembolization (TACE). Hepatic arterial phase images were obtained 5 phases in a row with a shared central k-space of 12.5% within 22 seconds single breath hold, followed by portal venous, late (2 and 3 minutes), and hepatobiliary phase imaging. One-hundred-eight HCC nodules (size: 5–88 mm, mean size: 18.2 mm) confirmed on angiographic CT and lipiodol CT were evaluated for LI-RADS category based on single arterial phase and mHAP findings. Appearances of wash out, capsule, corona enhancement, and image quality were also evaluated using 5-point scale.

RESULTS

Twenty-four HCCs (22.2 %) (size: 6–19 mm, mean size: 12.3 mm) were categorized as LR-3 based on the single arterial phase.

Capsule appearance (25.9 %) and washout (57.4 %) were most frequently observed in late phase (2 minutes) and portal venous phase, respectively. Corona enhancement was observed in 73.1 % of all HCCs. Among the 24 HCCs with LR-3, corona enhancement was observed in 75 % nodules and contributed to upgrade category. No significant difference was found in the frequency of corona enhancement between mHAP and angiographic CT (P = 0.17). Image quality was valued as good or excellent in all cases.

CONCLUSION

View-sharing mHAP was feasible without compromising image quality and contributed to improve diagnostic confidence for hypervascular HCC in gadoxetic acid-enhance MR imaging.

CLINICAL RELEVANCE/APPLICATION

Multi-phasic hepatic arterial phase imaging using view-sharing technique can frequently capture the corona enhancement and improve diagnostic confidence for HCC in gadoxetic acid-enhanced MRI.

SSQ06-08 Quick and Robust Liver Iron Content Determination by MRI at 1.5 T Studied in 195 Patients

Thursday, Dec. 1 11:40AM - 11:50AM Room: E350

Participants
Arthur P. Wunderlich, PhD, Ulm, Germany (*Presenter*) Nothing to Disclose
Holger Cario, Ulm, Germany (*Abstract Co-Author*) Nothing to Disclose
Mario Teigeler, Ulm, Germany (*Abstract Co-Author*) Nothing to Disclose
Meinrad J. Beer, MD, Wuerzburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Stefan A. Schmidt, Ulm, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To validate a quick and robust method for LIC determination based on gradient echo (GRE) MRI in a large patient cohort.

METHOD AND MATERIALS

195 patients (86f, 109m, age range 2 … 80 y, mean 29.1 ± 19.9 y) suspected for liver iron overload were investigated by 1.5 T MRI (Siemens Avanto, Siemens Healthcare, Iselin, NY). LIC reference values were obtained by the MRI based Ferriscan® method. Additionally, transversal slices of the liver were acquired with GRE using whole-body resonator as receiver coil with flip angle (FA) of 20° and 90°, TR 120ms and TE 4.8/19.1ms. Liver-to-muscle signal intensity ratio (SIR) and its uncertainty was calculated by manually placing three ROIs in vessel-free parts of the liver and two in paraspinal muscles. From linear regression of SIR logarithm to reference LIC, a relation was derived to determine LIC based on gradient echo data. Results were tested for diagnostic accuracy compared to reference LIC with respect to the threshold of 4.5 mg/g (80 µmol/g) relevant for treatment management.

RESULTS

LIC determination from GRE data performed excellent. Concerning the 4.5 mg/g threshold, our analysis yielded 48 true negatives (results of both methods below the threshold) and 2 false negatives (only GRE results below the threshold) as well as 143 true positives (above threshold) and 2 false positives. This means a sensitivity of 98.6% ± 1.9%, specifity of 96.0% ± 5.4% and positive/negative predictive value of 98.6%/96%. Accuracy was 98%.

CONCLUSION

The simple SIR approach, eliminating the need for sophisticated mathematics, proved highly efficient using our data analysis approach working with logarithm of intensity ratios. Demand for good signal homogeneity is a limitation, since body volume coil has to be used as receiver. This reduces signal-to-noise ratio and prohibits use of parallel imaging. Despite this, LIC can be determined with high diagnostic accuracy from GRE data requiring only a few breathholds.

CLINICAL RELEVANCE/APPLICATION

GRE MRI based LIC determination using logarithm of liver-to-muscle SIR is quick and easy as well as precise and suitable for clinical routine.

SSQ06-09 Quantitative Measurements for Gadoxetic Acid-Enhanced MRI for Preoperative Prediction of Posthepatectomy Liver Failure in Patients with Hepatocellular Carcinoma: Comparison with Future Remnant Liver Volume and Indocyanine Green Clearance Test

Thursday, Dec. 1 11:50AM - 12:00PM Room: E350

Participants
Dongkyun Kim, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Joon-Il Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Moon Hyung Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jae Young Byun, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sung Eun Rha, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Soon Nam Oh, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Seung Eun Jung, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Michael Y. Park, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To identify if gadoxetic acid-enhanced MR quantitative measurements are useful for predicting posthepatectomy liver failure (PHLF) in hepatocellular carcinoma (HCC) patients by comparison with future remnant liver volume (FRLV) and indocyanine green (ICG) clearance test.

METHOD AND MATERIALS

Preoperative gadoxetic acid-enhanced MR were retrospectively evaluated in 73 consecutive patients with anatomical liver resection of HCC. As quantitative measurement of liver function, relative liver enhancement (RLE) and hepatocyte uptake index (HUI) were measured. RLE was calculated as relative increase of signal intensity of liver parenchyma between unenhanced and hepatobiliary

phase. HUI was calculated as following : VL x [(L20/S20)-1], (VL=liver volume, L20=mean signal intensity of liver, S20=of spleen on hepatobiliary phase). FRLV is expected volume of remnant liver after anatomical resection on preoperative CT. Plasma disappearance rate (PDR) and retention rate at 15 minutes (R15) of ICG were measured. We investigated additional value of multiplication of FRLV by RLE or HUI. Univariate analysis by Mann-Whitney test and multivariate analysis by logistic regression were performed to identify independent predictors of PHLF. To compare predictive performances between them, AUCs from receiver operating characteristic (ROC) were compared. PHLF was defined according to the criteria of International Study Group of Liver Surgery.

RESULTS

18 (24.6%) of 73 patients met the criteria of PHLF. Univariate analysis revealed that all 5 parameters, RLE, HUI, FRLV, ICG-PDR and R15, were significantly associated with PHLF. Multivariate analysis demonstrated that HUI, FRLV and ICG-R15 were independent predictors (p=0.007, 0.042 and 0.022, respectively). AUCs of HUI, FRLV, ICG-R15 and HUI x FRLV were 0.916, 0.840, 0.749 and 0.926. AUC of HUI or HUI x FRLV was significantly higher than that of ICG-R15 (p=0.039 and 0.023). However, AUC of HUI x FRLV was not significantly higher than that of HUI (p=0.252).

CONCLUSION

HUI measured from gadoxetic acid-enhanced MRI is superior than ICG clearance test and can be used to predict PHLF in HCC patients. Addition of FRLV to HUI does not further improve predictive performance for PHLF than HUI alone.

CLINICAL RELEVANCE/APPLICATION

1. Estimated liver function from gadoxetic acid-enhanced MR is superior than ICG clearance test in predicting PHLF.
2. Addition of FRLV to HUI does not further improve predictive performance for PHLF.

SSQ07

Science Session with Keynote: Gastrointestinal (Colon Cancer Screening and Staging)

Thursday, Dec. 1 10:30AM - 12:00PM Room: E353A

GI CT OI

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

Participants
Judy Yee, MD, Clayton, CA (*Moderator*) Research Grant, EchoPixel, Inc
Dushyant V. Sahani, MD, Boston, MA (*Moderator*) Research support, General Electric Company; Medical Advisory Board, Allena Pharmaceuticals, Inc

Sub-Events

SSQ07-01 Gastrointestinal Keynote Speaker: CT Colonography in 2016

Thursday, Dec. 1 10:30AM - 10:40AM Room: E353A

Participants
Judy Yee, MD, Clayton, CA (*Presenter*) Research Grant, EchoPixel, Inc

SSQ07-02 Bowel Preparation in CT Colonography:Is Diet Necessary? (DIETSAN) A Randomized Trial

Thursday, Dec. 1 10:40AM - 10:50AM Room: E353A

Awards
Student Travel Stipend Award

Participants
Domenico De Santis, MD, Charleston, SC (*Presenter*) Nothing to Disclose
Davide Bellini, MD, Latina, Italy (*Abstract Co-Author*) Nothing to Disclose
Damiano Caruso, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Marco Rengo, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Andrea Laghi, MD, Rome, Italy (*Abstract Co-Author*) Speaker, Bracco Group Speaker, Bayer AG Speaker, General Electric Company Speaker, Koninklijke Philips NV

PURPOSE

To investigate whether diet restriction affects the quality of colon cleansing during reduced bowel preparation for CT colonography.

METHOD AND MATERIALS

This pragmatic single-centre randomized trial recruited asymptomatic and symptomatic patients aged 45 years or older and referred by clinicians for CT Colonography. Patients were randomly assigned in a 1:1 ratio, in block of ten, to receive a reduced bowel preparation with diet restriction or the same reduced bowel preparation without diet restriction. All investigators were masked to treatment allocation. The primary endpoint, analyzed by intention to treat, was a composite of indices describing the quality of large bowel cleansing. The trial is registered with ClinicalTrial.gov, number NCT02371655.

RESULTS

100 patients were randomly allocated to treatments (50 with diet restriction; 50 without diet restriction) and were included in intention-to-treat analysis. Six patients withdrew consent, leaving for analysis 46 assigned to reduced bowel preparation with diet restriction and 48 assigned to reduced bowel preparation without diet restriction. The mean residual stool (0.22 of three, 95%CI 0.00-0.44) and fluid burden (0.39 of three, 95%CI 0.25-0.53) scores for patients underwent diet restriction were similar to those in patients didn't follow any diet restriction (0.25, 95%CI 0.03-0.47 [P = .82] and 0.49, 95%CI 0.30-0.67 [P = .38], respectively). Both bowel preparations resulted in optimal colon cleansing. Serious adverse events were absent.

CONCLUSION

A reduced bowel preparation in association with faecal tagging and without any diet restriction demonstrated optimal colon cleansing effectiveness for CT colonography.

CLINICAL RELEVANCE/APPLICATION

Diet restriction during bolowel preparation for CT colonography is not necessary.

SSQ07-03 CT Colonography in Patients with Colon-Containing Hernias

Thursday, Dec. 1 10:50AM - 11:00AM Room: E353A

Participants
Michael S. Furman, MD, Providence, RI (*Presenter*) Nothing to Disclose
Kevin J. Chang, MD, Sharon, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the utility of CT Colonography (CTC) as a noninvasive screening tool in patients with a colon-containing hernia.

METHOD AND MATERIALS

This retrospective analysis was performed under IRB waiver and was HIPAA compliant. A full text search of radiology reports for two hospitals from 2006 to March 2016 was conducted using a data-mining system (Montage, Montage Healthcare Systems,

Philadelphia, PA, USA). A keyword search term of "CT Colonography" and "Hernia" yielded an initial set of reports in which the study indication, the type of hernia, and the contents of the hernia sac were recorded. The C-RADS score was recorded to evaluate diagnostic quality and determine the incompletion rate (i.e. C0 rate). A review of the reports and selected images on PACS was also conducted to determine the cause of exam incompletion.

RESULTS

2100 CTCs were performed during the time period with 433 reports mentioning a hernia. While most of the hernias were either hiatal or without bowel content, 79 patients had hernias containing bowel (3.8%) with 87% of these exams being performed after incomplete colonoscopy (69/79). 51 of these patients had colon-containing hernias (2.4%). 38 cases consisted of herniated colon alone and 13 cases consisted of both herniated small and large bowel. Colon-containing hernia locations were 49% ventral (25/51), 43% inguinal (22/51), and 4% hiatal (2/51), with 1 case each in umbilical, diaphragmatic, and parastomal locations. While the short segments of colon at the hernia neck remained nondistensible, adequate insufflation beyond the hernia sac was possible in 46 cases (90%). 6 cases were C0 with 4 directly related to poor distension beyond the hernia, 1 for poor prep, and 1 for poor distension of the rectosigmoid unrelated to the hernia. No complications occurred during any CTC in the setting of a bowel-containing hernia.

CONCLUSION

Colon containing hernias have long been considered a relative contraindication to CTC. However, these hernias are often the cause of incomplete colonoscopy leaving few alternatives to complete screening of the nonvisualized colon. This review shows a carefully-performed CTC may be performed safely in patients with colon-containing hernias with successful colonic distension beyond the hernia sac achieved in 90% of patients.

CLINICAL RELEVANCE/APPLICATION

CT Colonography is a safe and effective way to screen the colon in patients with colon-containing hernias.

SSQ07-04 Effect of Computer-Aided Detection of Flat Lesions on the Performance of Readers with Various Experience in CT Colonography

Thursday, Dec. 1 11:00AM - 11:10AM Room: E353A

Participants
Yasuji Ryu, MD, Boston, MA (*Presenter*) Nothing to Disclose
Janne J. Nappi, PhD, Boston, MA (*Abstract Co-Author*) Royalties, Hologic, Inc.; Royalties, MEDIAN Technologies;
Minh Phan, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Koichi Hayano, MD, Chiba, Japan (*Abstract Co-Author*) Nothing to Disclose
Chinatsu Watari, MD, boston, MA (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Yoshida, PhD, Boston, MA (*Abstract Co-Author*) Patent holder, Hologic, Inc; Patent holder, MEDIAN Technologies;

PURPOSE

To evaluate the effect of optimized computer-aided detection (CADe) on the performance of human readers in the detection of non-polypoid flat lesions in aymptomatic patients from a large multi-center CT colonography (CTC) clinical trial.

METHOD AND MATERIALS

A total of 200 cathartic CTC cases including examinations with colonoscopy-confirmed, morphologically flat lesions and normal examinations were sampled from a European multi-center CTC trial for asymptomatic patients at increased risk of colorectal cancer. Iodine tagging without or with barium was used in 1/3 of the cases. Three experienced readers (radiologists, surgeon, and internist) and an inexperienced reader reviewed the 200 CTC cases and recorded all detected lesions using primary 3D interpretation and a CADe second-read paradigm, where the CADe that was developed at our institution had been trained with cases independent from this study. The per-patient sensitivities, specificity, and area under the ROC curve (AUC) for the detection of flat lesions were compared between unassisted and CADe-assisted readers.

RESULTS

There were 34 patients (17%) with non-polypoid flat lesions: 17 patients had 18 flat lesions ≥10 mm and 17 had 27 flat lesions 6-9 mm, for which standalone CADe yielded 94% per-patient sensitivities. For the flat lesions ≥6 mm, the average per-patient sensitivities, specificities, and AUCs of the four unassisted readers were 60%, 81%, and 0.71, respectively, whereas those of CADe-assisted readers were 73% (p=.037), 79% (p=.34), and .77 (p=.0036), respectively. For 6-9 mm flat lesions, the corresponding performances were 54%, 83%, and 69% for unassisted readers, whereas those of CADe-assisted readers were 73% (p=.058), 82% (p=.28), and .78 (p=.019), respectively. For the flat lesions ≥10 mm, the performances were 59%, 94%, and .77 for unassisted readers, whereas those of CADe-assisted readers were 64% (p=.093), 94% (p=.76), and .80 (p=.069), respectively.

CONCLUSION

The use of CADe optimized for the detection of flat lesions increased statistically significantly the detection performance as measured by the AUC for ≥6 mm and 6-9 mm flat lesions in asymptomatic patients.

CLINICAL RELEVANCE/APPLICATION

Colorectal flat lesions are often missed in CT colonography examinations; however, the use of computer-aided detection could substantially improve detection sensitivity.

SSQ07-05 Evaluation of a CT Colonography Self-Training Program with or without CAD in Inexperienced Readers

Thursday, Dec. 1 11:10AM - 11:20AM Room: E353A

Participants
Lapo Sali, MD, Florence, Italy (*Presenter*) Nothing to Disclose
Silvia Delsanto, PhD, Torino, Italy (*Abstract Co-Author*) Researcher, im3D SpA
Daniela Sacchetto, Turin, Italy (*Abstract Co-Author*) Researcher, im3D SpA
Andrea Ferraris, MD, Turin, Italy (*Abstract Co-Author*) Nothing to Disclose
Giovanni Gandini, MD, Torino, Italy (*Abstract Co-Author*) Nothing to Disclose

Franco Iafrate Sr, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Andrea Laghi, MD, Rome, Italy (*Abstract Co-Author*) Speaker, Bracco Group Speaker, Bayer AG Speaker, General Electric Company Speaker, Koninklijke Philips NV
Lia Morra, PhD, Torino, Italy (*Abstract Co-Author*) Researcher, im3D SpA
Daniele Regge, MD, Torino, Italy (*Abstract Co-Author*) Speakers Bureau, General Electric Company
Mario Mascalchi, MD, PhD, Florence, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine whether: 1) a CT colonography (CTC) self-training program may improve reading performance of inexperienced readers; 2) CAD use during self-training may influence learning.

METHOD AND MATERIALS

In 3 centers 20 trainees (17 radiology residents, 3 radiologists) with no experience in CTC interpretation were randomized (1:1) to perform a self-training program using specific software (im3D CADCOLON SelfTraining): 1) with CAD as second reader; 2) without CAD. Training dataset consisted of 150 CTCs verified at colonoscopy. After a brief introductory course, an assessment test of 37 cases (21 positive, 24 lesions) with second reader CAD was administered to trainees. The same test was repeated after training. Per-patient sensitivity and specificity, and per-lesion sensitivity of the unassisted phase were calculated. Correlation between baseline and final performance was studied with linear regression analysis. A generalized estimating equation model was applied to evaluate learning and the impact of CAD use during training.

RESULTS

Average per-patient baseline vs. post-training sensitivity and specificity were respectively 93%(390/420) vs. 94%(395/420), and 76%(242/320) vs. 85%(271/320); per-lesion sensitivity was 74% (356/480) vs. 83%(396/480). Improvements in per-patient specificity ($p<0.0001$) and per-lesion sensitivity ($p=0.002$) were statistically significant. A significant inverse correlation was found between baseline performance and learning both for per-patient specificity ($R=-0.77, p<0.0001$) and sensitivity ($R=-0.56, p=0.009$), but not for per-lesion sensitivity ($p=0.77$). After correcting for baseline performance, a significant positive effect on specificity in the final test was observed in the CAD arm compared with the no-CAD arm (no CAD vs. CAD OR:0.46, CI95 %: 0.26-0.81; p=.007). No effect on per-patient or per-lesion sensitivity was observed ($p=0.56$ and $p=0.85$).

CONCLUSION

A self-training program for CTC improves readers' specificity and per-lesion sensitivity. CAD use during training may be beneficial for improvements in specificity.

CLINICAL RELEVANCE/APPLICATION

CAD use during training may help to improve specificity. Further studies to generalize this finding are needed.

SSQ07-06 Forward Projected Model-Based Iterative Reconstruction Solution (FIRST) in Low-Dose CT Colonography: Preoperative Assessment in Patients with Colorectal Cancer

Thursday, Dec. 1 11:20AM - 11:30AM Room: E353A

Participants
Narumi Taguchi, Kumamoto, Japan (*Presenter*) Nothing to Disclose
Seitaro Oda, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Masanori Imuta, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Takeshi Nakaura, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Daisuke Utsunomiya, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Yoshinori Funama, PhD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Hideaki Yuki, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Masafumi Kidoh, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Kenichiro Hirata, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Yasuyuki Yamashita, MD, Kumamoto, Japan (*Abstract Co-Author*) Consultant, DAIICHI SANKYO Group

PURPOSE

The purpose of this study was to assess the effect of forward projected model-based iterative reconstruction solution (FIRST) on the preoperative assessment and planning of colorectal cancer in low-dose CT colonography (CTC).

METHOD AND MATERIALS

We studied 30 consecutive patients with colorectal cancer referred for surgical treatment. All underwent CTC under a standard radiation dose (SD) protocol in the supine position and a low-dose (LD, radiation dose reduction of approximately 85%) protocol in the prone position. The SD protocol images were reconstructed with standard filtered back projection (FBP). The LD protocol images were postprocessed using FBP and FIRST. Objective and subjective image quality parameters were compared among the three different CT image sets. Preoperative evaluation e.g. site, length, and T- and N staging was also performed by two experienced, and compared to post-surgical findings.

RESULTS

FIRST yielded the lowest image noise among the three reconstructions, there was a significant difference among them. The mean visual scores were significantly higher for SD-FBP and LD-FIRST than LD-FBP; those for SD-FBP and LD-FIRST were equivalent. More accurate preoperative information by CTC was obtained under SD-FBP and LD-FIRST than LD-FBP; those of SD-FBP and LD-FIRST were comparable.

CONCLUSION

FIRST can yield significantly improved image quality at low-dose CTC and provide equivalent preoperative information to a standard radiation dose protocol.

CLINICAL RELEVANCE/APPLICATION

FIRST can markedly reduce radiation dose while maintaining sufficient preoperative information.

SSQ07-07 Reducing the Radiation Dose of CT Colonography Applying a Spectral Filtration Technique and Advanced Modeled Iterative Reconstruction in Third-Generation Dual-Source CT: A Pilot Study

Thursday, Dec. 1 11:30AM - 11:40AM Room: E353A

Participants
Jingjuan Liu, MD, Beijing, China (*Presenter*) Nothing to Disclose
Wei Liu, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Huadan Xue, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Zheng Yu Jin, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess whether radiation dose of computed tomography colonography (CTC) could be further reduced while maintaining image quality applying novel spectral filtration and advanced modeled iterative reconstruction (ADMIRE) in third-generation dual-source CT(3rd DSCT).

METHOD AND MATERIALS

This prospective study consecutively included 62 patients, 21 of which were colorectal cancer patients. All patients underwent CTC at low dose protocol in supine position with tin-filtered Sn150kVp, ultra low dose protocol in prone position with tin-filtered Sn100kVp and standard 120kVp protocol in prone position. Both Sn150kVp and Sn100kVp images were reconstructed with ADMIRE of strength level 5, while 120kVp images were reconstructed with filtered back projection (FBP). Effective dose (ED) was compared among three protocols. Image noise (average of four locations) and signal-to-noise ratio (SNR) of psoas muscle and colorectal cancer were measured quantitatively. Qualitative assessment of 2D and virtual endoscopy (VE) were conducted at a five-score scale and were analyzed among different protocols and body mass index (BMI) patients.

RESULTS

ED was significantly lower in the Sn150kVp and Sn100kVp protocol than the 120kVp protocol, resulting in a 21% and 87% decrease (1.60 ± 0.31mSv, 0.26 ± 0.08 mSv vs. 2.02 ± 0.55 mSv; $p < 0.01$). Noise was decreased by 44% for Sn150kVp-ADMIRE5 compared with 120kVp-FBP (10.6±2.3 HU vs. 18.8±2.9 HU, p=0.000) while SNRpsoas and SNRcancer were increased by 85% and 60% (4.60 ± 1.22 vs. 2.48 ± 0.51, p=0.014; 3.91 ± 1.21 vs. 2.45 ± 0.78, p=0.012). Meanwhile, both noise and SNR were not significantly different between 120kVp-FBP and Sn100kVp-ADMIRE5($p>0.05$). Sn150kVp-ADMIRE5 has a better subjective performance than 120kVp-FBP, whereas Sn100kVp-ADMIRE5 were scored lower but still comparably good enough for supplying additional information. Noise and image quality were somewhat compromised with increased BMI, however no significant difference was found among different protocols.

CONCLUSION

Using Sn150kVp and Sn100kVp with ADMIRE reconstruction could reduce radiation dose in CTC by 21% and 87% as compared to conventional 120kVp-FBP protocol. Sn150kVp could provide better image quality. The image quality in Sn100kVp is sufficient for diagnosis although comproised.

CLINICAL RELEVANCE/APPLICATION

CTC at Sn150kVp and Sn100kVp with ADMIRE reconstruction in 3rd DSCT could reduce radiation dose remarkablely with robust image quality, which provides patients an alternative low dose CTC strategy.

SSQ07-08 Comparison of Non-Gaussian and Gaussian Diffusion Models of Diffusion Weighted Imaging at 3.0T MRI: A Pilot Study in Patients with Rectal Cancer

Thursday, Dec. 1 11:40AM - 11:50AM Room: E353A

Participants
Guangwen Zhang, xian, China (*Presenter*) Nothing to Disclose
Jinsong Zhang, Xi'an, China (*Abstract Co-Author*) Nothing to Disclose
Shuangshuang Wang, Xian, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare non-Gaussian diffusion models of diffusion-weighted imaging (DWI) including intra-voxel incoherent motion (IVIM) and stretched-exponential model (SEM) with Gaussian diffusion model at 3.0T MRI in the patients with rectal cancer, and to determine the optimal method for clinical application and further research in rectal carcinoma.

METHOD AND MATERIALS

Fifty nine consecutive patients with pathologically confirmed rectal adenocarcinoma underwent DWI with 16 b factors (0, 10, 20, 30, 40, 60, 80, 100, 150, 200, 400, 800, 1000, 1200, 1500, 2000s/mm2) at 3.0T MR system. DWI signals were fitted to the mono-exponential and non-Gaussian diffusion models (IVIM-mono, IVIM-bi and SEM) on primary tumor and adjacent normal rectal tissue. Standard apparent diffusion coefficient (ADC)derived from mono-exponential model, slow- and fast-ADC, f value (fraction of fast ADC) derived from IVIM model, α value and distributed diffusion coefficient (DDC) derived from SEM model were generated and compared between the tumor and normal tissues.

RESULTS

Stretched-exponential model, IVIM-mono and Mono exponential model can simulate actual attenuation of rectum better than IVIM-bi method. Stretched-exponential model exhibited the best fitting results to actual DWI signals of rectal cancer and normal rectal wall (R2=0.998, 0.999). DDC and α value of stretched-exponential model show significantly statistical differences between tumor and normal rectal wall ($p<0.01$). Statistical differences between tumors and normal rectums were also found in slow-ADC of both IVIM-mono and IVIM-bi, fast-ADC of IVIM-bi and Standard ADC in mono-exponential model ($p<0.01$).

CONCLUSION

Both non-Gaussian and Gaussian diffusion models of DWI could depict diffusion behavior of rectal cancer and normal tissues, of which stretched-exponential model is the most optimized result.

CLINICAL RELEVANCE/APPLICATION

(dealing with multi-b value DWI) SEM could provide much more valuable physiologic and pathologic information for rectal cancer and is recommended in further evaluation of the nature and prognosis of the carcinoma in rectum.

SSQ07-09 Interval Increase in Lesion Enhancement on Hepatocellular Phase Gadoxetic Acid Enhanced MRI is Associated with Complete Response to Neoadjuvant Chemotherapy in Colorectal Liver Metastases

Thursday, Dec. 1 11:50AM - 12:00PM Room: E353A

Awards
Student Travel Stipend Award

Participants
Shahriar Islam, MBBS, London, United Kingdom (*Presenter*) Nothing to Disclose
Shih Zhu R. Yiin, MBBS, FRCR, Singapore, Singapore (*Abstract Co-Author*) Nothing to Disclose
Angela M. Riddell, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Dow-Mu Koh, MD,FRCR, Sutton, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim was to determine whether the degree of enhancement on hepatocellular phase gadoxetic enhanced MRI and the apparent diffusion coefficient (ADC) before and after neoadjuvant chemotherapy could identify pathologic complete responders in colorectal liver metastases (CRLM).

METHOD AND MATERIALS

In this retrospective study, 22 patients (15 M: 7F ; mean age =65) with CRLM treated with neoadjuvant chemotherapy prior to liver resection were evaluated with gadoxetic acid enhanced MRI at 1.5T before and after chemotherapy. Breath-hold T1W and DWI using 4 b-values (0- 750 s/mm2) were performed. Regions of interest were drawn encompassing metastases on T1W images and ADC map by two expert radiologists with over 15 years experience to record their average signal intensities (SI) normalized to the signal intensities of paravertebral muscle and the average ADC value. We compared the median ADC value; pre-contrast and hepatocellular phase normalized SI and their percentage change in pathologic complete responders and pathologic non complete responders before and after chemotherapy using Mann-Whitney test. Receiver operating curve characteristics (ROC) of these parameters were determined. A p-value of < 0.05 was deemed statistically significant.

RESULTS

All patients received FOLFOX/FOLFIRI based-chemotherapy, while 8 received in addition bevacizumab. There were 37 CRLM at histology, of which 10 showed complete pathological response. There was a significant difference in the median percentage increase in the hepatocellular phase normalized SI of CRLM after neoadjuvant chemotherapy between pathologic complete responders (19.4%, 5.6%) and pathologic non complete responders (5.6%, 2.3%) ($p = 0.03$, $P = 0.04$) for readers 1 and 2 respectively. By ROC analysis, an increase in the median hepatocellular phase normalized SI of 19% after chemotherapy has a sensitivity of 67.6% (95%CI: 46-83.5%) and specificity of 44.4% (13.7-78.8%) for identifying pathologic complete responders ($p=0.03$). The other parameters including ADC were not statistically significant.

CONCLUSION

An interval increase in the hepatocellular phase normalized SI of CRLM is associated with pathologic complete response following neoadjuvant chemotherapy.

CLINICAL RELEVANCE/APPLICATION

Non-invasive identification of complete responders to neoadjuvant chemotherapy in CRLM may help to avoid major hepatic surgery.

SSQ08

Science Session with Keynote: Gastrointestinal (Esophagus and Stomach)

Thursday, Dec. 1 10:30AM - 12:00PM Room: E353C

GI CT MR

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

FDA Discussions may include off-label uses.

Participants
Douglas S. Katz, MD, Mineola, NY (*Moderator*) Nothing to Disclose
William C. Small, MD, PhD, Atlanta, GA (*Moderator*) Nothing to Disclose

Sub-Events

SSQ08-01 Gastrointestinal Keynote Speaker: Update on the Role of Imaging in the Management of Esophagus and Gastric Cancer

Thursday, Dec. 1 10:30AM - 10:40AM Room: E353C

Participants
Douglas S. Katz, MD, Mineola, NY (*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/

Douglas S. Katz, MD - 2013 Honored Educator
Douglas S. Katz, MD - 2015 Honored Educator

SSQ08-02 Barium Swallow: Is It Still Useful in Modern Radiology?

Thursday, Dec. 1 10:40AM - 10:50AM Room: E353C

Participants
Cheng Xie, MBChB,BSC, Oxford, United Kingdom (*Presenter*) Nothing to Disclose
Sophie Shilston, Oxford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Peter Cox, Oxford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Horace F. D'Costa, Oxford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Elderly patients complaining of dysphagia but do not meet the criteria for direct endoscopy are often referred for barium swallow examination (BSE) to investigate both structural and functional abnormalities. The purpose of this study was to evaluate the diagnostic accuracy of BSE in the detection of oesophageal malignancy in this group of patients and illustrate its complementary role in modern radiology.

METHOD AND MATERIALS

This is a retrospective cohort study of 200 consecutive patients (mean age 72 years) who had BSE for dysphagia without alarming symptoms of malignancy. Patients' BSE results, subsequent investigations including endoscopy/biopsy, histology, CT and up to 3 years of electronic case notes were reviewed.

RESULTS

BSE showed 22 suspicious malignant strictures, 50 normal findings, 128 benign causes of dysphagia in which 74% were due to dysmotility. Subsequent endoscopy and histology confirmed 15/22 cases of oesophageal malignancy (8 adenocarcinomas; 7 squamous cell carcinomas), 5 benign strictures (Barrett's oesophagus and peptic disease), and 2 normal results. These findings yielded 100% sensitivity, 96.2% specificity of BSE for the detection of oesophageal malignancy in this group of patients. Positive and negative predictive values were 68.2% and 100%, respectively. In addition, a BSE case series was collected to illustrate its role in the diagnosis and exclusion of incidental oesophageal mass.

CONCLUSION

BSE not only plays an important role in the diagnosis of functional oesophageal disorders, but it also demonstrates high sensitivity and specificity in the detection of oesophageal malignancy in the elderly patient with non-specific dysphagia.

CLINICAL RELEVANCE/APPLICATION

For elderly patients complaining of dysphagic symptoms without alarming features of malignancy BSE can serve as an effective first line investigation. This can help reduce the demand of endoscopy for every elderly patient without red flag symptoms and act an alternative investigation for those who are unable to tolerate endoscopy. It is also an useful tool for investigating incidental oesophageal mass found on CT.

SSQ08-04 Abstract Differentiating Malignant from Benign Gastric Mucosal Lesions with Quantitative Analysis in Dual Energy Spectral CT Initial Experience

Thursday, Dec. 1 11:00AM - 11:10AM Room: E353C

Participants
Meng Xiaoyan, BMedSc, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Hu Daoyu, PhD, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Zhen Li, MD, PhD, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
anqin li, Wuhan, China (*Presenter*) Nothing to Disclose

PURPOSE

To investigate the value of quantitative analysis in dual energy spectral computed tomography (DESCT) for differentiating malignant gastric mucosal lesions from benign gastric mucosal lesions (including gastric inflammation and normal gastric mucosa).

METHOD AND MATERIALS

This study was approved by the ethics committee and all patients provided written informed consent. 161 consecutive patients (63 with gastric cancer (GC), 48 with gastric inflammation (GI) and 50 with normal gastric mucosa (NGM)) who underwent dual-phases contrast enhanced DESCT scans in the arterial phase (AP) and portal venous phase (PVP) were included in this study. Iodine concentration (IC) in lesions was derived from the iodine-based material-decomposition images and normalized to that in the aorta to obtain normalized iodine concentration (nIC). The ratios of IC and nIC between the AP and PVP were calculated. Diagnostic confidence for GC and GI was evaluated with reviewing the features including gastric wall thickness, focal and eccentric on the conventional polychromatic images. All statistical analyses were performed by using statistical software SPSS 17.0.

RESULTS

IC and nIC in GC differed significantly from those in GI and NGM, except for nICAP in comparing GC with GI. Mean nIC values of GC (0.18±0.06 in AP and 0.62±0.16 in PVP) were significantly higher than that of NGM (0.12±0.03 in AP and 0.37±0.08 in PVP) (all $p<0.05$). There was also significant difference for IC values in GC, GI and NGM (24.19±8.27 mg/mL, 19.07±5.82 mg/mL and 13.61±2.52 mg/mL, respectively in AP and 28.00±7.01 mg/mL, 24.66±6.55 mg/mL and 16.94±3.06 mg/mL, respectively in PVP). Based on ROC analysis, nIC and IC in PVP had high sensitivities of 88.89% and 90.48%, respectively in differentiating GC from NGM, while the sensitivities were 71.43% and 88.89% during AP. IC and nIC ratios did not provide adequate diagnostic accuracy with their AUCs less than 0.65. With the conventional features, the diagnostic accuracy for GC and GI were 75.0% and 98.0%, respectively.

CONCLUSION

Quantitative analysis of DESCT imaging parameters for gastric mucosa, such as nIC and IC, is useful for differentiating malignant from benign gastric mucosal lesions.

CLINICAL RELEVANCE/APPLICATION

Quantitative analysis of DESCT imaging parameters for gastric mucosa, such as nIC and IC, is useful for differentiating malignant from benign gastric mucosal lesions.

SSQ08-05 3D Dynamic Contrast-Enhanced Ultrasound of Liver Metastases from Gastrointestinal Tumors: First-in-Human Assessment of Feasibility and Reproducibility

Thursday, Dec. 1 11:10AM - 11:20AM Room: E353C

Participants
Ahmed El Kaffas, PhD, Palo Alto, CA (*Presenter*) Co-founder, Oncoustics
Rosa Maria Silveira Sigrist, MD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose
George Fisher, MD, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Sunitha Bachawal, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Joy Liau, MD, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose
Alexander Karanany, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose
Jarrett Rosenberg, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Huaijun Wang, MD, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Dimitre Hristov, PhD, Stanford, CA (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV Partner, SoniTrack Systems, Inc
Juergen K. Willmann, MD, Stanford, CA (*Abstract Co-Author*) Research Consultant, Bracco Group; Research Grant, Siemens AG; Research Grant, Bracco Group; Research Grant, Koninklijke Philips NV; Research Grant, General Electric Company; Advisory Board, Lantheus Medical Imaging, Inc; Advisory Board, Bracco Group

PURPOSE

Dynamic contrast enhanced ultrasound (DCE-US) is a low-cost tool proposed for identifying early responders to cancer therapy. To date, sampling errors resulting from 2D imaging have restricted DCE-US when used to assess highly heterogeneous tumors. The purpose of this study was to perform a first-in-human clinical assessment of 3D DCE-US feasibility and reproducibility, and as a way to overcome sampling errors.

METHOD AND MATERIALS

Patients with liver metastases from gastrointestinal cancers were imaged with a Philips EPIQ7 coupled to an X6-1 matrix transducer. A total of 16 scan sessions were carried out over 10 patients. Pairs of repeated bolus and disruption-replenishment images were acquired within each scan session to determine reproducibility of parameters. Bolus consisted of intravenous injection of 0.2 ml Definity microbubbles followed by saline. Disruption-replenishment was carried out by infusing 0.9 ml of Definity microbubbles in 35.1 ml of saline over 8 min. Volumes-of-interest (VOI) and regions-or-interest (ROI) were segmented in each image to extract time-intensity curves (TICs). Parameters were quantified for the whole VOI and 4 sub-ROIs. Bolus parameters were: time-to-peak (TP), peak enhancement (PE), area-under-the-curve (AUC), mean-transit-time (MTT). Disruption-replenishment parameters were: relative blood volume (rBV), relative blood flow (rBF) and regional mean flow velocity (rMFV).

RESULTS

A large coefficient of variation (CV) was for ROIs from the same volume confirming potential sampling errors. The TP and MTT had the lowest CV while the rBF, rBV and rMFV parameters had the largest plane-to-plane variations with CVs up to 54%. Measurements made in 3D were consistently different than measurements made in 2D with an average percent difference of 60%. Reproducibility, evaluated by the concordance correlation coefficient (CCC) between repeated measurements, was good (0.80) to

excellent (0.95). The TP and MTT were the least reproducible with CCCs lesser than 0.80.

CONCLUSION

This first in human study confirms 2D DCE-US sampling errors and demonstrates that 3D DCE-US imaging with a matrix array transducer is feasible and reproducible in the clinic.

CLINICAL RELEVANCE/APPLICATION

DCE-US is inexpensive, exempt from radiation exposure and available at the bedside. Eliminating sampling errors through 3D imaging further potentiates its role as a clinical tool to identify early response to cancer therapy.

SSQ08-06 Preoperative TNM Stating of Initially Unresectable Gastric Cancer After Neoadjuvant Chemothereapy: Diagnostic Performance of MDCT Using New Staging Criteria

Thursday, Dec. 1 11:20AM - 11:30AM Room: E353C

Participants
Ijin Joo, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Se Hyung Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Cheong-Il Shin, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Su Joa Ahn, Seoul , Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Joon Koo Han, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the diagnostic performance of new MDCT criteria for TNM staging in gastric cancer patients after neoadjuvant chemotherapy.

METHOD AND MATERIALS

This retrospective study was approved by our institutional review board and the requirement for informed consent was waived. We included thirty-seven patients with initially unresectable gastric cancers who underwent neoadjuvant chemotherapy followed by surgery. MDCT images were reviewed to determine the TNM staging of gastric cancers using new criteria dedicated to assessment after chemotherapy. In the new criteria, non-enhancing perigastric infiltrations do not affect T-staging; non-enhancing lymph nodes are regarded as negative lymph nodes; and subtle remaining infiltrations after marked decrease in distant metastasis size are regarded as M0. Using pathologic stages or operation records as the reference standard, the diagnostic performance of MDCT using the new criteria was assessed.

RESULTS

According to histologic analysis, T-staging was confirmed in 34 patients including 5 ypT4b cases and N-staging was confirmed in 37 patients including 17 ypN-positive cases. Using histology or operation records, 10 patients were confirmed as M1 and 26 patients as M0. Sensitivity, specificity, and accuracy of MDCT for the diagnosis of adjacent organ invasion (T4b); regional LN metastases (N-positive); and distant metastases (M1) were 80.0% (4/5), 96.6% (28/29), 94.1% (32/34); 70.6% (12/17), 70.0% (14/20), 70.3% (26/37); and 60.0% (6/10), 100% (26/26), 88.9% (32/36), respectively.

CONCLUSION

By applying new criteria for initially unresectable gastric cancers after neoadjuvant chemotherapy, MDCT demonstrated good diagnostic performances for the determination of adjacent organ invasion or distant metastases.

CLINICAL RELEVANCE/APPLICATION

In unresectable gastric cancer patients, MDCT may be useful in selecting resection candidates after neoadjuvant therapy as it shows high specificity for adjacent organ invasion and distant metastases.

SSQ08-07 A Prediction Model using Computed Tomographic Findings for Peritoneal Carcinomatosis in Patients with Advanced Gastric Cancer

Thursday, Dec. 1 11:30AM - 11:40AM Room: E353C

Participants
Mimi Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Woo Kyoung Jeong, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Dongil Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyoung Doo Song, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Soon Jin Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Won Jae Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Research Grant, Samsung Electronics Co, Ltd

PURPOSE

The sensitivity of computed tomography (CT) for detection of peritoneal carcinomatosis (PC) of advanced gastric cancer (AGC) before surgery is relatively low. The purpose of our study is to develop a predictive model derived from the CT features of PC in the patients with AGC.

METHOD AND MATERIALS

94 patients (M:F=54:40; mean age, 56.0 years; range, 24-83 years) with PC and randomly sampled 120 patients (M:F=82:39; mean age, 59.4 years; range, 31-83 years) among the 360 AGC patients without PC, who underwent preoperative CT and undergoing surgery between January 2012 and December 2014 were included in the study. A radiologist retrospectively analyzed tumor size, presence of lymph node metastasis, and subtle findings of PC including peritoneal thickening without enhancement, stranding, plaque and small bowel wall thickening or irregularity on a five-point scale and presence of ascites. The definitive CT finding of PC including omental cake and rectal shelf was also evaluated. A prediction model named as PC score was constructed by CT features independently associated with PC with use of multiple logistic regression analysis and diagnostic performance was compared with that of the definitive findings of PC using ROC curve analysis.

RESULTS

Three imaging features of were independently associated with PC: Tumor size larger than 4.2cm (odds ratio [OR]=11.42 [4.02–32.45]), lymph node metastasis (OR=2.20 [1.19–4.06]) and plaque (OR=4.38 [2.86–6.70]). The PC score could be calculated by following formula: PC score = 0.79×lymph node metastasis + 1.48×grades of peritoneal plaque + 2.44×tumor larger than 4.2cm. The PC score showed higher area under the receiver operating characteristic curve (AUC) of 0.915 in the prediction of the PC with higher sensitivity(88.3%) than definitive finding of PC (AUC=0.694, sensitivity=38.3%)

CONCLUSION

Tumor size, lymph node metastasis and peritoneal plaque grading are independently associated with PC of AGC and the derived prediction model shows higher AUC and sensitivity for prediction of PC than definitive finding.

CLINICAL RELEVANCE/APPLICATION

We developed a robust model with high sensitivity to predict PC with the use of preoperative CT findings, and this model may be helpful in customizing the treatment for AGC patients.

SSQ08-08 CT Perfusion Evaluation of Gastric Cancer: Correlation with Histologic Type

Thursday, Dec. 1 11:40AM - 11:50AM Room: E353C

Participants
Dong Ho Lee, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Se Hyung Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Joon Koo Han, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To prospectively evaluate if the perfusion parameters of gastric cancer can provide information regarding histologic types of gastric cancers.

METHOD AND MATERIALS

Our institutional review board approved this study and informed consent was obtained from all patients. Between October 2015 and March 2016, 19 patients who underwent preoperative perfusion CT (PCT) and subsequent curative gastrectomy were enrolled. PCT data were analyzed using dedicated software program (VPCT body, Siemens Medical System). We calculated blood flow, blood volume, mean transit time, time-to-peak, and permeability surface value of gastric cancers. Perfusion parameters were compared according to histologic type (poorly cohesive carcinoma [PCC] versus non-PCC), tumor differentiation (well or moderately differentiated versus poorly differentiated) and N-staging (positive versus negative lymph node metastasis) using Mann-Whitney U test. Receiver operating characteristic analysis was used to determine the optimal cut-off value of significant parameters.

RESULTS

Permeability surface value of PCC was significantly higher than other histologic types (44.9 ml/100g/min in PCC versus 25.2 ml/100g/min in non-PCC, P=0.005). The area under the curve for permeability surface value to predict PCC was 0.875. Sensitivity of 88.9% (8/9) and specificity of 90.9% (10/11) were achieved with a cut-off value of 37.9 ml/100g/min. Other perfusion parameters were not significantly different according to histologic type, tumor differentiation, and N-staging of gastric cancers.

CONCLUSION

Obtaining perfusion parameters from PCT was feasible in all patients with gastric cancers. A preoperative imaging diagnosis of PCC type gastric cancers could be possible with a permeability surface value of PCC which was significantly higher than non-PCC.

CLINICAL RELEVANCE/APPLICATION

Exact preoperative differentiation between poorly cohesive carcinoma (PCC) and non-PCC by perfusion CT may be clinically useful as CT can overcome the sampling error by endoscopic biopsy.

SSQ08-09 A Comparison Between 3.0T MRI and Histopathology for Preoperative T Staging of Potentially Resectable Esophageal Cancer

Thursday, Dec. 1 11:50AM - 12:00PM Room: E353C

Participants
Zhaoqi Wang, Zhengzhou, China (*Presenter*) Nothing to Disclose
Hui Liu, Shanghai, China (*Abstract Co-Author*) Employee, Siemens AG
Hongkai Zhang, zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose
Jinrong Qu, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To explore the value of 3.0T MRI using multiple sequences (star VIBE, Blade and Diffusion-weighted imaging/DWI) in evaluating the preoperative T staging for potentially resectable espophageal cancer (EC) with pathologic confirmation.

METHOD AND MATERIALS

Sixty-six patients with endoscopically proven EC and indeterminate T1/T2/T3/T4a staging by CT were examined on a 3T scanner. Two independent readers assigned a T staging on MRI according to the 7th edition of UICC-AJCC TNM Classification, and post-operative pathologic confirmation was considered the gold standard. Inter-reader agreement was also calculated.

RESULTS

The accuracy of MRI T staging was: 82% (54/66) for reader 1, 86% (57/66) for reader 2, Inter-reader agreement is excellent (kappa=0.951). For the EC with invading lamina propria, muscularis mucosae, or submucosa (T1 staging), the T staging of MRI achieved 82% (14/17) agreement for both reader 1 and 2; For invasion of muscularis propria (T2 staging), MRI agreement achieved 90%(20/22)for reader 1 and 100%(22/22)for reader 2; while for the invasion of adventitia (T3 staging), MRI could achieve

agreement in 86%(18/21) for two readers; then for the invasion of pleura, pericardium, diaphragm, or adjacent peritoneum (T4a staging), MRI could achieve agreement is 33%(2/6) and 50%(3/6) for reader 1 and 2, respectively.

CONCLUSION

3.0T MRI using multiple sequences (star VIBE、Blade and DWI) showed high accuracy for patients with potentially resectable EC in T staging. The T staging accuracy of lamina propria or submucosa, muscularis proria and adventitia is better than adjacent membrane structure. 3.0T MRI using multiple sequences could be used as a noninvasive imaging method for pre-operative T staging of EC.

CLINICAL RELEVANCE/APPLICATION

3.0T MRI using multiple sequences (star VIBE、Blade and DWI) could be used as a noninvasive imaging method for pre-operative T staging of EC.

SSQ09

Genitourinary (Functional Renal Imaging and Contrast Issues)

Thursday, Dec. 1 10:30AM - 12:00PM Room: E353B

GU CT SQ

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

Participants
Hersh Chandarana, MD, New York, NY (*Moderator*) Equipment support, Siemens AG; Software support, Siemens AG; Advisory Board, Siemens AG;
Dean A. Nakamoto, MD, Beachwood, OH (*Moderator*) Research agreement, Toshiba Medical Systems Corporation
Cary L. Siegel, MD, Saint Louis, MO (*Moderator*) Nothing to Disclose

Sub-Events

SSQ09-01 Shearwave Sonoelastography Evaluation of Renal Allograft: Intergroup Comparison Between Stable Allograft, Dysfunction

Thursday, Dec. 1 10:30AM - 10:40AM Room: E353B

Participants
Nitin P. Ghonge, MD, New Delhi, India (*Presenter*) Nothing to Disclose
Mohita Mohan, MBBS, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate whether Shearwave Sonoelastography(SSE) could differentiate stable renal graft from acute graft dysfunction and chronic graft dysfunction and to correlate SSE values with resistive index(RI),serum creatinine(Cr),nankivelle GFR(Ngfr) and biopsy findings.

METHOD AND MATERIALS

Total of 60 post renal transplant patients were assessed by ultrasonography(US), SSE and Doppler US .Three major groups; stable, Acute graft Dysfunction(AD) and Chronic graft dysfunction(CD) were segregated based on clinical parameters. Recipients with skin-allograft distance > 3cms , peritransplant fluid collection and/or recipients with allograft parenchymal thickness < 1cm were excluded from the study. AD was defined as an abrupt reduction in renal functions fulfilling any one or more criteria;Ngfr< 50 ml/min,an absolute increase in Cr≥0.3 mg/dL or increase of ≥50%,proteinuria +ve and prior to the episode baseline values similar to the stable group. CD was defined as progressive worsening of renal functions for >3 months without recovery (Ngfr<50ml/min,increasedCr, proteinuria). RI of segmental arteries and SSE at upper,midinterpolarand lower pole were taken and mean values were calculated. BANFF 07 score was used in cases where graft biopsy was done.

RESULTS

Out of 60, 30 patients were having graft dysfuction; (AD -19, CD -11). Mean renal graft parenchymal stiffness(PS) was 12.25±6.72 kPa (range 3.94 -32.98) and in stable graft,AD and CD was 8.51 ± 2.44 , 11.06± 2.91 and 24.50± 4.49 kPa respectively. SSE was able to differentiate stable graft from AD(p= 0.01)and CD(p< 0.001).PS values of chronic allograft nephropathy(CAN). Grade 1 differed significantly from grade 2 (p 0.02). However, there is no significant difference between grade 2 and grade 3. PS showed a highly significant negative correlation with Ngfr(Pearson r:-0.725,p:<0.001)and positive correlation with RI(r:0.562, p:<0.001) and Cr(r:0.714,p<0.001).

CONCLUSION

SSE can differentiate stable graft from AD and CD. The inverse correlation of SSE-based Parenchymal Stiffneess with Ngfr and positive correlation with RI and Cr shows that SSE can effectively reflect functional status of the renal graft.

CLINICAL RELEVANCE/APPLICATION

SSE reflects the graft's functional status and grade of fibrosis. Increase of Parenchymal Stiffness over time can predict renal graft failure and progression to Chronic Allogaft Nephropathy and consequent need for immunosuppresive drugs regimes.

SSQ09-02 Quantifying Renal Lipid Deposition and Functional Assessment with MR Imaging in Diabetic Nephropathy

Thursday, Dec. 1 10:40AM - 10:50AM Room: E353B

Participants
Ying-Lian Feng, MD, Nanjing, China (*Presenter*) Nothing to Disclose
Shenghong Ju, MD, PhD, Nanjing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the difference in renal lipid deposition and water molecular diffusion features among non-diabetic volunteers and type 2 diabetic patients without and with microalbuminuria by using Dixon imaging and diffusion tensor imaging (DTI).

METHOD AND MATERIALS

A total of 38 diabetic volunteers (normoalbuminuria: n = 20; microalbuminuria: n = 18) and 14 healthy volunteers were included in this study. Quantified magnetic resonance imaging (MRI) parameters including Dixon imaging parameters (renal fat fraction [RFP] and subcutaneous fat fraction [SFP]) and DTI parameters (mean values of fractional anisotropy [FA], apparent diffusion coefficient [ADC], and eigenvalues [λi]) were measured. All of the MRI parameters were compared among cohorts using one-way ANOVA with Bonferroni post hoc analysis. Correlations between DTI imaging parameters and estimated glomerular filtration rate

(eGFR) were evaluated.

RESULTS

Renal lipid percentage in microalbuminuric group was significantly higher compared with normoalbuminuric group and healthy volunteers group (6.2% ± 1.6%, 5.1% ± 0.9% and 4.6% ± 0.6%, respectively; P < .001). However, subcutaneous fat percentage in microalbuminuric group was significantly lower than the other two groups (81.8% ± 3.9%, 85.1% ± 2.9% and 86.0% ± 1.8%, respectively; P < .002). Both cortical and medullary FA values were reduced in microalbuminuric group (cortex: r = 0.222 ± 0.045; medulla: r = 0.306 ± 0.059) than in normoalbuminuric group (cortex: r = 0.260 ± 0.027, P < .002; medulla: r = 0.392 ± 0.050, P < .000) and healthy volunteers (cortex: r = 0.254 ± 0.032, P < .002; medulla: r = 0.442 ± 0.032, P < .000). The cortical ADC values in the microalbuminuric group ([2.4 ± 0.3] × 10^{-3} mm^2/s) was significantly lower than the normoalbuminuric group ([2.6 ± 0.3] × 10^{-3} mm^2/s). There were positive correlations between eGFR and FA (cortex: r = 0.52, P = .000; medulla: r = 0.395, P = .003).

CONCLUSION

Dixon imaging and DTI may serve as useful non-invasive biomarkers in evaluating the progression of diabetic nephropathy.

CLINICAL RELEVANCE/APPLICATION

(Dealing with Dixon and DTI imaging)"Dixon and DTI imaging of renal parenchyma may be useful in monitoring renal lipid deposition and water molecular diffusion features for patients with type 2 diabetes."

SSQ09-03 Shear Wave Elastography Evaluation of Renal Transplant Fibrosis

Thursday, Dec. 1 10:50AM - 11:00AM Room: E353B

Participants
Heather M. Early, MD , Folsom, CA (*Presenter*) Nothing to Disclose
Ellen Cheang, MD, Sacramento, CA (*Abstract Co-Author*) Nothing to Disclose
Jorge Aguilera, BS, Sacramento, CA (*Abstract Co-Author*) Nothing to Disclose
Ghaneh Fananapazir, MD, Sacramento, CA (*Abstract Co-Author*) Nothing to Disclose
John P. McGahan, MD, Sacramento, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the utility of 2D Shear Wave Elastography (SWE) in accurately detecting renal allograft fibrosis. To find a noninvasive, low-cost method for monitoring and predicting renal allograft outcomes.

METHOD AND MATERIALS

70 renal transplant recipients were prospectively studied at our institution between August 2015 through February 2016 who were scheduled for either standard-of-care 3-month renal allograft biopsy or in patients suspected of having allograft dysfunction. B-mode and Doppler ultrasound of the entire kidney and SWE of the select region to be biopsied was performed using the General Electric (GE) LOGIQ E9 system prior to biopsy. Cortical and medullary shear wave measurements were acquired and post-processed separately. The median and mean results of 10 SWE measurements for each the cortex and the medulla were computed separately and compared to histologic fibrosis scores, using the Banff 2007 working classification system. Associations between SWE and fibrosis was performed by categorizing SWE values into 3 groups: high (those 1 standard deviation (SD) above the mean), mid-range SWE values (plus/minus 1 SD from the mean), and low SWE values (below 1 SD from the mean) for both cortex and medulla.

RESULTS

Upon separating the median and mean SWE results for each the cortex and medulla, no statistical significance was found for mean cortical, median cortical or mean medullary SWE values (p-values: 0.32, 0.37 and 0.06, respectively) in correlation to fibrosis. Only the univariate median medulla SWE values reached statistical significance (p = 0.044). We further found that for every unit increase in the median medulla shear wave measurement, the odds of fibrosis increase by about 20%. Low medulla SWE values also demonstrated a trend towards significance (p = 0.0709), suggesting that patients with lower medullary SWE values have a lower likelihood of having fibrosis.

CONCLUSION

Use of SWE within the renal allograft population remains tenuous. Although no significant correlations were found between fibrosis and SWE of the renal cortex in our study, our median medulla results do suggest a correlation with fibrosis. Further investigation remains to validate our shear wave results and clinical relevancy.

CLINICAL RELEVANCE/APPLICATION

Evaluating SWE in the transplanted kidney has proven challenging, yet trends in our data indicate shear wave elasticity evaluation of renal allografts remains a hopeful prospect on the horizon

SSQ09-04 Predicting Renal Function Loss after Radiofrequency Ablation

Thursday, Dec. 1 11:00AM - 11:10AM Room: E353B

Participants
Cinthia Cruz, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
James H. Thrall, MD, Boston, MA (*Abstract Co-Author*) Stockholder, Peregrine Pharmaceuticals, Inc; Stockholder, iBio, Inc; Stockholder, Antares Pharma, Inc; Speaker, Bracco Group; ;
Debra A. Gervais, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Azadeh Tabari, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Alexi Otrakji, MD, Boston, MA (*Presenter*) Nothing to Disclose

PURPOSE

Determine the capability of a prototype threedimensional quantitative method of the index of renal parenchyma enhancement as a predictor of kidney function (EGFR/Creatinine) and kidney function loss in patients with renal cell carcinoma after ablation.

METHOD AND MATERIALS

Retrospective single institution HIPAA compliant and institutional review board approved study from 2002-2015. Consecutive single kidney patients who had biopsy proven RCC and underwent radiofrequency ablation were included. Pretreatment and postreatment CTs at 1, 3 and 6 months, with precontrast and arterially enhanced phases for each time point, were analyzed. Manual segmentation of the enhancing parenchyma was performed excluding the tumor. Perirenal fat was used as reference. The prototype software calculates the volume of renal enhancement (VE) based on the count of voxels' intensities (Housfield units) after excluding the nonenhanced voxels (based on the reference region) within the segmented area as well as viability percentage. Pearson correlation tests were done to evaluate for relationships between the volume and units of enhancement (viable kidney), and kidney function (KF, as GFR/creatinine). Pearson correlation and linear regression were used to assess correlations.

RESULTS

26 patients (F:M, 8:18) and 104 sets of axial CT images were analyzed. The mean VE in the pretreatment and time points(TP) 1, 3 and 6 were: 396.4, 404.4, 389.7 and 375.4 cm3, respectively. Means of contrast enhancement were: 116, 119, 124 and 115 HU, concordant with VE. Viability percentages 90.3, 89.8, 93.5 and 90.7 were not concordant to enhancement and VE. KF showed progressive worsening with time: 0.88, 0.91, 0.92 and 0.93. Significant correlations were found between the VE and KF at the 4 different time points (R: 0.47, R:0.45, R:0.56 and R:0.60, p=0.01) and between the enhancement units and KF at pretreatment, 3 and 6 months. (R: 0.67, R:0.65 and R:0.58 respectively p<0.001). VE increased in the first month after ablation in average 16/26 (61.5% p<0.01) of the cases. Viability percentage decreased by 11.6% in average 6 months after ablation, ranging from 0.6 to 29%.

CONCLUSION

Renal VE calculated with the prototype enhancement quantification tool highly correlates with renal function and may be used to predict the loss of kidney function after ablation.

CLINICAL RELEVANCE/APPLICATION

Renal parenchymal enhancement evaluated by three-dimensional prototype software may be used as indicator of renal function.

Honored Educators

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

Debra A. Gervais, MD - 2012 Honored Educator

SSQ09-05 Can Computed Tomography Volumetry Replace MAG3-Szintigraphy for Determination of Split Renal Function?

Thursday, Dec. 1 11:10AM - 11:20AM Room: E353B

Participants
Christian P. Houbois, MD, Cologne, Germany (*Presenter*) Nothing to Disclose
Stefan Haneder, MD, Mannheim, Germany (*Abstract Co-Author*) Nothing to Disclose
David C. Maintz, MD, Koln, Germany (*Abstract Co-Author*) Nothing to Disclose
Matthias Schmidt, MD, Koeln (Cologne), Germany (*Abstract Co-Author*) Nothing to Disclose
Martin Hellmich, MD, PhD, Cologne, Germany (*Abstract Co-Author*) Nothing to Disclose
Roger Wahba, Cologne, Germany (*Abstract Co-Author*) Nothing to Disclose
Michael Puesken, MD, Muenster, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The current gold standard for determination of renal function, split for each kidney, is Tc-99m-mercapto-acetyltriglycin (MAG3) scintigraphy. Several pre-operative preparations, e.g. before nephrectomy, include beside the assessment of the split renal function (SRF), contrast-enhanced computed tomography (CT) for the anatomy. A difference in SRF over 20% is a relative contraindication for operation. Initial studies comparing MAG3-scintigraphy and renal cortex volumetry (RCV) using CT showed equal results for the split renal in specific patient collective with normal renal function. This study aimed to compare MAG3-scintigraphy and CT-RCV within a large patient collective including impaired renal function.

METHOD AND MATERIALS

300 patients (146 male, 154 female, mean age - 54y) with MAG3-scintigraphy and abdominal, contrast-enhanced CT within two weeks were enrolled. Two independent readers assessed all CT datasets in the arterial phase using the semi-automatically volumetry tool of IntelliSpace Portal (Philips Healthcare, Best, The Netherlands). Statistical calculations were done with SPSS Statistics and R. Pearson´s correlation and Bland-Altman plots were used for analysis.

RESULTS

Preliminary evaluation included data from 71 patients. We observed a strong Pearson correlation between reader one and two (reader one: mean kidney volume right 93.5 cm3 (SD ± 30.0), mean kidney volume left 93.0 cm3 (SD ± 32.0); reader two mean kidney volume right 82.1 cm3 (SD ± 24.4), mean kidney volume left 82.9 cm3 (SD ± 23.2); r = 0.79) for CT-RCV. Mean GFR for both readers was 61.6 ml/min (SD ± 50.4). Bland-Altman analysis comparing CT-RCV SRF from examiner one and two with MAG3-scintigraphy showed good agreement (bias, 95% limits of agreement for examiner one vs. MAG3 0.04%, -0.4% to 0.3%, r = 0.67; examiner two vs. MAG3 -0,04%, -0,4% to 0.3%, r = 0,72).

CONCLUSION

Renal cortex volumetry seems to be a promising, reliable technique to estimate the split renal function. For that it could be suitable for reducing radiation exposure in living kidney donors.

CLINICAL RELEVANCE/APPLICATION

CT volumetry can replace MAG3-scintigraphy for the determination of split renal function in a pre-operative setting and hence

reduce radiation exposure.

SSQ09-06 Allergic Cross-Reactivity to Non-Ionic Iodinated and Gadolinium-Based Contrast Media; Analysis of More than 200,000 Injections

Thursday, Dec. 1 11:20AM - 11:30AM Room: E353B

Participants
Faezeh Sodagari, MD, Chicago, IL (*Presenter*) Grant, Siemens AG
Atilla Arslanoglu, MD, Chicago, IL (*Abstract Co-Author*) Grant, Siemens AG
Brenda D. Schmitz, RN, MS, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Frank H. Miller, MD, Chicago, IL (*Abstract Co-Author*) Research Grant, Siemens AG
Vahid Yaghmai, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the incidence and clinical characteristics of the cross-reaction between non-ionic iodinated (ICM) and gadolinium-based contrast media (GBCM).

METHOD AND MATERIALS

In this HIPAA-compliant, IRB-approved retrospective study, acute adverse reactions to non-ionic ICM- or GBCM used in a large academic institution were assessed during a four-year period. The data on the acute contrast reactions were extracted from the electronic health records. Patients who had acute adverse reactions to both non-ionic ICM and GBCM were identified. The total number of the injections of the contrast media were extracted from the radiology information system. The incidence rate and the clinical characteristics of the cross-reactions between ICM and GBCM were evaluated using descriptive statistics.

RESULTS

Of 213,725 (106,447 ICM and 107,278 GBCM) contrast injections during a 4-year period, a total of 821 (621 ICM and 200 GBCM) acute contrast reaction incidents in 776 individual patients were reported. The overall rates of the reaction to ICM and GBCM were 0.58% and 0.19%, respectively. Thirty-eight patients had more than one incidents of reaction with 7 patients (2 men, 5 women; mean age: 57.2 ± 16 yrs) showing a cross-reaction between ICM and GBCM (overall incidence rate: 0.003%). All cross-reactions were mild and occurred in outpatient imaging facilities. None of the patients required medication for the treatment of the cross-reaction. The time interval between the reactions ranged from 17 to 706 (median: 64) days. In 6 patients, the cross-reaction was observed after the injection of GBCM in those with a previous history of mild (4/6) or moderate (2/6) reaction to ICM. One patient had a mild reaction to ICM after a previous mild reaction to GBCM. One patient showed a cross-reaction to GBCM despite receiving standard allergy premedication for previous mild allergic reaction to ICM.

CONCLUSION

The cross-reaction between non-ionic ICM and GBCM, although possible, is an extremely rare incident that may present as a mild acute reaction.

CLINICAL RELEVANCE/APPLICATION

There is no significant cross-reaction between ICM and GBCM used in CT and MRI studies.

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
Frank H. Miller, MD - 2012 Honored Educator
Frank H. Miller, MD - 2014 Honored Educator

SSQ09-07 NSsaFe: Observational Study on the Incidence of Nephrogenic Systemic Fibrosis in Patients with Renal Impairment Following Gadoterate Meglumine Administration

Thursday, Dec. 1 11:30AM - 11:40AM Room: E353B

Participants
R G. McWilliams, Liverpool, United Kingdom (*Presenter*) Speaker, FUJIFILM Holdings Corporation; Consultant, Cook Group Incorporated; Research Grant, Endologix, Inc

PURPOSE

To determine the incidence of Nephrogenic Systemic Fibrosis (NSF) in patients with renal impairment after gadoterate meglumine (DOTAREM®, Guerbet, France) administration.

METHOD AND MATERIALS

The NSsaFe study is a worldwide post-marketing study including hundreds of patients with moderate, severe or end stage renal impairment, scheduled to undergo a routine contrast-enhanced Magnetic Resonance Imaging (MRI) using gadoterate meglumine. At inclusion visit, medical history, indications for MRI and product administration conditions were recorded for each patient. Adverse Events (AEs) occurring during MRI examination or usual follow-up period post-contrast agent administration were recorded. Patients were followed up over 2 years with 3 visits separated by at least 3 months in order to detect any signs of NSF.

RESULTS

As of 16 March 2016, data of 540 patients were analyzed (mean age: 69.6 ± 12.7 years [min-max: 21-95]; male: 58.5%; mean BMI: 26.3 ± 5.3 kg/m2 [13.2-50.2]). Renal impairment was evaluated as moderate for 69.3% of patients, severe for 16.1% and

end-stage for 12.0%; 2.6% of patients had undergone a previous kidney transplant. The mean (±SD) estimated Glomerular Filtration Rate (eGFR) was 37.6 ± 15.7 ml/min/1.73 m2 [4.0-74.2]. Main MRI indication was to assess suspected abnormalities of the central nervous system (34.6%) and mean total volume injected was 15.8 ± 5.9 ml. A total of 407 patients (97.4%) attended the first follow-up visit, 308 (73.7%) attended the second, and 222 (53.1%) attended the third. No AEs considered to be related to the administration of gadoterate meglumine were reported. No cases of NSF have been observed.

CONCLUSION

Intermediate data of the NSsaFe study show no cases of NSF after gadoterate meglumine administration in patients with at least moderate renal impairment. Data collected so far confirm the good safety profile of gadoterate meglumine in this high risk population.

CLINICAL RELEVANCE/APPLICATION

Intermediate data of 540 patients in the NSsaFe study show no cases of NSF after gadoterate meglumine administration in patients with at least moderate renal impairment.

SSQ09-08 Gadolinium Chelate Safety in Pregnancy: Nearly Undetectable Levels in the Juvenile Nonhuman Primate after in Utero Exposure

Thursday, Dec. 1 11:40AM - 11:50AM Room: E353B

Awards
Student Travel Stipend Award

Participants
Joao Prola Netto, MD, Portland, OR (*Presenter*) Nothing to Disclose
Mark Woods, PhD, Portland, OR (*Abstract Co-Author*) Nothing to Disclose
Victoria Roberts, PhD, Beaverton, OR (*Abstract Co-Author*) Nothing to Disclose
Christina A. Miller, BS, Portland, OR (*Abstract Co-Author*) Nothing to Disclose
Antonio E. Frias Jr, MD, Portland, OR (*Abstract Co-Author*) Nothing to Disclose
Karen Y. Oh, MD, Portland, OR (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine whether gadolinium is found in juvenile nonhuman primate tissues after maternal injection of intravenous gadoteridol (ProHance).

METHOD AND MATERIALS

Gravid rhesus macaques and their offspring were prospectively studied in one research protocol to evaluate the effects of a maternal malnutrition (hypoproteic diet) on the placenta and fetal development (n=5 subjects and 5 controls). On gestational day 85 and 135 (term pregnancy of 165 days), the macaques were sedated, intubated, and placed in the MRI scanner. Intravenous gadoteridol contrast (0.1 mmol/kg of maternal weight) was administered for placental imaging. Amniocentesis was performed on day 135 prior to the second ProHance dose. After spontaneous normal term delivery, the offspring were followed for approximately 7 months. Gadolinium concentration in the juvenile macaque tissues (bone, liver, skin, spleen, lungs, brain, and kidney) was measured by inductively coupled plasma mass spectrometry (ICP-MS) and is expressed as percent maternal dose per gram of juvenile tissue (%ID/g).

RESULTS

Sampled juvenile tissues showed gadolinium was detectable at extremely low levels in only two tissues: the femur (2.5 x 10-5 %ID/g) and liver (0.15 x 10-5 %ID/g). No detectable amounts in the remaining organs, with a limit of detection (LOD) of 0.0003 x 10-5 %ID/g. Gadolinium concentration in the amniotic fluid was 0.028 x 10-5 %ID/g, at 50 days post administration of a single ProHance injection.

CONCLUSION

Minimal gadolinium in the amniotic fluid 50 days after the first maternal injection confirms it crosses the placenta, as shown in our previous study. However, only trace gadolinium is found in juvenile macaque tissues after in utero exposure to two weight-based clinical doses of gadolinium chelate, indicating clearance of contrast agent. Given the similarities between human and nonhuman primate placental physiology, we suggest there could be relatively little deposition in human fetal tissues following maternal ProHance injection.

CLINICAL RELEVANCE/APPLICATION

Our results may have implications for the safety of contrast-enhanced MRI in pregnancy as only trace gadolinium is found in tissues of juvenile offspring after maternal infusion of gadoteridol.

SSQ09-09 Breakthrough Reaction Rates in High-Risk Patients Receiving Accelerated Corticosteroid Premedication before Contrast-Enhanced CT

Thursday, Dec. 1 11:50AM - 12:00PM Room: E353B

Awards
Trainee Research Prize - Fellow

Participants
Benjamin Mervak, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Richard H. Cohan, MD, Ann Arbor, MI (*Abstract Co-Author*) 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; ;

PURPOSE

To determine the allergic-like breakthrough reaction rate in high-risk patients premedicated with an accelerated corticosteroid

regimen before low-osmolality iodinated contrast material (LOCM)-enhanced CT.

METHOD AND MATERIALS

IRB approval was obtained and informed consent waived for this retrospective study. Patients (n=179) were identified that completed a variety of corticosteroid premedication regimens, each with a duration of <10 hours, prior to LOCM-enhanced CT between 6/1/2008-1/1/2016. Breakthrough reaction rates were compared to the breakthrough reaction rate for high-risk patients receiving a 13-hour premedication regimen, and the breakthrough reaction rate for patients premedicated for a known contrast allergy (2.1% [13/626]) using Chi square tests.

RESULTS

There were 36 one-hour, 83 five-hour, 16 six-to-nine-hour, and 44 "rapid" regimens with duration not otherwise specified. Most subjects (65% [116/179]) had a prior iodinated contrast reaction. The breakthrough reaction rate was 2.8% (5/179; 95% CI = 0.4-5.2%; vs. 1.2% [13/1051] previously reported for a 13-hour regimen, p=0.11). All breakthrough reactions occurred in subjects with a prior contrast reaction (4.3% [5/116], 95% CI = 0.6-8.0%; p=0.19 vs. patients with a prior contrast reaction receiving a 13-hour regimen); all 5 patients experiencing breakthrough reactions had received a five-hour regimen. Two reactions were severe, one moderate, and two mild. No reactions occurred in subjects premedicated for other reasons (0% [0/63]).

CONCLUSION

Rapid steroid premedication is associated with a breakthrough reaction rate approximately double the breakthrough reaction rate following a 13-hour regimen. However, the differences in breakthrough reaction rates of the rapid and 13-hour regimens were not statistically different for the number of patients included in this series.

CLINICAL RELEVANCE/APPLICATION

Subjects receiving an accelerated premedication regimen (n=179) had a breakthrough reaction rate that may be double the rate following 13-hour premedication, but the difference was not statistically significant.

SSQ10

Science Session with Keynote: Informatics (Quality and Safety)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S403A

IN SQ

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

Participants
Woojin Kim, MD, Philadelphia, PA (*Moderator*) Officer, Nuance Communications, Inc
Kevin W. McEnery, MD, Houston, TX (*Moderator*) Advisor, Koninklijke Philips NV; Research Agreement, Koninklijke Philips NV
Kevin L. Junck, PhD, Birmingham, AL (*Moderator*) Nothing to Disclose

Sub-Events

SSQ10-01 Informatics Keynote Speaker: Using Imaging Informatics to Improve Quality and Safety in the Era of Value-Based Care

Thursday, Dec. 1 10:30AM - 10:40AM Room: S403A

Participants
Woojin Kim, MD, Philadelphia, PA (*Presenter*) Officer, Nuance Communications, Inc

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/

Woojin Kim, MD - 2012 Honored Educator

SSQ10-02 Errors in Interpretation of Risk Estimates when Cumulative Dose is Considered

Thursday, Dec. 1 10:40AM - 10:50AM Room: S403A

Participants
Colin Walsh, MSc,BA, Dublin, Ireland (*Presenter*) Nothing to Disclose
Dara Murphy, Dublin, Ireland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

There has been considerable discussion in the literature about cumulative dose and whether it should play a role in the justification of future radiation exposures. We argue that with the increasing availability of dose histories we need to be aware of the types of errors that arise when considering cumulative dose.

METHOD AND MATERIALS

Errors relating to interpretation of risk where cumulative dose is a factor may be broken down into two categories: the first relates to how risk is modelled for low dose exposures; the second to the biological mechanisms by which harm may occur or develop.

RESULTS

Risk is modelled stochastically for low dose exposures and there is potential for confusion when we apply probability models in situations where the risk is repeated. The 'gambler's fallacy' can exert a powerful influence on our thinking leading to an overestimation of risk for subsequent exposures. Cumulative doses in excess of 100mSv - where there is clearer evidence of a link between radiation exposure and cancer induction – can cause additional concern. The second type of error relates to concerns that biological damage may accumulate with accumulating dose, leaving a patient at increased risk to a subsequent exposure. This is a factor for tissue effects at high doses, but we argue that there is no proper basis for applying this to low dose exposures. It is possible that a low dose exposure may cause vulnerabilities which place a patient at higher risk; it is possible it might promote resistance to a future exposure; it's possible that an exposure might produce vulnerability in one patient, and promote resistance in another. These effects, if they occur, are not sufficiently large to be detectable in the patient population. Adapting risk estimates based on the linear no threshold model to take account of such potential effects would be premature.

CONCLUSION

Confusion over interpretation of risks may lead to overestimation of risks for patients who have had previous scans, and deemphasise risks for patients who only need one scan.

CLINICAL RELEVANCE/APPLICATION

Modern information technology provides ready access to cumulative dose information. There are considerable benefits to providing this data. However, there is also a strong potential for confusion over radiation risks when dose history is considered. Overestimating or underestimating radiation risk can negatively impact clinical decision-making and patient care.

SSQ10-03 Current FDG PET Dosing in the US - An Overview from NCTN Clinical Trials

Thursday, Dec. 1 10:50AM - 11:00AM Room: S403A

Participants
Katherine Binzel, PhD, Columbus, OH (*Presenter*) Nothing to Disclose
David Poon, BS, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose

Preethi Subramanian, MS, BEng, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Prayna Bhatia, BS, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Chadwick L. Wright, MD, PhD, Lewis Center, OH (*Abstract Co-Author*) Nothing to Disclose
Michael V. Knopp, MD, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Nathan C. Hall, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Jun Zhang, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

With increasing attention to radiation dose exposure overall, refined approaches to reduce dose burden from PET tracers are needed. In order to establish more insight into current national practices, we analyzed PET acquisition data from national cooperative trials performed within the NCI National Clinical Trial Network.

METHOD AND MATERIALS

FDG dosing recommendations have been established more than a decade ago (2006 for NCI) at 10 – 20 mCi, while FDA labeling envisions 5 -10 mCi. International clinical practice is trending to consistently lower tracer doses, however short of meta-analysis of published research papers, no data on current trends within national trials have been analyzed. We performed a multiple database query and analysis of NCTN clinical trials that include FDG PET/CT imaging.

RESULTS

More than 2000 PET examinations were included in this evaluation, from 177 different sites across the country. 92% of PET exams had injected doses greater than 10 mCi, with the current average dose trending around 13 mCi. Based on anecdotal data, US FDG dosing remains substantially higher than international practices. Protocol compliance was found to be high e.g. one trial of 474 FDG PET exams and a protocol dose guidance of 7-20 mCi, 2% used doses were below that range, however 10% were above. From an ALARA perspective, PET FDG dosing ranges should be lowered and should reach convergence with the FDA guidelines.

CONCLUSION

The evaluation of FDG PET dosing over several multi-institutional clinical trials showed that in general compliance with protocol dosing guidelines is excellent. There were a minimal number of studies which were completed outside of protocol dosing limits. However, the trend for dosing at sites across the country is well above FDA recommendations of 5-10 mCi of FDG, but within the decade old NCI recommendations. FDG dosing protocol guidance should reflect current opportunities to lower tracer radiation dose and long standing recommendations revisited on behalf of ALARA.

CLINICAL RELEVANCE/APPLICATION

FDG dosing compliance is high in national clinical trials that use PET, however protocol guidelines and practice recommendations remain above FDA guidelines and should be lowered.

SSQ10-04 Quantitative and Qualitative Optimization of Dosimetry in Computed Tomography Explorations of the Temporal Bone using Two Iterative Reconstruction Algorithms

Thursday, Dec. 1 11:00AM - 11:10AM Room: S403A

Participants
Olivier Legeas, MD, Brest, France (*Presenter*) Nothing to Disclose
David Bourhis, Brest, France (*Abstract Co-Author*) Nothing to Disclose
Julien Ognard, MD, MSc, Brest, France (*Abstract Co-Author*) Nothing to Disclose
Marc Garetier, MD, Brest, France (*Abstract Co-Author*) Nothing to Disclose
Adele Pennaneach, Quimper, France (*Abstract Co-Author*) Nothing to Disclose
Philippe F. Meriot, MD, Brest, France (*Abstract Co-Author*) Nothing to Disclose
Douraied Ben Salem, MD, PhD, Brest, France (*Abstract Co-Author*) Nothing to Disclose

CONCLUSION

The two analysed iterative reconstruction algorithms responded well to the objectives of dose reduction in the exploration of the temporal bone.

Background

Iterative reconstruction (IR) has recently demonstrated its ability to reduce the dose of X-rays used in the exploration of several anatomical regions. However, there is no study involving a qualitative and quantitative comparison of the various IRs available for exploring the temporal bone. The aim of this study is to analyse Two IR algorithms (ASIR, GE Healthcare and SAFIRE, Siemens) in order to optimise dosimetry in scans of the temporal bone.

Evaluation

Using a Catphan® phantom, we studied the quantitative relationship between the contrast to noise ratio (CNR), the dose expressed as the volume computed tomography dose index (CTDIvol) and the strength of IR. The reference reconstruction technique was Filtered Back-projection (FBP) and the reference CTDIvol was 113mGy. We verified the absence of a reduction in spatial resolution and we defined an optimized dose to maintain reference CNR for each scale of IR. Based on these data we acquired series of images on an anthropomorphic phantom with an authentic human temporal bone for each level of iteration at the optimized dose; the purpose of this was to evaluate them qualitatively. Four radiologists used a three points image quality score to evaluate 16 anatomical structures, and an analysis of variance (ANOVA) was performed.

Discussion

The resulting measurements demonstrated a constant CNR with reduced dose without a loss of spatial resolution in the two manufacturers' systems. For each of the 5 scales of IR, the optimized dose was respectively 83, 59, 40, 22 and 11mGy for SAFIRE, and 89, 75, 64, 53 and 44 mGy for ASIR, and the mean image quality score were respectively 1,9(FBP); 1,7 (IR1); 1,6 (IR2); 1,7 (IR3);1,3(IR4);1,1(IR5) for SAFIRE and 1,9(FBP); 1,9 (IR1); 1,5 (IR2); 1,5 (IR3);1,3(IR4);0,9(IR5) for ASIR. The ANOVA analysis showed no significant difference between FBP and IR3 for SAFIRE and between FBP ans IR1 for ASIR, that leads to 65% dose reduction for SAFIRE and 20% for ASIR.

SSQ10-05 Radiological Arousal? Physiological Indices of Unconscious Detection of "Missed" Lung Lesions

Thursday, Dec. 1 11:10AM - 11:20AM Room: S403A

Participants
Gregory DiGirolamo, PhD, Worcester, MA (*Presenter*) Nothing to Disclose
Zachary R. Zaniewski, BA, Worcester, MA (*Abstract Co-Author*) Nothing to Disclose
Max P. Rosen, MD, MPH, Worcester, MA (*Abstract Co-Author*) Stockholder, Everest Scientific Inc; Consultant, PAREXEL International Corporation; Stockholder, Cynvenio Biosystems, Inc; Medical Advisory Board, Cynvenio Biosystems, Inc

PURPOSE

We have previously shown, that radiologists (RADS) look significantly longer at the location in which a lesion is present, even when they don't consciously recognize and report the lesion. Here we ask if the unconscious detection produces a change in physiological arousal, independent of conscious report, when an abnormality is present in the image. We used eye-tracking and pupil diameter to measure changes in arousal, as pupil diameter is a reliable and accurate measurement of physiological arousal.

METHOD AND MATERIALS

6 experienced RADS interpreted 18 axial chest CT scans (9 normal and 9 abnormal (containing 16 nodules). Pupil size was measured to determine if the presented lung lesion produced an unconscious detection and associated change in arousal. Pupil diameter was measured under 4 conditions: 1) A lung lesion was present, and the RAD was looking directly at it and successfully consciously detected it; 2) A lung lesion was present, and the RAD was looking directly at it and didn't consciously detect or consider it; 3) A lung lesion was present, and the RAD was neither looking directly at it nor consciously detected or considered it; and 4) No lesion was present.

RESULTS

On average 8/16 (50%, +/- 9%) lung nodules were consciously identified. Arousal, as indexed by pupil diameter, significantly differed between our 4 conditions, with $F(3, 15) = 3.44$, $p < 0.05$. Compared to arousal when looking at healthy tissue, arousal significantly increased ($p < 0.05$) when a lung lesion was present, and the RAD was looking directly at it and consciously detected it; or when RADS were looking at the lesion and were unconscious of it ($p<0.005$). Arousal was also significantly greater ($p< 0.05$) when a lesion was present, but RADS were neither looking at it or consciously detected it. Arousal was equivalent in all conditions in which a lesion was present regardless of the conscious detection.

CONCLUSION

Our data show that unconscious processes successfully detect the presence of a lesion and increase physiological arousal, as indexed by changes in pupil size, even without conscious awareness of the abnormality. Moreover, this increased arousal occurs with the presence of an abnormality even if not looking directly at the lesion.

CLINICAL RELEVANCE/APPLICATION

Many findings missed in clinical practice, may actually be detected unconsciously. The use of measures of physiological arousal may be used to improve radiologists' performance.

SSQ10-06 Preempting Unsafe and Near-Miss Events in MRI: Impact of Interventions and an Enterprise Reporting and Tracking System

Thursday, Dec. 1 11:20AM - 11:30AM Room: S403A

Participants
Judah Burns, MD, Bronx, NY (*Presenter*) Nothing to Disclose
William Walter, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Michael L. Lipton, MD, PhD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

An online portal for anonymous reporting and tracking actual and near miss MRI safety events was instituted to enhance the overall culture of safety surrounding MRI at a multi-site (n=8) tertiary health system. We present the results of 13 consecutive years of monitoring, including the initiation of incremental MRI safety measures, in relation to growing MRI volumes across the enterprise.

METHOD AND MATERIALS

Prospective collection of MRI safety and near-miss event reports was initiated in 2002. Ongoing monitoring of reports motivated numerous MRI safety initiatives, including: electronic door locks with auto-locking and monitoring capabilities, educational initiatives for referring clinicians, two-level written screening forms, and ferromagnetic detectors. Near-miss events were tabulated for hospital and outpatient sites, and categorized as: burn, nerve stimulation, Zone 4 door left open, unauthorized personnel, unsafe equipment, unsafe implant, incomplete screening form, and pacemaker referral. Categorized results were tabulated and compared to annual MRI exam volume.

RESULTS

Following a 6 month run-in period, 374 total events were reported (mean = 28.8/year). During the assessment period (2003-2015), departmental MRI volumes increased from 18,223 to 41,465 annual exams. The normalized rate of reported events decreased progressively from 0.27% to 0.05%. Pacemaker referral was the most commonly reported potential safety event (56%), followed by "incomplete screening form" and "unsafe implant". During the first 4 years of the monitoring program, the average annual rate of reported events was 0.18% and declined significantly to 0.07% over the final 9 years ($p<0.0001$). During this period, MRI exam volume shifted from predominantly hospital-based (80%) to a mix of hospital (56%) and outpatient imaging.

CONCLUSION

The initiation of an enterprise-wide MRI safety monitoring tool, which motivated a series of targeted mitigation strategies, enhanced the overall institutional culture of safety. A progressive reduction in MRI unsafe and near-miss events, both in absolute and relative terms, was achieved over 4 years and sustained over a subsequent 9-year period. Impact was greatest at hospital-based imaging sites, particularly during the first few years of the program.

CLINICAL RELEVANCE/APPLICATION

Tracking of MRI safety and near-miss events contributes to a reduction of relative and absolute annual reported events.

SSQ10-07 An Addition to the Radlex Playbook Naming Convention that Allows for Series Level Dose Comparisons

Thursday, Dec. 1 11:30AM - 11:40AM Room: S403A

Participants
Timothy P. Szczykutowicz, PhD, Madison, WI (*Presenter*) Equipment support, General Electric Company; License agreement, General Electric Company
Robert K. Bour, MD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Amanda Ciano, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Annelise Malkus, PhD, Madison, WI (*Abstract Co-Author*) Licensing agreement, General Electric Company
Frank N. Ranallo, PhD, Madison, WI (*Abstract Co-Author*) Grant, General Electric Company
Myron A. Pozniak, MD, Madison, WI (*Abstract Co-Author*) Stockholder, Cellectar Biosciences, Inc; Support, General Electric Company

CONCLUSION

Our proposed extension to the Radlex naming convention would not require the same degree of stewardship as the existing standard since there are only a relatively small number of contrast phases using in diagnostic radiology (early arterial, late arterial, etc.).

Background

CT can contain multiple acquisitions associated with different contrast phases. The naming associated with each of these images impacts many downstream workflows, for example hanging protocols and dose mapping. This work focuses on a proposed addition to the widely accepted Radlex playbook system that will enable series level dose comparison both intra and inter institutionally.

Evaluation

We exported all irradiation events for CT from our commercial dose monitoring software which included all dose information and the protocol and series names. By combining the protocol name and series name, we were able to create a unique identifier for each irradiation event. This identifier is indication specific (since the protocol name can be linked to a Radlex indication specific RPID) and contrast phase specific (since our series names contain series specific verbiage). Using this system, we can map irradiation events together even when multiple protocols are used for one exam or only part of a protocol was used. Our proposed addition to the Radlex system is a new standardized series level naming convention that relates to the contrast usage for the series. For example, the series name denotes the presence of contrast and what phase. For routine exams like our head protocol, this results in series names like "HEAD W/O" and "HEAD W IVC". However, the utility of our system is shown when we scan a stroke patient which involves a non-contrast head, a CTA head, a perfusion scan and a with contrast head. Our naming convention allows for the routine head portions of this stroke workflow to be correctly mapped to a routine head Radlex RPID for dose reasons, and the total stroke dose to be computed.

Discussion

The type of series level naming in use at our institution allows one to compare doses both on an indication and series level. It also allows for analysis of the frequency optional portions of a protocol are used.

SSQ10-08 Experiences Operationalizing an Annotation Image Markup-compliant (AIM) PACS Tool Within Interpretation Workflow for Tracking Oncological Measurements

Thursday, Dec. 1 11:40AM - 11:50AM Room: S403A

Participants
Pritesh Patel, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Merlijn Sevenster, PhD, Cambridge, MA (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Thomas A. Forsberg, MSc, Cambridge, MA (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Aaldert J. Elevelt, MS, Best, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Rob van Ommering, PhD, Eindhoven, Netherlands (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Igor Trilisky, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Pieter C. Vos, MS, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Paul J. Chang, MD, Chicago, IL (*Abstract Co-Author*) Co-founder, Stentor/Koninklijke Philips NV; Researcher, Koninklijke Philips NV; Medical Advisory Board, lifeIMAGE Inc; Advisory Board, Bayer AG

PURPOSE

An integrated PACS tool ("Measurement Assistant" [MA], Philips) has been demonstrated in previously published work to provide efficient and accurate structured authoring of oncological RECIST measurements in AIM-compliant format. This early work on a controlled number of cases established that radiologists experienced a time penalty in "baseline" exams due to the entering and labelling new lesions, which was balanced by improved efficiency when interpretating "followup" exams due to semi automated lesion identification and navigation. We report on utilization, efficiency and learning experiences of a continuous quality improvement (CQI) project to adopt MA in the abdomen section of an academic hospital.

METHOD AND MATERIALS

A version of MA with granular interaction logging was installed on all abdomen workstations. Readers were trained and encouraged to track all measurements of confirmed oncological lesions. Utilization was tracked by detecting if MA had been used in reports with measurements. Measurement reporting time per exam (MRT) was estimated from the MA interaction log file events. A learning effect was studied by comparing (t test) number of MA interactions in each reader's first, second and third 20 exams read with MA.

RESULTS

In the course of 30 weeks, 1,736 exams were read with MA by 36 readers. Average utilization was 77% and rose from 66% in the first four weeks to 84% in the last four. Estimated MRT was 43 seconds with MA on baseline exams and 16 seconds on followup

exams. Compared to the first 20 exams, readers had 21% (P < 0.001) fewer interactions with MA in the second 20 exams. Between the second and third set of 20 exams, there was no significant interaction reduction (P = 0.54).

CONCLUSION

MA was successfully adopted in the abdomen section. Earlier reported time efficiency gains were confirmed in this study in an uncontrolled setting. Users had no significant learning curve after the first 20 exams read with MA.

CLINICAL RELEVANCE/APPLICATION

Oncological measurements can be collected in AIM-compliant re-usable format by means of a PACS-integrated tool resulting in both improved lesion documentation accuracy and improved efficiency relative to traditional methods.

SSQ10-09 The Cost of Distraction: Quantifying the Effects of Telephone Interruptions on the Diagnostic Radiologist Using Mobile Eye Tacking

Thursday, Dec. 1 11:50AM - 12:00PM Room: S403A

Awards
Student Travel Stipend Award

Participants
Booth Aldred, MD, Salt Lake City, UT (*Presenter*) Nothing to Disclose
Marta E. Heilbrun, MD, Salt Lake City, UT (*Abstract Co-Author*) Nothing to Disclose
Richard H. Wiggins III, MD, Salt Lake City, UT (*Abstract Co-Author*) Nothing to Disclose
Satoshi Minoshima, MD, PhD, Salt Lake City, UT (*Abstract Co-Author*) Royalties, General Electric Company; Research Consultant, Hamamatsu Photonics KK; Research Grant, Hitachi, Ltd; Research Grant, Nihon Medi-Physics Co, Ltd;
Trafton Drew, PhD, Salt Lake City, UT (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The third leading cause of death in the United States is the result of medical errors. In diagnostic radiology, an estimated 30% of errors are classified as perceptual and potentially preventable. Radiologists' job is made even more difficult by telephone interruption. Correlational studies show increased interruptions are associated with more disagreements in patient diagnosis. We aim to quantify the effect of distraction on diagnostic accuracy, interpretation time, and eye-movement patterns.

METHOD AND MATERIALS

Sixteen radiologists, ranging from 4th year residents, fellows, to attending physicians participated in the study. A work-list of "emergent" studies, including six computed tomographic studies with a spectrum of critical findings, were interpreted and dictated. Each session included two interrupting phone calls with pre-recorded messages requesting the interpreting radiologist give a "wet read" on two separate studies. Telephone interruptions were counterbalanced across cases, allowing comparison of identical cases between radiologists.

RESULTS

Diagnostic accuracy was unaffected by interruption in the preliminary sample. However, after controlling for time attending the interruption, total time spent on each case was increased in the face of distraction (8-1/2min: interrupted case, 5min: uninterrupted; $t(15)=4.5$, $p<.001$). Despite this increase in overall time spent examining cases that were interrupted, time spent looking at critical findings, such as a sternal fracture, was much lower (mean dwell time: 80ms during interruption trials, 5200ms during uninterrupted trials).

CONCLUSION

Mobile eye-tracking technology allows for unobtrusive observation of radiologists behavior in realistic scenarios with emulation of true reading room challenges. Our research suggests that telephone interruptions result in substantial changes in how radiologists approach the interrupted case. Increased overall time spent may result because they have no dedicated mechanism to allow return to where they left off. This was exemplified in the significant variability of radiologists to effectively return to a case after an interruption. In future work we hope to determine whether some strategies, such as templates, may ameliorate the costs associated with telephone interruption.

CLINICAL RELEVANCE/APPLICATION

Radiology distractions lead to increased interpretation time and search pattern failure.

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/

Richard H. Wiggins III, MD - 2012 Honored Educator

SSQ11

Molecular Imaging (New Tracers/Methods)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S505AB

CT MI MR NM

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

FDA Discussions may include off-label uses.

Participants
Vikas Kundra, MD, PhD, Houston, TX (*Moderator*) License agreement, Introgen Therapeutics, Inc
Zaver M. Bhujwalla, PhD, Baltimore, MD (*Moderator*) Nothing to Disclose

Sub-Events

SSQ11-01 Novel Intrinsically Zirconium-89 Radiolabeled Self-Destructing Mesoporous Silica Nanostructures for in Vivo Biodistribution and Tumor Vasculature Targeting Studies

Thursday, Dec. 1 10:30AM - 10:40AM Room: S505AB

Awards
Student Travel Stipend Award

Participants
Shreya Goel, Madison, WI (*Presenter*) Nothing to Disclose
Feng Chen, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Sixiang Shi, MS, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Hector Valdovinos, MS, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Todd Barnhart, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Weibo Cai, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Long residence times and resultant toxicity remains a major roadblock in clinical translation of nanomaterials. We present synthesis of biodegradable mesoporous silica nanoparticles, to carry multiple cargos types and self-destruct over time after release of payload. Chelator-free labeling of bMSNs with 89Zr (t1/2 = 72. 8 h) was used to track their in vivo pharmacokinetics and CD105 targeting ability via positron emission tomography (PET) imaging.

METHOD AND MATERIALS

Multi-generational bMSNs with tunable pore diameters, were synthesized via biphase stratification approach and characterized. In vitro degradation and dual drug release studies were carried out in simulated body fluid (SBF) for 21 days. bMSNs were intrinsically chelated with oxophilic radionuclide 89Zr, followed by conjugation with polyethylene glycol (PEG) and TRC105 antibody to form (89Zr)bMSN-PEG-TRC05 for in vivo PET imaging in 4T1 metastatic murine breast tumor model.

RESULTS

Degradation of nanocarriers into biocompatible and non-toxic byproducts presents a favorable prospect for their clinical translation. Dendritic bMSNs with spoke-like radiating bimodal mesoporous channels showed large pore size (5.4 nm and 12 nm) resulting in rapid and complete degradation in SBF within 21 days. bMSNs showed high co-encapsulation and pH-dependent release of the drugs. Excellent 89Zr labeling yield (~ 98 % within 2 h at 75 °C) and radiostability (> 95% upto 72 h) were observed. CD105 specificity of (89Zr)bMSN-PEG-TRC05 was confirmed in vivo with PET images with significantly enhanced tumor uptake (4.5±0.6, 11.2±2.1, 11.5±1.3 and 11.2±0.9 %ID/g at 0.5, 6, 24 and 48 h post injection). The specificity was further confirmed with systematic ex vivo biodistribution and histological examination.

CONCLUSION

The versatile and easily tunable approach shows great potential for bench-to-bedside transition of personalized nanomedicine. The nanoparticles can be tailored to (i) label clinically relevant diagnostic and therapeutic radioisotopes without tiresome chelator chemistries, (ii) carry small-molecule and large biomolecular drugs for combination therapy, (iii) specifically target any tumor type by modifying the targeting ligand, and, (iv) auto-destruct and excrete from the body within a reasonable time period.

CLINICAL RELEVANCE/APPLICATION

Biodegradable nanoparticles with multiple cargo carrying ability combat two primary roadbloacks in clinical translation of nanomedicine.

SSQ11-02 Protein Corona: A Simple Solution that Enables Clinical Translation of Stem Cell Imaging

Thursday, Dec. 1 10:40AM - 10:50AM Room: S505AB

Awards
Student Travel Stipend Award

Participants
Hossein Nejadnik, MD, PhD, Stanford, CA (*Presenter*) Nothing to Disclose
Seyedmeghdad Taghavigarmestani, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Philip Yang, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Morteza Mahmoudi, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Heike E. Daldrup-Link, MD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To develop a new, transfection-agent free labeling approach that is clinically applicable for localizing and tracking stem cells, using MR imaging with minimum manipulation of nanoparticles and cells.

METHOD AND MATERIALS

We labeled human mesenchymal stem cells (hMSC) by ferumoxytol in media containing human serum (group 1), fetal bovine serum (group 2), StemPro® media (group 3), protamine (group 4) and protamine+heparin (group 5). Formation of protein corona around ferumoxytol was characterized by dynamic light scattering (DLS), zeta potential, and liquid chromatography–mass spectrometry (LC-MS). Iron uptake was evaluated by DAB-prussian blue, Lysotracker and inductively coupled plasma spectrometry(ICP). To evaluate the effect of different labeling methods on MR signal, labeled and unlabeled hMSCs were imaged in vitro as well as ex vivo in pig knee. MR imaging was performed in a 3T MR scanner, using T2W FSE and MESE sequences to calculate T2 relaxation times. Data was analyzed using ANOVA test with $p<0.05$.

RESULTS

DLS and zeta potential showed more disperse nanoparticles and decrease of negative charge of nanoparticles in all groups compared to bare nanoparticles. LC-MS revealed different proteins covering nanoparticles. Most common proteins in group 1 were Apolipoprotein A-I, E, C-I, and A-II, and in group 2 were Hemoglobin alpha and beta, Apolipoprotein A-II, Alpha-2-HS-glycoprotein, and Albumin. ICP and histology results showed higher iron uptake in group 1 compared to other groups. hMSCs in group 1 revealed significantly shorter T2 relaxation times (17.03±0.23ms) compared to unlabeled, group 2, 3, 4, and 5 hMSCs (33.29±1.22, 26.79±1.46, 20.70±0.81, 25.61±0.33, 21.90±0.44 ms) ($p<0.05$). After implantation into pig knee, Labeled hMSCs in group 1 revealed significantly shorter T2 relaxation times (12.68±0.11ms) compared to unlabeled, group 2, 3, 4, and 5 hMSCs (35.74±2.75, 20.94±3.9, 17.50±0.33, 19.48±1.13, 17.42±0.21 ms) ($p<0.05$). In vivo applications in pig knees are ongoing.

CONCLUSION

This study showed a significant higher ferumoxytol uptake by hMSCs labeled with human serum containing media compared to previously reported approaches with transfection agents.

CLINICAL RELEVANCE/APPLICATION

Protein-corona-mediated cell labeling represents a new and readily clinically translatable method for labeling "off the shelf" cell products with ferumoxytol.

SSQ11-03 Radiotracer Derivatives of Trimethoprim (TMP) for Imaging Transgenic Cells

Thursday, Dec. 1 10:50AM - 11:00AM Room: S505AB

Awards
Student Travel Stipend Award

Participants
Mark A. Sellmyer, MD, PhD, Philadelphia , PA (*Presenter*) Nothing to Disclose
Iljung Lee, philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Catherine Hou, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Brian Lieberman, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Chenbo Zeng, philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
David A. Mankoff, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Speaker, Koninklijke Philips NV; Consultant, General Electric Company; Advisory Board, RefleXion Medical Inc
Robert Mach, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

There is a clinical need for quantitative, sensitive methods to image genetically engineered cells, including immune cells used for cell-based therapy. Given the genetic manipulation inherent to gene therapy, a genetic imaging handle / reporter protein is a logical solution and positron emission tomography (PET) can provide the desired sensitivity and spatial resolution. We developed a PET imaging strategy based on the bacterial protein E. coli dihydrofolate reductase (Ec DHFR) and its highly specific small molecule inhibitor, trimethoprim (TMP). Here, we describe the initial synthesis and testing of [18F] fluoropropyl-TMP, [18F]FPTMP.

METHOD AND MATERIALS

[18F]FPTMP was synthesized via a bis-boc protected reaction. HCT116 cells were transduced with YFP-Ec-DHFR fusion gene and sorted by FACS. Cell uptake, time course and saturation assays with [18F]FPTMP were performed (and with competing cold TMP or methotrexate). Protein was quantified by Lowry method. To show in vivo activity, immune deficient mice were xenografted with HCT116 DHFR and control cells. Tumors were grown for 2 weeks prior to injection of ~ 200 µCi of [18F]FPTMP. PET/CT imaging, time activity curves and biodistribution studies were performed.

RESULTS

[18F]FPTMP radiosynthesis showed high specific activity and there was rapid uptake (~3-fold at 5 minutes) and excellent overall target to background (over 16-fold at 2h) in vitro in HCT116 DHFR cells. Cold TMP completely inhibited uptake and methotrexate had no effect in control cells, suggesting no cross reactivity with mammalian DHFR. [18F]FPTMP saturation studies showed an expected low Kd of 0.46 nM (+/- 0.07) and Bmax of 2870 +/- 106 fmol/mg. In a mouse xenograft model, there was over 6-fold specific signal induction in Ec DHFR tumors with [18F]FPTMP and over 40-fold induction relative to muscle. [18F]FPTMP showed a favorable biodistribution, with mixed renal and hepatobiliary metabolism.

CONCLUSION

The radiosynthesis and in vivo application of [18F]FPTMP for PET reporter gene imaging is a simple solution providing a quantitative, sensitive tool that could be easily applied to imaging cell therapy in humans.

CLINICAL RELEVANCE/APPLICATION

Clinicians are interested in basic questions for cell therapies – Are the cells getting to where they are supposed to go and are there sites of off-target accumulation? – And TMP radiotracers may provide a single, facile reporter to allow such monitoring.

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 A. Mankoff, MD, PhD - 2013 Honored Educator

SSQ11-04 Non-Invasive Quantification of Macrophage Recruitment in Head and Neck Carcinoma using Flourine 19MRI

Thursday, Dec. 1 11:00AM - 11:10AM Room: S505AB

Awards
Student Travel Stipend Award

Participants
Aman Khurana, MD, San Diego, CA (*Presenter*) Nothing to Disclose
Fanny Chapelin, MS, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Hongyan Xu, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Quyen Nguyen, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Eric T. Ahrens, PhD, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Head and neck squamous cell carcinoma (HNSCC) is a source of significant morbidity and mortality worldwide with risk factors including HPV status, tobacco and alcohol. In HPV negative tumors, reduced survival outcomes associated with tumor protein 53 (TP53) mutation only occur in combination with loss of chromosome 3p with reduction in median survival from 5 years for TP53 mutations to 1.7 years for a double hit (TP53 and 3p). The reasons for worse outcomes are still unclear with potential explanations including decreased radiosensitivity of double-hit tumors and/or role of infiltrating host immune cells/macrophages. Previous studies have also shown that "double-hit/Cal27" xenografts have higher matrix metalloproteinase (MMP) activity and since a significant amount of MMP is provided by tumor associated macrophages, we expect more macrophage accumulation for the "double-hit/Cal27" group compared to the "single-hit/SCC4" group.

METHOD AND MATERIALS

A novel perfluorocarbon (PFC) emulsion was used to tag macrophages in situ with high specificity and sensitivity and no background. Approximately 5x106 cells of two different cell lines, single-hit/ SCC4 and double-hit/ Cal27, were injected in bilateral flanks of 10 mice (n=5 in each group). These mice were then injected intravenously with 0.2ml of PFC emulsion (VS-1000, Celsense, Inc., Pittsburgh, PA) and 19F and proton MRI was performed on Day 2 & 10 post-injection. Tumors were then excised for histology toevaluate immune cell recruitment and to differentiate between M1 & M2 macrophages.

RESULTS

The average number of 19F spins within the tumors were significantly more (approximately double, $p<0.05$) for the "double-hit/Cal27" group compared to the "single-hit/SCC4" group (3.94x1019 compared to 1.98x1019 19F / tumor) signifying ncreased tumor associated macrophage burden in the double hit tumors. The number of infiltrating macrophages per tumor decreased in both groups over the course of 8 days but not significantly.

CONCLUSION

These preliminary results show that by using a PFC nanoemulsion via an IV injection and 19F MRI, tumor associated macrophage burden of prognostically different double hit and single hit tumors can be easily differentiated in vivo.

CLINICAL RELEVANCE/APPLICATION

This non-invasive method to quantify tumor associated macrophage burden will pave the way to identify prognostically poor head and neck tumors with the 19F MRI in clinical trials.

SSQ11-05 Chelator-Free 89Zr-Labeling of Gd2O2S:Eu Nanoparticles with Super In Vivo Radio-Stability

Thursday, Dec. 1 11:10AM - 11:20AM Room: S505AB

Participants
Shreya Goel, Madison, WI (*Presenter*) Nothing to Disclose
Fanrong Ai, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Yonghua Zhan, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Feng Chen, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Todd Barnhart, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Weibo Cai, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Owing to the special electronic shell structure of Eu atom, Gd2O2S:Eu nanoparticles can be excited by Cerenkov or γ radiation. The intense luminescence in the red region can be observed, which can be harnessed for optical imaging. Herein we report the first study of 89Zr-labeled Gd2O2S:Eu nanoparticles ([89Zr]Gd2O2S:Eu) with high radio-stability for in vivo radioluminescence imaging (RLI).

METHOD AND MATERIALS

Monodispersed Gd2O2S:Eu nanoparticles (diameter ~20 nm) were synthesized using a co-thermal decomposition of precursors Gd(ddtc)3(Phen) and Eu(ddtc)3(Phen) and surface modified with amphiphilic DSPE-PEG5k. The abundant O atoms in the Gd2O2S:Eu nanoparticles were utilized for chelator-free radiolabeling with oxophilic isotope, zirconium-89 (89Zr; t1/2 = 78.4 h). PET imaging was used to study the in vivo radiostability of the [89Zr]Gd2O2S:Eu nanoparticles.[89Zr]Gd2O2S:Eu nanoparticles were subcutaneously/intravenously injected into mice to demonstrate RLI in vivo.

RESULTS

[89Zr]Gd2O2S:Eu nanoparticles were successfully synthesized for RLI studies. ~ 76.1% 89Zr-labeling yield was achieved upon.RL intensity of [89Zr]Gd2O2S:Eu nanoparticles wasdepended on the radioactivity, concentration of [Eu] and the distance between 89Zr and Gd2O2S:Eu. In vivo, the [89Zr]Gd2O2S:Eu yielded enhanced optical signal with open (collecting both RLI signal from [89Zr]Gd2O2S:Eu and Cerenkov luminescence signal) and 620 nm (collecting only the RLI signal from [89Zr]Gd2O2S:Eu, but not the Cerenkov luminescence signal from 89Zr) filters. Separately injected 89Zr and Gd2O2S:Eu, and 89Zr only controls showed significantly reduced signal intensity.PET imaging indicated high radiostability of [89Zr]Gd2O2S:Eu complex in intravenously injected mice. Dominant liver and spleen uptake and low bone uptake was seen upto 7 days.

CONCLUSION

We demonstrate the synthesis, in vitro and in vivo applications of radioluminescent nanoparticles.89Zr could be intrinsically labeled to Gd2O2S:Eu, with high labeling yield and good in vivo radiostability.RLI overcomes the tissue penetration limitation of traditional optical imaging modalities, due to the excitation of Gd2O2S:Eu from Cerenkov radiation or higher energy particles from 89Zr decay.

CLINICAL RELEVANCE/APPLICATION

Our proof-of-principle study conveys the promising potential of [89Zr]Gd2O2S:Eu nanoparticles as multimodality (PET/Cerenkov/RL/CT) imaging probes.

SSQ11-06 Pharmacokinetic Analysis and Extravasation Study of a Novel Nanobubble Ultrasound Contrast Agent

Thursday, Dec. 1 11:20AM - 11:30AM Room: S505AB

Participants
Hanping Wu, MD, Cleveland, OH (*Presenter*) Nothing to Disclose
Reshani Perera, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Agata A. Exner, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Our group recently presented a simple strategy using the nonionic surfactant, Pluronic, as a size control excipient to produce nanobubbles in the 100 nm range which exhibited stability and echogenicity on par with clinically available microbubbles. The objective of the current study was to evaluate biodistribution and extravasation of the Pluronic-stabilized lipid nanobubbles compared to microbubbles in two experimental tumor models in mice.

METHOD AND MATERIALS

Standard microbubbles or Pluronic L10 lipid-stabilized perfluoropropane nanobubbles were bolus injected into mice bearing either an orthotropic mouse breast cancer (BC4T1) or subcutaneous mouse ovarian cancer (OVCAR-3) through tail vein. The mean echo-power value in the liver, kidney and tumor as function of time was acquired and the peak enhancement and decay slope were calculated for each tissue. To quantify extravasation, fluorescently-labeled nanobubbles and microbubbles were intravenously injected into mice bearing the same tumors. Three hours later, 0.1 ml fluorescein labeled tomato lectin (1mg/ml) was i.v. injected into mice to label the vessels. The mice were then perfused with PBS, the tumor tissue was harvested and imaged to measure bubble signal in tissue.

RESULTS

The mean diameter of nanobubble and microbubble was 123.0 nm ± 24.9 and 685.0 nm ± 129.5, respectively. No significant differences were observed in peak enhancement between the nanobubble and microbubble groups in the three tested regions (tumor, liver and kidney). The decay rates of nanobubbles in all 3 ROIs were slower than those of microbubbles, and significant differences were noted in tumor of both models (0.79 dB/min ± 0.40 vs 1.13 dB/min ± 0.24 in BC4T1 tumor, and 1.66 dB/min ± 0.76 vs 2.64 dB/min ± 0.46 in OVCAR-3 tumor, respectively). Nanobubbles were also retained in tumor tissue to a higher extent compared to microbubbles in both tumor models.

CONCLUSION

Pluronic-stabilized nanobubbles show equivalent peak enhancement and slower washout in tumors compared to microbubbles. Histological analysis demonstrates enhanced nanobubble extravasation and enhanced retention within tumor tissue. This study demonstrates potential augmented utility of these agents in ultrasound molecular imaging and drug delivery beyond the tumor vasculature.

CLINICAL RELEVANCE/APPLICATION

Pluronic-stabilized nanobubbles can offer more robust properties in areas of molecular imaging and drug delivery.

SSQ11-07 Is Delayed Dynamic PET Acquisition Still Valuable for 18F-FLT Kinetics Quantification?

Thursday, Dec. 1 11:30AM - 11:40AM Room: S505AB

Participants
Xiaoli Liu, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Jun Zhang, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Preethi Subramanian, MS, BEng, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Bhuvaneswari Ramaswamy, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Michael V. Knopp, MD, PhD, Columbus, OH (*Presenter*) Nothing to Disclose

PURPOSE

Cancer patients with poor veins frequently have venous access problems and cannot be injected on the PET table for dynamic imaging, which leads to the loss of early kinetic information. In this study we investigate whether kinetic parameters can still be accurately estimated using a delayed dynamic FLT PET acquisition, and how long a dynamic acquisition is required for accurate quantification.

METHOD AND MATERIALS

30min-dynamic FLT PET scans were acquired on a Gemini TF 64 system in continuous list mode. Dynamic PET data were reconstructed following a 26-frame protocol (8x15s, 6x30s, 5x1min, 5x2min, 2x5min). Maximum activity concentrations (Bq/mL) of both tumors and plasma in the descending aorta were obtained with 3D VOI. Ki values were calculated using Patlak Analysis based on different linear regression onset time (T0) points (1, 6, 7, 8, 9 and 10min) and end time (Td) points (16, 20, 25 and 30min). Ki of the 1-30min data set were taken as the gold standard and compared with the rest data series. Pearson product-moment correlation coefficient (R) of 0.9 was chosen as a limit for the correlation coefficient. A total of 32 data sets were evaluated.

RESULTS

Ki calculated with 6-8min injection-to-acquisition time showed excellent correlations (R>0.9) with gold standard regardless of Td value. When acquisition started 9min after dose injection, Td should be ≥20min to ensure accurate Ki estimation. If acquisition were initiated 10min post dose injection, Td=30min was required for accurate Ki estimation. 6-25min acquisition generated the best Ki correlation (R=0.99) while the worst occurred with 10-16min acquisition (R=0.62). Equivalent acquisition durations (EAD) were calculated by Td-T0; data acquired with shorter injection-to-acquisition time generated more accurate Ki values (R=0.96 and 0.80 for 6-16min and 10-20min, respectively). Acquisitions with EAD≥8min could provide accurate Ki values (R>0.9) except for those of 10-20min (R=0.80) and 10-25min (R=0.89).

CONCLUSION

Dynamic FLT PET acquisition after 6-10min injection-to-acquisition delay can still generate accurate Ki values, even with equivalent acquisition duration as short as 8 minutes.

CLINICAL RELEVANCE/APPLICATION

This study demonstrated the ability of delayed dynamic FLT PET imaging without influencing the kinetic quantification, making its application more feasible for clinical therapy response assessment.

SSQ11-08 Pseudo-Cloaking Contrast Media (PCCM's) for In vivo Differentiation using Detection-based spectral CT

Thursday, Dec. 1 11:40AM - 11:50AM Room: S505AB

Participants
Khaled A. Nasr, PhD, Dallas, TX (*Presenter*) Nothing to Disclose
Todd C. Soesbe, PhD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Robert E. Lenkinski, PhD, Dallas, TX (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV; Research Consultant, Aspect Imaging;
Matthew A. Lewis, PhD, Dallas, TX (*Abstract Co-Author*) Research collaboration, CMR Naviscan Corporation

PURPOSE

To develop and evaluate simultaneously administered contrast media that exhibit pseudo-cloaking (PCCM's) for in vivo differentiation using clinical detection-based spectral CT.

METHOD AND MATERIALS

Compound of elements (Z=70 to Z=78) were purchased and used for phantom studies. Nanopowder colloidal of tungsten carbide (WC, 20 mg/mL W), tungsten oxide (WO3, 20 mg/mL W) and rhenium sulfide (ReS2, 20 mg/mL Re), tantalum (Ta, 20 mg/mL), tantalum oxide (Ta2O5, 20 mg/mL) were synthesized by colloidal and microemulsion method in 2% carboxymethylcellulose. Four female Fischer rats (n = 4) averaging 150 g mass were fasted for 24 hours. The rats were then given 4 mL of oral contrast. Phantoms and animal images were obtained using a detection-based spectral CT scanner (IQon, Philips Healthcare).

RESULTS

Phantom images exhibit a clear separation between elements (Z=70 to Z=78) and iodine-based contrast media. As a result, two contrast media, one made from high-Z elements and the second made from iodine-based contrast media could be used simultaneously to distinguish between an oral and vascular contrast in a single CT examination. Unfortunately, most compounds of high-Z elements have unknown or high toxicity (LD50) making them unsuitable to be used for in vivo CT imaging. In this study we selected tungsten carbide (LD50 >2000 mg/Kg), tungsten trioxide (LD50= 1059 mg/Kg rat oral), tantalum (LD50= 2500 mg/Kg), tantalum oxide (LD50= 8000 mg/Kg) and rhenium sulfide as an oral contrast and iopamidol as iodine-based vascular contrast agent for phantoms and in vivo imaging. Both PCCM's and iodine-based contrast media appear in the conventional image with high attenuation. In the virtual non-contrast (VNC) images, contrast from iodine was removed but tungsten and rhenium contrast was not affected. In iodine-no-water images (I-n-W), iodine contrast was not affected but contrast from tungsten and rhenium was removed.

CONCLUSION

Colloidal nanoparticles of low toxicity compounds of tantalum, tungsten and rhenium were shown to be excellent candidates of PCCM's providing a clear separation from iodine-based contrast media observed in phantom and in vivo imaging using detection-based spectral CT. Both barium and bismuth-based contrast media were shown to have similar radiographic appearance as Iodine.

CLINICAL RELEVANCE/APPLICATION

High-Z element PCCM's can provide clear oral and vascular differentiation in a single CT examination detection-based spectral CT

SSQ11-09 Pharmacokinetic Monitoring of Adoptively Transferred CEA-Targeted Human T Lymphocytes with a Dual-Modal Positron Emission Tomography (PET) Near-Infrared Fluorescent (NIRF) Imaging Agent

Thursday, Dec. 1 11:50AM - 12:00PM Room: S505AB

Participants
Stefan Harmsen, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Ilker Medine, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Fuat Nurili, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Jose Lobo, New York, NY (*Abstract Co-Author*) Nothing to Disclose

Yiyu Dong, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Maxim A. Moroz, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Nagavarakishore Pillarsetty, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Vladimir Ponomarev, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Oguz Akin, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Omer Aras, MD, New York, NY (*Presenter*) Nothing to Disclose

PURPOSE

Despite the remarkable progress of adoptive T cell therapy in cancer treatment, there remains an urgent need for the noninvasive tracking of the transfused T cells. Therefore, we developed a dual-modal PET/NIRF nanoparticle-based imaging agent to efficiently label human CAR T cells ex vivo and monitored the therapeutic effect of CAR T-cell in a murine model of ovarian cancer.

METHOD AND MATERIALS

Human T lymphocytes co-transduced with chimeric antigen receptors (CAR) specific for human carcinoembryonic antigen and a Renilla luciferase, were labeled with the extrinsic 89Zr-PET/NIRF nanoparticle-based imaging agent ex vivo. The labeled CEA-targeted CAR T cells were injected (i.p. and i.v.) into SCID mice bearing intraperitoneal lesions of human ovarian carcinoma cells (SKOV3) engineered to overexpress hCEA and transduced with firefly reporter gene Renilla luciferase reporter gene. The localization of adoptively transferred T cells in this peritoneal ovarian carcinomatosis model was monitored with bioluminescence imaging (BLI) as well as small-animal PET and end-point near infrared fluorescence imaging (λmax=800 nm)

RESULTS

The adoptively transferred CEA-targeted CAR T cells were efficiently labeled with the dual-modal PET/NIRF imaging agent without affecting CAR T cell viability and cytotoxic functionality on the target cells. Small animal PET imaging enabled whole-body tomographic CAR T cell tracking over a long period of time to establish the pharmacokinetic profile of these T cells following i.p. or i.v. administration. More importantly, by correlating the PET imaging with BLI, it was shown that i.p. is the most effective route of administration in terms of co-localization with the peritoneal ovarian cancer tumor deposits. Lastly, end-point NIRF imaging of the labeled CAR T cells demonstrated specific infiltration in CEA-overexpressing tumor deposits.

CONCLUSION

These results show that noninvasive monitoring of genetically engineered human T lymphocytes labeled by our dual-modal PET/NIRF imaging agent provides high resolution anatomically correlated information on T-cell trafficking and has translational implications.

CLINICAL RELEVANCE/APPLICATION

Clinically applicable strategies of noninvasive cell tracking can greatly impact the design and development of T cell-mediated cancer therapy, the assessment of patient response to antitumor treatment, and the optimization (personalization) of therapeutic plans.

SSQ12

Musculoskeletal (Knee)

Thursday, Dec. 1 10:30AM - 12:00PM Room: E451A

MK MR

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

Participants
David A. Rubin, MD, Saint Louis, MO (*Moderator*) Nothing to Disclose
Mary M. Chiavaras, MD, PhD, Ancaster, ON (*Moderator*) Consultant, Toshiba Medical Systems Corporation; Research Grant, Arthrex, Inc; ;

Sub-Events

SSQ12-01 Distribution of Subchondral Travecular Bone Density: Effects of Meniscal Integrity

Thursday, Dec. 1 10:30AM - 10:40AM Room: E451A

Participants
Aticha Ariyachaipanich, MD, Bangkok, Thailand (*Presenter*) Nothing to Disclose
Emel Kaya, MD, Sisli, Turkey (*Abstract Co-Author*) Nothing to Disclose
Sheronda Statum, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Reni Biswas, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Dosik Hwang, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Betty Tran, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Won C. Bae, PhD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Christine B. Chung, MD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study is to describe the appearance and density of the cadaveric tibial subchondral trabecular bone in the knees with normal and torn menisci.

METHOD AND MATERIALS

3D-high resolution PD CUBE MRI exams of the 6 cadaveric knees were acquired in the axial plane at 0.25 mm resolution. Images were reformatted in the coronal and sagittal plane and reviewed by two musculoskeletal radiologists. Menisci were evaluated in each compartment as normal, intrasubstance degeneration or tear in the anterior horn, mid-body, and posterior horn. At each meniscal compartmental designation, the tibial subchondral (within 5 mm) trabecular pattern was evaluated, and subchondral trabecular bone density was determined in meniscal covered- vs. –uncovered regions using a Matlab routine.

RESULTS

In the samples, 2 exams showed normal medial menisci while the remaining four exams demonstrated medial meniscal tear in consensus. In normal samples (A,B), region of high trabecular bone density was found centrally in axial images. In contrast, in samples with meniscal tear (C,D,E,F), there was a tendency of the shift of the region of high bone density towards the location of the meniscal tear. Tear-associated bone changes were also observable in other planes (E,F). Trabecular bone density of normal samples in meniscal-covered and –uncovered regions were 30 ± 4.6% (mean ± std. dev.) and 40 ± 3.4%, respectively, while those of torn samples were 36 ± 5.3% and 47 ± 3.8%, suggesting a slightly higher (p=0.17) values in torn samples, and a significantly higher (p=0.001) values in uncovered regions.

CONCLUSION

Changes in subchondral trabecular density are identified in the setting of meniscal pathology.

CLINICAL RELEVANCE/APPLICATION

Quantitative evaluation of trabecular response to meniscal pathology may offer insight into bone adaptation as a surrogate for meniscal mechanical axis, and offer insight into "inside-out" theories of osteoarthritis.

SSQ12-02 MR Proprieties of the Posterior Root Ligaments of the Knee in Cadaveric Specimens and Healthy Volunteers: Morphology and Relaxation Patterns with a Focus on Adjacent Cartilage

Thursday, Dec. 1 10:40AM - 10:50AM Room: E451A

Awards
Student Travel Stipend Award

Participants
Alessandro Vidoni, MD, San Diego, CA (*Presenter*) Nothing to Disclose
Tineke De Coninck, MD, Ghent, Belgium (*Abstract Co-Author*) Nothing to Disclose
Sheronda Statum, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Reni Biswas, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Betty Tran, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Won C. Bae, PhD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Christine B. Chung, MD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To explore the relationship of root ligament morphology and quantitative MR properties in cadaveric specimens and asymptomatic volunteers.

METHOD AND MATERIALS

7 fresh cadaveric knees (64 to 92 years) (screened for degrees of degeneration with CT) and 6 healthy volunteers (25 to 42 years) were imaged at 3T. Morphologic (PD, T1 SE, PD CUBE), and quantitative standard (T2 CUBE) and ultra-short TE (T2*) MR sequences were performed. Thr study took place under the approval of the institutional review board (IRB). 3 anatomical regions were considered for morphology:1.root ligaments posterior horns medial and lateral menisci grade I= intrasubstance signal intensity increase not touching the articular surface; grade II= partial discontinuity; grade III= full-thickness tear;2. articular cartilage of femur in contact with root ligaments
3. articular cartilage of tibia in contact with root ligamentsboth evaluated with modified ICRS grading system. In addition, qMRI values of those regions were extrapolated with mono-exponential fitting and T2 maps (when ICRS grade 2 or less).

RESULTS

In cadaveric knees, pathology of root ligament included grade 1 (n=4 PLRL; n=1 PMRL) degeneration. In all cases, apposing articular cartilage was abnormal: femur (grade I n=3; grade II n=2) and tibia (grade I n=1; grade II n=2; grade III n=2). T2 relaxation values obtained in degenerated RL (average: T2 CUBE= 37.18; UTE T2*=19.913) and adjacent cartilage of femur (average: T2 CUBE= 54.84; UTE T2*= 28.38) and tibia (average: T2 CUBE= 52.69; UTE T2*=17.87). Reference values obtained in healthy volunteers: root ligament (average: T2 CUBE= 19.33; UTE T2*= 9.02), femoral (average: T2 CUBE= 26.98; UTE T2*= 16.54) and tibial (average: T2 CUBE= 22.53; UTE T2*= 13.17) cartilage. Values of femoral cartilage at the level of the curved posterior aspect of the condyle were increased due to magic angle effect.

CONCLUSION

Morphologic and quantitative MR evaluation of the posterior horn meniscal root ligaments can identify structural change that is associated with chondral degeneration. The morphologic alterations of posterior root ligaments as well as of adjacent cartilaginous surfaces of tibia and femur suggest an interdependence between root ligament structural alteration and chondral integrity that may be mechanical in nature.

CLINICAL RELEVANCE/APPLICATION

Quantitative MRI values of root ligament and related cartilage are good predictors for degeneration.

SSQ12-03 The Association of Superolateral Hoffa's Fat Pad Edema and Synovitis with Structural Changes in the Patellofemoral and Tibiofemoral Joints: The MOST Study

Thursday, Dec. 1 10:50AM - 11:00AM Room: E451A

Participants
Mohamed Jarraya, MD, Boston, MA (*Presenter*) Nothing to Disclose
Ali Guermazi, MD, PhD, Boston, MA (*Abstract Co-Author*) President, Boston Imaging Core Lab, LLC Research Consultant, Merck KgaA Research Consultant, Sanofi-Aventis Group Research Consultant, TissueGene, Inc Research Consultant, OrthoTrophic Research Consultant, AstraZeneca PLC
David T. Felson, MD, MPH, Boston, MA (*Abstract Co-Author*) Consultant, Zimmer Biomet Holdings, Inc
Frank W. Roemer, MD, Boston, MA (*Abstract Co-Author*) Chief Medical Officer, Boston Imaging Core Lab LLC; Research Director, Boston Imaging Core Lab LLC; Shareholder, Boston Imaging Core Lab LLC; ;
Michael C. Nevitt, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Joshua J. Stefanik, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the relation of superolateral Hoffa's fat pad (SHFP) edema and Hoffa-synovitis to cartilage damage and bone marrow lesions (BMLs) in the patellofemoral (PF) and tibiofemoral (TF) joints.

METHOD AND MATERIALS

The Multicenter Osteoarthritis (MOST) study is a NIH-funded longitudinal cohort study of older individuals with or at risk for knee OA. We used data from the 60-month study visit where all eligible subjects had knee MRI assessed for other structural features of knee OA. SHFP edema and Hoffa-synovitis (infrapatellar and/or intercondylar) were assessed on sagittal proton density-weighted fat-suppressed MRI images by two musculoskeletal radiologists and dichotomized into presence (>1) and absence (=0). Cartilage damage and BMLs were scored in the PF and TF joints. We used three definitions of structural damage: 1) any cartilage damage (WORMS score of ≥2), 2) full-thickness cartilage damage (WORMS score 2.5, 5-6) and 3) any BML (WORMS score of ≥1). We further defined the location of PF and TF joint damage in the lateral and medial compartments. Separate logistic regression models were used to determine the relation of SHFP edema to our three definitions of structural damage in the medial and lateral PF and TF joints, adjusting for age, sex and BMI. The same models were used with Hoffa's synovitis as the exposure instead of SHFP edema.

RESULTS

1041 knees were included; Mean (sd) age and BMI were 66.8 (7.5) and 29.6 (4.8), respectively; 65% were female. SHFP edema and Hoffa-synovitis was present in 12.7% and 59.3% of knees, respectively. Compared with knees without SHFP edema, knees with SHFP edema showed statistically significant increase in odds of any and full-thickness cartilage damage, and any BML in the lateral PF joint only. Compared with knees without synovitis, knees with Hoffa-synovitis showed statistically significant odds of any and full thickness damage, and BMLs in all 4 compartments (table).

CONCLUSION

While synovitis is a marker of whole-joint disease, SHFP edema is a surrogate of local lateral PF joint disease only. SHFP edema is likely the result of mechanical impingement and maltracking leading to local structural abnormalities like cartilage and osseous changes.

CLINICAL RELEVANCE/APPLICATION

Unlike synovitis, SHFP edema is a surrogate of local lateral PF joint disease only, independent from structural changes in the TF joint.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying

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/

Ali Guermazi, MD, PhD - 2012 Honored Educator

SSQ12-04 Radiograph-based Grading of Infrapatellar Pad Opacity of Assessment of Knee Synovitis: Reliability Study with Contrast-enhanced MRI Correlation

Thursday, Dec. 1 11:00AM - 11:10AM Room: E451A

Participants
Seong Jong Yun, Cheongwon-gun, Korea, Republic Of (*Presenter*) Nothing to Disclose
Youngsik Lim, MD, Gyeonggi-do, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yong Sung Park, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Wook Jin, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
So Young Park, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yunkyung Shin, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ji Seon Park, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyung Nam Ryu, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ye Na Son, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyunseok Jeong, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the reliability of infrapatellar fat pad (IPFP) opacity grading based on lateral knee radiograph for assessment of knee synovitis using correlation with contrast-enhanced (CE) magnetic resonance (MR) imaging.

METHOD AND MATERIALS

Institutional review board approval was obtained. Retrospective review of lateral knee radiographs and CE knee MR examinations (time interval, 0–7 days) from 79 patients (male:female, 37:42; mean age, 60.1 years) was performed by two radiologists independently. They evaluated the following grades: (1) IPFP opacity alteration grade (CR-IPFP grade 0–3) and joint effusion grade (CR-EFF grade 1–3) on lateral knee radiograph, (2) IPFP signal alteration grade (MR-IPFP grade 0–3) and grade of joint effusion amount (MR-EFF grade 1–3) on CE MR images, (3) individual synovitis grade (MR-SYN grade 1–3) at 11 divided sites on CE MR images, and (4) compartments (parapatellar, periligamenous, perimeniscal) MR-SYN grade (grade 1–3) and whole-knee MR-SYN grade (grade 1–4) by adding individual MR-SYN grade. For statistical analysis, the Spearman correlation test and weighted kappa (κ) values were used.

RESULTS

The CR-IPFP grade was strongly correlated with the MR-IPFP grade (ρ=0.906), and also with the whole-knee MR-SYN (ρ=0.740), suprapatellar MR-SYN (ρ=0.708), infrapatellar MR-SYN (ρ=0.726), and the parapatellar MR-SYN grades (ρ=0.718). The CR-IPFP grade was moderately correlated with MR-SYN grades of the other 9 sites and 2 compartments (ρ=0.502–0.687). The MR-IPFP grade was strongly correlated with the whole-knee MR-SYN (ρ=0.748) and the parapatellar MR-SYN grades (ρ=0.739). For CR-IPFP grade and MR-IPFP grade, interobserver reliability were 0.830 and 0.844, respectively. For MR-SYN grades of each site and whole-knee, interobserver reliability were 0.730–1.000 and 0.803, respectively.

CONCLUSION

CR-IPFP grade enabled reliable evaluation and reporting of the knee synovitis. Especially, both CR-IPFP and MR-IPFP grades were well correlated with the MR-SYN grade of the whole-knee and the parapatellar compartment.

CLINICAL RELEVANCE/APPLICATION

Grading of IPFP opacity alteration on lateral knee radiograph is a potentially screening and an easy tool to evaluate the severity of knee synovitis.

SSQ12-05 Quantitative Assessment of Meniscal Degeneration with Ultrashort Echo Time-T2* and Standard T2 Mapping MRI

Thursday, Dec. 1 11:10AM - 11:20AM Room: E451A

Participants
Soo Yeon Choi, MD , Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Sang Hoon Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Min Hee Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hye Won Chung, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Myung Jin Shin, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the feasibility of standard T2 mapping and ultrashort echo time-T2 star (UTE-T2*) mapping to detect the meniscal degeneration of the knee.

METHOD AND MATERIALS

Standard T2 map and UTE-T2* map were acquired on two hundred eight menisci of ninety nine patients, medial or lateral meniscus after the routine MR sequences. UTE-T2* mapping images were acquired at seven echo times (TE=0.1 2.5 4.8 7.2 9.5 11.8 14.2ms) with TR=20.2ms. Standard T2 mapping images were acquired at 6 echo times (TE=13.0 26.0 39.0 52.0 65.0 78.0ms) with TR=2600ms. Images were graded the meniscal degeneration according to the morphologic criteria on intermediate-weighted sequences. [Grade 0, normal, no abnormal hyperintensity within meniscus; Grade 1, small focal area of hyperintensity within meniscus; Grade 2, linear areas of hyperintensity without extension to articular surface; Grade 3, abnormal hyperintensity extending to the articular surface, indicated tear]. Regions of interest were manually drawn on each menisci and abnormal hyperintensity portion within meniscus to calculated the mean T2* and T2 values.

RESULTS

Grade 0, 1, 2 and 3 were diagnosed in 50, 52, 50 and 56 menisci, respectively. Both mean T2 and T2* values of menisci were found to significantly different between the all grades and tended to be higher in more severely degraded meniscus. (P <0.001 for both) The mean T2 values of the menisci were 10.78, 15.81, 20.26 and 30.80ms, and the mean UTE-T2* values of the menisci were 7.10, 9.64, 12.01 and 18.98ms for grade 0, 1, 2 and 3, respectively. Mean T2 and T2* values of hyperintensity portion within menisci (Grade 1-3) were significantly higher than the values of menisci (P <0.0001 for both) and also increased with the grade of meniscal degeneration (P=0.002 between grade 1 and 2 in mean T2 value, others P <0.001). Mean T2 values of hyperintensity were 20.05, 24.39 and 38.92ms and mean UTE-T2* values of hyperintensity were 10.94, 13.67 and 22.36ms at T2* values for grade 1, 2 and 3, respectively.

CONCLUSION

Standard T2 mapping and UTE-T2* mapping are both sensitive to detect degenerative changes in meniscus and can be used to quantitatively characterize meniscus degeneration in patients.

CLINICAL RELEVANCE/APPLICATION

Standard T2 mapping and UTE-T2* mapping are novel tool for the detection and quantification of meniscal degeneration that may predict progression of meniscal degeneration and development of meniscal tear.

SSQ12-06 Association of MRI-Based Tibial Slope Measurements with Mucoid Degeneration of the Anterior Cruciate Ligament; A Case - Control Study

Thursday, Dec. 1 11:20AM - 11:30AM Room: E451A

Participants
Nima Hafezi Nejad, MD, MPH, Baltimore, MD (*Presenter*) Nothing to Disclose
Bashir Zikria, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Alex Johnson, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Yalda Siddiqui, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Robert M. Kwee, Heerlen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Shivani Ahlawat, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
John N. Morelli, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Laura M. Fayad, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Shadpour Demehri, MD, Baltimore, MD (*Abstract Co-Author*) Research support, General Electric Company; Researcher, Carestream Health, Inc; Consultant, Toshiba Corporation;

PURPOSE

To investigate whether medial (MTS) and lateral tibial slope (LTS) measurements are associated with the presence of ACL mucoid degeneration (MD) independent of age, gender, BMI and Medial Tibiofemoral Compartment (MTFC) damage.

METHOD AND MATERIALS

Following IRB approval for this retrospective study, four musculoskeletal radiologists interpreted 471 consecutive knee MRI examinations obtained by consensus. ACL MD cases had intact ACL from origin to insertion, and MR pulse sequence with increased signal intensity and easily distinguishable bundles on fat-saturated Proton Density (PD) images (but not on PD images). A sample of 108 examinations including 36 knees with ACL MD and 72 age and gender matched controls with normal ACLs were included in the analysis.

Whole Organ MR Imaging Score (WORMS) was used to assess the severity of meniscal and cartilage damage (MTFC damage). Tibial slope measurements were done by defining the tibial proximal anatomic axis (TPAA). Tangent lines were drawn and the angles between the TPAA and the medial and lateral tibial plateaus were measured on fat saturated PD images, blinded to ACL MD determination. Analysis was performed using generalized estimating equations with stepwise adjustments.

RESULTS

Knees with ACL MD had significantly higher values of LTS, but not MTS measurements (7.20º (95%CI: 4.36–9.07) vs. 5.28º (2.72–7.89); P-value: 0.04). In the adjusted models, there was a significant linear association between MTS and LTS measurements and ACL MD. Every one degree higher, MTS and LTS values were associated with 3.4 % (0.2–6.5; P-value: 0.03) and 4.3 % (1.8–6.7; P-value<0.01) higher probability of having ACL MD, respectively.

CONCLUSION

We found a trend of linear association between the MTS and LTS with the presence of ACL MD. The association was greater for the LTS and was independent of subjects' age, gender, BMI, and MTFC damage (WORMS≥5).

CLINICAL RELEVANCE/APPLICATION

Our results suggest that similar to the known association between increased MTS and LTS measurements and ACL rupture, re-injury and graft failure, these increased measurements are also associated with the presence of ACL MD.

SSQ12-07 Coup-Contrecoup Mechanism in the Knee: Exploring the Association between Superolateral Patellar Instability and Posteromedial Corner

Thursday, Dec. 1 11:30AM - 11:40AM Room: E451A

Awards
Student Travel Stipend Award

Participants
Shobhit Sharma, MD , Little Rock, AR (*Presenter*) Nothing to Disclose
Vibhor Wadhwa, MBBS, MD, Little Rock, AR (*Abstract Co-Author*) Nothing to Disclose
Shelly Lensing, Little Rock, AR (*Abstract Co-Author*) Nothing to Disclose
Tarun Pandey, MD, FRCR, Little Rock, AR (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To study association between non-traumatic lateral patellar instability and degenerative pathology of the posteromedial corner (PMC) of knee and to investigate if severity of the patellar instability correlates with medial meniscal extrusion.

METHOD AND MATERIALS

Retrospective review of 101 consecutive knee MRIs (age range 11-80 years; 66% female) with exclusion of traumatic knee injuries was performed. Patellar instability was evaluated using 8 parameters: Insall-Salvati ratio, patellar tilt, patellotrochlear index, sulcus angle, lateral trochlear inclination, patellar subluxation, patellofemoral cartilage loss & superolateral Hoffa's fat pad edema. Patellar instability was defined (and scored 0-8) by abnormality of these indices. PMC of the knee was evaluated for tear and/or degeneration of the medial meniscus, posteromedial capsule and muscular complex (semimembranosus and medial head of gastrocnemius). Medial meniscal extrusion was also quantified.

RESULTS

The prevalence of patellar instability and PMC pathology was 78% (79/101) and 93% (94/101) respectively. 79% with patellofemoral cartilage degeneration had meniscal extrusion vs 43% with no degeneration ($p<0.001$). Also, cartilage degeneration was significantly associated ($p<0.05$) with tear/degeneration of medial head of gastrocnemius as well as that of the posterior capsule. Other patellar instability factors showed significant associations with PMC pathology: Abnormal patellar tilt and sulcus angle with meniscal tear/degeneration and abnormal patellotrochlear index with semimembranosus degeneration were significant ($p<0.05$).Severity of patellar instability (0/8 to observed maximum 6/8) was significantly associated with prevalence of meniscal extrusion ($p=0.001$). The prevalence of extrusion for those with 0, 1-2 and 3-6 abnormalities was 33%, 64% and 79% respectively. Also, the degree of extrusion (in mm) significantly increased with increasing patellar instability; the mean (SD) was 0.6 (1.1), 1.1 (1.2), and 1.4 (1.2) for 0, 1-2, and 3-6 abnormalities ($p=0.030$).

CONCLUSION

Patellar instability is associated with PMC pathology and the severity of patellar instability can be a predictor of worsening medial meniscal extrusion.

CLINICAL RELEVANCE/APPLICATION

The association between PMC pathology and patellar instability suggests a coup-countrecop mechanism. Hence pathology in PMC region should alert towards patellar instability and vice versa.

SSQ12-08 Spontaneous Osteonecrosis of the Knee (SONK): The Role of MR Imaging in Predicting Clinical Outcome

Thursday, Dec. 1 11:40AM - 11:50AM Room: E451A

Awards
Student Travel Stipend Award

Participants
Jared Nesbitt, MD, Stony Brook, NY (*Presenter*) Nothing to Disclose
Dharmesh Tank, MD, Stony Brook, NY (*Abstract Co-Author*) Nothing to Disclose
Marco A. Oriundo Verastegui, MD, Lima, Peru (*Abstract Co-Author*) Nothing to Disclose
Elaine S. Gould, MD, Stony Brook, NY (*Abstract Co-Author*) Nothing to Disclose
Mingqian Huang, MD, Syosset, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the potential associations between MR imaging patterns and findings in patients with diagnosis of subchondral fracture around the knee, formerly known as SONK, and their clinical outcome.

METHOD AND MATERIALS

We evaluated 43 knees of 37 patients (28 male, 15 female), who had diagnosis of subchondral fractures around the knee. The mean age is 56 years old (range 17- 83). Musculoskeletal fellowship trained radiologists evaluated all 43 knee MRI for: 1) location of marrow edema; 2) periosseous edema; 3) subchondral fracture; 4) subchondral articular surface contour; 5) meniscal tear and extrusion; 6) adjacent soft tissue edema; 7) joint effusion. Independent clinical chart review was performed for clinical outcomes with follow up time average of 13.3 months (range 0 - 88 month). Poor outcome was defined as progression to articular surface collapse, continued complaints leading to surgical knee replacement or another episode of SONK. Chi-square analysis and Student's T tests were conducted to test the statistical significance of association between MR findings and outcomes. Statistical significance were set at $p=0.05$ level.

RESULTS

Of 43 knees, 6 patients had another episode of SONK (14%), 11 patients were not improving or needed injection vs arthroscopy (26%), 4 patients required arthroplasty (9%), 22 patients had no negative outcome (51%). Age ($P=0.62$), gender ($P=0.84$), diabetic status ($P= 0.73$) and location of marrow edema ($P= 0.30$) show no influence on outcome. The poor outcome group had a significantly higher average BMI (31.7 vs. 28.0, $P=0.02$). Positive change of subchondral articular surface contour was the only imaging finding in isolation associated with poor outcome (80% vs. 39.9%, $P=0.02$). The presence of multiple imaging findings of above 3), 4), 5) and 6) had a higher percentage of poor outcomes (77.8%) compared to those with less positive findings (47.2%).

CONCLUSION

MR imaging findings may help at identifying SONK patients with risk of developing unfavorable clinical outcomes.

CLINICAL RELEVANCE/APPLICATION

There is potential of MR Imaging at helping prognosticate subchondral fractures around the knee. Careful and close follow up with more aggressive treatment can help certain group of patients to minimize their risk.

SSQ12-09 Imaging Features of iBalance, New High Tibial Osteotomy: What the Radiologist Needs to Know

Thursday, Dec. 1 11:50AM - 12:00PM Room: E451A

Participants
Erin F. Alaia, MD, New York, NY (*Presenter*) Nothing to Disclose
Christopher J. Burke, MBChB, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Michael Alaia, MD, New York, NY (*Abstract Co-Author*) Speaker, Jubilant Life Sciences Ltd
Gina A. Ciavarra, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Eric J. Strauss, MD, New York, NY (*Abstract Co-Author*) Consultant, Arthrex Inc
Ignacio Rossi, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Robert Meislin, MD, New York, NY (*Abstract Co-Author*) Consultant, Arthrex Inc
Zehava S. Rosenberg, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

iBalance high tibial osteotomy, (iHTO, Arthrex Inc, Naples Florida), is a recently introduced surgical procedure for correction of knee genu varus malalignment. iHTO, utilizing a polyetheretherketone (PEEK) implant and osteoinductive compounds (OIC), presents challenging post operative radiographs which can easily be misinterpreted as infection. Our purpose is to report, based on review of 24 cases, the previously undescribed to the best of our knowledge, radiographic features of iHTO and its complications.

METHOD AND MATERIALS

Retrospective query of our digital database was performed to identify iHTO cases. The clinical and post-surgical images in all cases with > 1-month follow up imaging, were reviewed with attention to 1. Correction of varus malalignment, 2. Healing at the osteotomy site, 3. Changes in the OIC, and 4. Complications.

RESULTS

There were 24 iHTOs in 23 patients (17 men, 6 women, ages 21-59, mean 44, median 46), imaged 2 to 29 months post-surgery, with angle of correction, when available, ranging from 5-14 degrees. Immediate post-surgical correction of genu varum deformity was seen in 100% of patients. 100% depicted oval radiolucencies, at bone PEEK interface simulating erosions and infection. Four, often overlapping, signs of healing were noted: 1. Blurring of bony margins at the osteotomy site, noted within 2 weeks post surgery, 2. Blurring of sharp interface between OIC and host bone, 3. Anterior, posterior and less commonly medial bridging callus, 4. Resorption of OIC, noted as early as 4 months. Complications, seen in 8 cases (33%), included genu varum recurrence (n=2), painful exuberant bone formation, (n=1), persistent pain requiring knee arthroplasty, (n=1), and propagation of the osteotomy through the lateral tibial cortex (n=5). In patients with >6 months follow-up, nonunion and possible infection was seen in 1 patient.

CONCLUSION

iHTO typically depicts oval radiolucencies at the PEEK bone interface not to be mistaken for infection. Familiarity with this features, as well as with other signs of healing, should aid the radiologist in accurate interpretation of post operative films of iHTO patients.

CLINICAL RELEVANCE/APPLICATION

Radiologists should be aware of potential complications and the normal radiographic appearance of healing after iHTO, which may mimic infection to the inexperienced reader.

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/

Zehava S. Rosenberg, MD - 2014 Honored Educator

SSQ13

Nuclear Medicine (Breast/Chest Imaging)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S504CD

BR CH CT MR NM

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

Participants
Matthias J. Eiber, MD, Muenchen, Germany (*Moderator*) Nothing to Disclose
Terence Z. Wong, MD, PhD, Chapel Hill, NC (*Moderator*) Nothing to Disclose

Sub-Events

SSQ13-01 Positron Emission Tomography (PET) Imaging of Chemokine Receptor CXCR4 in Patients with Breast Carcinoma: Initial Experience

Thursday, Dec. 1 10:30AM - 10:40AM Room: S504CD

Participants
Tibor Vag, MD, PhD, Munich, Germany (*Presenter*) Nothing to Disclose
Stephan Metz, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Katja Steiger, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Johannes Ettl, Munchen, Germany (*Abstract Co-Author*) Nothing to Disclose
Markus Niemeyer, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Stefan Paepke, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Hans-Jurgen Wester, Munchen, Germany (*Abstract Co-Author*) CEO, SCINTOMICS GmbH
Markus Schwaiger, MD, Munich, Germany (*Abstract Co-Author*) Research Grant, Siemens AG; Speaker, Siemens AG

PURPOSE

CXCR4 is a chemokine receptor that is overexpressed in several types of human cancers including breast cancer and seems to play crucial rule in the mechanism of metastasis. The aim of this proof of concept study was to evaluate the novel CXCR4 targeted Positron Emission Tomography (PET) probe 68Ga-Pentixafor for Imaging of breast carcinoma.

METHOD AND MATERIALS

10 patients suffering from breast cancer (9 patients with primary breast cancer, one patient with local recurrent breast cancer) underwent either PET/CT or PET/MR imaging using 68Ga-Pentixafor. The lesions included 9 invasive ductal carcinomas (IDC) and one invasive lobar cancer (ILC). Maximum standardized uptake values (SUVmax) and tumor-to-background ratios (T/B ratio) were determined in the breast cancer lesions and correlated with immunohistochemistry.

RESULTS

8 of 10 breast cancers were visually detectable with a mean SUVmax of 3.1 (range 1.7 to 4.5) and a mean T/B ratio of 2.8. The visually undetectable lesions included the case of ILC and one IDC (T2 Grade 2). Immunohistochemistry revealed highest CXCR4 staining intensity in the patient with local recurrent breast cancer which also showed highest T/B ratio of all examined lesions. Lowest CXCR4 staining intensity was observed in the visually undetectable case of ILC. Interestingly, the CXCR4 positive cells in immunohistochemical workup not only comprised tumor cells but also surrounding lymphocytes.

CONCLUSION

CXCR4 directed PET imaging of breast cancer is feasible. Moreover, based on these first observations in this small patient cohort, histopathological CXCR4 expression profile on the tumor cell surface seems to correlate with signal intensity in PET imaging.

CLINICAL RELEVANCE/APPLICATION

CXCR4 directed PET imaging might be a promising new tool in oncology. Further studies are necessary to evaluate, if signal intensity of the primary cancer in PET is associated with prognostic factors, e.g with metastatic potential of the tumor.

SSQ13-02 Impact of High Definition Reconstruction in FLT PET/CT

Thursday, Dec. 1 10:40AM - 10:50AM Room: S504CD

Participants
Preethi Subramanian, MS, BEng, Columbus, OH (*Presenter*) Nothing to Disclose
Prayna Bhatia, BS, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Katherine Binzel, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Nathan C. Hall, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Bhuvaneswari Ramaswamy, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Michael V. Knopp, MD, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Jun Zhang, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

18F-fluorothymidine (FLT) is a promising non-invasive PET/CT imaging biomarker taken up in proliferative tissues such cancer lesions, bone marrow and liver that is also used for therapy response assessments which necessitates precise delineation and accurate SUV measurements. We therefore proposed and assessed the benefits of reducing the image reconstruction voxel volume 64mm3 (SD)⇒8mm3 (HD) and thus increasing the effective imaging matrix size.

METHOD AND MATERIALS

Using the list mode raw data from a FLT PET/CT therapy assessment trial, 10 breast cancer patients studies that were imaged

using the list mode raw data from a FLT PET/CT therapy assessment trial, 10 breast cancer patients studies that were imaged using a dose of 10 mCi on a conventional TOF PET/CT system, were reconstructed using a newly implemented high definition (HD) reconstruction approach. The previous FLT datasets were used as comparator and had been reconstructed using a standard definition (SD) default approach using 4 mm voxel length and 33 subsets with 3 iterations. For the HD approach using the 2mm voxel length which leads to 1/8 of the referenced voxel volume, 4 reconstructions with 3 iterations and 33, 21, 15 and 9 subsets were performed on Baseline and follow-up FLT scans. Quantitative assessments were performed by placing 3D ROIs on lesions as well as healthy liver and bone marrow (L1, L3 & L5 vertebrae). Image review was done by three blinded readers.

RESULTS

Initially we compared the different subset approaches for the HD reconstruction and found the 3i9s rated as clinically preferable and was subsequently used. Image quality, lesion detectability and lesion delineation was rated preferable by blinded review and was found to be significantly ($p<.01$) improved on the high definition recon. Our quantitative assessment included 72 lesions across the 24 PET exams, the SUV_Max of lesions increased on average by 18%, while the liver background SUV_Mean varied by only 2-3% between HD and SD recon. Substantial increases in SUV_Mean were also noted in the bone marrow (13%).

CONCLUSION

High definition image reconstruction was found to be feasible and highly beneficial for FLT PET leading to substantially improved image quality and lesion delineation as well as more accurate quantification.

CLINICAL RELEVANCE/APPLICATION

FLT PET imaging benefits from high definition reconstruction leading to improved image quality, lesion delineation and quantitative accuracy.

SSQ13-03 Quantification Accuracy in Detection of Primary Breast Cancer and Axillary Lymph Node Metastasis by Whole-body (WB) and Prone Breast PET/MR Compared with PET/CT

Thursday, Dec. 1 10:50AM - 11:00AM Room: S504CD

Participants
Sirong Chen, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
Catherine Wong, Hong Kong, Hong Kong (*Presenter*) Nothing to Disclose
William Cheung, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
Yim Lung Leung, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
Thomas K. Cheng, MBBS, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
Ka Nin Wong, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
Gladys G. Lo, MD, Happy Valley, Hong Kong (*Abstract Co-Author*) Nothing to Disclose
Chi Lai Ho, Hong Kong, Hong Kong (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

In this prospective study, we focus on evaluating PET quantification accuracy in primary breast carcinoma (CA) and axillary lymph node (LN) metastasis using WB PET/MR and regional prone PET/MR acquired with breast coil, as compared with PET/CT.

METHOD AND MATERIALS

From April to June 2015, 13 breast CA patients (age=53.4±10.5y) were enrolled for clinically indicated PET/CT and subsequent PET/MR (Biograph mCT & mMR). PET/CT acquired with 2min/bed at ~70min post 18F-FDG injection. WB PET/MR started at ~120min with 5min/bed PET acquisition and axial T2 HASTE, DWI & coronal T2. Regional prone PET/MR with breast coil began at ~160min with 5min PET acquisition and routine breast sequences. PET/CT and PET/MR for primary and axillary LN disease were interpreted individually, with SUVmax and ADC measured.

RESULTS

A total of 20 breast CA lesions (size=2.6±2.0cm) and 11 axillary LN metastases were confirmed by histopathology and follow-up. PET/CT identified 18/20 primary lesions and 9/11 metastatic axillary LN. For primary breast CA, WB PET/MR detected 15/20 lesions and SUVmax was underestimated compared to PET/CT (5.5±5.1 vs 6.9±6.3; median %change=-20%, range=-31~0%). Prone breast PET/MR detected 18/20 lesions with SUVmax comparable to that of PET/CT (6.8±6.2 vs 6.9±6.3; median %change=-3%, range=-10~9%), while inversely correlated with ADC (range=0.59~1.03, mean=0.85±0.12 ×10-3mm2/s, r=-0.627, $p<0.05$). For axillary LN metastasis, WB PET/MR was similar to PET/CT for identifying 9/11 nodes with comparable SUVmax (median %change=9%, range=-11~17%, r=0.889, $p<0.05$). However, prone breast PET/MR detected only 7/11 nodes with significantly different SUVmax (%change=-80~41% compared with PET/CT), which was due to various segmentation misclassification errors of the adjacent non-breast soft tissue as seen on the attenuation coefficient maps, including the axillae.

CONCLUSION

Regional prone PET/MR with breast coil was comparable to PET/CT in quantitative assessment of primary breast CA but was not suitable for evaluation of the axillary nodes, whereas results were opposite for WB PET/MR. Combined prone breast and WB PET/MR is the recommended procedure, particularly if monitoring treatment response is needed for these 2 locations.

CLINICAL RELEVANCE/APPLICATION

Regional prone PET/MR with dedicated breast coil has higher PET quantification and diagnostic accuracy for primary breast tumors than WB PET/MR but should not be used for non-breast tissue assessment.

SSQ13-04 Evaluation of PET and MR Datasets in Integrated 18F-FDG PET/MRI: A Comparison of Different MR Sequences for Whole-Body Restaging of Breast Cancer Patients

Thursday, Dec. 1 11:00AM - 11:10AM Room: S504CD

Participants
Johannes Grueneisen, Essen, Germany (*Presenter*) Nothing to Disclose
Lino Sawicki, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Benedikt M. Schaarschmidt, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Axel Wetter, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose

Michael Forsting, MD, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Lale Umutlu, MD, Essen, Germany (*Abstract Co-Author*) Consultant, Bayer AG

PURPOSE

To evaluate the diagnostic value of different MR sequences and PET data, acquired with an integrated PET/MR scanner, for whole-body restaging of breast cancer patients.

METHOD AND MATERIALS

A total of 32 consecutive patients with a suspected recurrence of breast cancer were prospectively enrolled for a whole-body 18F-FDG PET/MR examination. The whole-body MR protocol comprised: 1) T2w HASTE ax., 2) DWI ax. and 3) post-contrast T1w VIBE ax. Two readers evaluated the following datasets 1. MRI alone, 2. PET/MR-HASTE/DWI, 3. PET/MR-HASTE/VIBE, PET/MR-HASTE/DWI/VIBE and were instructed to identify the total number of tumor lesions in each reading session. The diagnostic confidence for each detected lesion (3 point ordinal scale) and the lesion conspicuity (4 point ordinal scale) for the three different MR sequences were additionally rated.

RESULTS

Tumor recurrence was present in 21/32 (66%) patients and a total of 141 lesions (malignant, n = 101; benign, n = 40) were described. On a lesion based analysis, MRI revealed a sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of 81%, 85%, 93%, 64% and 82%, respectively and a confidence level (CL) of 2.24 ± 0.71 for the identification of tumor recurrence. All three PET/MR readings were rated higher than MRI alone (PET/MR-HASTE/DWI: 92%, 93%, 97%, 82% and 92%, CL: 2.44 ± 0.66; PET/MR-HASTE/VIBE: 93%, 93%, 97%, 84% and 93%; CL: 2.65 ± 0.53; PET/MR-HASTE/DWI/VIBE: 94%, 95%, 98%, 86% and 94%, CL: 2.72 ± 0.49). Furthermore, mean values for lesion conspicuity were 3.30 ± 0.82 (VIBE), 3.02 ± 0.84 (HASTE) and 2.82 ± 1.15 (DWI), respectively and differed significantly from each other.

CONCLUSION

Our results demonstrate the usefulness of 18F-FDG PET data as a valuable additive to MR imaging for more accurate restaging of breast cancer patients. Furthermore, the presented data underline the benefit of contrast-enhanced MR sequences and questions the use of DWI.

CLINICAL RELEVANCE/APPLICATION

Well-considered MR protocols are required for an accurate and effective oncological work-up of breast cancer patients using integrated PET/MRI. The omission of DWI does not result in a significant impairment of the staging performance but enables a distinctive reduction in scan-duration accompanied by improved patient comfort.

SSQ13-05 Integrative and Comparative Analysis of 18F-FDG PET/CT and DWIFASE, DWIEPI, STIR on 3T and 1.5T MR Imaging: Strategy to Converge More the Trajectory for Diagnosis and Prognostication of Lung Cancer

Thursday, Dec. 1 11:10AM - 11:20AM Room: S504CD

Participants
Ho Yun Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yoshiharu Ohno, MD, PhD, Kobe, Japan (*Presenter*) Research Grant, Toshiba Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Bayer AG; Research Grant, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd; Research Grant, Fuji Pharma Co, Ltd; Research Grant, FUJIFILM RI Pharma Co, Ltd; Research Grant, Guerbet SA;
Takeshi Yoshikawa, MD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation
Yuji Kishida, MD, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Masao Yui, Otawara, Japan (*Abstract Co-Author*) Employee, Toshiba Corporation
Yoshimori Kassai, MS, Otawara, Japan (*Abstract Co-Author*) Employee, Toshiba Corporation
Shinichiro Seki, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Hisanobu Koyama, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Kyung S. Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kazuro Sugimura, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, Eisai Co, Ltd Research Grant, DAIICHI SANKYO Group

PURPOSE

To quantitatively compare the potential of FDG PET/CT and diffusion-weighted imaging obtained with fast advantage spin-echo sequence (DWIFASE), echo planar imaging sequence (DWIEPI), and short inversion time inversion recovery (STIR) imaging on 3T as well as 1.5T MR imaging in the diagnosis and prognostic prediction of lung cancer.

METHOD AND MATERIALS

3T and 1.5T MRI and PET/CT were prospectively performed in 75 consecutive patients with suspicious lung cancer, followed by surgical treatment. ADCs from DWI and tumor-to-muscle ratio from STIR was calculated in terms of primary lesions as ADCFASE, ADCEPI,3T or ADCEPI,1.5T and STIR3T or STIR1.5T. Spearman correlation coefficient was analyzed between ADCs or STIR values. Multivariate logistic regression analysis was performed to investigate the discriminating factors of malignancy from benign lesions in terms of 1.5T MRI & PET or 3T MRI & PET. Also, all ADC and STIR values and SUVmax as well as clinical characteristics such as staging, histologic subtype, age, sex, and smoking history were investigated with univariate and multivariate Cox regression analysis to evaluate the prognostic potential, where ROC analysis was used to estimate the discriminating performance of prediction model built.

RESULTS

All 83 lung lesions (72 malignant, 11 benign) were analyzed. STIR3T were higher than STIR1.5T (2.401 ± 0.757 and 1.401 ± 0.507, R = 0.533, P < 0.001). ADCFASE and ADCEPI,1.5T were correlated better than correlations with ADCEPI,3T (R = 0.876, 0.821, and 0.659, all Ps < 0.001). Multivariate logistic regression analysis helped identify STIR1.5T (OR, 1.006), ADCEPI,1.5T, (0.027) and SUVmax (1.862) in 1.5T as well as ADCFASE (0.752) and SUVmax (1.664) in 3T as significant differentiators of malignancy, with 96.9% sensitivity & 75% specificity, 98.5% & 78.6%). Multivariate analysis revealed sex (HR, 0.042), pathologic subtype (0.007), and STIR3T (17.418) are independent predictors for clinical outcome, with Az of ROC curve of 0.891.

CONCLUSION

We found the potential of DWI and STIR on 3T MRI and 1.5T MRI as well as PET/CT regarding the diagnostic and prognostic prediction of lung cancer, for which the capability was improved when sequences were combined efficiently.

CLINICAL RELEVANCE/APPLICATION

Quantitative image variables from DWI and STIR on 3T and 1.5T MRI can allow more accurate diagnosis and prognostication of lung cancer, thus may contribute to more robust predictive and prognostic biomarkers.

SSQ13-06 Do Staging Differences Between Thoracic 18F-FDG PET/CT and 18F-FDG PET/MR Lead to Different Therapeutic Decisions in Patients Suffering from Non-Small Cell Lung Cancer?

Thursday, Dec. 1 11:20AM - 11:30AM Room: S504CD

Participants
Benedikt M. Schaarschmidt, MD, Dusseldorf, Germany (*Presenter*) Nothing to Disclose
Johannes Grueneisen, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Benedikt Gomez, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Philipp Heusch, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Gerald Antoch, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Christian Buchbender, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate whether differences in thoracic tumor staging between 18F-fluordeoxyglucose positron emission tomography / computed tomography (18F-FDG PET/CT) and 18F-FDG PET / magnetic resonance (18F-FDG PET/MR) imaging change therapeutic decisions in Non-Small Cell Lung Cancer (NSCLC) patients.

METHOD AND MATERIALS

Seventy-seven NSCLC patients (34 female, 43 male, mean age 61 ± 10y) that underwent whole-body 18F-FDG PET/CT from the base of skull to the upper thighs and subsequent thoracic 18F-FDG PET/MR were enrolled in this retrospective study. Thoracic 18F-FDG PET/CT and 18F-FDG PET/MR images were staged by two independent radiologists according to the 7th edition of the AJCC staging manual. Treatment strategies based on staging results of either thoracic 18F-FDG PET/CT or 18F-FDG PET/MR were discussed separately in a simulated interdisciplinary tumor board consisting of an oncologist, a radiation oncologist, a thoracic surgeon and a radiologist under consideration of the histopathological subtype and all available clinical data at the timepoint of imaging. Therapeutic decisions based on both imaging modalities were recorded. Descriptive statistics were used for comparison of the results and reasons for changes in the therapeutic decision were investigated.

RESULTS

Differences in thoracic tumor staging were observed in 35% of patients (27 patients) between thoracic 18F-FDG PET/CT and 18F-FDG PET/MR. Differences between both hybrid imaging modalities were detected when assessing the T-stage in 18% (n = 14), the N-stage in 23% (n = 18), and the M-stage in 1% (n = 1). However, these differences in thoracic tumor staging changed patient therapy management in only six patients (8%).

CONCLUSION

Thoracic 18F-FDG PET/CT and PET/MR lead to comparable therapeutic decisions in patients suffering from NSCLC. 18F-FDG PET/MR can be considered a true alternative to 18F-FDG PET/CT for clinical NSCLC staging.

CLINICAL RELEVANCE/APPLICATION

Comparable therapeutic decisions in PETCT and PET/MR in NSCLC patients allow prospective randomized studies on PET/MR in NSCLC imaging and will speed up its introduction in clinical practice.

SSQ13-07 Clinical Utility of PET/CT's Triggered by ACR LungRads Category 4A or 4B Lung Cancer Screening CT Result

Thursday, Dec. 1 11:30AM - 11:40AM Room: S504CD

Participants
Brandon A. Howard, MD, Durham, NC (*Presenter*) Nothing to Disclose
Matthew P. Thorpe, PhD, MD, Savoy, NC (*Abstract Co-Author*) Nothing to Disclose
Joseph G. Mammarappallil, MD, PhD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

F-18 FDG PET/CT (PCT) is invaluable in pulmonary nodule workup, and uptake correlates with malignancy and, in early stage lung cancers, survival. The National Lung Cancer Screening Trial demonstrated mortality benefit of low-dose screening CT (LDCT) for high risk persons. In ACR LungRads, Category 4 is "suspicious" for malignancy: For 4A, PCT is triggered for an 8-15 mm solid nodule on baseline and for 4B, for a new solid nodule/ solid component of part-solid nodule measuring >= 8 mm. Previous literature rates PCT performance as poor for nodules < 10 mm, however. Given FWHM of PCT scanners is ~8 mm, the lower limit trigger of 8 mm in LungRads will include small nodules which may be underestimated by partial volume effect (3D PET, 3*FWHM = 24 mm). PCT may be insensitive when used in this manner and regular screening may be equivalent. Our study goal is to report the diagnostic utility of PCT performed for workup of Category 4 findings on LDCT.

METHOD AND MATERIALS

This IRB-approved, HIPAA-compliant study retrospectively reviewed PCT from Feb 2015- March 2016, prompted by positive screening LDCT (Category 4A/4B or read as positive= greater than mediastinum). Standardized uptake value (SUVmax) of nodules was measured. LDCT nodule size and morphology were recorded. Results were correlated with pathology and change in clinical management.

RESULTS

16 patients underwent 16 PCT with 21 nodules yielding mean CT size of 14 (range 8- 30) mm and CT features of solid, part solid, cavitary, spiculated. 6 were PET-positive and of these, 4 malignant on histology; 2 were inflammatory on histology. 15 nodules were PET-negative; 3 of these were classified as benign with no further followup recommended; 12 were scheduled for CT follow up per LungRads. PET-positive rate was 29.5 ± SE 0.10% overall, and PPV as judged by histology or stable behavior on subsequent CT was 0.66 (95% CI 0.29-1.0).

CONCLUSION

38% of nodules on PCT performed for Category 4 LDCT were positive, and 67% of these were malignant. Average nodule size in our population was > 8 mm trigger, but < 24 mm limit for full PET recovery. PET-negative nodules were not sampled, but many of these nodules were stable in size. Further study is needed in a larger patient cohort with longer followup.

CLINICAL RELEVANCE/APPLICATION

Although PCT redemonstrates utility in workup of indeterminate nodules, optimal triggers for PCT in the setting of CT lung cancer screening need further study.

SSQ13-08 Whole-Body FDG-PET/MRI: Comparison of the Capability for the IASLC/ ITMIG Thymic Epithelial Tumor Staging with Whole-Body MRI, Integrated FDG-PET/CT and Conventional Radiological Examination

Thursday, Dec. 1 11:40AM - 11:50AM Room: S504CD

Participants
Yoshiharu Ohno, MD, PhD, Kobe, Japan (*Presenter*) Research Grant, Toshiba Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Bayer AG; Research Grant, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd; Research Grant, Fuji Pharma Co, Ltd; Research Grant, FUJIFILM RI Pharma Co, Ltd; Research Grant, Guerbet SA;
Yuji Kishida, MD, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Shinichiro Seki, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Hisanobu Koyama, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Takeshi Yoshikawa, MD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation
Yoshiko Ueno, MD, PhD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Kota Aoyagi, Otawara, Japan (*Abstract Co-Author*) Employee, Toshiba Corporation
Katsusuke Kyotani, RT, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Kouya Nishiyama, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Wakiko Tani, RT, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Shigeo Kaminaga, Otawara-shi, Japan (*Abstract Co-Author*) Employee, Toshiba Corporation
Hitoshi Yamagata, PhD, Otawara, Japan (*Abstract Co-Author*) Employee, Toshiba Corporation
Kazuro Sugimura, MD, PhD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, Eisai Co, Ltd Research Grant, DAIICHI SANKYO Group

PURPOSE

To compare the diagnostic capability for the IASLC/ ITMIG thymic epithelial tumor staging among whole-body FDG-PET/MRI, whole-body MRI including diffusion weighted imaging (DWI), integrated FDG-PET/CT with contrast-enhanced (CE-) brain MRI and conventional radiological examination including whole-body CE-CT and CE-brain MRI.

METHOD AND MATERIALS

64 consecutive thymic epithelial tumor patients (30 men, 34 women; mean age 56 years) prospectively underwent whole-body MRI including DWI, integrated PET/CTs, conventional radiological examinations, pathological examinations from specimens obtained CT-guided biopsy and surgical resection and surgical reports as well as follow-up examinations. Then, TNM staging in each patient was determined based on tumor board reviewing all examination results. All co-registered PET/MRIs were generated by means of our proprietary software. Then, TNM staging was evaluated by four different reader groups based on the IASLC/ ITMIG thymic epithelial tumor staging system. To determine inter-observer agreements of each factor assessment on all methods, kappa statistics as well as kai-square tests were performed. To evaluate agreements of all factors between each method and final diagnosis, kappa statistics were also performed. Finally, diagnostic accuracy of each factor and clinical stage was statistically compared each other by using McNemar's test.

RESULTS

Inter-observer agreements of each factor on all methods were determined as substantial or almost perfect (0.67

CONCLUSION

Whole-body PET/MRI and MRI have better potential for the IASLC/ ITMIG thymic epithelial tumor staging than conventional radiological examination, and are considered at least as valuable as PET/CT with CE-brain MRI in this setting.

CLINICAL RELEVANCE/APPLICATION

Whole-body PET/MRI and MRI have better potential for the IASLC/ ITMIG thymic epithelial tumor staging than conventional radiological examination.

SSQ13-09 Sensitivity of PET/MR for Detecting Pulmonary Nodules in Pediatric Cancer Patients

Thursday, Dec. 1 11:50AM - 12:00PM Room: S504CD

Participants
Anne Muehe, MD, Stanford, CA (*Presenter*) Nothing to Disclose
Heike E. Daldrup-Link, MD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose
Lillian M. Lai, MD, Iowa City, IA (*Abstract Co-Author*) Nothing to Disclose
Andrew Quon, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Valentina Taviani, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Samantha Holdsworth, PhD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the sensitivity of MR, integrated PET+MR and PET+CT for the detection of pulmonary nodules in pediatric cancer patients compared to clinical CT as a standard of reference

METHOD AND MATERIALS

In this prospective IRB-approved, HIPAA-compliant study we performed 15 "one stop" whole body PET/MR scans of 11 pediatric and young adult patients with lymphoma (n=6), bone sarcoma (n=2) and other cancers (n=3). Scans were performed on a GE Signa 3T hybrid PET/MR scanner 60 minutes after 18F-FDG (2-3MBq/kg), using free-breathing axial T2-FSE (TR 5048ms/TE 116ms) and PROPELLER (TR 5669ms/TE 101ms) sequences with simultaneous PET-data acquisition. Two experienced reviewers assessed the number, location and size of pulmonary nodules on CT, MR, PET+MR (i.e. positive on PET and MR) and PET+CT (i.e. positive on PET and CT) scans. Sensitivities of MR, PET+MR and PET+CT were compared with CT as standard of reference.

RESULTS

CT revealed 151 total nodules with 59 ≥ 10mm, 48 between 5-9mm, 34 between 3-4mm and 10 < 3mm in size respectively. MR detected 116 total nodules with 59 ≥ 10mm, 44 between 5-9mm, 12 between 3-4mm and 1 < 3mm in size respectively. Considering clinically significant nodules ≥ 3mm, sensitivity was 81.5% for MR, 56% for PET+MR and 49% for PET+CT. PET+MR and PET+CT detected 59 and 57 nodules > 1 cm, 22 and 14 nodules 5-9 mm, and 4 and 3 nodules 3-4 mm, respectively. The mean effective dose of PET/MR (2.5 mSv) was significantly lower compared to PET/CT (11.4 mSv).

CONCLUSION

MR provided comparable sensitivity compared to CT for the detection of pulmonary nodules ≥ 5 mm, but inferior sensitivity for the detection of 3-4 mm nodules. The PET part of the PET/MRI outperformed the PET part of the PET/CT in the detection of FDG-avid nodules. PET/MR reduced the radiation exposure of the patient by 75% compared to PET/CT.

CLINICAL RELEVANCE/APPLICATION

Solving the limited sensitivity of MRI for the detection of pulmonary nodules will enable "one stop" staging of pediatric cancer patients with substantially reduced radiation exposure compared to PET/CT. Our ongoing studies address further improvement of MRI technologies for detection of clinically relevant pulmonary nodules with a size of 3-4mm.

SSQ14

Neuroradiology (Contrast and Radiation in Neuroimaging)

Thursday, Dec. 1 10:30AM - 12:00PM Room: N228

NR CT SQ

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

Participants
Christopher T. Whitlow, MD, PhD, Winston-Salem, NC (*Moderator*) Nothing to Disclose
Rivka R. Colen, MD, Houston, TX (*Moderator*) Nothing to Disclose

Sub-Events

SSQ14-01 Diagnostic Performance of Low-Dose Volume Perfusion CT for the Detection of Cerebral Vasospasm

Thursday, Dec. 1 10:30AM - 10:40AM Room: N228

Awards
Student Travel Stipend Award

Participants
Ahmed Othman, MD, Tuebingen, Germany (*Presenter*) Nothing to Disclose
Saif Afat, MD, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose
Carolin Brockmann, MD, Mannheim, Germany (*Abstract Co-Author*) Nothing to Disclose
Omid Nikoubashman, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose
Marc A. Brockmann, MD, Luebeck, Germany (*Abstract Co-Author*) Nothing to Disclose
Jong H. Kim, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Konstantin Nikolaou, MD, Tuebingen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Speakers Bureau, Bayer AG
Martin Wiesmann, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

In this study, we aimed to assess the diagnostic performance of Low-Dose Volume Perfusion CT (VPCT) for the detection of cerebral vasospasm as compared to angiography.

METHOD AND MATERIALS

38 datasets from 25 patients with subarachnoid hemorrhage and suspected cerebral vasospasm were included. VPCT and angiography were performed within 6 hours. VPCT images were acquired at 80 kVp and 180 mAs. Low-Dose VPCT datasets at 40% of the original dose levels were generated using a realistic low-dose simulation method. Perfusion maps (CBF, CBV, MTT, TTD) were generated for both original and low-dose datasets. Two blinded neuroradiologists independently evaluated presence and severity of vasospasm on original and low-dose perfusion maps on a 3-point Likert scale (0=no vasospasm, 1=vasospasm affecting <50%, 2=vasospasm affecting >50% of vascular territory). A third neuroradiologist independently assessed angiography for presence and severity of vasospasm on a 3-point Likert scale (0=no vasospasm, 1=vasospasm affecting<50%, 2=vasospasm affecting>50% of vessel diameter). Original and low-dose perfusion maps were evaluated regarding diagnostic accuracy for cerebral vasospasm with angiography as reference standard. Correlation analysis of findings on perfusion maps and on angiography was performed. Furthermore, the agreement between original and low dose images was assessed.

RESULTS

Perfusion maps from original and low dose datasets yielded comparable diagnostic accuracy without significant differences (Original: AUC=.818; low dose: AUC=..815; p=.906). Findings on original and on low dose perfusion maps showed strong correlation with angiography (original: r=.664; MS: r=656). Findings in original and low dose perfusion maps showed almost perfect agreement (Kappa=.916).

CONCLUSION

Results of this study indicate that a radiation dose reduction of VPCT to 40% of the original radiation dose yields comparable diagnostic accuracy for the detection of cerebral vasospasm to standard dose VPCT.

CLINICAL RELEVANCE/APPLICATION

Utilizing low dose VPCT imaging in patients with subarachnoid hemorrhage yields to a remarkable reduction of cumulative dose without compromising the diagnostic performance of VPCT. This is important because patients with cerebral vasospasm are often young and usually undergo multiple imaging studies.

SSQ14-02 Automatic Tube Current Modulation in 120-kV and Dual-Energy Unenhanced Head Computed Tomography: Effects on Image Quality, Radiation Dose and Diagnostic Accuracy for Detection of Intracranial Hemorrhage

Thursday, Dec. 1 10:40AM - 10:50AM Room: N228

Awards
Student Travel Stipend Award

Participants
Jan-Erik Scholtz, MD, Boston, MA (*Presenter*) Nothing to Disclose
Moritz H. Albrecht, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Doris Leithner, MD, Frankfurt am Main, Germany (*Abstract Co-Author*) Nothing to Disclose
Christoph Polkowski, MD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose

Simon S. Martin, MD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose
Julian L. Wichmann, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Thomas Lehnert, MD, Frankfurt Am Main, Germany (*Abstract Co-Author*) Nothing to Disclose
Thomas J. Vogl, MD, PhD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose
Ralf W. Bauer, MD, Frankfurt, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens Healthcare GmbH; Speakers Bureau, Bayer Healthcare; Speakers Bureau, GE Healthcare

PURPOSE

To assess image quality, diagnostic accuracy and radiation dose of unenhanced head CT for detection of intracranial hemorrhage (ICH) using automatic tube current modulation (ATCM) in 120kV and dual-energy (DE) computed tomography.

METHOD AND MATERIALS

120 patients who received unenhanced head CT on a third-generation 192-slice dual-source CT with indication for ICH were retrospectively evaluated. Patients were examined with four different protocols: 120 kV (Group A, n=35), DE (Group B, n=30), 120kV+ATCM (Group C, n=31), and DE+ATCM (Group D, n=24). Attenuation and noise of gray matter (GM) and white matter (WM) were assessed. GM and WM signal-to-noise ratio (SNR), GM-WM contrast-to-noise ratio (CNR) and posterior fossa artifact index (PFAI) were calculated. Three blinded readers rated GM-WM contrast, delineation of ventricular margins, sharpness of subarachnoidal space and visualization of posterior fossa on 5-point Likert Scales. Sensitivity, specificity and diagnostic accuracy were calculated for the detection of ICH. Interobserver agreement was calculated using Fleiss' Kappa. Radiation dose was assessed as CT dose index volume (CTDIvol) and dose-length product (DLP).

RESULTS

ATCM resulted in a significant radiation dose reduction by 18.5% in 120kV (CTDIvol, 32.18±3.35mGy vs. 39.47±0.44mGy) and 27.0% in DE CT (CTDIvol, 29.95±3.51mGy vs. 41.0±0.0mGy). Subjective ratings showed good to excellent ratings for all protocols without any non-diagnostic cases. ATCM resulted in a slightly, but significantly decrease of GM-WM CNR in 120kV and DE ($p<0.05$) and slight increase of PFAI in 120kV ($p<0.05$) and DE-CT ($p>0.05$). The raters achieved excellent sensitivity (94.9-100%), specificity (94.7-100%) and diagnostic accuracy (area under the ROC curve, 0.867-1.00) for detection of ICH with almost perfect interobserver agreement (0.83-0.96) for all protocols.

CONCLUSION

ATCM results in a significant radiation dose reduction in both 120kV and DE unenhanced head CT with slightly lower GM-WM contrast and slight increase of noise in the posterior fossa without impairment in diagnostic accuracy for the detection of ICH.

CLINICAL RELEVANCE/APPLICATION

ATCM can be safely activated in routine in 120kV and DE unenhanced head CT for the detection and rule out of ICH to reduce radiation exposure.

SSQ14-03 Frequency of Gadolinium (Gd)deposition in the Dentate Nucleus after 13 Monthly Triple-Doses of Gd

Thursday, Dec. 1 10:50AM - 11:00AM Room: N228

Participants
Jhimli Mitra, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Paul A. DiCamillo, MD, PhD, Cleveland, OH (*Presenter*) Nothing to Disclose
Stuart D. Cook, MD, Newark, NJ (*Abstract Co-Author*) Advisory Board, Schering AG Speakers Bureau, Schering AG
Diego Cadavid, MD, Newark, NJ (*Abstract Co-Author*) Grant, Bayer AG
Leo J. Wolansky, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Pallavi Tiwari, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Deposition of Gadolinium (Gd) in the dentate nuclei causing T1- hyperintensity months after intravenous Gd administration is a troubling and poorly understood phenomenon. Studies to date have included varied diagnoses and inconsistent dosing. Our purpose was to study precontrast T1 enhancement due to Gd deposition in a cohort of 16 subjects with multiple sclerosis (MS), each of whom had received Gd in evenly divided monthly triple doses for over 13 months, totaling 39 doses equivalents of Gd.

METHOD AND MATERIALS

16 subjects with relapsing forms of MS had been enrolled in a trial in which they were randomized to be treated with Beta-interferon-1b or Glatiramer Acetate. To monitor efficacy, subjects underwent MRI, receiving monthly cumulative 0.3 mmol/kg Gadopentetate dimeglumine (triple dose or TdGd) for 13 consecutive months, totaling 39 dose equivalents of Gd per patient. TR, TE, voxel size, and positioning along corpus callosum line remained constant throughout the study. We retrospectively compared signal intensity in the dentate nucleus on precontrast T1 weighted MRI, comparing screening MR with the End of Year (EOY) MR, after 39 cumulative doses. The scans were bias corrected and the EOY intensities were aligned to the baseline using a piecewise linear histogram normalization method. An automatic volumetric segmentation of the dentate nuclei was performed using a cerebellar atlas that was non-rigidly registered to each subject baseline scan. The EOY scan was further aligned to the baseline using an affine registration. Mean intensity difference within the structures of interest was compared between the baseline and the EOY scans using a two-sided t-test.

RESULTS

Statistically significant increase in mean signal intensity was seen in the 27 of 32 dentate nuclei in the 16 patients on the EOY scan compared with screening MRI ($p<0.01$ for left and $p<0.003$ for right dentate).

CONCLUSION

39 cumulative doses of Gadopentetate dimeglumine resulted in MRI evidence of Gd deposition in 27 of 32 dentate nuclei. Further research may elucidate reasons for variability of Gd deposition and potential clinical relevance.

CLINICAL RELEVANCE/APPLICATION

Our study supports earlier investigations in showing increased T1 signal with high cumulative doses of Gd. Further research is

needed to conclusively rule out a clinical correlation of Gd deposition.

SSQ14-04 Cranial Bone-subtraction CT Angiography Using 80kVp and Sinogram-affirmed Iterative Reconstruction: Low Contrast Medium- and Low Radiation Dose Protocol

Thursday, Dec. 1 11:00AM - 11:10AM Room: N228

Participants
Yasunori Nagayama, MD, Kumamoto, Japan (*Presenter*) Nothing to Disclose
Takeshi Nakaura, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Akinori Tsuji, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Joji Urata, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Mitsuhiro Furusawa, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Yasuyuki Yamashita, MD, Kumamoto, Japan (*Abstract Co-Author*) Consultant, DAIICHI SANKYO Group
Hideaki Yuki, MD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Kenichiro Hirata, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the feasibility of a low contrast-, low radiation dose protocol for cranial bone-subtraction CT angiography (BSCTA) using 80 kVp and sinogram-affirmed iterative reconstruction (SAFIRE).

METHOD AND MATERIALS

This retrospective study received institutional review board approval; written informed consent was waived. We included 60 patients who had undergone BSCTA under the 120- (n=30) or the 80 kVp protocol (n=30). The contrast medium was 370 mgI/kg for the 120- and 296 mgI/kg for the 80 kVp protocol; 120 kVp images were reconstructed with filtered back-projection (FBP), 80 kVp images with SAFIRE (S3). We compared the effective dose (ED), CT attenuation, image noise, and contrast-to-noise ratio (CNR) of the protocols with Student t test. Two radiologists scored arterial enhancement, image sharpness, depiction of small arteries, visibility of arteries adjacent to the skull base/clip, and the overall image quality on 4-point scale.

RESULTS

The estimated ED was 62% lower with the 80- than the 120 kVp protocol (0.59 ± 0.06 vs 1.55 ±0.14 mSv, $p<0.01$). CT attenuation of the internal carotid artery (ICA) and middle cerebral artery (MCA) was significantly higher on 80- than 120 kVp images (ICA: 561.5 ± 106.6 vs 368.0 ± 61.3 mSv, $p<0.01$; MCA: 560.8 ± 109.1 vs 364.4 ± 65.6 mSv, $p<0.01$). The objective image noise was higher on 80- than 120 kVp images (11.1 ± 1.2 vs 9.0 ± 61.3, $p<0.01$). The CNR was significantly higher on 80- than 120 kVp images (ICA: 46.4 ± 10.0 vs 36.1 ± 7.0 mSv, $p<0.01$; MCA: 45.4 ± 11.1 vs 35.8 ± 8.9 mSv, $p<0.01$). Visibility of the arteries adjacent to skull base/clip was not significantly different ($p=0.32$). The other subjective scores were higher on 80- than 120 kVp images ($p<0.01$).

CONCLUSION

Scanning at 80 kVp with SAFIRE yields higher image quality for BSCTA and a 62% reduction in the radiation- and a 20% reduction in the contrast medium dose compared with the 120 kVp protocol with FBP.

CLINICAL RELEVANCE/APPLICATION

80 kVp scanning with IR facilitates substantial reduction of the radiation- and contrast medium dose for BSCTA.

SSQ14-05 Subtraction Artery Angiography in Head and Neck with Low Radiation and Contrast Dose Dual-energy Spectral CT

Thursday, Dec. 1 11:10AM - 11:20AM Room: N228

Participants
Ma Guangming, MMed, Xianyang City, China (*Presenter*) Nothing to Disclose
Chuangbo Yang, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
Lei Yuxin, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
Dong Han, MA, Xianyang, China (*Abstract Co-Author*) Nothing to Disclose
Shan Dang, Xianyang, China (*Abstract Co-Author*) Nothing to Disclose
Haifeng Duan, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
Yongjun Jia, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the application of low radiation and contrast dose Spectral CT angiology (CTA) in the head and neck with subtraction method for bone removal.

METHOD AND MATERIALS

60 cases for head and neck CTA were randomly divided into groups A (n=30) and B (n=30). Group A underwent plain CT with 100kVp, 200mA; Spectral CT with BMI-dependent low dose protocols and 50ml contrast dose (Visipaque: 270mgI/ml) in the arterial phase. Group B used conventional scanning with120kVp, auto mA for noise index of 12 for both plain and contrast-enhanced phases and 60ml contrast dose (Omnipaque: 350mgI/ml). Images were reconstructed with ASiR(60%ASiR for group A and 40%ASiR for group B). Subtraction images were formed by subtracting the plain images from enhanced images (with the 65keV enhanced Spectral CT image in group A). CT numbers and their standard deviations (SD) in aortic arch, carotid arteries, middle cerebral artery and air were measured in the subtraction images. The signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) for the common and internal carotid arteries and middle cerebral artery were calculated. Image quality in terms of bone removal effect was evaluated by two experienced radiologists independently and blindly using a 4-point system. Radiation dose and total iodine load were recorded. Measurements were statistically compared between the two groups.

RESULTS

The two groups had same demographic results. There was no difference in the CT number, SNR and CNR values for carotid arteries and middle cerebral artery in the subtraction images between the two groups ($p>0.05$). However, the bone removal effect in group

A was rated at 3.73±0.45, better than the 3.10±0.61 in group B (p<0.05), with excellent agreement between the two observers (Kappa>0.80). The radiation dose in group A was 3.81±0.76mSv, 53% lower than the 8.04±0.81mSv in group B (P<0.05). The total iodine intake in group A was 13.5g, 36% lower than the 21g in group B (p<0.05).

CONCLUSION

Spectral CT imaging in the Subtraction angiography in head and neck provides better bone removal with significantly reduced radiation and contrast dose compared with conventional subtraction method.

CLINICAL RELEVANCE/APPLICATION

Spectral CT imaging may be used in head and neck CT angiography to provide better bone removal with significant radiation and contrast dose reduction.

SSQ14-06 90-kVp Low-Tube-Voltage Carotid and Intracerebral CT-Angiography in Combination with Advanced Modeled Iterative Reconstruction Algorithm: Effects on Radiation Dose, Image Quality and Accuracy for the Detection of Carotid Stenosis

Thursday, Dec. 1 11:20AM - 11:30AM Room: N228

Participants
Doris Leithner, MD, Frankfurt am Main, Germany (*Presenter*) Nothing to Disclose
Julian L. Wichmann, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Simon S. Martin, MD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose
Moritz H. Albrecht, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Jan-Erik Scholtz, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Thomas J. Vogl, MD, PhD, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate low-tube-voltage 90-kVp acquisition in combination with advanced modeled iterative reconstruction algorithm (ADMIRE) for carotid and cerebral CT-angiography (CCTA) with regard to radiation exposure, image quality, artefact and detection of carotid stenosis.

METHOD AND MATERIALS

We retrospectively evaluated 43 patients (33 male, 10 female; mean age: 61.7 years) who underwent dual-energy CCTA on a third-generation 192-slice dual-source CT. 90-kVp and standard linear-blended 120-kvp image series were compared. Signal attenuation and image noise of CCA at shoulder height with highest degree of artefact, CCA at bifurcation, ICA in the carotid syphon, MCA and BA were measured. Signal-to-noise and contrast-to-noise ratio (CNR) were calculated. Subjective image quality was rated by three independent reviewers using 5-point grading scales regarding artefact and suitability at all objectively measured levels. Detection and quantification of carotid stenosis was performed. Radiation dose was expressed as dose-length product (DLP). Interobserver agreement was calculated using intraclass correlation coefficient (ICC).

RESULTS

Attenuation and noise of all measured arteries were significantly increased in 90-kVp compared to linear blended 120-kVp (all p<0.001). CNR of all arteries were significantly increased in 90-kVp compared to linear blended 120-kVp (ICA, 38.2±13.5 vs. 22.4±8.0 HU; p<0.001). Artefact and suitability was rated excellent in both image series without significant differences. Highest artefact level, but still with excellent suitability was rated at shoulder height in both image series without significant difference (90-kVp, 4.9±0.4; 120-kVp, 4.8±0.5). Detection rate of carotid stenosis was excellent in 90-kVp and 120-kVp linear-blended image series with no significant difference (carotid stenoses in 32 of 129 segments; ICC, 0.94). DLP was reduced by 40.3% with 90-kVp acquisition (110.6±32.1 vs.185.4±47.5 mGy·cm, P<0.001).

CONCLUSION

90-kVp CCTA in combination with ADMIRE results in increased CNR, excellent suitability with low artefacts and significant reduction of radiation exposure. Detection and quantification of carotid stenosis maintains excellent.

CLINICAL RELEVANCE/APPLICATION

90-kVp CCTA combined with ADMIRE on a third-generation 192-slice DSCT is feasible in routine and results in substantial radiation dose reduction and increased CNR without impairment of image quality.

SSQ14-07 Performance and Dose Reduction of Organ Dose Modulation (ODM) Technology For Radiation Sensitive Organs During the Computed Tomography Angiography (CTA) of Craniocervical Arteries

Thursday, Dec. 1 11:30AM - 11:40AM Room: N228

Participants
Wang Mingyue, Zhengzhou, China (*Presenter*) Nothing to Disclose

PURPOSE

To investigate the performance and dose reduction of organ dose modulation (ODM) technology for radiation sensitive organs during the computed tomography angiography (CTA) of craniocervical arteries

METHOD AND MATERIALS

91 patients suspected of arterial vascular disease were involved in this study and underwent craniocervical arteries CTA examination from December 2014 to June 2015. Patients were divided into two groups: group A (n = 46) with ODM technique “on” for thyroid and orbital area only during plain CT scan , and group B (n=45) with ODM technique “on” both plain and enhanced CT scans. The tube current in the anterior/posterior/left/right direction of thyroid and orbital area and radiation doses were recorded. The CT attenuation values, standard deviation (SD), contrast-to-noise ratio (CNR) and the noise of background of carotid artery and segment of internal carotid artery were measured, respectively.

RESULTS

For group A, the reduction of the tube current at thyroid gland and the orbital region was 7.77%(51/656)、16.63%(68/409), respectively. There was statistically difference for the tube current in anterior/left/right direction of the thyroid gland and orbital area between ODM "on" and "off", respectively ($p<0.01$). CTDIvol and ED were (15.6±1.39)mGy and (1.44±0.17)mSv in the plain phase with ODM "on" and (17.4±1.36)mGy and (1.60±0.18)mSv in the enhanced phase with ODM "off". There were no significant differences for the CT value, SD, CNR and background SD of the carotid artery between two groups [(406±55), 9.7,(8.45,10.7), (42±9)、8.6(7.7,9.3) vs (419±48), 10.1(9.6,10.8), (40±7, 9.0(8.6,9.5)and p=0.318, 0.160, 0.458, 0.054]. The same results were found in the supraclinoid carotid artery area between group Aand group B(p= 0.497,0.849,0.207,0.122). There was no significant difference for the overall image quality between the two groups(Z=-0.164, P=0.870)

CONCLUSION

ODM technique can reduce radiation dose to protect the sensitive organs by decreasing the tube current during craniocervical CTA examination without reducing the image quality

CLINICAL RELEVANCE/APPLICATION

The organ dose modulation (ODM) technique could be performed to protect radiosensitive organs during CT scan

SSQ14-08 Comparison of Head CT Radiation /Doses (CTDIvol, DLP, & SSDE) from ACR Dose Index Registry across Different Medical Facilities and Geographical Regions

Thursday, Dec. 1 11:40AM - 11:50AM Room: N228

Participants
Amirhossein Mozafarykhamseh, MD, boston, MA (*Presenter*) Nothing to Disclose
Atul Padole, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Debapriya Sengupta, MBBS,MPH, Reston, VA (*Abstract Co-Author*) Nothing to Disclose
Judy Burleson, Reston, VA (*Abstract Co-Author*) Nothing to Disclose
Subba R. Digumarthy, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Mannudeep K. Kalra, MD, Boston, MA (*Abstract Co-Author*) Technical support, Siemens AG; Technical support, Medical Vision
Mythreyi Bhargavan-Chatfield, PhD, Reston, VA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare head CT radiation doses (CTDIvol, DLP & SSDE) from the ACR Dose Index Registry (DIR) among various age groups across geographical regions and types of facilities in United States of America

METHOD AND MATERIALS

Using Radiology PlayBook identification (RPID) numbers, we assessed CT dose metrics (CT dose index volume (CTDIvol) and dose length product (DLP)) for a total of 332137 head CT exams (mean age 59.5±22.3 yrs) in the ACR DIR between 2011-2015 (10% sample). Data were stratified according to the geographic census in to (New England (NE), Middle Atlantic (MA), South Atlantic (SA), East North Central (ENC), East South Central (ESC), West South Central,(WSC) Mountain (MO) and Pacific(PA) regions and then sub-stratified based on the year CT (201, -15) ,age (≤ 40 years; 41-64 years; ≥65 years) and type of medical facility (academic, community, multispecialty, freestanding). Mean and standard deviations for maximum CTDIvol (mGy) and DLP (mGy.cm) were calculated. ANOVA tests were performed to compare the variation

RESULTS

The national mean CTDIvol and DLP for head CT were 15±9 and 353±298, respectively. There was significant variation of CTDIvol and DLP values between census divisions. The highest CTDIvol and DLP was seen for WSC (55±21, 904±425 n=10301) while the lowest was for PA (26±21, 540±485, n=34300) ($p<0.0001$). In all 8 census divisions, elderly patients received a higher dose. The mean±SD CTDIvol and DLP were 50±23, 804±337 for ≥65 years compared to 48±22 and 785±391 in <40 years and 48±26 and 789±383for 41-64 years (p value<0.0001)

CONCLUSION

There were significant variations in the values of CTDIvol and DLP for head CT among different US census regions. In all 8 census divisions, elderly patients received a higher dose

CLINICAL RELEVANCE/APPLICATION

More efforts are needed to encourage age based dose adjustment for CT radiation dose

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/

Subba R. Digumarthy, MD - 2013 Honored Educator

SSQ14-09 Lens Dose Reduction by Patient Position Modification during Neck CT Exams

Thursday, Dec. 1 11:50AM - 12:00PM Room: N228

Participants
Elizabeth Mosher, Rockville, MD (*Presenter*) Nothing to Disclose
Choonsik Lee, PhD, Rockville, MD (*Abstract Co-Author*) Nothing to Disclose
John A. Butman, MD, PhD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Nadia M. Biassou, MD, PhD, Arlington, VA (*Abstract Co-Author*) Nothing to Disclose
Les R. Folio, DO, MPH, Bethesda, MD (*Abstract Co-Author*) Research agreement, Carestream Health, Inc

PURPOSE

Irradiation of the lens during a neck CT may increase a patient's risk of developing cataracts. Clinical Center Radiologists and technologists have developed new CT imaging protocols that include a reduction in scan range and modifying neck positioning using a head tilt. This study will evaluate the efficacy of this protocol in the reduction of lens dose.

METHOD AND MATERIALS

We retrieved CT images of twenty patients (ten male and ten female) who had two sets of CT images: before and after the implementation of the new protocol. The lens doses before the new protocol were calculated using an in-house CT dose calculator, where computational human phantoms with no head tilt are included. We also calculated the lens dose for the patient CT conducted after the new protocol by using an adult male computational phantom with the neck position deformed to match the angle of the head tilt. We also calculated the doses to other radiosensitive organs including the globes of the eye, brain, pituitary gland and salivary glands before and after head tilt.

RESULTS

Our dose calculations demonstrated that modifying neck position reduced dose to the lens by 87% on average (range: 52-98%; $p<0.0001$). Globe, brain, pituitary and salivary gland doses also decreased by an average of 78% (36-97%), 49% (24-87%), 60% (2-92%) and 25% (5-62%), respectively. The new protocol resulted in a nearly ten-fold decrease in lens dose.

CONCLUSION

The use of a head tilt and scan range reduction is an easy and effective method to reduce radiation exposure to the lens and other radiosensitive organs.

CLINICAL RELEVANCE/APPLICATION

The utilization of a head tilt during neck CT imaging will limit a patient's risk for cataracts, while still allowing for the inclusion of critical neck structures in the CT image.

SSQ15

Neuroradiology/Head and Neck (Advanced Imaging of the Head and Neck)

Thursday, Dec. 1 10:30AM - 12:00PM Room: N229

HN NR CT MR

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

FDA Discussions may include off-label uses.

Participants
Christine M. Glastonbury, MBBS, San Francisco, CA (*Moderator*) Author with royalties, Reed Elsevier
Ashley H. Aiken, MD, Atlanta, GA (*Moderator*) Nothing to Disclose

Sub-Events

SSQ15-01 Shear Wave Elastography in Lymph Nodes: A Feasibility and Diagnostic Study

Thursday, Dec. 1 10:30AM - 10:40AM Room: N229

Participants
Linda Chami, MD, Paris, France (*Presenter*) Nothing to Disclose
Alain Giron, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Claire Pellot-Barakat, Orsay, France (*Abstract Co-Author*) Nothing to Disclose
Jean Gabarre, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Frederic Charlotte, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Malek Ezziane, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Veronique Leblond, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Olivier Lucidarme, MD, Paris, France (*Abstract Co-Author*) Consultant, Bracco Group Consultant, F. Hoffmann-La Roche Ltd Consultant, Boehringer Ingelheim GmbH

PURPOSE

to evaluate diagnostic accuracy and feasibility of Shear Wave elastography (SWE) in lymph nodes (LN's)

METHOD AND MATERIALS

260 patients referred for needle core biopsy of superficial LN's under ultrasound guidance were prospectively included (with IRB approval). Bmode US and SWE examinations were performed using an Aixplorer® ultrasound machine (SuperSonic Imagine Ltd). Quantitative SWE parameters were registered (mean stiffness values (Emean), standard deviation (SD), maximum stiffness values (Emax)) and qualitative patterns of the SWE elasticity color map were evaluated in consensus by two readers (nodular pattern, blue pattern, rim of higher stiffness). SWE measurements were performed both in the long and short axis planes in a subgroup of 152 patients. A subgroup of 42 LN's were prospectively scanned twice by two operators in order to assess inter-observer agreement (intraclass coefficient) on quantitative SWE parameters. Finally, these results were compared to histological findings.

RESULTS

Final diagnosis was benign LN's in 27,6% (n=72), lymphomas in 42,7% (n=111), carcinomas in 17% (n=44) and other disease in 12,7% (n=33). Emean values were significantly higher for carcinomas and lymphomas than for benign LN's (22,9 [16.29,6] kPa ; 16 [12.20] kPa; 11,4 [6,8.16] kPa respectively $p < 0.05$). E max values and SD were significantly lower for benign than for other LN's (E max values: 17.45 [7.7.27] kPa for benign and 32.6 [18.3.46.9] kPa, 47.7 [33.62] kPa, 29.2 [21.37] kPa for other LN's, carcinomas, lymphomas respectively; $p<0,01$) both in the long and short axis. Interestingly, Emean values were consistently higher by about 25% than short axis values (mean discrepancy : 4,11 kPa ; $p<10-3$). For SWE qualitative parameters, the presence of a rim of higher stiffness was significantly correlated with carcinomas,blue pattern with benign LN's and nodular pattern with carcinomas and other disease ($p<10-4$). Emean values for observer 1 and 2 and intraclass coefficient assessed twice were 16.04, 14.68 kPa (NS) and 0.764 respectively.

CONCLUSION

Quantitative and qualitative SWE provided accurate informations to differentiate LN's according to histology. Emean values were consistently higher when measured from the long axis plane than the short axis one.

CLINICAL RELEVANCE/APPLICATION

To improve accuracy of ultrasound imaging for differentiating benign from other superficial LN's

SSQ15-02 Differentiation of Malignant Cervical Lymphadenopathy by Dual-energy CT: An Initial Experience

Thursday, Dec. 1 10:40AM - 10:50AM Room: N229

Participants
Liang Yang, Beijing, China (*Presenter*) Nothing to Disclose
Dehong Luo, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Lin Li, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Yanfeng Zhao, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Meng Lin, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Wei Guo, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the diagnosis value of the quantitative parameters derived from dual-energy CT (DECT) in differentiating malignant cervical lymphadenopathy caused by thyroid carcinoma (TC), salivary gland carcinoma (SC), squamous cell carcinoma (SCC) and

lymphoma.

METHOD AND MATERIALS

From January 2014 to December 2015, 92 patients with pathologically confirmed cervical lymphadenectasis of TC, SC, SCC and lymphoma ware retrospective analyzed. All patients underwent DECT with gemstone spectral imaging mode before therapy. The quantitative parameters included IC-L (iodine concentration of lesion), WC-L (water concentration of lesion) and λHU(slope of spectral HU curve), which were obtained by analyzing monochromatic images. Parameters of different type lesions were compared.

RESULTS

65 male, 27 female; mean age, 48 years. IC-L for TC (n=18), SC (n=9), SCC (n=36), lymphoma (n=29) were (39.85±14.57)·100μg/cm3, (23.01±3.15)·100μg/cm3, (16.00±5.31)·100μg/cm3 and (14.66±4.17)·100μg/cm3 respectively. λHU for TC, SC, SCC, lymphoma were 5.45±1.95, 3.12±0.41, 2.16±0.75, 1.95±0.64 respectively. The difference of IC-L, λHU were significant among different groups (F=48.31, 49.16 respectively, P<0.05). Post hoc pairwise comparisons of IC-L and λHU demonstrated significant difference between TC and SC or SCC or lymphoma (P<0.05) and between SC and SCC or lymphoma (P<0.05). The median of WC-L in TC, SC, SCC, Lymphoma group was [1036.22(1026.298~1042.14) mg/cm3], [1032.25(1025.03.31~1036.17) mg/cm3], [1034.63(1027.68~1038.61) mg/cm3], [1034.08(1031.21~1041.26) mg/cm3], respectively. There was no significant difference of WC-L between different groups (H=0.39, P>0.05).

CONCLUSION

Quantitative parameters derived from DECT showed significant differences among malignant cervical lymphadenopathy of TC, SC, SCC, lymphoma. DECT can help distinguish different malignant cervical lymphadenopathy.

CLINICAL RELEVANCE/APPLICATION

Quantitative parameters derived from DECT were useful supplements to conventional CT images, and were helpful for distinguishing different malignant cervical lymphadenopathy. Using these quantitative parameters in preoperative evaluation of cervical malignant lymphadenopathy might help radiologists avoid subjective bias related to experience and raise diagnostic confidence. These studies thus offered an important adjunct to diagnose the different cervical malignant lymphadenopathy.

SSQ15-04 The Value of Diffusion-Weighted Imaging Using Readout-Segmented Echo-Planar Imaging, Parallel Imaging, and Two-Dimensional Navigator-Based Reacquisition in the Evaluation of Parotid Gland Tumors

Thursday, Dec. 1 11:00AM - 11:10AM Room: N229

Participants
Zanxia Zhang, Zhengzhou, China (*Presenter*) Nothing to Disclose
Jingliang Cheng, MD,PhD, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose
Yong Zhang, DO, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose
Shujian Li, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study was to investigate the role of readout-segmented echo-planar imaging using parallel imaging and a two-dimensional navigator-based reacquisition (RESOLVE) in differentiating various types of primary parotid gland tumors.

METHOD AND MATERIALS

Sixty-five patients with parotid gland tumors confirmed by pathology were retrospectively reviewed. All the patients received preoperative conventional MRI and RESOLVE DWI (b-values of 0 and 1000 s/ mm2). The apparent diffusion coefficient (ADC) maps were reconstructed, and the ADC values of the solid parts of the lesions were calculated and the receiver operating characteristic curves (ROC) was drawn to obtain the cut-off value for differentiating benign and malignant parotid gland tumors.

RESULTS

59 patients with parotid gland tumor were included in the study. The mean ADC value of pleomorphic adenomas were significantly higher than that of all other examined subtypes. ADC values of warthin tumors were significantly lower than pleomorphic adenoma (p=0.000), basal cell adenoma (p=0.000) and malignant tumors (p=0.001). No significant difference was found between basal cell adenoma and malignant tumors (p=0.067). ADC cut-off values were 1.22×10 - 3×10 - 3mm2/s between pleomorphie adenomas and malignant tumors and 0.90×10 - 3mm2/s between adenomas and malignant tumors; using 0.90×10-3mm2/s≤ADC values＜1.22×10-3mm2/s to make a diagnosis of maligangt tumors, the sensitivity, specificity, accuracy, and positive and negative predictive values were 93.8%, 81.4% , 84.7% , respectively.

CONCLUSION

RESOLVE can be applied as a complementary tool in the detection of benign and malignant lesions of the parotid gland for producing high-resolution DWI.

CLINICAL RELEVANCE/APPLICATION

RESOLVE can be applied as a complementary tool in the detection of benign and malignant lesions of the parotid gland for producing high-resolution DWI.

SSQ15-05 Pleomorphic Adenoma and Malignant Tumor of Parotid Glan: Diagnostic Value of Single-Source Dual-Energy Spectral Computed Tomography

Thursday, Dec. 1 11:10AM - 11:20AM Room: N229

Participants
Lin Li, MD, Beijing, China (*Presenter*) Nothing to Disclose

PURPOSE

To quantitatively evaluate the diagnostic value of single-source dual-energy spectral Computed Tomography between pleomorphic

adenoma and malignant tumor of parotid gland.

METHOD AND MATERIALS

From January to December in 2015, 17 cases with parotid tumor underwent enhanced neck CT using a single-source dual-energy spectral CT mode before operation. The scanning parameters included tube voltage rapid-switching between 80kV/140kV, tube current of 260mA; helical pitch of 0.984 and rotation speed of 0.7s/r. Spectral analysis was performed using the Gemstone Spectral Imaging (GSI) Viewer software on the AW4.6 workstation (GE healthcare).GSI Viewer automatically calculate the optimal energy level for getting the highest CNR. The slope value (K) of spectral HU curve was calculated by using the following equation: K= (HU40keV-HU100keV)／(100-40). The iodine concentration (IC), water concentration (WC), normalized IC artery (NICA), normalized IC muscle (NICM) and K were compared between pleomorphic adenoma and malignant tumors. The statistical analysis was performed with SPSS 19.0 software. ROC analysis was performed to evaluate the efficiency of the multiple variables for detecting malignant tumors.

RESULTS

Seven pleomorphic adenoma and ten malignant tumors were confirmed by pathology. The optimal contrast-noise-ratio (CNR) was achieved at 66.16±2.17 keV. The IC, NICA, NICM and K of malignant tumors were significantly higher than pleomorphic adenoma ($P<0.05$). The optimal IC, NICA, NICM and K threshold was 0.935mg/mL, 0.14, 2.00 and 1.11, achieving 100%, 80%, 70% and 100% sensitivity, 71.4%, 71.4%, 85.7% and 71.4% specificity, respectively. The accuracy was 88.2%, 82.4%, 76.5% and 88.2%, respectively.

CONCLUSION

The single-source dual-energy spectral Computed Tomography can help differentiating malignant from pleomorphic adenoma.

CLINICAL RELEVANCE/APPLICATION

Spectral imaging can reflect the iodine concentration of pleomorphic adenoma and malignant tumors and it is useful in differential diagnosis.

SSQ15-06 Initial Clinical Experience using Ultra-High Definition Digital PET/CT in Head and Neck Oncology

Thursday, Dec. 1 11:20AM - 11:30AM Room: N229

Participants
Chadwick L. Wright, MD, PhD, Lewis Center, OH (*Presenter*) Nothing to Disclose
Aashish D. Bhatt, MD, Louisville, KY (*Abstract Co-Author*) Nothing to Disclose
Prayna Bhatia, BS, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Preethi Subramanian, MS, BEng, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Katherine Binzel, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Michael V. Knopp, MD, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Piotr J. Maniawski, MSc, Cleveland, OH (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Jun Zhang, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study is to assess the clinical potential of next generation digital photon counting PET (dPET) detector technology to enable ultra-high definition imaging in patients with head and neck cancer and compare its imaging characteristics to conventional photomultipler tube detector (cPET) PET/CT.

METHOD AND MATERIALS

Fifteen head and neck cancer patients in this ongoing study agreed to participate to an intra-individual comparison of FDG PET imaging using pre-commercial release dPET/CT (Vereos) and cPET/CT (Gemini TF 64) imaging systems. Standard of care cPET imaging was performed at ~75 min p.i. of 481 MBq FDG, investigational dPET imaging either at ~55 min or ~95 min p.i. All other aspects of image acquisition were kept identical. Digital PET images were reconstructed using Time-of-Flight with 4 mm3 (standard definition), 2 mm3 (high definition), and 1 mm3 (ultra-high definition) voxel volumes and compared with standard definition cPET images by a three reader panel.

RESULTS

All 30 data sets were evaluable. Ultra-high definition dPET imaging was consistently rated best in terms of image quality with significantly ($p < 0.01$) higher readers scores. Improved lesion detectability with sharper delineation was consistently described by the blinded readers compatible with substantially reduced partial volume. Lesion detectability was found to be especially improved in smaller (<15 mm) lesions and better characterization of larger heterogeneous lesions was also noted. While large, homogenous lesions had comparable SUV values on both cPET and dPET, smaller lesions demonstrated higher SUV as did heterogeneous lesions.

CONCLUSION

Ultra-high definition PET in head and neck cancer patients was enabled by dPET with significantly improved image quality, lesion detectability and confidence in lesion classification compared to cPET. Digital PET benefits from the faster Time-of-Flight timing resolution (~325 ps) compared with cPET (~550 ps). While FDG PET imaging in head and neck cancer is already of proven clinical value, ultra-high definition dPET appears to be a further leap for disease staging and therapy planning.

CLINICAL RELEVANCE/APPLICATION

Ultra-high definition digital PET improves image quality, lesion detectability and confidence in classification especially for small, metabolic active lesions in head and neck cancer.

SSQ15-07 Diffusion Kurtosis Imaging for Differentiating Parotid Tumors

Thursday, Dec. 1 11:30AM - 11:40AM Room: N229

Participants
Chuanting Li, MD, PhD, Jinan, China (*Presenter*) Nothing to Disclose

Jinfen Yu, MD, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Chunning Sun, MD, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Weidong Zhang, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Bin Zhao, MD, Jinan, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To explore the values of diffusion kurtosis imaging (DKI) in differential diagnosis benign and malignant parotid tumors.

METHOD AND MATERIALS

32 patients with parotid tumor were examined with conventional MRI and DKI on a MAGNETOM Skyra 3.0 T MRI scanner. The DKI parameters were as follows: TR=3700ms, TE=95ms, FOV=210mmx210mm, slice thickness=3 mm with 0 mm gap, b-values= 0, 1000 and 2000mm2/s, 20 orthogonal directions. The data of DKI was analyzed with Diffusion Kurtosis Estimator to calculate mean kurtosis (MK), mean diffusivity (MD) and fractional anisotropy (FA). The diagnostic accuracy of MK, MD and FA values was evaluated with sensitivity, specificity, and area under receiver operating characteristic (ROC) curve (AUC).

RESULTS

There was a significant difference benign and malignant parotid tumors in the values of MK, FA and MD (p= 0.003, 0.019 and 0.047). The mean MK value of benign parotid tumors was lower than malignant parotid tumors, and it was 0.73±0.27 and 1.09±0.25 respectively. The mean FA value of benign parotid tumors was lower than malignant parotid tumors, and the mean MD value of benign tumors was higher than malignant tumors. The diagnosis of cut-off point between benign and malignant parotid tumors for MK was 1.0528. The sensitivity, specificity and AUC for MK were 75.00%, 91.30% and 0.853. The AUC for FA and MD in differential benign and malignant parotid tumor was 0.783 and 0.739.

CONCLUSION

Parameters of DKI may depict microstructure changes of parotid tumors and could provide quantitative information for the parotid tumors. DKI is helpful in differential diagnosis benign and malignant parotid tumors.

CLINICAL RELEVANCE/APPLICATION

Diffusion kurtosis imaging may depict microstructure changes of parotid tumors. Parameters of DKI could provide quantitative information for the parotid tumors. DKI could used in clinical for differentiating parotid tumors and planning operation.

SSQ15-08 Pre-Treatment Intra-voxel Incoherent Motion Diffusion-weighted Imaging (IVIM-DWI) in Predicting Induction Chemotherapy Response in Locally Advanced Hypopharyngeal Carcinoma

Thursday, Dec. 1 11:40AM - 11:50AM Room: N229

Participants
Wei Guo, Beijing, China (*Presenter*) Nothing to Disclose
Dehong Luo, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Meng Lin, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Lin Li, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Yanfeng Zhao, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Liang Yang, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of this study was to predict response to induction chemotherapy in patients with locally advanced hypopharyngeal carcinoma by IVIM values.

METHOD AND MATERIALS

Twenty eight patients with locally advanced hypopharyngeal carcinoma underwent IVIM studies using twelve different b values (b=0, 10, 20,30,50,70 100,150,200,400,800 and 1000 s/ mm2). All patients underwent two MRI studies: a baseline exam before any treatment and a mid-treatment exam 3 weeks after induction chemotherapy. In IVIM approach, D*, f and D were extracted from a bi-exponential fit. For comparison, ADC map were extracted from a mono-exponential fit. At the end of induction chemotherapy, patients were classified as responders or non-responders group according to the Response Evaluation Criteria in Solid Tumors criteria (RECIST). The patients were classified into high grade group (G1), moderate grade group (G2) and low grade group (G3) according to the tumor pathological grading. The predictive value of IVIM parameters were examined with Student's t-test, analysis of variance (ANOVA) and receiver operating characteristic (ROC) curves.

RESULTS

Compared with the pretreatment value, the posttreatment ADC value and D value was significantly higher and the posttreatment D* value was significantly lower (all $P<0.05$). In contrast, posttreatment f parameter only changed slightly ($P>0.05$). Compared with non-responders, a notably lower pretreatment ADC value, D value, posttreatment D* value, and higher posttreatment ADC value, D value, ΔADC, ΔD, and ΔD* were observed in responders (all $P<0.05$), but no significant change in Δ f among the two group ($P>0.05$). The ROC curve analysis indicated that, the cutoff of pretreatment D value in best predicting tumor's chemotherapeutic response was $0.847\times10-3$ mm2/s, and the corresponding AUC, sensitivity, and specificity were 0.806, 75.0% and 88.9%, respectively. Although pretreatment IVIM-derived parameters had no significant differences between high grade, moderate grade and low grade group, a trend towards lower D* was observed with increasing tumor grading from G3 to G1.

CONCLUSION

IVIM-DWI can potentially predict the treatment response to induction chemotherapy for hypopharyngeal carcinoma.

CLINICAL RELEVANCE/APPLICATION

IVIM-DWI can predict the treatment response to induction chemotherapy for hypopharyngeal carcinoma.

SSQ16

Science Session with Keynote: Pediatrics (Radiation Dose Estimation and Optimization)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S102AB

CT PD SQ

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

Participants
Michael J. Callahan, MD, Boston, MA (*Moderator*) Nothing to Disclose
R. Paul Guillerman, MD, Houston, TX (*Moderator*) Nothing to Disclose

Sub-Events

SSQ16-01 Pediatrics Keynote Speaker: Radiation Dose Optimization and Risk Assessment-Future Research Priorities

Thursday, Dec. 1 10:30AM - 10:40AM Room: S102AB

Participants
R. Paul Guillerman, MD, Houston, TX (*Presenter*) Nothing to Disclose

SSQ16-02 Major Indicators of Dose Development in Pediatric Chest Computed Tomography - An Analysis of 2138 CT Scans

Thursday, Dec. 1 10:40AM - 10:50AM Room: S102AB

Participants
Michael Esser, MD, Tuebingen, Germany (*Presenter*) Nothing to Disclose
Ilias Tsiflikas, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Sabine Hess, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Matthias Teufel, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Konstantin Nikolaou, MD, Tuebingen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Speakers Bureau, Bayer AG
Juergen F. Schaefer, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To analyze possible influences of different methods of dose reduction on pediatric chest CT and to determine major indicators of dose development.

METHOD AND MATERIALS

In this retrospective observational study, 2138 chest CT examinations performed in the period from January 2007 to March 2014 in 1012 patients were analyzed (median age, 10 years; range, two days to 17.9 years). Patients were divided into six age groups according to diagnostic reference values. Volume CT dose index (CTDI) was recorded, effective dose (Eeff) and size-specific dose estimate (SSDE) were calculated for all scans. It was also recorded, if a dose modulation technique and/or high-pitch mode (pitch ≥ 3.0) were used. Multivariate analysis of variance was used to report correlation between variables.

RESULTS

Median CTDI of all 2138 scans was 1.79 mGy [95% CI, 2.9-3.2], Eeff was 1.76 mSv [2.8-3.1] and SSDE was 3.16 mGy [4.8-5.2]. Median dose-specific values decreased in all age groups within the observation time, whereas the number of scans and patient age did not change significantly. High-pitch mode (n=458) resulted in lower CTDI, Eeff and SSDE in all age groups ($p<0.001$), independent of contrast agent use. Non-enhanced scans with automatic exposure control (n=410) delivered median dose values up to twice as high as compared to those without dose modulation, even when the use of different CT devices was taken into consideration ($p<0.001$). When contrast agent was applied, the dose-related disadvantages using dose modulation were limited to infants and children up to 15 years.

CONCLUSION

Radiation dose in pediatric chest CT was considerably reduced in the last decade, while high-pitch scanning seems to essentially contribute to this development. However, the use of dose modulation technique should be considered according to patient age and depending on the examination protocol.

CLINICAL RELEVANCE/APPLICATION

High-pitch acquisition can significantly lower dose exposure in routine pediatric CT imaging. The use of a dose modulation technique is not always advantageous and should be considered individually.

SSQ16-03 Comparison of the Measured and Estimated Effective Dose in Pediatric CT Examination with Lower Tube Voltage Scan Settings: Phantom Study

Thursday, Dec. 1 10:50AM - 11:00AM Room: S102AB

Participants
Takanori Masuda, Hiroshima, Japan (*Presenter*) Nothing to Disclose
Yoshinori Funama, PhD, Kumamoto, Japan (*Abstract Co-Author*) Nothing to Disclose
Masao Kiguchi, RT, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose
Yukari Yamashita, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose
Naoyuki Imada, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose

Kazuo Awai, MD, Hiroshima, Japan (*Abstract Co-Author*) Research Grant, Toshiba Corporation; Research Grant, Hitachi, Ltd; Research Grant, Bayer AG; Research Grant, Eisai Co, Ltd; Medical Advisor, General Electric Company; ; ; ; ;
Yoriaki Matsumoto, HIROSHIMA, Japan (*Abstract Co-Author*) Nothing to Disclose
Takayuki Oku, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomoyasu Satou, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The simplest method for estimating the effective dose (ED) in individual patients is by conversion from the dose-length product (DLP) displayed on the CT console by using k-factors. We compared the estimated ED (e-ED) obtained with the DLP and k-factors with the actually measured ED (am-ED) recorded on radio-photoluminescence glass dosimeters (RPGDs) in 3 different anthropomorphic phantoms simulating pediatric subjects.

METHOD AND MATERIALS

We used 3 anthropomorphic phantoms simulating a newborn,a 1-year-old-, and a 5-year-old child (phantoms A, B, and C, respectively) (ATOM Phantom, CIRS, Norfolk, VA, USA) and a 64-detector CT scanner (VCT, GE). The tube voltage was 80-, 100-, and 120 kVp, the tube current was set at noise index 12. We obtained the am-ED to organs for each phantom. We then recorded the DLP displayed on the CT console and calculated the e-ED using k-factors according to ICRP Publication 60, 102, 103. We defined the e-ED error rate (%) using the formula error rate = |(e-ED - am-ED / am-ED)| x 100].

RESULTS

The am-ED was 2.3, 2.5, and 2.6 mSv for phantom A; 2.4, 2.9, and 3.2 mSv for phantom B; and 2.6, 2.9, and 3.2 mSv for phantom C at 80-,100-, and 120 kVp, respectively. The e-ED was 2.8, 2.8, and 3.0 mSv for phantom A; 2.3, 2.2, and 2.4 mSv for phantom B; and 3.0, 2.8, and 2.9 mSv phantom C at 80-,100-, and 120 kVp, respectively. The error rate of e-ED was 21.7, 12.0 and 15.4% for phantom A; 0.1, 24.1, and 25.0% for phantom B, and 15.4, 0.1, and 0.1% for phantom C at 80-,100-, and 120 kVp, respectively.

CONCLUSION

The error rate of e-ED ranged from 0.1% (min) to 25.0% (max) in our pediatric phantoms.

CLINICAL RELEVANCE/APPLICATION

When calculating the estimated effective dose based on the DLP and k-factors in pediatric patients, a potential maximum error rate of 25% must be taken into account.

SSQ16-04 Automated Tube Current Selection Provides Consistent Relationship between Radiation Dose and Body Size in Pediatric Abdomen CT Scans

Thursday, Dec. 1 11:00AM - 11:10AM Room: S102AB

Participants
Boaz Karmazyn, MD, Indianapolis, IN (*Presenter*) Nothing to Disclose
Huisi Ai, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose
Elise Miller, MD, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose
Fangquin Ouyang, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose
Samuel G. Jennings, MD, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Body CT scan protocols in children are based on body size. We wanted to know if automated tube current selection can provide consistent relationship between body size and radiation dose in routine pediatric abdomen CT scans.

METHOD AND MATERIALS

A 1 year retrospective study on all consecutive non-repeated routine abdomen CT scans in children (age <18 years). Age, gender, body weight (BW) and CTDIvol (32cm) were registered for each study. SSDE was calculated using conversion factors derived from either the BW or mid scan length slice effective diameter. Pearson correlation coefficient was used to estimate strengths of correlations between body size (BW and ED) and dose (CTDIvol and SSDE).

RESULTS

353 abdominal CT scans were included (53.5% males) with average age of 9.2 years (range 1 month to 18 years). There was a strong positive correlation between CTDIvol and BW and between CTDIvol and ED (r=0.84 and 0.82, respectively, p<0.0001). A quadratic equation best represent these relationship. There was moderate positive correlation between SSEDE and BW and between SSDE and ED, (r=0.62 and 0.63, respectively, p<0.0001).

CONCLUSION

Use of automated tube current selection in pediatric patients provides a consistent relationship between CTDIvol and body size. The quadratic equation that best represents this relationship for our practice group preference of image quality can be used for quality assurance processes, and can be shared and compared between different institutions.

CLINICAL RELEVANCE/APPLICATION

Automated tube current selection in pediatric patients provide a consistent relationship between body size and CT radiation dose which can be shared and compared between different institutions.

SSQ16-05 Factors Determining Radiation Dose in Pediatric Chest CT: Arm Position and Presence of Devices as Independent Factors

Thursday, Dec. 1 11:10AM - 11:20AM Room: S102AB

Participants
Young Jin Ryu, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose

Young Hun Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jung-Eun Cheon, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
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
Ji-Eun Park, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yu Jin Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate factors associated with the higher SSDE in pediatric chest CT.

METHOD AND MATERIALS

From November 2013 to May 2015, 315 pediatric chest CT scans were obtained in one CT scanner and classified into five groups according to age (<3 years, n = 65; 3-5 years, n = 54; 6-10 years, n = 58; 11-15 years, n = 81; >15years, n = 57). In each age group, chest CT scan were divided into two subgroups (Group A, greater than 75th percentile of the size-specific dose estimates (SSDE) for each age group, n = 77; Group B, less than 75th percentile, n = 238). All CT scans were performed with the same protocol using automatic tube voltage and current selection techniques (reference kV of 120 and reference mAs of 100). Sex ratio, age, tube current, weight, height, body mass index (BMI), anteroposterior (AP) body diameter, lateral diameter were compared between Group A and B. In addition, arm angles on scout coronal image and coronal reformatted image, presence of medical devices in the scan field and degree of off-centering within the CT gantry were also compared.

RESULTS

Group A showed significantly higher tube current, weight, BMI, and longer AP/lateral diameters (P <.001, P = .005, P <.001, P = .004, P = .006, respectively), compared with Group B. Narrower arm angles on scout coronal image and coronal reformatted image (P <.001, P <.001, respectively) and the presence of medical devices in the scanning filed (P = .018) were significantly associated with higher SSDE. There are no significant differences between two groups regarding sex ratio, age, height and degree of off-centering. In multivariate analysis, narrower arm angles and presence of device as well as higher BMI were independently associated with higher SSDE.

CONCLUSION

Arms down by the sides and presence of medical device as well as higher BMI were independent factors associated with the higher radiation dose in pediatric chest CT.

CLINICAL RELEVANCE/APPLICATION

Changing positions of arm and device is the simple but important method to reduce radiation dose in the pediatric chest CT.

SSQ16-06 Dose Optimization for Full Spine Radiographs in Idiopathic Scoliosis Patients

Thursday, Dec. 1 11:20AM - 11:30AM Room: S102AB

Participants
Caroline Ernst, MD, Brussels, Belgium (*Presenter*) Nothing to Disclose
Nico Buls, DSc, PhD, Jette, Belgium (*Abstract Co-Author*) Nothing to Disclose
Armand Laumen, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose
Gert Van Gompel, PhD, Brussel, Belgium (*Abstract Co-Author*) Nothing to Disclose
Filip Verhelle, MSc, Brussel, Belgium (*Abstract Co-Author*) Nothing to Disclose
Johan De Mey, Jette, Belgium (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To optimize our Full Spine Radiograph protocol used in the follow up of children with idiopathic scoliosis.

METHOD AND MATERIALS

We performed a lowered dose posterioranterior (PA) full spine radiograph in 40 patients (protocol B) with idiopathic scoliosis aged 10-16 years (10 males;30 females) on a Luminos dRF (Siemens). Dose reduction was achieved by adding a 0.2 mm cupper filter and lowering the tube intensity. Radiographs were scored on 6 criteria (5-point Likert scale) by a pediatric radiologist and a pediatric orthopedist who were blinded to patient identity and clinical information. The scored criteria were bone/soft tissue contrast, bone sharpness, visibility of processus spinosis, delineation of the intervertebral spaces, assessment of the spinal curve and Risser grade, representing a total score between minimal 6 and maximal 30 points. These scores were compared to the scores of 40 PA full spine X-ray's performed in 2013 with our standard protocol (protocol A) again in patients aged between 10 and 16 years with idiopathic scoliosis (7 males;33 females). Tube intensity, entrance dose (D) and dose area product (DAP) were compared. Statistical analysis was performed using IBM SPSS (v23) and included assessment of DAP, D, tube intensity, image quality score and interobserver variability by intraclass correlation coefficients (ICC). A p value of less than 0.05 was considered significant.

RESULTS

Mean age was 13,3 ± 1.6 years for group A and 13.4 ± 1.7 years for group B. For protocol A the mean tube intensity was 1.3 ± 0.4 mAs, the mean D was 5.0 ± 1.8 mGy and the mean DAP was 85.3 ± 32.7 µGy.m2. With protocol B, exposure parameters reduced to: tube intensity 0.7 ± 0.4 mAs, D 2.8 ± 1.3 mGy and DAP 47.0 ± 22.4 µGy.m2 (all p<0.05). Mean image quality score for protocol A was 28.1 ± 2.4 points (range 21-30), comparable to the mean total score of protocol B 27.9 ± 2.3 points (range 22-30). Interobserver agreement was excellent (ICC 0.92).

CONCLUSION

This study demonstrates that a lowered dose (45%) full spine radiograph can be performed in patients with idiopathic scoliosis by adding a 0.2 mm Cu filter and lowering tube intensity without loss of image quality.

CLINICAL RELEVANCE/APPLICATION

Dose optimization is a key aspect in pediatric radiology, in particular with patients receiving recurrent radiographs.

SSQ16-07 Unenhanced Brain CT in Children:Comparison of Wide-Volume, One-Shot Volume and Helical Scan Modes in 320-Slice Multidetector CT

Thursday, Dec. 1 11:30AM - 11:40AM Room: S102AB

Participants
Sunkyung Jeon, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Young Hun Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jung-Eun Cheon, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
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 compare the image quality and radiation dose of three scan modes (wide-volume, one-shot volume and helical scan modes) in 320-row multidetecor CT for pediatric brain imaging

METHOD AND MATERIALS

Institutional review board approval was obtained with no informed consent required for this retrospective analysis. Fifty seven children (36 boys and 21 girls; mean age, 6.6 years; range, 2 months to 15 years) who underwent unenhanced brain CT using one of three scan modes (wide-volume, n=19; one-shot volume, n=20; helical scan, n=20) were included in this study. The same tube potential and effective tube current-time product according to the patient's age (group A, 0–24 months; group B, 25 months–15 years) were applied to three scan modes. For qualitative analysis, we evaluated overall image quality, noise, gray matter(GM)–white matter(WM) differentiation and streak artifacts in the posterior fossa using a 5-point grading system. For quantitative analysis, noise, signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) between the GM and WM were calculated. As a measure of radiation dose, CT dose index per unit volume (CTDIvol) and dose-length product (DLP) were compared among three scan modes.

RESULTS

Qualitatively, the wide-volume scan showed significantly better overall image quality and less artifacts in the posterior fossa, compared with the one-shot volume scan. The wide-volume scan was associated with less image noise and posterior fossa artifacts compared with the helical scan. The GM-WM differentiation was not significantly different among three scan modes. Regarding the quantitative analysis, the wide-volume and one-shot volume scans showed significantly less noise and higher GM and WM SNR than the helical scan. The CNR was significantly higher in the wide-volume scan followed by the one-shot volume and helical scans . The CTDIvol was significantly lower in the one-shot volume scan. The DLP was significantly lower in the wide-volume and one-shot volume scans compared with the helical scan.

CONCLUSION

As for unenhanced brain CT in children, both wide-volume and one-shot volume scans reduced radiation exposure compared with the helical scan, while the wide-volume scan showed better image quality with less posterior fossa artifacts than the one-shot volume scan.

CLINICAL RELEVANCE/APPLICATION

Application of wide-volume scan could decrease radiation exposure while improving the image quality in pediatric unenhanced brain CT.

SSQ16-08 Identifying High Exposure Cases in Pediatric Fluoroscopy: Comparison of Fluoroscopy Time to Weight-stratified Dose-area Product Thresholds

Thursday, Dec. 1 11:40AM - 11:50AM Room: S102AB

Participants
Matthew S. Lazarus, MD, PhD, Bronx, NY (*Presenter*) Nothing to Disclose
Amichai J. Erdfarb, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
William Malouf, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Terry L. Levin, MD, Mamaroneck, NY (*Abstract Co-Author*) Nothing to Disclose
Eduardo Nororis, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Benjamin Taragin, MD, Teaneck, NJ (*Abstract Co-Author*) Medical Advisory Board, Carestream Health, Inc

PURPOSE

Fluoroscopy studies are a significant source of radiation exposure children. Fluoroscopy time (FT) limits have been used to screen for high exposure cases, however this is an indirect metric that does not account for differences in technique such as pulsed imaging or collimation. Dose-area product (DAP) is a more accurate reflection of radiation exposure, but is heavily affected by patient size, making the development of DAP thresholds challenging in children of various ages.

METHOD AND MATERIALS

Dose data from fluoroscopic studies performed in a pediatric tertiary care hospital were prospectively collected over 16 months. Study type, FT, DAP, and patient weight were recorded. Patient weight and DAP were compared by linear regression. Thresholds were established based on 90th percentile of either FT or DAP. Agreement between FT and DAP thresholds for identifying high exposure cases was assessed using Cohen's kappa.

RESULTS

A total of 391 cases, including 201 upper gastrointestinal studies (UGI), 114 voiding cystourethrograms (VCUG), and 76 other studies (e.g., barium enema, esophagram), were collected. DAP correlated with patient weight ($r2=0.46$, $p<0.001$). For all studies, FT thresholds were: 174 s for 6-12 lbs, 177 s for 12-25 lbs, 165 s for 25-50 lbs, 191 s for 50-100 lbs, and 244 s for >100 lbs; DAP thresholds were: 11 µGy•m2, 23 µGy•m2, 33 µGy•m2, 167 µGy•m2, and 645 µGy•m2, respectively. Of the 36 cases which exceeded the 90th percentile for FT, and the 36 cases which exceeded the 90th percentile for DAP, 15 cases exceeded both (Cohen's $\kappa=0.36$). Subgroup analysis demonstrated $\kappa=0.27$ for UGIs alone, and $\kappa=0.45$ for VCUGs alone.

CONCLUSION

DAP monitoring is a more direct measure of dose than FT, however its correlation with weight requires use of weight-stratified thresholds. We have calculated and applied both FT and DAP thresholds, and demonstrated poor overlap when comparing these two methods. Therefore, use of FT thresholds, an indirect measure of dose, may not adequately identify high exposure cases. Establishment and adoption of weight-based DAP thresholds should provide a more accurate method of dose monitoring.

CLINICAL RELEVANCE/APPLICATION

Fluoroscopy time is typically used to track radiation exposure in pediatric fluoroscopy, however adoption of weight based dose-area product thresholds should provide more accurate dose monitoring.

SSQ16-09 Evaluation of Contrast Dose, Radiation Dose and Image Quality in Contrast-Enhanced CT in Pediatric Abdomen using Low Tube Voltage and Low-Concentration Iodinated Contrast Agent

Thursday, Dec. 1 11:50AM - 12:00PM Room: S102AB

Participants
Xiao Xia Wang, Shanghai, China (*Presenter*) Nothing to Disclose
Li Wei Hu, DIPLENG, MENG, Pudong, China (*Abstract Co-Author*) Nothing to Disclose
Haisheng Qiu, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Yumin Zhong, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess image quality, contrast dose and radiation dose in enhanced abdominal CT with low tube voltage and low-concentration iodinated contrast agent in children.

METHOD AND MATERIALS

Forty-eight patients were randomized to one of the two protocols: group A (n=24) and group B (n=24). Group A: tube voltage was 80 kVp, and contrast agent being Visipaque (270mg I/mL, GE Healthcare). Group B: tube voltage was 100 kVp, and contrast agent being Iopamiro (370mg I/mL, Bracco). The degree of enhancement and noises in the abdominal aorta and portal vein were measured in two groups; while signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) were calculated. A five point scale was used to subjectively evaluate image quality and image noise. DLP (mGy/cm) and CTDIvol (mGy) were recorded.

RESULTS

There was no significant difference in age, weight or BMI between the two groups (all p >0.5). The iodine load in Group A (5517.3±3197.2mgI) was 37% lower than that in Group B (8772.1±8474.6mgI). The DLP and CTDIvol values for Group A and Group B were similar (all p >0.05). The mean arterial and portal venous enhancement and the noises, CNRs and SNRs for Group A and Group B were similar (all p>0.05). The mean score on quality of arterial phase (AP) and portal venous phase (PVP) images in Group B had scores of 4.31±0.53 and 4.35±0.52, while scores of 4.29±0.51 and 4.25±0.51 were obtained in Group A, there was no statistically significant difference between the two groups.

CONCLUSION

The scanning protocol using low tube voltage (80kVp) and low-concentration iodinated contrast agent (270mgI/mL) enables 37% reduction in iodine load while maintaining compatible image quality, and effective radiation dose compared with the conventional scan protocol.

CLINICAL RELEVANCE/APPLICATION

The scanning protocol using low tube voltage (80kVp) and low-concentration iodinated contrast agent (270mgI/mL) with a high ASIR (70%) is appropriate for enhanced abdominal CT scanning of pediatric patients.

SSQ17

Pediatrics (General and Neonatal Imaging)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S102C

CT MR US PD

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

Participants
Anne Marie Cahill, MBBCh, Philadelphia, PA (*Moderator*) Nothing to Disclose
Christopher I. Cassady, MD, Houston, TX (*Moderator*) Nothing to Disclose

Sub-Events

SSQ17-01 Abdominal Computed Tomography in Pediatric Blunt Trauma: The Significance of Isolated Free Fluid

Thursday, Dec. 1 10:30AM - 10:40AM Room: S102C

Participants
Preetam Gongidi, DO, Philadelphia, PA (*Presenter*) Nothing to Disclose
Jared S. Meshekow, MD, Camden, NJ (*Abstract Co-Author*) Nothing to Disclose
Thomas J. Presenza, DO, Haddonfield, NJ (*Abstract Co-Author*) Nothing to Disclose
Joshua Hazelton, DO, Camden, NJ (*Abstract Co-Author*) Nothing to Disclose
John Gaughan, PhD, Camden, NJ (*Abstract Co-Author*) Nothing to Disclose
Nicole Fox, MD, Camden, NJ (*Abstract Co-Author*) Nothing to Disclose
Emily D. Scattergood, MD, Haddonfield, NJ (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Computed tomography of the abdomen and pelvis (CTAP) is widely used by both trauma surgeons and Emergency Department physicians for the identification of intraabdominal injury in the pediatric trauma patient. Multidetector computed tomography (MDCT) is the mainstay of imaging these days and CTAP is the imaging workhorse for diagnostic evaluation of blunt abdominal trauma. Incidental finding of intraperitoneal free fluid in absence of identifiable injury, referred to as isolated free fluid (IFF), may create a clinical dilemma in the pediatric blunt trauma patient. The uncertainty of the significance of IFF may lead clinicians to manage the patient with in-house observation, potentially leading to increased hospital length of stay and unnecessary hospital costs. We hypothesize that the presence of IFF in the pediatric blunt trauma patient does not require further diagnostic workup and should not mandate additional care.

METHOD AND MATERIALS

A retrospective review of all pediatric trauma patients ≤18yrs with a blunt mechanism of injury who received a CTAP (2011-2015, n=671) was performed at our Level 1 Adult/Level 2 Pediatric Trauma Center. Admission radiology reports were collected and analyzed, while repeat scans during the same hospital stay were excluded. We defined IFF as simple free fluid with Hounsfield units of <20 along with the absence of identifiable injury in the abdomen and pelvis. Attending radiologist reports, age, gender, ISS, mechanism of injury, and clinical outcomes were analyzed using univariate Chi-square test. A $p<0.05$ was considered significant.

RESULTS

A total 671 patients ≤18years with a blunt mechanism of injury had a CTAP performed on admission to the trauma service during the study period. We found 120 (17.9%) patients had IFF as the only positive finding on CTAP scan. Females were more than twice as likely to have IFF than their male counterparts (29% v. 13%, p0.05). No patients with IFF on CTAP developed intraabdominal pathology or required operative management of the abdomen.

CONCLUSION

The presence of IFF on CTAP in the pediatric trauma patient with blunt mechanism is not associated with any injuries that require operative management. The presence of IFF should not mandate additional clinical care in the pediatric blunt trauma patient.

CLINICAL RELEVANCE/APPLICATION

This research has clinical relevance to changing current management of pediatric trauma patients with blunt mechanism trauma.

SSQ17-02 Identification of Quality Improvement Areas in Pediatric MRI from Analysis of Patient Safety Reports

Thursday, Dec. 1 10:40AM - 10:50AM Room: S102C

Awards
Student Travel Stipend Award

Participants
Camilo Jaimes Cobos, MD, Boston, MA (*Presenter*) Nothing to Disclose
Diana Murcia, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Karen Miguel, RN, MPH, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Cathryn Defuria, RN, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Pallavi Sagar, MBBS, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Michael S. Gee, MD, PhD, Jamaica Plain, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To estimate the rate of safety reports in pediatric MRI and determine risk factors associated with safety report frequency.

METHOD AND MATERIALS

In a retrospective HIPAA-compliant, IRB-approved study, the RIS was queried to identify MRI studies performed in pediatric patients (0-18 yrs) from 2010-2015 and then cross-matched with the institutional safety incident reporting system. Safety report (SR) severity was graded on a 5-point scale: did not reach/affect the patient, reached but did not affect the patient, caused minor harm (IV infiltration, skin injury), caused major harm (anaphylaxis, code), or death. Patient age, location, and the use of sedation/GA were recorded. Chi-square test was used to evaluate significance of differences between groups.

RESULTS

A total of 89 SR were identified from a total of 16749 pediatric MRI studies, yielding a prevalence of 0.53%. In 15 reports (17%) the event did not reach and did not harm the patient, 39 (44%) reached the patient but caused no harm, 32 (36%) caused mild harm, and 3 (3%) caused major harm. There were no deaths. The two most common causes for SR were service coordination (n=32; 36%) and adverse drug reactions (n=17; 19%). 3482 (20.7%) MRIs involved sedation/GA. There was a significantly increased SR rate in MRIs that used sedation/GA (0.8%) relative to awake MRI (0.46%), with an odds ratio (OR) of 1.75 (P<0.05). SR rate also varied significantly by location (p<0.05), with a rate of 1.2% for inpatients, 0.6% for E.R. patients, and 0.4% for outpatients. Increased SR rates were seen in the younger age categories, with newborns (1.1%), infants (1.1%), and young children (0.9%) associated with SR rates significantly higher than those in older children (P < 0.05) . The odds ratio of younger children (<6 yrs) having a SR relative to older children (>6yr) was 2.2.

CONCLUSION

The prevalence of safety reports in MRI performed in children is increased relative to previously published data on adults. The majority of events caused no harm or only minor harm. The most common causes of SRs were service coordination and adverse drug reaction. Children below the age of 6 yrs, inpatients, and use of sedation/GA are all factors associated with higher SR rates and should be the focus of quality improvement strategies.

CLINICAL RELEVANCE/APPLICATION

Data on safety reports in pediatric MRI is sparse. Knowledge of safety profile of pediatric MRI can be used to guide evidence-based recommendations.

SSQ17-03 Are Skull Radiographs Necessary in a Skeletal Survey for Abusive Trauma in Children if CT Head with 3D Surface Rendering is also performed?

Thursday, Dec. 1 10:50AM - 11:00AM Room: S102C

Participants
Swati S. Mody, MD, Troy, MI (*Presenter*) Nothing to Disclose
Harutyun Haroyan, MD, Detroit, MI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study is to compare CT head with skull radiographs for evaluation of skull fractures, and based on the findings, ascertain if skull radiographs are necessary in a skeletal survey if CT head with 3D rendering is also available.

METHOD AND MATERIALS

Skull radiographs from skeletal surveys and CT head performed at the same time for suspected abusive trauma in 122 patients (age range: 6 days to 71 weeks) over a one-year period were reviewed retrospectively for skull fractures. Both studies were independently read by two pediatric radiologists. The number of skull fractures, location and type of fracture were documented for each study. The radiologists assigned confidence level for diagnosis of each fracture on Likert scale of 1 through 5, with 1 being least and 5, most confident. The skull radiographs consisted of at least AP and lateral views. Unenhanced CT head was obtained with images reformatted in 3 planes and 3D surface reconstructions.

RESULTS

Skull fractures were identified in 45.14% of patients on CT (n=37) compared to 35.38% on radiographs (n=29). 8 cases with fractures identified on CT did not demonstrate fractures on skull radiographs. There was high confidence level for diagnosis of fractures on CT in these patients, 4 in one and 5 in seven cases. In 1 patient, fracture was suspected on radiographs with low confidence level of 1, and not confirmed on CT. Overall, larger number of separate fractures were identified with CT (n=54) compared to skull radiographs (n=45).

CONCLUSION

CT head is superior to skull radiographs for diagnosis of skull fractures in abusive head trauma. When CT head is also obtained with 3D surface reconstruction, the possibility of omitting skull radiographs from skeletal survey should be considered to diminish risk of generating contradictory reports and moreover, decrease radiation exposure in this vulnerable population.

CLINICAL RELEVANCE/APPLICATION

Abusive head trauma is the leading cause of death in infants and young children. Per ACR guidelines, skeletal survey for suspected abusive injury requires minimum AP and lateral radiographs of the skull. In addition to skeletal survey, majority of these children get CT head for workup. The purpose of this study is to compare CT head with skull radiograph for evaluation of skull fractures, and thereby, ascertain if skull radiographs can be omitted in a skeletal survey if CT head with 3D reconstructions is available to reduce radiation.

SSQ17-04 Quantitative Shape Analysis of Skull Deformity on Head CT Images

Thursday, Dec. 1 11:00AM - 11:10AM Room: S102C

Participants
Min Jin Lee, BS, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Helen Hong, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyu Won Shim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yong Oock Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

CONCLUSION

Our method is useful for the quantification of severity of skull deformity for diagnosis, prognosis and surgical planning of craniosynostosis.

Background

Craniosynostosis is the premature fusion of the one or more cranial sutures resulting in skull deformity. 3D CT is the most standard imaging for early diagnosis and surgical planning of craniosynostosis. Despite the advances of 3D CT, quantitative assessment of skull deformity remains highly dependent on clinician experience. We propose a quantitative shape analysis of skull deformity on head CT images and apply our method to the classification of craniosynostosis.

Evaluation

Our method was tested on dataset consisting of 45 deformity subjects with sagittal(S) and bicoronal(B) synostosis and 45 normal subjects. In deformity subjects, typical and mild deformities were included and the skull with mild deformity subject was similar shape with that of normal subject. To generate the representative planes which reflect skull deformity, the position of S- and B-planes was defined by the region of fused suture. To quantify the severity of skull deformity, shape features which reflect skull morphology were extracted in each S- and B-planes of segmented skull. A cranial index was calculated as the ratio of the width to the length of skull. A cranial radius index was determined by considering the position and degree of a prominent area such as bossing or narrowing of skull. To consider mild deformity subjects, a cranial partial slope index was determined by considering the slope of frontal skull. A cranial extreme spot and near cranial extreme spot indices were determined by considering the distribution of area which maximize the distance between cranial boundary points. For early diagnosis of craniosynostosis, support vector machine was trained with the training shape features and tested with five-fold cross validation. Our results were evaluated by sensitivity, specificity and accuracy of 86%, 95% and 92%, for sagittal, 100%, 98% and 98% for bicoronal, respectively.

Discussion

Our method can provide a reliable quantification tool and identify suspected case as mild subjects for assessing the severity of skull deformity and diagnosis of craniosynostosis. This research was supported by the MISP(Ministry of Science, ICT & Future Planning), Korea, under the National Program for Excellence in SW)(R7719-16-1002) supervised by the IITP(Institute for Information & communications Technology Promotion)(R7719-16-1002)

SSQ17-05 Comparison of Image Quality between Conventional VIBE and Radial VIBE in Free-Breathing Pediatric Abdominal MRI

Thursday, Dec. 1 11:10AM - 11:20AM Room: S102C

Participants
Hyun Joo Shin, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Myung-Joon Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Mi-Jung Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyun Gi Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the image quality between conventional volume interpolated breath-hold examination (VIBE) and radial VIBE in contrast-enhanced fat-suppressed T1-weighted images of pediatric abdominal MRI during free-breathing.

METHOD AND MATERIALS

We retrospectively reviewed the images from pediatric patients who underwent contrast-enhanced abdominal MRI with a 3.0 T magnet using conventional VIBE (conventional group) and radial VIBE (radial group) while freely breathing. For objective analysis, the mean values of noise and signal-to-noise ratio (SNR) in liver on contrast-enhanced fat-suppressed T1-weighted images were compared. For subjective analysis, overall image quality, respiratory motion, portal vein clarity, and hepatic margin sharpness were assessed by four point scales.

RESULTS

Nine patients (mean age of 2.8±2.3 years) in the conventional and 17 patients (mean age of 2.4±2.8 years) in the radial groups were included. By objective analysis, the noise was significantly lower and the SNR was significantly higher in the radial group than those in the conventional group (all, $p<0.001$). In the subjective analysis, overall image quality, respiratory motion, portal vein clarity, and hepatic margin sharpness were all significantly higher in the radial group (all, $p<0.001$).

CONCLUSION

Pediatric abdominal MR images with radial VIBE showed lower noise with higher SNR in objective analysis and higher image quality in subjective analysis, compared to conventional VIBE.

CLINICAL RELEVANCE/APPLICATION

By applying radial VIBE in contrast-enhanced abdominal MR acquisition, we can obtain better image quality even in infants and young children while freely breathing.

SSQ17-06 Pediatric MRI in the Emergency Department Over Five Years: An Analysis of Usage and Trends

Thursday, Dec. 1 11:20AM - 11:30AM Room: S102C

Participants
Miriam Hulkower, MD, Bronx, NY (*Presenter*) Nothing to Disclose
Benjamin Taragin, MD, Teaneck, NJ (*Abstract Co-Author*) Medical Advisory Board, Carestream Health, Inc
Reubin Davoudzadeh, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Dan Wang, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Tao Wang, MD,PhD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Meir H. Scheinfeld, MD, PhD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Michele J. Fagan, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Our institution as well as others have added 24/7 MRI availability for Pediatric Emergency Department (PED) patients. Our purpose was to evaluate MRI usage and trends among pediatric patients.

METHOD AND MATERIALS

IRB exemption was obtained. All MRI exams performed on PED patients from 2011 through 2015 were tabulated along with demographic data. PED triage volume data were also obtained to normalize MRI data. The z-test was used to compare MRI utilization in male and female patients. A Chi-squared test for trend in proportions was used to test for a trend in usage over the five year period. MRI utilization per ED visit versus patient age was tabulated and confidence intervals were calculated. MRI usage for each hour of the day was plotted to determine the hours with the highest volume.

RESULTS

There were a total of 997 MRI exams and 561,704 triages performed over the five year period. Regarding category of MRI exam, 57% were of the brain, 15% were of the spine, 13% were neurologic MRA exams, 6% were of the abdomen, 5% were of the face, 4% were musculoskeletal and 0.3% were of the chest. There was significantly higher MRI utilization for females (MRI performed during 0.21% of ED visits) compared to males (MRI performed during 0.14% of ED visits, $p<0.001$). There was a statistically significant increasing utilization trend over the five year period ($p<0.001$) with MRI being performed during 0.12% of visits in 2011 and 0.24% of visits during 2015. Utilization generally increased with patient age, with lowest utilization in 3 year olds (MRI during 0.0053% of visits) and highest utilization in 17 year olds (MRI during 0.54% of visits). Highest PED MRI volume was during the evening and early nighttime hours with peak volume occurring during the 10 PM hour when 8.2% of MRI exams were performed.

CONCLUSION

The most common exams performed in the PED were neurological. Utilization was higher in girls and in older children. Utilization progressively increased over the study period. Evening and early nighttime hours saw the greatest MRI usage.

CLINICAL RELEVANCE/APPLICATION

The data presented demonstrates that there is increasing PED MRI utilization, particularly of neurological studies, suggesting that off-hour resource availability during the evening and early nighttime hours would be well utilized.

SSQ17-07 UltraFast™ Doppler Ultrasonography for Arterial Evaluation in Children: Comparison with Conventional Doppler Ultrasonography

Thursday, Dec. 1 11:30AM - 11:40AM Room: S102C

Participants
Yu Jin Kim, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Young Hun Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jung-Eun Cheon, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
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
Ji-Eun Park, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Young Jin Ryu, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the utility of UltraFast™ Doppler ultrasonography (US) for Doppler assessment of hepatic and renal arteries in children.

METHOD AND MATERIALS

From March through April 2016, Doppler US examinations for 25 arteries (15 hepatic arteries and 10 renal arteries) were performed in 12 patients (6 boys and 6 girls, mean age 7.2 years). Doppler assessment of each artery was performed under free breathing by using both UltraFast™ Doppler and conventional Doppler US techniques. Peak systolic velocity, end-diastolic velocity, and resistive index were compared between the two techniques. Doppler acquisition times were also evaluated.

RESULTS

The peak systolic velocity was significantly lower in the UltraFast™ Doppler than conventional Doppler US (36.54±12.80 cm/s vs. 38.80±12.51 cm/s, $p=0.0007$). The end-diastolic velocity showed no significant difference between the two techniques (11.69±4.35 cm/s vs. 11.54±4.01 cm/s, $p=0.5987$). UltraFast™ Doppler US showed lower resistive index values than conventional Doppler US (0.67±0.06 Vs. 0.69±0.07, $p=0.0048$). Regarding the acquisition time, conventional Doppler US required 85.2 sec on average (range 12-269 sec) while UltraFast™ Doppler was obtained in a fixed acquisition time of 4 sec.

CONCLUSION

When compared with the conventional Doppler US, UltraFast™ Doppler ultrasonography was associated with lower peak systolic velocity and resistive index values and a shorter acquisition time for arterial evaluation in children.

CLINICAL RELEVANCE/APPLICATION

UltraFast™ Doppler ultrasonography could be a good alternative to conventional Doppler ultrasonography for children who cannot hold their breath.

SSQ17-08 Effect of Motion for Measurement of Tissue Stiffness on Ultrasound Elastography: A Moving Liver Fibrosis Phantom Study

Thursday, Dec. 1 11:40AM - 11:50AM Room: S102C

Participants
Hyun Joo Shin, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Myung-Joon Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Mi-Jung Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the effect of movement for measurement of tissue elasticity on ultrasound elastography using moving liver fibrosis phantoms.

METHOD AND MATERIALS

We used elasticity phantoms (Shear Wave Liver Fibrosis Phantom, model 039, CIRS) of custom-made stiffness of 3.0 and 16.9 kPa. For simulating regular movement, Orbital Shaker (FinePCR SH30) was used to make regular circular and horizontal motion for 35 and 60 times per minute. We used a supersonic shear wave imaging (SSI, Aixplorer, SuperSonic Imagine, Aix-en-Provence, France) with 1-6 MHz convex and 2-10 MHz linear transducers in abdominal settings, and acoustic radiation force impulse imaging (ARFI, ACUSON S3000, Siemens Healthcare, Erlangen, Germany) with 1-6 MHz convex transducer in routine abdominal setting and 4-9 MHz linear transducer in breast ARFI setting. The values were obtained twenty times at each depth of 2, 3, 4 and 5 cm and mean values in kPa were selected. The stiffness values between moving and static status were compared using paired t-test and Wilcoxon signed-rank test.

RESULTS

Using SSI, in the lower velocity movement, convex transducer using 3 kPa phantom was less affected by the movement, regardless of the acquisition depths and the directions of the movement. SSI showed a tendency of increased values during the movement, compared to the static status. In the higher velocity movement, most of the values were significantly different between moving and static status. Using ARFI, 2 cm depth using linear transducer with 3 kPa phantom was less affected by the movement, regardless of the velocities and the directions of the movement. During the lower velocity movement, 4 cm depth using convex transducer with 3 kPa phantom was less affected by the movement, regardless of the direction. ARFI showed higher failure rates during the measurement especially in moving status.

CONCLUSION

The effect of movement on the measurement of elasticity was different according to the machines, stiffness of the phantoms, acquisition depths, transducers, velocity and direction of the movement. We found out the conditions that were less affected by the movement in SSI and ARFI using elasticity phantoms.

CLINICAL RELEVANCE/APPLICATION

This attempt will lead wide application of ultrasound elastography in the patients who have difficulty in holding their breath during the examination, including pediatric population.

SSQ17-09 Gadolinium Deposition in Pediatric Brain: Findings After Multiple Exposures to Gadobenate Dimeglumine

Thursday, Dec. 1 11:50AM - 12:00PM Room: S102C

Participants
Guenther K. Schneider, MD, PhD, Homburg, Germany (*Abstract Co-Author*) Research Grant, Siemens AG; Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Research Grant, Bracco Group;
Paul S. Raczeck, MD, Homburg, Germany (*Presenter*) 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;
Jonas Stroeder, MD, Homburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The possibility of gadolinium (Gd) deposition in the pediatric brain following exposure to Gd-based contrast agents (GBCA) is an emotive and potentially serious issue. We sought to determine if T1-signal changes potentially indicative of Gd-deposition occur in pediatric brain structures after multiple exposures to gadobenate dimeglumine (MultiHance; Bracco).

METHOD AND MATERIALS

34 patients (Group 1; 17M/17F; mean age: 7.18 years; range: 9 months-17 years; mainly oncologic patients) that received between 5 and 15 injections (mean: 7.8 injections; each at 0.05 mmol/kg bw) of gadobenate over a mean of 2.24 years (range: 9 months-7 years) were compared with 24 control patients (Group 2; 16M/8F; mean age: 8.78 years; range: 7 months-17 years) that had never been exposed to any GBCA. Exposure to gadobenate was for diagnosis and for therapy monitoring. Two blinded readers independently determined the signal intensity (SI) at regions-of-interest placed in the dentate nucleus (DN), globus pallidus (GP), pons, and thalamus on unenhanced T1-weighted spin echo images from both groups. Unpaired t-tests were used to compare SI values and DN–to–pons and GP–to–thalamus SI ratios between Groups 1 and 2.

RESULTS

Mean SI values in the DN, GP, pons and thalamus were 366.4, 360.5, 370.5 and 360.3 (Group 1) and 374.3, 364.4, 377.0 and 363.2 (Group 2) for reader 1, and 367.8, 392.3, 373.6 and 370.5 (Group 1) and 370.9, 380.5, 381.9 and 373.3 (Group 2) for reader 2. No significant differences between groups 1 and 2 were noted by either reader for comparisons of SI values ($p>0.5$; all comparisons) or for comparisons of mean DN–to–pons and GP–to–thalamus SI ratios (0.989 vs. 0.993 [$p=0.383$] and 1.0 vs. 1.003 [$p=0.572$], respectively, for reader 1; 0.984 vs. 0.973[$p=0.217$] and 1.06 vs. 1.049 [$p=0.185$], respectively, for reader 2). The number of exposures and the time between first and last exposures did not influence SI values among patients in group 1.

CONCLUSION

SI increases in the DN, GP, pons and thalamus that are potentially indicative of Gd-deposition are not seen in pediatric patients after multiple exposures to gadobenate dimeglumine, even in patients with 15 injections over a time interval of 6 years.

CLINICAL RELEVANCE/APPLICATION

Gadobenate-enhanced MRI of pediatric patients should not be avoided due to fears of Gd deposition.

SSQ18

Physics (CT-Quantitative)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S403B

BQ CT PH

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

FDA Discussions may include off-label uses.

Participants
Kenneth R. Hoffmann, PhD, Buffalo, NY (*Moderator*) Vice President, Imagination Software Corporation; Stockholder, Imagination Software Corporation; Officer, Imagination Software Corporation ;
Hiroyuki Yoshida, PhD, Boston, MA (*Moderator*) Patent holder, Hologic, Inc; Patent holder, MEDIAN Technologies;

Sub-Events

SSQ18-01 Deep-Learning Bladder Cancer Treatment Response Assessment in CT Urography

Thursday, Dec. 1 10:30AM - 10:40AM Room: S403B

Participants
Kenny H. Cha, MSc, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Lubomir M. Hadjiiski, PhD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Heang-Ping Chan, PhD, Ann Arbor, MI (*Abstract Co-Author*) Institutional research collaboration, General Electric Company
Ravi K. Samala, PhD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Richard H. Cohan, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Elaine M. Caoili, MD, MS, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Alon Z. Weizer, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Ajjai S. Alva, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To estimate bladder cancer treatment response in CT urography (CTU) by training a Deep-Learning Convolution Neural Network (DL-CNN) to recognize the patterns of bladder lesions indicative of treatment response.

METHOD AND MATERIALS

With IRB approval, pre- and post-neoadjuvant chemotherapy CTU scans of 82 patients (87 lesions) were collected retrospectively. Cystectomy was performed at the end of treatment, and the cancer stage after treatment was used as the reference standard to determine if a patient responded to treatment. 27% of the patients had T0 cancer stage after chemotherapy, which corresponds to a complete response to treatment. Bladder lesions in the CTU scans were segmented using our Auto-Initialized Cascaded Level Sets (AI-CALS) system. Regions of interests (ROIs) were extracted from within the segmented lesions from corresponding pre- and post-treatment scans of a patient and were paired together in multiple combinations to generate pre-post-treatment paired ROIs. A total of 104 temporal lesion pairs were generated from the 87 lesions, resulting in 6,700 pre-post-treatment paired ROIs. We trained a DL-CNN to distinguish between bladder lesions that were diagnosed as stage T0 post-treatment and those that were greater than stage T0. Leave-one-case-out cross-validation was performed for training and testing the DL-CNN. In each partition the trained DL-CNN outputted a likelihood of stage T0 score for the left-out test case. An observer performance study with two experienced radiologists was also performed independently, in which the radiologist estimated the likelihood of stage T0 after viewing each pre-post-treatment CTU pair. Receiver operating characteristic (ROC) analysis was performed and the area under the curve (AUC) was calculated for the DL-CNN and radiologists' estimates.

RESULTS

The AUC for prediction of T0 disease after treatment was 0.75 ± 0.05 for the DL-CNN, and 0.75 ± 0.05 and 0.70 ± 0.06 for the two radiologists. The differences in the AUC values among the DL-CNN and the two radiologists did not reach statistical significance.

CONCLUSION

Our study demonstrated the feasibility of using DL-CNN for the estimation of bladder cancer treatment response in CTU

CLINICAL RELEVANCE/APPLICATION

Deep learning CNN may be useful as decision support for bladder cancer treatment response assessment, vital for identifying non-responders and stopping treatment to preserve their physical condition.

SSQ18-02 K-Means Clustering Guided Bilateral Filter for Dynamic CT Perfusion at Lower Dose Levels

Thursday, Dec. 1 10:40AM - 10:50AM Room: S403B

Participants
Francesco Pisana, Heidelberg, Germany (*Presenter*) Doctoral student, Siemens AG
Thomas Henzler, MD, Mannheim, Germany (*Abstract Co-Author*) Research support, Siemens AG; Speaker, Siemens AG
Stefan O. Schoenberg, MD, PhD, Mannheim , Germany (*Abstract Co-Author*) Institutional research agreement, Siemens AG
Ernst Klotz, DiplPhys, Forchheim, Germany (*Abstract Co-Author*) Employee, Siemens AG
Bernhard Schmidt, PhD, Forchheim, Germany (*Abstract Co-Author*) Employee, Siemens AG
Marc Kachelriess, PhD, Heidelberg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To develop a practical filter for functional maps quality improvement in dynamic CT perfusion (CTP), exploiting the temporal redundancy of data.

METHOD AND MATERIALS

CTP acquisitions are normally performed with low kVp and mAs values, to keep the radiation dose in acceptable levels. Functional maps are derived by non-linear algorithms and normally result in enhanced noise. We developed a new image filter exploiting data redundancy in two ways: first, voxels belonging to vessels and small anatomical structures were automatically segmented from noise using the temporal autocorrelation function of the high spatial frequencies and an optimal guiding image was created (G). In a second step, all voxels were iteratively classified in K clusters, based on their temporal CT values, via k-means clustering (K); this information was used to avoid mixing distinct functional classes. Based on that, we implemented a k-means clustering guided bilateral filter (KG) and compared its performances to the time-intensity profile similarity filter (TIPS) and to the partial temporal non local means filter (PATEN). The study was conducted on an in-house developed phantom and on clinical cases. The dose reduction potential of KG compared to TIPS was also estimated by adding noise to the raw-data.

RESULTS

For a better comparison, all filters were implemented with the same sizes. Blood flow maps obtained from the KG filtered CT images showed the highest contrast-to-noise ratio improvements (6.96), followed by the TIPS (5.81) and the PATEN (2.09) ones. The KG filter was able to better preserve the original spatial resolution of the CT images. Finally, computational times were significantly shorter with the KG filter. Our results suggest that with the KG filter, dose could be reduced potentially by c.ca 40 % at same CNR levels when compared to the TIPS filter.

CONCLUSION

The proposed KG filter seems to provide better results when compared to state-of-the-art filters for quality improvement of CTP functional maps, and in much shorter times. To our knowledge, this is the first approach using the k-means clustering and the temporal autocorrelation function in a denoising strategy for CTP.

CLINICAL RELEVANCE/APPLICATION

We believe the potential of the proposed algorithm can be further exploited and optimized, to allow for lower dose CTP protocols that still provide high diagnostic quality in clinically acceptable times.

SSQ18-03 Building Towards a QIBA Challenge: Establishing Exchangeability between Clinical and Virtual Databases for Quantitative CT Volumetry

Thursday, Dec. 1 10:50AM - 11:00AM Room: S403B

Participants
Marthony Robins, BSc, Durham, NC (*Presenter*) Nothing to Disclose
Justin B. Solomon, PhD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Andrew J. Buckler, MS, Wenham, MA (*Abstract Co-Author*) Stockholder, vascuVis Inc President, vascuVis Inc CEO, vascuVis Inc Stockholder, Elucid Bioimaging Inc President, Elucid Bioimaging Inc CEO, Elucid Bioimaging Inc
Ehsan Samei, PhD, Durham, NC (*Abstract Co-Author*) Research Grant, General Electric Company; Research Grant, Siemens AG

PURPOSE

To devise and pilot test a Challenge through Quantitative Imaging Biomarkers Alliance (QIBA) to establish statistical exchangeability between virtually inserted and native lesions.

METHOD AND MATERIALS

Computational lung lesion models (based on pathologically confirmed malignant tumors) were virtually inserted into 16 phantom datasets and 30 chest CT cases using a validated image-domain insertion program. The study is designed as a public challenge to academic researchers and commercial software developers to apply their segmentation and volume estimation algorithms on simulated and corresponding real lung lesions. Initial data were analyzed in terms of bias (in phantom data only), location reproducibility, and algorithm reproducibility (variance between measurements by different algorithms on the same lesion) in volume estimation between the virtual and real lesions to assess non-inferiority of virtually inserted lesions.

RESULTS

Pilot results from three segmentation algorithms (iNtutition, Tera Recon Inc., Syngo.via, Siemens Healthcare, and IntelliSpace, Philips Healthcare) yielded <2% difference in mean bias for real and virtual lesions, respectively for one algorithm, while others yielded 5-6%, and 5-8%, respectively. Lesion complexity and insertion location (juxta-pleura and mediastinum) affected volume estimation for both virtual and real lesions similarly with no statistically significant difference ($p > .05$). Algorithm reproducibility was consistent between virtual and real lesions for all lesion types (solitary or attached), noise levels, pitch, and slice thickness.

CONCLUSION

Patient images provide anatomical detail but often lack ground truth. Standardized databases of virtually inserted lesions can address this obstacle. These pilot results pave the way for a broad QIBA challenge to enable generalization for statistical similarity of hybrid (virtual lesions inserted in clinical patient data) datasets to clinical datasets across a wider set of volumetry algorithms.

CLINICAL RELEVANCE/APPLICATION

Standardized databases of virtually inserted lesions will help to develop and validate better lesion segmentation tools for quantitative CT towards enacting precision medicine.

SSQ18-04 Measuring Head Movement in 3D During CT-Perfusion Analysis - A Pilot Study

Thursday, Dec. 1 11:00AM - 11:10AM Room: S403B

Participants
Mette C. Marklund, MD, PhD, Roskilde, Denmark (*Presenter*) Nothing to Disclose
Anders O. Baandrup, BSC, Roskilde, Denmark (*Abstract Co-Author*) Nothing to Disclose
Troels Wienecke, MD,PhD, Roskilde, Denmark (*Abstract Co-Author*) Nothing to Disclose
Carsten Thomsen, Copenhagen, Denmark (*Abstract Co-Author*) Nothing to Disclose

CONCLUSION

A robust, very accurate and low tech marker can be used for measuring head movement in the X-, Y and Z-direction and rotation during a CTP.

Background

The purpose of this pilot study is to test a simple, non-anatomical dependent method to calculate head motion in the X-, Y- and Z-dimensions and rotation. Most CT-scanners have inbuilt options for movement correction based on landmarks. Some of the algorithms operate in 3D others in 2D. Only very few studies have examined, how much the patient actually moves during a CT perfusion (CTP) study since no external, non-anatomic dependent marker for objective measurement in all 3 dimensions exists.

Evaluation

To determine the motion in patients instructed to lying still, we developed a marker designed to be placed on the patients forehead. The marker was drawn in Autocad® and 3D printed. It contains 4 air filled cones in 2 planes pointing in 2 directions in each plane. It was tested in a phantom set-up with a micrometer (Mitutoyo 164-163 Digimatic Micrometer) enabling the marker moving as little as 0.001 mm. Raw data were calculated by an external radiologist with no knowledge on the applied movement parameters. By applying an advanced mathematical algorithm, measuring the size and elliptical deformation of the black holes during the scan, a very accurate value (δ) for movement in the X-, Y- and Z-direction could be calculated. The marker was placed on the forehead of 5 consecutive patients suspected for Ischemic Stroke (IS) undergoing CTP. The patients were all well-cooperating. Movement parameters (fig. 4) are given for our most restless patient nr. 3: δ(X): -3.6 to 4.4 mm, δ(Y): -1.3 to 1.9 mm,δ(Z): -1.4 to 2.0 mm and rotation -2.0 to 3.2 degrees.

Discussion

Movement artifacts lower the signal/noise ratio and increase the risk of diagnostically insufficient images. Even though the movement errors can be reduced by post processing, the S/N-ratio will remain lower than if the patient had not moved at all. Determining the extent of true motion is fundamental for setting up future projects aiming to optimize head stabilization and developing advanced post processing algorithms.

SSQ18-05 Initial Validation of a View-Sharing Acquisition Using a Physical Perfusion Phantom

Thursday, Dec. 1 11:10AM - 11:20AM Room: S403B

Participants
Jacob Johnson, Madison, WI (*Presenter*) Institutional research support, General Electric Company
Leah Henze Bancroft, PhD, Madison, WI (*Abstract Co-Author*) Institutional research support, General Electric Company
Edward F. Jackson, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Jorge E. Jimenez, MS, Madison, WI (*Abstract Co-Author*) Institutional research support, General Electric Company
Frank R. Korosec, PhD, Madison, WI (*Abstract Co-Author*) Research support, General Electric Company
Courtney K. Morrison, Madison, WI (*Abstract Co-Author*) Research support, General Electric Company
Roberta M. Strigel, MD, MS, Madison, WI (*Abstract Co-Author*) Research support, General Electric Company
Ryan Bosca, PhD, Madison, WI (*Abstract Co-Author*) Research support, General Electric Company

PURPOSE

Dynamic contrast-enhanced (DCE) MRI is a clinical research tool that can provide quantitative imaging biomarkers (QIBs) of perfusion. As new commercially-available and research MR acquisition strategies utilize view sharing and sparse sampling techniques to achieve high spatial and temporal resolution images, validating the ability of these methods to reproduce QIBs is critically important. We used a perfusion phantom to evaluate the reproducibility of gamma-variate (GV) fits using a commercial view-sharing sequence (DISCO) compared with a conventional fast spoiled gradient echo sequence (FSPGR).

METHOD AND MATERIALS

The phantom (Shelly Medical Imaging Technologies) consists of a peristaltic pump that provides a single input to a custom shell-contained perfusion cylinder. Within the cylinder, the input is coiled and perforated which allows flowing water to traverse the length of the input to the "tube" output or flow into the bulk of the cylinder to the "cylinder" output. Adjustable valves control the flow ratio, r, of the tube/cylinder output. The flow was set to 4mL/s and r was set to 0.5. Images were acquired on a 3.0T GE MR750 scanner using a 32-channel head coil (NOVA) with the FSPGR (FOV=24x12x7.2 cm^3, matrix=256x128x24, 9.7s/volume) and DISCO (FOV=24x12x28.8 cm^3, matrix=256x128x96, 9.6s/volume) sequences. The FSPGR data were acquired twice during two different scanning sessions to assess reproducibility. For each method, a power injector was used to inject 5mL of Gd-DOTA followed by a 10mL saline flush at a rate of 2mL/s after acquiring images for 60s. The GV parameters (alpha and beta) were estimated for all contrast concentration time curves. The mean, 95% confidence intervals (CI), and coefficients of variation (CV) were calculated for each parameter.

RESULTS

For the conventional DCE-MRI acquisition, the mean, 95%CI, and CV for alpha was 2.66, (2.32, 3.00), and 6.53%, respectively, while that of beta was 25.13, (21.60, 28.65), and 7.17%, respectively. The alpha and beta parameters for the DISCO acquisition were 2.98 and 23.13, respectively.

CONCLUSION

For comparable temporal resolutions, DISCO reproduced the GV parameters within the 95% CI of the conventional DCE-MRI acquired parameters.

CLINICAL RELEVANCE/APPLICATION

For a conventional temporal resolution, DCE-MRI GV reproducibility of a commercial view-sharing technique was established. This methodology can be used to validate other research techniques.

SSQ18-06 Quantitative CT Perfusion Imaging of the Liver in Sparse-view Setting

Thursday, Dec. 1 11:20AM - 11:30AM Room: S403B

Participants
Esmaeil Enjilela, PhD, London, ON (*Abstract Co-Author*) Nothing to Disclose
Ting-Yim Lee, MSc, PhD, London, ON (*Abstract Co-Author*) License agreement, General Electric Company
Jiang Hsieh, PhD, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company
Errol E. Stewart, PhD, London, ON (*Abstract Co-Author*) Nothing to Disclose
Mark Dekaban, London, ON (*Abstract Co-Author*) Nothing to Disclose
Aaron So, PhD, London, ON (*Presenter*) Nothing to Disclose
Feng Su, PhD, London, ON (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

We investigated the effect of projection undersampling on quantitative CT liver perfusion imaging.

METHOD AND MATERIALS

Dynamic contrast enhanced (DCE) liver images were acquired from a 68 kg patient with hepatocellular carcinoma (HCC) after intravenous contrast injection, with a 64-slice GE HD750 CT scanner at 120 kVp, 70 mA and 0.4 s gantry period using an axial shuttle mode for 42 times, during which the patient was free-breathing throughout. DCE liver images were reconstructed from full projections (984) using filtered backprojection (FBP), and 1/3 (328) and 1/4 (246) of full projections, evenly distributed over 360° with FBP and compressed sensing (CS). Each set of DCE liver images were registered and analyzed with CT Perfusion (GE) to generate hepatic arterial blood flow (HABF) maps. HABF measurements from the sparse-view FBP and CS protocols were compared to those from the full-view FBP method.

RESULTS

Mean HABF measured from full (984) view FBP were comparable to those from 328-view FBP and 328-view CS: 60.6 vs. 63.1 and 62.2 mL/min/100g in liver tumor, and 27.7 vs. 25.6 and 23.4 in normal liver tissue, respectively. In the 246-view setting, FBP failed to minimize streaks in DCE images, leading to a larger discrepancy in HABF measurement from full-view FBP: 37.0 vs. 27.7 mL/min/100g in tumor (-25% difference), and 70.5 vs. 60.6 (16.3% difference) in normal tissue, respectively. By contrast, DCE images generated from the same number of projections (246) with CS was without streaks and the resulting HABF values were in better agreements with those of full-view FBP: 29.8 vs. 27.7 mL/min/100g (-7.6% difference) in tumor, and 55.1 vs. 60.6 (-9.1% difference) in normal tissue, respectively. Projected effective doses of the full and ¼ view DCE acquisition protocols for 8 cm coverage were 11.3 and 3.8 mSv respectively.

CONCLUSION

Only 1/3 of full projections were needed in CT liver perfusion measurement, regardless of the choice of image reconstruction algorithm (FBP or CS). Under extremely sparse condition (< 1/3 of full projections), CS may be more reliable than FBP in preserving image quality and accuracy of liver perfusion measurement.

CLINICAL RELEVANCE/APPLICATION

It is feasible to achieve low dose (<4 mSv) CT perfusion imaging of the whole liver for HCC treatment planning and follow-up by reducing the number of projection measurement in DCE acquisition.

SSQ18-07 Identifying Quantitative Image Features that Correlate with Radiologists' Image Quality Preferences on Breast CT

Thursday, Dec. 1 11:30AM - 11:40AM Room: S403B

Participants
Juhun Lee, PhD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Robert M. Nishikawa, PhD, Pittsburgh, PA (*Presenter*) Royalties, Hologic, Inc; Research Consultant, iCAD, Inc;
Ingrid Reiser, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
John M. Boone, PhD, Sacramento, CA (*Abstract Co-Author*) Research Grant, Siemens AG; Royalties, Wolters Kluwer nv;

PURPOSE

To evaluate which quantitative image features on breast computed tomography (CT) images correlate with radiologists' subjective image quality preferences.

METHOD AND MATERIALS

A total of 102 pathology-proven breast lesions in 92 dedicated breast CT images were collected under an IRB-approved protocol. An iterative image reconstruction (IIR) algorithm was used to obtain CT images with 28 different image qualities. Through image feature analysis from breast lesions (developing classifiers on 23 image features extracted from the lesion), three IIRs and one clinical reconstruction with a wide range of image quality (from smooth to sharp quality) were selected for an IRB-approved reader study. A subset of breast lesions was selected (N = 30, 17 malignant) with corresponding trained classifier AUCs of 0.68 – 0.95 for the selected reconstructions. For each lesion, six experienced MQSA radiologists ranked the four image data sets in regards to their impression of best diagnostic information. In addition, each feature value was ranked for the four reconstructions. The correlation between computer feature and radiologists' rankings was evaluated to identify computer features that correlate with radiologists' preferences. The correlation analysis was repeated for benign and malignant lesions separately, as the characteristics of benign and malignant lesions are different.

RESULTS

Five image features were identified. The radiologists' image quality preferences increased as the lesion shape became more spherical (p-value = 0.02), as the lesion surface flattened (p-value = 0.01), and as the lesion texture increased (p-value = 0.02) for benign lesions. Radiologists' preferences increased as more lesion margin was visible (p-value = 0.02) and as lesion contrast at the margin increased (p-value = 0.03) for malignant lesions. For all lesions, radiologists' preferences increased as the lesion texture increased (p-value = 0.02).

CONCLUSION

There exists a set of quantitative image features that correlate with radiologists' image quality preferences, potentially allowing subjective impression to be quantified. More cases and readers are required to generalize these results.

CLINICAL RELEVANCE/APPLICATION

We identified quantitative image features that correlate with radiologists' perceptions of image quality for breast CT images. These features may be useful for optimizing reconstruction algorithms and evaluating dose reduction techniques.

SSQ18-08 Modeling of Human Lungs: An Anatomically Based Prototyping of Airways, Arteries, and Veins from Initially Segmented Branches to the Terminal Branches and Interstitium

Thursday, Dec. 1 11:40AM - 11:50AM Room: S403B

Participants
Ehsan Abadi, Durham, NC (*Presenter*) Nothing to Disclose
Gregory M. Sturgeon, MS, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
William P. Segars, PhD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Justus E. Roos, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Carl E. Ravin, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Ehsan Samei, PhD, Durham, NC (*Abstract Co-Author*) Research Grant, General Electric Company; Research Grant, Siemens AG

PURPOSE

To mathematically model and grow airway, artery, and vein trees toward simulation of comprehensive lung architecture facilitating virtual clinical trials (VCTs).

METHOD AND MATERIALS

Lung lobes and initial branches of airways, arteries, and veins were segmented separately inside each lobe using CT data of 58 adult patients. Airway trees were grown, within the boundary of each lobe, from the endpoints of the segmentations based on a volume-filling method. The growth model for the arteries was spatially constrained to neighboring and corresponding airways according to the anatomical understanding of bronchial arterial units. In contrast, pulmonary veins and venules were grown independently according to the anatomical known interstitial meshwork. At each bifurcation, diameters of the daughter branches were assigned using morphometry equations in the literature. The algorithm was assigned to stop growing if a branch length was less than 1.2 mm. Co-incidental intersections were identified automatically and subsequently avoided. Simulated CT images were obtained from the virtual lung phantoms using an analytical algorithm developed in our lab and reconstructed using filtered backprojection.

RESULTS

A database of 58 adult patient-specific lung phantoms was created. Airways and vessels were generated up to 16 and 15 bifurcations, respectively. For airways and arteries, the diameters in the first branches were on the order of 10, 6, 8, 5, and 8 mm for the upper left lobes, lower left lobes, upper right lobes, middle right lobes, and lower right lobes, respectively. For veins, the first branch diameters were 16, 8, 10, 9, and 12 mm. Terminal generated branches diameters were approximately 0.2, 0.3, and 0.3 mm for airways, arteries, and veins, respectively.

CONCLUSION

We present an algorithm to create anatomically-informed lung phantoms. For the first time, we 1) incorporated airway, artery, and vein tree structures from initially segmented branches to the terminal branches; and 2) simulated CT images based on these models. The outcome will be used to perform VCTs such as patient-based optimization and comparison of imaging techniques that would not be practical using simplistic phantoms or real human datasets.

CLINICAL RELEVANCE/APPLICATION

Modeling anatomically-informed lung airways and vessels to the level of interstitial structures makes the virtual phantoms more representative of clinical realities which lead to more realistic VCTs.

SSQ18-09 Application of Compressed Sensing for Low-intensity Sparse-view CT Myocardial Perfusion Imaging

Thursday, Dec. 1 11:50AM - 12:00PM Room: S403B

Participants
Esmaeil Enjilela, PhD, London, ON (*Abstract Co-Author*) Nothing to Disclose
Ting-Yim Lee, MSc, PhD, London, ON (*Abstract Co-Author*) License agreement, General Electric Company
Jiang Hsieh, PhD, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company
Aaron So, PhD, London, ON (*Presenter*) Nothing to Disclose

PURPOSE

We investigated the effectiveness of compressed sensing (CS) for reconstructing dynamic contrast-enhanced (DCE) CT heart images from sparsely sampled x-ray projections at different noise levels in CT myocardial perfusion (MP) imaging.

METHOD AND MATERIALS

Prospectively ECG gated CT MP imaging was acquired on three normal pigs (40-60kg) over 22-25 heart beats after contrast injection with a 64-slice GE HD750 CT scanner using 140kV/80mA/350ms. Reference DCE heart images were reconstructed from the full set of beam-hardening (BH) corrected projections (984) with filtered backprojection (FBP). Synthetic noise that incorporated the effects of energy-integrating detector and bowtie beam filtering was added to the BH corrected projections to simulate image noise corresponds to 50, 40, 30 and 20 mA at 140 kV and 350 ms gantry period. From each set of simulated low mA projections, one-third (328) evenly distributed over 360º was used to reconstruct DCE heart images with CS. MP maps generated from each set of FBP and CS DCE images with CT Perfusion (GE) were compared in the lateral, apical and septal wall of the myocardium over 8 consecutive 5 mm slices (144 myocardial segments total).

RESULTS

328-view CS DCE images at all low mA settings were able to resolve the same anatomical features as 80 mA 984-view FBP. MP maps derived from each low mA CS DCE image set were also comparable to those from 80 mA full-view FBP. Bland-Altman analysis revealed subtle mean bias in CT MP measurement for all low mA sparse-view CS protocols compared to 80 mA full-view FBP: 2.67 mL/min/100g (95% CI: 18.37 – 13.04 ml/min/100g), 5.35 (21.51 – 10.81), 6.02 (24.34 – 12.29) and 8.77 (30.15 – 12.62) for 50, 40, 30 and 20 mA respectively. Projected effective dose of the 20 mA 328-view CS protocol for MP imaging was 0.66 mSv and 12 times lower than that of the standard 80 mA full-view FBP protocol (8 mSv) for 8 cm axial coverage.

CONCLUSION

Compared to FBP, CS was effective in reconstructing DCE heart images from 1/3 of full projections at four times reduced mA without affecting the anatomical and functional CT assessment.

CLINICAL RELEVANCE/APPLICATION

Low mA and sparse view dynamic acquisition coupled with CS reconstruction can minimize radiation dose of CT MP imaging, which would facilitate its use for assessing high-risk coronary artery disease.

SSQ19

Physics (CT-Performance and Evaluation)

Thursday, Dec. 1 10:30AM - 12:00PM Room: S404AB

CT PH

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

Participants
Xiaochuan Pan, PhD, Chicago, IL (*Moderator*) Research Grant, Koninklijke Philips NV; Research Grant, Toshiba Corporation; Research Grant, Varian Medical Systems, Inc
Ingrid Reiser, PhD, Chicago, IL (*Moderator*) Nothing to Disclose

Sub-Events

SSQ19-01 Dual-Energy CT Intra- and Inter-Scanner Variability within One Make & Model

Thursday, Dec. 1 10:30AM - 10:40AM Room: S404AB

Participants
Megan Jacobsen, Houston, TX (*Presenter*) Nothing to Disclose
Cayla Wood, MS, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Dianna D. Cody, PhD, Houston, TX (*Abstract Co-Author*) In-kind support, General Electric Company

PURPOSE

It can be logistically difficult to scan patients on the same exact device for repeat visits in multi-scanner facilities. The reliability between dual-energy (DE) CT scanners' quantitative results is not known, nor is their individual repeatability. Therefore, we evaluated intra- and inter-scanner variability with respect to several quantitative metrics specific to dual-energy CT.

METHOD AND MATERIALS

Eleven identical GE HD-750 CT scanners in a busy clinical environment were used to perform DE CT scans of a large elliptical quality control (QC) phantom (Gammex, Inc.; Middleton, WI) containing many standard insert materials. The protocol contained 6 CTDIvol levels (17.1-33.9mGy) to provide variation in mAs. The DEQC phantom was scanned approximately bi-weekly from July 2015-March 2016; 12 scans were obtained from each scanner. Iodine accuracy for the 2, 5, and 15mg/ml rods (on an Iodine(Water) image set) and soft tissue HU (40HU at 50keV based on NIST constants) from the 50keV data set were used to assess intra- and inter-scanner variability (standard deviation). Additionally, intra- and inter-scanner variability were calculated for 120kVp (CTDIvol=38.3mGy) daily water HU measurements over the same time period.

RESULTS

Intra-scanner variability average for 2mg/ml Iodine was 0.12 mg/ml (range 0.07-0.16 mg/ml), for 5mg/ml Iodine was 0.14 mg/ml (range 0.09-0.20 mg/ml), for 15mg/ml Iodine was 0.28 mg/ml (range 0.24-0.39 mg/ml), for soft tissue inserts was 2.6 HU (range 1.9-3.4 HU) and for daily QC was 0.4 HU. *Inter*-scanner variability average for 2mg/ml Iodine was 0.16 mg/ml (range 0.10-0.21 mg/ml), for 5mg/ml Iodine was 0.19 mg/ml (range 0.13-0.23 mg/ml), for 15mg/ml Iodine was 0.38 mg/ml (range 0.33-0.45 mg/ml), for soft tissue inserts was 4.0 HU (range 3.2-4.5 HU) and for daily QC was 0.7 HU.

CONCLUSION

Intra-scanner variability for the iodine and soft tissue inserts averaged 0.18 mg/ml and 2.6 HU respectively, and inter-scanner variability averaged 0.24 mg/ml and 4.0 HU, respectively. The iodine results may support using multiple scanners for dual-energy scanning over the course of a patient's treatment, but if clinicians rely heavily on 50keV measurement of soft tissue, this may need revisiting.

CLINICAL RELEVANCE/APPLICATION

Scanner-to-scanner quantitative consistency for dual-energy CT may impact scheduling; evaluating patients on the same scanner for repeat exams may be logistically impossible at some sites.

SSQ19-02 Dual-Energy CT Iodine Accuracy Across Vendors and Platforms

Thursday, Dec. 1 10:40AM - 10:50AM Room: S404AB

Participants
Megan Jacobsen, Houston, TX (*Presenter*) Nothing to Disclose
Cayla Wood, MS, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Dianna D. Cody, PhD, Houston, TX (*Abstract Co-Author*) In-kind support, General Electric Company

PURPOSE

Although a major benefit of dual-energy CT is its quantitative capabilities, it is critical to understand how results vary by scanner manufacturer and/or model before making clinical patient management decisions. Each manufacturer utilizes a specific dual-energy CT approach; cross-calibration may be required for facilities with more than one dual-energy CT scanner type.

METHOD AND MATERIALS

A solid dual-energy quality control phantom (Gammex, Inc.; Middleton, WI) representing a large body cross-section containing three Iodine inserts (2mg/ml, 5mg/ml, 15 mg/ml) was scanned on these CT systems: GE HD-750 (80/140kVp), prototype GE Revolution CT with GSI (80/140kVp), Siemens Flash (80/140kVp and 100/140kVp), Siemens AS128 (80/140kVp), Siemens Edge (120kVp) and Philips IQon (120kVp and 140kVp). Iodine content was measured in units of concentration (mg/ml) from a single 5mm-thick central image. Three to five acquisitions were performed on each scanner platform in order to compute standard deviation. Scan

acquisitions were approximately dose-matched (~25mGy CTDIvol) and image parameters were as consistent as possible (thickness, kernel, no noise reduction applied).

RESULTS

Iodine measurement error ranges were -0.24 to 0.16 mg/ml for the 2mg/ml insert, excluding a single outlier (-12.0 to 8.0%), -0.40 to 0.26 mg/ml for the 5mg/ml insert (-8.0 to 5.2%), and -1.46 to 0.99 mg/ml for the 15mg/ml insert (-9.7 to 6.6%). Standard deviations ranged from 0 to 0.31 mg/ml for the repeated acquisitions from each scanner. The average iodine measurement error and standard deviation across all systems and inserts was -0.20 ± 0.57 mg/ml (-0.9 ± 5.1%). The largest absolute measurement error was found in the 15mg/ml iodine insert.

CONCLUSION

There was generally good agreement in Iodine quantification across 3 dual-energy CT manufacturers and 4 scanner models (with one exception). This was unexpected given the widely different underlying dual-energy CT mechanisms employed. Future work will include additional scanner platforms, independent verification of the Iodine insert standard concentrations (especially the 15 mg/ml insert), and how much measurement variability can be clinically tolerated.

CLINICAL RELEVANCE/APPLICATION

Current daily CT quality control programs do not address dual-energy CT. This is particularly important if clinical facilities rely on dual-energy CT data from more than one scanner make and model.

SSQ19-03 Spectral CT "Fingerprinting" On a Pre-Clinical Detection Based Spectral CT Scanner: Tools for Exploration and Examples

Thursday, Dec. 1 10:50AM - 11:00AM Room: S404AB

Participants
Matthew A. Lewis, PhD, Dallas, TX (*Presenter*) Research collaboration, CMR Naviscan Corporation
Todd C. Soesbe, PhD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Quyen N. Do, PhD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
William A. Moore, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Xinhui Duan, PhD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Shlomo Gotman, Haifa, Israel (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Robert E. Lenkinski, PhD, Dallas, TX (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV; Research Consultant, Aspect Imaging;

PURPOSE

Spectral CT "Fingerprinting" is the principle of looking for distinct patterns in the statistics of a projection-space spectral decomposition using the classic photoelectric/Compton scatter basis set of Alvarez and Macovski. Compared to conventional CT and dual energy image-space spectral decomposition, the voxels in this decomposition have the potential to be more stable.

METHOD AND MATERIALS

We developed software tools to transfer data from the original Spectral Basis Images (SBIs) from a detection-based spectral CT (IQon, Philips Healthcare) to a format for analysis using the recently published ScatterJn scatterplot analysis package (Zeitvogel and Obst, 2016) in ImageJ (NIH). As described elsewhere, we refer to these scatter plots as material attenuation decomposition (MAD) plots. In current form, this process is limited by the 8-bit dynamic range of ScatterJn, but the SBI soft tissue zone can readily be moved to an 8-bit space in a lossless manner. Using this tool chain, it is possible to go back and forth between the original imaging volume and a scatterplot of the underlying 2D data. We have explored both phantoms and clinical images using this approach.

RESULTS

In a calibration phantom containing vials with differing concentration of zinc salt, different vials can be identified in the scatterplot for all voxels. It is clear however that the vial with the lowest concentration can not be separated from voxels for the water only background. Silicone has a unique signature in the fingerprint, and therefore these tools can be used to rapidly segment breast implants. In the head, CSF is found in an 'L' shaped region, possibility indicating some residual artifacts due to the cranium. Soft tissue outside the cranium can be shown to be distinct from brain tissue in fingerprint analysis.

CONCLUSION

Using a chain of software tools, we were able to correlate the spatial distribution of spectral decomposition coefficients with a per slice or global MAD plot. Blurring artifacts in the MAD plot due to bone were uncovered during exploration with these tools.

CLINICAL RELEVANCE/APPLICATION

Using an approach such as this, it may be possible to differentiate pathology from healthy tissue based on location in the MAD plot.

SSQ19-04 Evaluation of CT Brain Perfusion Quantitation Using A Dynamic Phantom

Thursday, Dec. 1 11:00AM - 11:10AM Room: S404AB

Participants
Eric L. Gingold, PhD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Kiran S. Talekar, MBBS, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Lisa M. Tartaglino, MD, Newtown Square, PA (*Abstract Co-Author*) Nothing to Disclose
Jaydev K. Dave, PhD, MS, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Richard J. Gorniak, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Adam E. Flanders, MD, Narberth, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To measure the quantitative precision of CT perfusion imaging for a range of procedural variables, including CT scanner model and

hemodynamics, while also validating the ability of a novel dynamic phantom to be useful in this regard.

METHOD AND MATERIALS

Although widely used for the evaluation of acute stroke, vasospasm, and other neurovascular disorders, CT brain perfusion (CTP) has not been well-characterized for quantitative precision and accuracy. It is not possible to perform reproducibility testing on human subjects, and phantoms simulating the hemodynamics have previously not been available. We evaluated a new phantom designed for CTP consisting of tissue-equivalent plastic and moveable rods that simulate arterial and venous contrast enhancement as well as perfused brain tissue. The phantom was scanned on two 64-slice CT scanners made by different manufacturers at 2 simulated flow rates and processed with commercial time density analysis software. Quantitative measures of cerebral blood flow (BF), cerebral blood volume (BV), and mean transit time (MTT) were recorded and analyzed for precision and consistency.

RESULTS

Repeat scanning of the perfusion phantom showed consistent appearance of the artery and vein time-attenuation curves. Reproducibility of BF, BV and MTT on each scanner was in the range of 2-5% for phantom slices that received the simulated contrast bolus in its entirety. A -33% change in the speed of the simulated contrast bolus resulted in a -17 to -25% change in measured blood flow and 16 to 28% increase in mean transit time, while measured blood volume remained effectively unchanged. Comparing results obtained from scanners made by different manufacturers, the arterial and venous contrast curves were similar, whereas large differences were observed in BF, BV and MTT calculated by the post-processing software.

CONCLUSION

The dynamic CT perfusion phantom is a useful tool for evaluating quantitative CT brain perfusion. It has revealed important differences in calculated parametric values between CT scanners, and for different cardiac output conditions. The phantom can be used to optimize scanning protocols and to benchmark postprocessing software.

CLINICAL RELEVANCE/APPLICATION

Improved understanding of the accuracy and precision of CT brain perfusion will increase diagnostic confidence in the technique, and has the potential to validate its clinical value.

SSQ19-05 Design and 3D Printing of an Anthropomorphic Brain CT Phantom Based on Patient Images

Thursday, Dec. 1 11:10AM - 11:20AM Room: S404AB

Participants
Baiyu Chen, Rochester, MN (*Presenter*) Nothing to Disclose
Shuai Leng, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Thomas J. Vrieze, RT, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Amy E. Alexander, BEng, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Lifeng Yu, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Jane S. Matsumoto, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
David R. De Lone, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Cynthia H. McCollough, PhD, Rochester, MN (*Abstract Co-Author*) Research Grant, Siemens AG

PURPOSE

To construct a realistic brain CT phantom using 3D printing techniques and patient images.

METHOD AND MATERIALS

CT images of a patient with an acute cerebral infarction were chosen, showing hyper-attenuation in the right M1-segment due to an internal clot. Using the images, a voxelized virtual brain phantom was created using segmentation software (Mimic, Materialise, Belgium). The segmentation was performed based on CT number thresholding, with additional morphologic processes (region growing, dilation, and erosion) performed to improve anatomical fidelity by suppressing image noise. The voxelized phantom was processed by computer aided design (CAD) software (3-Matic, Materialise) to generate stereolithography (STL) files. The STL file was sent to a 3D printer (Objet Connex 350, Stratasys, MN) and a physical phantom was printed. Three materials of different radiodensities were used in the printed phantom to reflect the CT number differences between white matter, gray matter, and cerebrospinal fluid. The printed phantom was placed within a skull phantom and scanned on a 192-slice scanner (SOMATOM Force, Siemens Healthcare, Germany) with a routine head protocol. Images of the phantom were then compared to the images of the original patient.

RESULTS

Despite the high degree of anatomical complexity (over 200 CAD shells), the brain CT phantom was successfully printed. The absolute CT numbers for white matter, gray matter, and cerebrospinal fluid were different between the phantom and the original patient images as a result of the limited choice of 3D printing materials. However, the CT number differences between white matter, gray matter, and cerebrospinal fluid were the same for the phantom and patient images. Therefore, when viewed with the same display window width but different window level, the phantom and patient images showed similar ranges of gray scales and contrast levels. When viewed at such setting, the phantom images and patient images also showed great similarity in terms of anatomical structure and texture.

CONCLUSION

An anthropomorphic brain CT phantom was designed and 3D printed. CT images of the phantom showed great similarity to the anatomy of the original patient.

CLINICAL RELEVANCE/APPLICATION

This study demonstrated that the complex heterogeneous anatomy of the brain can be imitated with a 3D printed phantom. The phantom may be useful for evaluation and optimization of neuro CT protocols.

SSQ19-06 Quantitative Performance for ACR CT Accreditation Images Across Different Vendors, Protocols, and Institutions: Initial Report of an ACR-RSNA Collaboration

Thursday, Dec. 1 11:20AM - 11:30AM Room: S404AB

Participants
Yakun Zhang, MS, Durham, NC (*Presenter*) Nothing to Disclose
Ehsan Samei, PhD, Durham, NC (*Abstract Co-Author*) Research Grant, General Electric Company; Research Grant, Siemens AG
Sujith Nair, Reston, VA (*Abstract Co-Author*) Nothing to Disclose
Laura P. Coombs, PhD, Reston, VA (*Abstract Co-Author*) Nothing to Disclose
Edward F. Jackson, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Daniel C. Sullivan, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the variability in fundamental image quality attributes of operation across a sample of clinical CT systems across the US through a pilot collaboration between the ACR and the RSNA (QIBA).

METHOD AND MATERIALS

To obtain ACR CT accreditation, institutions are required to submit quality assurance images using the 4-module Gammex 464 phantom. Through a pilot collaboration between the RSNA QIBA and ACR, de-identified phantom data was provided. Four inserts in module 1 were used to evaluate HU and task-specific resolution (TTF). The low contrast module was used to assess CNR. The uniform module was used to assess noise property. Two task-based metrics that incorporate all the aforementioned metrics were also computed: detectability index (d') and estimability index (e'). A software package was created to automatically sort and analyze the images, and output results into a database and into summary pages. Statistical analysis was conducted on a pilot set of data from 20 scanners (representing 5 vendors and 67 protocols).

RESULTS

HU values and resolution showed small discrepancies among vendors. For polystyrene HU values, the ranges were -92.6±3.4, -90.5±0.1, -88.8±7.1, -92.4±5.6, and -100.8±5.2 for the 5 vendors. For resolution, the frequencies for 0.5 TTF for air insert were 0.42±0.01, 0.36±0.02, 0.33±0.02, 0.40±0.04, and 0.40±0.04 1/mm, respectively. Noise values were highly dependent on the protocol used: pediatric head (6.5±1.3), pediatric body (9.4±2.5), adult head (4.0±0.8), and adult body (4.8±0.8). Same was also the case for the CNR. The corresponding CNRs were: 1.0±0.2, 0.8±0.2, 1.7±0.4, and 1.3±0.3. Corresponding d' and e' for polystyrene were 115±27 and 0.025±0.014, 87±16 and 0.018±0.007, 166±36 and 0.032±0.011, 132±27 and 0.027±0.09 respectively.

CONCLUSION

While ACR accreditation offers a strong assurance in meeting a minimum quality for clinical CT imaging, clinical data across institutions, vendors, and protocols exhibit significant variability. A systematic analysis of national accreditation data can be used for future performance monitoring, consistency analysis, and programmatic planning.

CLINICAL RELEVANCE/APPLICATION

Analysis of reference phantom data across systems and institutions through the ACR Accreditation process enables extraction of multi-parameter clinical variability across our national healthcare system enabling more meaningful clinical and quantitative planning, accreditation, and integration into precision medicine practices.

SSQ19-07 Comparative Performance of Two Generations of Single-Source, Rapid kV-Switching Dual Energy CT Systems (GE 750HD and GE Revolution CT)

Thursday, Dec. 1 11:30AM - 11:40AM Room: S404AB

Awards
Student Travel Stipend Award

Participants
Yakun Zhang, MS, Durham, NC (*Presenter*) Nothing to Disclose
Wendy L. Ehieli, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Bhavik N. Patel, MD,MBA, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Rendon C. Nelson, MD, Durham, NC (*Abstract Co-Author*) Consultant, General Electric Company Consultant, Nemoto Kyorindo Co, Ltd Consultant, VoxelMetrix, LLC Research support, Bracco Group Research support, Becton, Dickinson and Company Speakers Bureau, Siemens AG Royalties, Wolters Kluwer nv
Ehsan Samei, PhD, Durham, NC (*Abstract Co-Author*) Research Grant, General Electric Company; Research Grant, Siemens AG

PURPOSE

To evaluate the attenuation (HU) stability and image quality of virtual monoenergetic images (VMI) for two generations of single-source, rapid kV-switching dual energy CT (DECT) systems (GE 750HD and GE Revolution) using a size-varying phantom.

METHOD AND MATERIALS

A size-varying phantom (Mercury 3.0, Duke University) with five tiered sections was used. Images were acquired on the two systems using consistent techniques at matched CTDIvol (around 9.5 mGy). ASIR-V at 50% was used to reconstruct VMI at 70 keV. In each section of the phantom, there are two subsections – one with uniform attenuation for noise assessment (NPS) and one with cylindrical inserts for resolution assessment (MTF) and HU measurement (average HU values). The 5 inserts include 8.5 mg/mL iodine concentration, bone, polystyrene (fat), and water equivalents, as well as an empty rod (air). A task-specific detectability index (DI) was calculated for iodine and water inserts using a 5 mm circular disk as the task.

RESULTS

HU values decreased with increasing diameters for 750HD and remained consistent for Revolution. For large SFOV, the respective HU values for 750HD and Revolution were 185±13.2 and 223±2.2 for iodine, -44±7.3 and -38±0.4 for polystyrene, 862±47 and 1004±6.8 for bone and -1±5.7 and 8±0.6 for water. The medium SFOV had similar HU values.Noise increased proportionally with diameters for both. The NPS curves almost overlapped at all diameters, indicating similar noise magnitude and texture. The MTF curves remained unchanged for small diameters with a small drop when the diameter reached the maximum 37 cm for both. The MTFs for Revolution medium SFOV was slightly higher than for 750HD but nearly identical for the large SFOV. DI decreased with

increasing diameter, where Revolution had slightly higher values. The average increase between 750HD and Revolution of DI across diameters for iodine were 0.17 and 0.53 for large and medium SFOV, respectively; the average increase for water were 0.11 and 0.33 for large and medium SFOV, respectively.

CONCLUSION

For the 70 keV VMI, Revolution showed significant HU stability across different diameters compared to 750HD. The two systems had similar noise performance. Revolution had slightly superior resolution and detectability performance.

CLINICAL RELEVANCE/APPLICATION

Two generations of single-source, rapid kV-switching DECT systems were compared. For VMI, the newer generation GE Revolution showed superior image quality.

SSQ19-08 Evaluation of Two Different Single-Source, Rapid kV-Switching Dual Energy MDCT Platforms: Are There Differences in Contrast Sensitivity, Noise Characteristics and Accuracy of Iodine Quantitation?

Thursday, Dec. 1 11:40AM - 11:50AM Room: S404AB

Awards
Student Travel Stipend Award

Participants
Wendy L. Ehieli, MD, Durham, NC (*Presenter*) Nothing to Disclose
Bhavik N. Patel, MD,MBA, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Yakun Zhang, MS, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Ehsan Samei, PhD, Durham, NC (*Abstract Co-Author*) Research Grant, General Electric Company; Research Grant, Siemens AG
Rendon C. Nelson, MD, Durham, NC (*Abstract Co-Author*) Consultant, General Electric Company Consultant, Nemoto Kyorindo Co, Ltd Consultant, VoxelMetrix, LLC Research support, Bracco Group Research support, Becton, Dickinson and Company Speakers Bureau, Siemens AG Royalties, Wolters Kluwer nv

PURPOSE

To compare contrast-to-noise ratios (CNR) and accuracy of iodine quantitation on two different single-source, rapid kV-switching dual energy MDCT platforms in a phantom model.

METHOD AND MATERIALS

A dual-energy phantom with inserts having known iodine concentrations (Gammex, Inc, Middleton, WI) was scanned with two different single-source, rapid kV-switching and gemstone spectral imaging platforms (Revolution CT and 750HD, GE Healthcare, Inc) using tailored parameters to match CTDIs. ROIs were placed on five different iodine-containing rods on a 5 mm thick section. MDCT variables included body size (large/medium SFOV), mode (axial/helical), pitch (0.984/0.992), z-axis collimation (40 mm: 750HD, 40 or 80 mm: Revolution) and gantry rotation time (GRT) (0.5-1 second). CNR (calculated via iodine and water equivalent inserts) was compared between the two platforms. Measured iodine concentrations were compared to known iodine concentrations; t test was performed.

RESULTS

Two matched protocols were evaluated. The first used a medium SFOV, axial mode, 40 mm collimation, GRT of 1 sec (Revolution) or 0.7 sec (750HD) and CTDI of 9.8 and 9.54 mGy, respectively. The Revolution had improved CNR with increasing iodine concentrations at 50 keV compared to the 750HD (mean increase in CNR 30.2%); at 70 keV, CNR were similar (mean increase 5.0%).The Revolution more accurately quantitated the iodine concentration compared to the 750HD [mean difference 0.35±0.3 mg/mL (4.9%) and 1.8±1.4 mg/mL (19.4%), respectively](p=0.011). The second used a large SFOV, helical mode (pitch 0.984), 40 mm collimation, GRT of 0.5 sec (Revolution) or 0.6 sec (750HD) and CTDI of 9.48 and 9.10 mGy, respectively. The Revolution had improved CNR at increasing iodine concentrations at 50 and 70 keV compared to the 750HD (mean increase in CNR: 87.8% and 48.1%, respectively). The Revolution more accurately quantitated the iodine concentration compared to the 750HD [mean difference 0.52±0.44 mg/mL (6.8%) and 1.44±0.84 mg/mL (20.0%), respectively](p=0.005).

CONCLUSION

The hardware changes on Revolution allow for improved CNR at increasing iodine concentrations. Furthermore, the Revolution more accurately measures iodine concentration.

CLINICAL RELEVANCE/APPLICATION

When comparing two generations of dual-energy CT systems on virtual monochromatic images, the newer generation GE Resolution shows improved CNR and more accurate iodine concentration measurements.

SSQ19-09 Dual-Energy CT Monochromatic Image Consistency Across Vendors and Platforms

Thursday, Dec. 1 11:50AM - 12:00PM Room: S404AB

Participants
Megan Jacobsen, Houston, TX (*Presenter*) Nothing to Disclose
Cayla Wood, MS, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Dianna D. Cody, PhD, Houston, TX (*Abstract Co-Author*) In-kind support, General Electric Company

PURPOSE

Although dual-energy CT provides improved sensitivity of HU for certain tissue types at lower simulated energy levels, if these values vary by scanner type they may impact clinical patient management decisions. Each manufacturer has selected a specific dual-energy CT approach (or in one case, three different approaches); understanding HU variability among monochromatic images may be required when more than one dual-energy CT scanner type is available for use.

METHOD AND MATERIALS

A large elliptical dual-energy quality control phantom (Gammex Inc.; Middleton, WI) containing several standard tissue type

materials was scanned at least three times on each of the following systems: GE HD-750 (80/140kVp), prototype GE Revolution CT with GSI (80/140kVp), Siemens Flash (80/140kVp and 100/140kVp), Siemens AS128 (80/140kVp), Siemens Edge (120kVp) and Philips IQon (120kVp and 140kVp). Monochromatic images were generated at 50, 70, and 140 keV. Soft tissue (29 HU at 120kVp) and Iodine (5 mg/ml) HU were measured on a single central 5mm-thick image; NIST constants were used to calculate the ideal HU for each material. Scan acquisitions were approximately dose-matched (~25mGy CTDIvol) and image parameters were held as consistent as possible across scanner types (thickness, kernel, no noise reduction).

RESULTS

Measured soft tissue (29 HU at 120 kVp) varied from 28 HU to 44 HU at 50 keV (excluding one outlier), from 21 HU to 31 HU at 70 keV, and from 19 HU to 32 HU at 140 keV. Measured iodine (5 mg/ml, 106 HU at 120 kVp) varied from 246 HU to 280 HU at 50 keV, from 123 HU to 129 HU at 70 keV, and from 22 HU to 32 HU at 140 keV.

CONCLUSION

Measured HU in standard rods across 3 dual-energy CT manufacturers and 6 scanner models varied directly with monochromatic level, with the most variability observed at 50 keV and least variability at 70keV. Future work will include additional scanner platforms and how measurement variability in monochromatic images impacts radiologists.

CLINICAL RELEVANCE/APPLICATION

Current daily CT quality control programs do not address dual-energy CT. This is particularly important if clinical facilities rely on dual-energy CT data from more than one scanner make and model.

SSQ20

Vascular Interventional (Radiation Safety/Topics of Interest)

Thursday, Dec. 1 10:30AM - 12:00PM Room: N227B

SQ IR

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

Participants
Sarah B. White, MD,MS, Philadelphia, PA (*Moderator*) Research support, Guerbet SA; Research support, Siemens AG; Consultant, Guerbet SA; Consultant, IO Rad
Charles T. Burke, MD, Chapel Hill, NC (*Moderator*) Nothing to Disclose

Sub-Events

SSQ20-01 Prevalence of Musculoskeletal Injuries in Interventional Radiologists

Thursday, Dec. 1 10:30AM - 10:40AM Room: N227B

Awards
Student Travel Stipend Award

Participants
James J. Morrison, MD, Portland, OR (*Presenter*) Nothing to Disclose
Younes Jahangiri Noudeh, Portland, OR (*Abstract Co-Author*) Nothing to Disclose
Sean Robinson, Portland, OR (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Interventional radiologists are exposed to a variety of work-related risk factors for musculoskeletal injuries. The purpose of this study was to investigate the prevalence of musculoskeletal injuries and identify associated risk factors in the IR physician population.

METHOD AND MATERIALS

A survey of the Society of Interventional Radiology (SIR) members was conducted utilizing the Nordic Musculoskeletal Questionnaire, a validated tool for examining symptom prevalence, along with demographic, practice, radio-protective equipment usage, and exercise information. Surveys were sent and collected between November-December 2015.

RESULTS

Surveys were sent to 4096 SIR members with 666 responses (16.3% response rate). A total of 640 participants (96%) completed the survey in entirety: 69 females (10.8%) and 571 males (89.2%) with a mean age of 47.5 years (+/-10.2), practice length of 17.1 years (+/-9.8), and body mass index of 25.5 kg/m2 (+/-3.9). Prevalence of musculoskeletal injury was 87.5% in the 12 months preceding the survey. For those reporting injuries, 57.9% attributed the symptoms to work-related activities. Lower back (61.4%), neck (55.5%), and shoulder (45.5%) complaints were the most common. Symptoms prevented 21.2% of respondents with injuries from being able to work over the same time period. In addition, 76.2% or respondents reported symptoms within the 7 days preceding completion of the survey. Negative effects upon ability to perform IR duties was reported by 26.1% of respondents while negative effects on life outside of IR was reported by 64.8%. On multivariate regression analysis higher body mass index (odds ratio: 2.24, P=0.002) and female gender (odds ratio: 3.37, P=0.026) were significantly associated with musculoskeletal injuries.

CONCLUSION

There is a high prevalence of musculoskeletal injuries in practicing interventional radiologists, the majority of which are attributed to work-related activities. The prevalence of neck and shoulder complaints is double that reported in the general physician population contrasted with a similar prevalence of lower back issues. Better understanding of the risk factors associated with these injuries can inform future preventative strategies and practices.

CLINICAL RELEVANCE/APPLICATION

This study establishes the prevalence of work related musculoskeletal injuries and associated risk factors in Interventional Radiologists with the goal of producing strategies for injury prevention.

SSQ20-02 Personalized Feedback on Staff and Patient Dose in Image Guided Interventions - A New Era in Radiation Dose Monitoring

Thursday, Dec. 1 10:40AM - 10:50AM Room: N227B

Awards
Student Travel Stipend Award

Participants
Anna M. Sailer, MD, MBA, Maastricht, Netherlands (*Presenter*) Nothing to Disclose
Leonie Paulis, PhD, MSc, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Laura W. Vergoossen, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Joachim E. Wildberger, MD, PhD, Maastricht, Netherlands (*Abstract Co-Author*) Institutional Grant, Agfa-Gevaert Group; Institutional Grant, Bayer AG; Institutional Grant, Koninklijke Philips NV; Institutional Grant, Siemens AG; Speakers Bureau, Bayer AG; Speakers Bureau, Siemens AG
Marco Das, MD, Maastricht, Netherlands (*Abstract Co-Author*) Research Consultant, Bayer AG Research Grant, Siemens AG Speakers Bureau, Siemens AG Research Grant, Koninklijke Philips NV
Cecile R. Jeukens, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Staff and patient dose monitoring is of high interest for legal and personal purposes. Dedicated individual feedback of procedural patient and staff doses is not yet available. Aim of this study was to design and implement a personalized feedback of procedural and personal doses for employees involved in image guided interventions.

METHOD AND MATERIALS

All team members (radiologists, endovascular surgeons and technicians, n= 27) involved in image guided interventions were equipped with personal dose meters (PDMs, Philips DoseAware). A reference PDM was mounted on the C-arm. Comprehensive procedural dose data including the dose area product (DAP) and effective doses from PDMs were prospectively monitored for each procedure for 6 months (n= 804) using an automated patient and staff dose tracking system (Philips DoseWise portal). A personalized feedback form was designed displaying for each employee individually the DAP and personal dose per procedure they were involved in, as well as the relative procedural dose ratios (staff PDM dose / reference PDM * 100%) and the cumulative dose. This study consisted of two phases: 1) team members did not receive dose feedback (first 5 months), 2) team members weekly received individual dose feedback. After the first month of implementation of personalized feedback, the dose feedback was evaluated through questionnaires.

RESULTS

In phase 2 (with dose feedback), the use of PDMs by employees increased by 13% to 88% compared to phase 1 (without feedback). The individual dose feedback was scored as valuable by 78% of the employees; there was no difference in scoring between physicians and technicians (p> 0.05). 83% of the team members scored that the feedback increased their personal radiation dose awareness and 67% answered that the feedback increased their feeling of occupational safety or had changed their behavior (56%).

CONCLUSION

Personalized feedback of staff and patient dose to employees involved in image guided interventions proofed feasible and valuable.

CLINICAL RELEVANCE/APPLICATION

Personalized feedback increases occupational radiation dose awareness and may be able to improve radiation safety and individual protection.

SSQ20-03 Lockblock Central Venous Occlusion Intervention/EP Simulation Study: Baseline Radiation Exposure Versus a Disposable Radiation Attenuation Shield, A Disposable Radiation Attenuation Drape and A Combination of Both on Operator Exposure

Thursday, Dec. 1 10:50AM - 11:00AM Room: N227B

Participants
Gregory I. Gordon, MD, Omaha, NE (*Presenter*) Founder, Radux Devices LLC; Stockholder, Radux Devices LLC; Consultant, HealthTronics, Inc; ; ;
Frank J. Rutar, MS, Omaha, NE (*Abstract Co-Author*) Nothing to Disclose
Irikles I. Piponos, MD, Omaha, NE (*Abstract Co-Author*) Nothing to Disclose
Arvin Bagherpour, MD, Houston, TX (*Abstract Co-Author*) CEO, GMED, LLC
Michael S. Salomon, MD, Omaha, NE (*Abstract Co-Author*) Stockholder, Radux Devices LLC
Sara Myers, PhD, Omaha, NE (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Evaluation of 2 separate, but similar, scatter radiation attenuation strategies; an absorbent, disposable radiation pad and an adhesive, portable radiation shield. Medical devices were evaluated independently, and in combination compared with baseline radiation dose to the hands and eyes of mannequin model.

METHOD AND MATERIALS

Articulating mannequin model was positioned in standard right-handed position for treatment of left central venous occlusive disease endovascular intervention during 10-second intervals for 10 separate measurements of operator hand (closest to field) and eyes (closest to field). Testing performed at 80KeV, mAs 36-60 (automatic dosing) on an anthropomorphic phantom. Study was performed at baseline and then repeated with the RadPad 5110A-O (Orange) disposable Radiation Pad, with the LockBlock disposable, articulating, radiation shield and with simultaneous use of both products. Mean attenuation values and modified mean attenuation values were measured. Modified mean measures excluded the high and low values of each study.

RESULTS

Modified mean, and (mean) dose reduction to hand was 64.60% (31.70%) for LockBlock, 36.30% (27.40%) for RadPad and 87.80% (88%) reduction for both. Modified mean (mean) attenuation to the eyes was 30.70% (32%) for the LockBlock, 27.70% / (27.20%) for the Radpad and 46.20% / (43.00%) for both.

CONCLUSION

Both RadPad Orange and LockBlock demonstrate significant reduction to operator hands and eyes independently, but demonstrate additive protection due to their differing but complimentary attenuation strategies.

CLINICAL RELEVANCE/APPLICATION

Occupational health risks, including the effects from long-term low dose radiation exposure and the musculoskeletal stress from wearing heavy personal protective equipment is a growing threat that requires increased attention and low cost solutions. This study addresses and analyzes additional radiation reduction strategies beyond the ALARA principles.

SSQ20-04 Towards a Benchmark in Radiation Reduction-Optimizing Staff Dose in Image Guided Interventions by Comparing Phantom Experiments with Real-Life Staff Doses

Thursday, Dec. 1 11:00AM - 11:10AM Room: N227B

Participants
Cecile R. Jeukens, PhD, Utrecht, Netherlands (*Presenter*) Nothing to Disclose
Leonie Paulis, PhD, MSc, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Laura W. Vergoossen, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Marco Das, MD, Maastricht, Netherlands (*Abstract Co-Author*) Research Consultant, Bayer AG Research Grant, Siemens AG Speakers Bureau, Siemens AG Research Grant, Koninklijke Philips NV
Joachim E. Wildberger, MD, PhD, Maastricht, Netherlands (*Abstract Co-Author*) Institutional Grant, Agfa-Gevaert Group; Institutional Grant, Bayer AG; Institutional Grant, Koninklijke Philips NV; Institutional Grant, Siemens AG; Speakers Bureau, Bayer AG; Speakers Bureau, Siemens AG
Anna M. Sailer, MD, MBA, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Interventional radiologists are exposed to scattered radiation during fluoroscopy guided interventions. The amount of scattered radiation depends on various factors such as the total X-ray dose, patient anatomy and location of the intervention, the position of the radiologist relative to the patient and the use of additional shielding. Aim of this study was to evaluate the conditions for minimal staff doses as a benchmark for radiation reduction and compare these to real-life radiation doses.

METHOD AND MATERIALS

Comprehensive experiments with an Alderson antropomorphic phantom were performed on a state of the art angiosuite (Philips Allura Clarity). The effect of several parameters on radiologist dose was evaluated namely: patient anatomy (head, thorax, abdomen), radiologist height (5'5" and 6'7") and position (angle and distance), and radiation protection tools (table curtain, table-side shield, ceiling shield). Phantom data were compared to clinical procedural and staff dose data (n= 609) acquired on the same system using personal dose meters (PDM, Philips DoseAware) and automatic dose tracking system (Philips DoseWise portal). A reference PDM was mounted on the C-arm.

RESULTS

In clinical procedures, the staff dose to C-arm reference dose ratios ranged from 6% to 48% for cerebral and biliary procedures, respectively, indicating an effect of type of intervention and staff position on staff dose. This was confirmed by phantom studies, which showed that the staff dose decreased by 84% from head to abdomen interventions. In addition, staff dose depended on the distance to the irradiated area (63% decrease from 1'8"to 2'7") and the staff torso rotation towards the patient (90% difference over a 90 degree range). Radiation protection tools decreased the staff dose by maximal 97%. Combining these phantom studies, staff dose can be reduced by at most 97% when using proper working habits.

CONCLUSION

Staff doses ranged widely between procedures depending on interventional site and staff position. Real-life staff doses were substantially higher than in phantom experiments with optimal shielding conditions, indicating room for possible improvements in radiation protection in clinical practices.

CLINICAL RELEVANCE/APPLICATION

Staff dose to reference PDM ratios provide a benchmark for radiation protection and optimal shielding reduction factors possible during image guided interventions.

SSQ20-05 Influence of Different Types of Acquisition Techniques on Procedural and Staff Dose in Image Guided Interventions

Thursday, Dec. 1 11:10AM - 11:20AM Room: N227B

Participants
Anna M. Sailer, MD, MBA, Maastricht, Netherlands (*Presenter*) Nothing to Disclose
Leonie Paulis, PhD, MSc, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Laura W. Vergoossen, Maastricht, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Marco Das, MD, Maastricht, Netherlands (*Abstract Co-Author*) Research Consultant, Bayer AG Research Grant, Siemens AG Speakers Bureau, Siemens AG Research Grant, Koninklijke Philips NV
Joachim E. Wildberger, MD, PhD, Maastricht, Netherlands (*Abstract Co-Author*) Institutional Grant, Agfa-Gevaert Group; Institutional Grant, Bayer AG; Institutional Grant, Koninklijke Philips NV; Institutional Grant, Siemens AG; Speakers Bureau, Bayer AG; Speakers Bureau, Siemens AG
Cecile R. Jeukens, PhD, Utrecht, Netherlands (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Patient and staff dose monitoring during image guided interventions is of increasing interest. Various types of acquisitions can be used such as fluoroscopy, digital subtraction angiography (DSA), roadmap and 3D imaging. Aim of this study was to gain insight in the procedural and occupational dose during interventional radiology procedures and evaluate the individual contribution of different acquisition techniques.

METHOD AND MATERIALS

All staff members (n= 27) were equipped with personal dose meters (PDMs, Philips DoseAware). Comprehensive procedural parameters, including the dose area product (DAP) per acquisition technique and effective staff dose from PDMs were prospectively monitored for each procedure using an automated dose tracking system (Philips DoseWise portal). Procedures (n= 609) performed between 10/2015 and 03/2016 were analyzed and grouped by procedure type; these included among others superficial femoral artery and infragenual interventions (n= 95), venous iliac and caval recanalization (n= 91), cerebral interventions (n= 77), visceral and renal artery interventions (n= 57), AV fistula maintenance (n= 48), biliary interventions (n= 44), aortic repair procedures (n= 41) and percutaneous gastrostomy (n= 26).

RESULTS

Procedural DAP doses were highest for aortic repair procedures (126.5 ±157.8 mGy*cm2) followed by visceral and renal artery interventions (96.3 ±83.3mGy*cm2) and venous recanalization procedures (65.2 ±73.2 mGy*cm2) and were lowest for percutaneous gastrostomy (2.7 ±2.8 mGy*cm2). Radiologists dose was highest for visceral and renal artery interventions

procedures (0.11 ±0.18 mSv) followed by aortic repair (0.09 ±0.09 mSv) and venous procedures (0.05 ±0.14 mSv). Mean procedural DAP was composed of fluoroscopy (51%), DSA (42%), roadmap (5%) and 3D acquisitions (2%). Radiologist dose was mostly driven by fluoroscopy (60%), followed by in-room acquired DSA (36%), roadmap (3%) and 3D (1%). Radiologist dose per in-room acquired DSA (3.5 µSv) was three times higher than per roadmap (1.1 µSv).

CONCLUSION

Fluoroscopy was the dominant contributor to procedural DAP and radiologist dose, followed by DSA. These insights in dose contribution of various imaging techniques might aid to minimize staff exposure.

CLINICAL RELEVANCE/APPLICATION

Occupational doses could be substantially reduced by acquiring DSA consistently from the control room whenever possible. Use of roadmap may be dose-efficient over DSA.

SSQ20-06 Evaluating Current and Recent Fellows' Perceptions on the Interventional Radiology Residency: Results of a 2015 Survey

Thursday, Dec. 1 11:20AM - 11:30AM Room: N227B

Participants
Jason C. Hoffmann, MD, Mineola, NY (*Abstract Co-Author*) Consultant, Merit Medical Systems, Inc; Speakers Bureau, Merit Medical Systems, Inc
Diane Szaflarski, MD, Mineola, NY (*Presenter*) Nothing to Disclose
Neyra Azimov, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose
Jonathan A. Flug, MD, MBA, Denver, CO (*Abstract Co-Author*) Nothing to Disclose
Micah M. Watts, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Paul J. Rochon, MD, Denver, CO (*Abstract Co-Author*) Nothing to Disclose
Sameer Mittal, MD, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose
Jeffrey F. Chick, MD, MPH, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Ayushi Singh, DO, Old Bethpage, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate current and recent interventional radiology (IR) fellows' perceptions on the planned IR residency.

METHOD AND MATERIALS

An anonymous, web-based survey was distributed to 82 current and recent IR fellows (completed training within the past 4 years) across the United States (U.S.). The survey contained 15 questions, most of which were based on a five-point Likert scale, while others contained free text responses. The survey was open for a three-week period in September 2015. Email addresses were obtained from program directors at two IR fellowship programs in the U.S.. An initial email with the survey link was sent out at the beginning of the survey period, with a follow-up email sent 10 days later. The results were analyzed by two trainees and three IR attending physicians.

RESULTS

Sixty-four current or former IR fellows completed the survey (response rate 78%). 17% decided to pursue a career in IR by the end of their third year of medical school. When asked if the IR residency will be an improved IR training pathway, 24% strongly agreed, 38% agreed, 20% were neutral, 8% disagreed, and 10% strongly disagreed. Based on current medical school curricula, 6% agreed that IR residency applicants will be ready to select such a pathway by the end of their third year of medical school, while 20% were neutral, 44% disagreed, and 30% strongly disagreed. When asked if sub-specialty IR fellowships with an emphasis on topics such as peripheral vascular disease, neuro-interventions, oncology, and/or pediatrics should be developed in the future, 15% strongly agreed, 36% agreed, 25% were neutral, 19% disagreed, and 5% strongly disagreed.

CONCLUSION

A majority of current and recent IR fellows surveyed believe that the IR residency will be an improved IR training pathway. However, most chose IR during their final year of medical school or during residency, and most believe that current medical school curriculum do not prepare students to decide upon a career in IR by the end of their third year of medical school. Thus, immediate and longer-term curriculum changes are necessary to ensure that medical students know enough about IR to make an appropriate career decision by the end of their third year of medical school.

CLINICAL RELEVANCE/APPLICATION

Immediate curriculum changes are necessary so that medical students receive enough exposure to IR to make an appropriate career choice by the end of their third year of medical school.

SSQ20-07 Monitoring Disease Activity and Therapy Response in Patients with Aortitis and Chronic Periaortitis Undergoing Immunosuppressive Therapy by Volume Perfusion CT

Thursday, Dec. 1 11:30AM - 11:40AM Room: N227B

Participants
Georg Bier, MD, Tubingen, Germany (*Presenter*) Nothing to Disclose
Mustafa Kurucay, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Joerg Henes, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Theodoros Xenitidis, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Heike Preibsch, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Konstantin Nikolaou, MD, Tuebingen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Speakers Bureau, Bayer AG
Marius Horger, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the role of perfusion-based CT for monitoring inflammatory activity in patients with aortitis and chronic periaortitis

undergoing immunosuppressive therapy.

METHOD AND MATERIALS

Volume perfusion CT (VPCT) was performed in 17 patients (median age 68.5 years) with aortitis or chronic periaortitis before and after immunosuppressive therapy. VPCT parameters (Blood flow & blood volume) as well as vessel wall and perivascular connective tissue thickness were measured and correlated with the course of the acute phase inflammatory parameters CRP and erythrocyte sedimentation rate (ESR).

RESULTS

In all patients under therapy, blood flow and blood volume values dropped at follow up ($p<.05$). In aortitis patients, CRP dropped from 3.86 ± 5.31 mg/dl to 0.9 ± 1.37 mg/dl and in periaortitis patients from 1.78 ± 2.25 mg/dl to 0.79 ± 1.55 mg/dl, whereas the ESR dropped from 45.71 ± 37.59 s to 8.57 ± 3.1 s and 36.78 ± 34.67 s to 17.22 ± 21.82 s, in aortitis and in periaortitis, respectively. Clinical symptoms were resolved in 12 patients at follow up. Moreover, at follow-up, the mean thickness of aortic wall thickness and/or perivascular tissue formation decreased by 41.7 ± 25.63 % (range, 0 - 87.5 %). The response was more vigorous in periaortitis patients (47.7 ± 27.0 %; range: 9 - 87.5 %) than in aortitis patients (35.4 ± 23.88 %; range: 0 - 62.5 %; $p<.001$).

CONCLUSION

The course of perfusion-CT parameters in aortitis and periaortitis undergoing immunosuppressive therapy differs significantly after therapy. In cases with bland serological data ("serologically occult vasculitis"), perfusion-CT was the sole reliable monitoring parameter.

CLINICAL RELEVANCE/APPLICATION

Serologically "occult" aortitis/periaortitis and great vessel vasculitis under therapy represent a disease entity, which is normally difficult to monitor under therapy with established methods (e.g. serology or PET). In these cases volume perfusion CT represents a reliable tool for disease activity assessment.

SSQ20-08 Using Time-Driven Activity Based Costing (TDABC) to Characterize Cost Variability in Interventional Radiology Procedures

Thursday, Dec. 1 11:40AM - 11:50AM Room: N227B

Participants
William Hsu, PhD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Cleo K. Maehara, MD, Brookline, MA (*Abstract Co-Author*) Nothing to Disclose
Lewellyn Andrada, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Katrina R. Beckett, MD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Justin P. McWilliams, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
John M. Moriarty, MD, Los Angeles, CA (*Abstract Co-Author*) Speaker, AngioDynamics, Inc Consultant, AngioDynamics, Inc Speaker, Sequent Medical, Inc Consultant, Sequent Medical, Inc Speaker, Argon Medical Devices, Inc Consultant, Argon Medical Devices, Inc
Dieter R. Enzmann, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

In a value-based healthcare environment, understanding the true cost of care delivery is necessary to improve efficiency and demonstrate cost savings, particularly in procedures that involve multiple providers and steps. Our department has adopted a data-driven TDABC approach that incorporates process modeling, time motion studies, and analysis of data from electronic hospital information systems to obtain per minute costs for labor, equipment, space, and supplies that can then be used to assess cost of each step.

METHOD AND MATERIALS

The initial process model (enumerating tasks and estimated timings) was developed in collaboration with an IR attending, nurse, and technologist. The model was further refined and validated through a time motion study of a hospital based IR port placement procedure. Following an IRB-approved protocol, timestamps from a total of 117 procedures (performed on 116 patients) were extracted from the electronic medical record. Departmental business systems were used to estimate current personnel, equipment, space, and supply cost rates.

RESULTS

Average times for tasks included: 50 min (patient prep), 38 min (IR suite prep), 80±33 min (procedure), 15 min (clean-up), and 120 min (patient recovery). Personnel capacity costs were: $6.00/min (IR attending), $1.50/min (nurse), $1.15/min (technologist), and $0.65/min (IR fellow). Equipment cost rate for fluoroscope and ultrasound are $0.94/min and $0.12/min, respectively. Inpatient procedures took significantly longer (112 min versus 72 min, $p=0.004$), resulting in a cost difference of $413 (equivalent to approximately 25% of the total cost). Among the seven IR attendings who performed at least one of the 117 port placement procedures, variation in average procedure times were insignificant (68 to 87 min), contributing a difference of $100 (less than 10% of the total cost).

CONCLUSION

TDABC is capable of elucidating differences in cost for a given procedure based on factors such as patient type, providers, equipment, and environment. We are conducting further analysis to compare cost with surgical port insertion and to better understand cost variability in different hospital settings.

CLINICAL RELEVANCE/APPLICATION

TDABC provides a more granular approach to investigating where further efficiencies can be achieved and ultimately, provide a basis for a more grounded cost-benefit analysis when comparing an exam to alternatives.

SSQ20-09 Development of a New Image Display System with use of an Electroencephalogram Sensor on Operator's Head

Thursday, Dec. 1 11:50AM - 12:00PM Room: N227B

Participants
Mitsuru Sato, Maebashi, Japan (*Abstract Co-Author*) Nothing to Disclose
Toshihiro Ogura, PhD, Maebashi, Japan (*Abstract Co-Author*) Nothing to Disclose
Sakuya Yamanouchi, Maebashi, Japan (*Abstract Co-Author*) Nothing to Disclose
Kosuke Yoshikawa, Gunma, Japan (*Presenter*) Nothing to Disclose
Wataru Tamashiro, Maebashi-Shi, Japan (*Abstract Co-Author*) Nothing to Disclose
Kunio Doi, PhD, Chicago, IL (*Abstract Co-Author*) Shareholder, Hologic, Inc License agreement, Hologic, Inc License agreement, Deus Technologies, LLC License agreement, Riverain Technologies, LLC License agreement, Mitsubishi Corporation License agreement, MEDIAN Technologies License agreement, General Electric Company License agreement, Toshiba Corporation Research support, Deus Technologies, LLC Research support, E. I. du Pont de Nemours & Company Research support, Elcint Medical Imaging Ltd Research support, FUJIFILM Holdings Corporation Research support, General Electric Company Research support, Hitachi, Ltd Research support, Eastman Kodak Company Research support, Konica Minolta Group Research support, Mitaya Manufacturing Co, Ltd Research support, Mitsubishi Corporation Research support, Koninklijke Philips NV Research support, Hologic, Inc Research support, Riverain Technologies, LLC Research support, Seiko Corporation Research support, Siemens AG Research support, 3M Company Research support, Toshiba Corporation
Ken Shimizu, Takasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Sae Tamura, Kiryu, Japan (*Abstract Co-Author*) Nothing to Disclose
Natsumi Miki, Takasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Misaki Tobe, Agatsuma, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

During IVR examination, physicians need to view images with a proper display system by use of a console within arm's reach. However, they may not be able to manipulate it because their hands may be tied up frequently. We developed an image display system by using an electroencephalogram (EEG) sensor on his/her head. This image display system can be used based on various data detected by this device, and the output can be converted to commands for various instructions such as paging which can be controlled by operator's eye blink, and zooming of a region indicated by the cursor which can be controlled by operator's concentration on his/her mind. In this study, we report that physicians could operate image display system by their EEG signal.

METHOD AND MATERIALS

In this study, we used a Mindwave MOBILE (Neurosky Ltd., CA, USA) as EEG sensor, which is applied to measure the potential difference between the electrodes attached to the left forehead and left earlobe. With this device, we can obtain raw data and attention meter levels, meditation meter levels, and eye blink strength on an eSense scale of 1 to 100, which is based on analysis of alpha wave and beta wave. We can use the output from the device by programming proper algorithms, and provide the suitable commands for various purposes. As an image display system, we employed an AZEWIN (AZE. Ltd., Tokyo, Japan). Thirtyone observers participated as operators with EEG device in this study. We investigated the average response time required for detection of eye-blink and the average detection rate. We also investigated the average response time required for zooming and the correct zooming rate.

RESULTS

The average response time required for detection of eye-blink was 0.43±0.02 s . The correct detection rate of 100% was achieved by 28 observers, whereas three observers provided 80%. The average response time required for zooming was 5.85±0.56 s. The correct zooming rate of 100% was achieved by 27 observers and 90% by three observers, and 80% by one observer.

CONCLUSION

During IVR examinations, image readings on an image display system may be made by radiologists by use of EEG signals for processing images properly without touching the console.

CLINICAL RELEVANCE/APPLICATION

We can operate with paging and zooming based on the use of electroencephalogram. We would develop a suitable image display system by combining multiple signals including EEG signal.

MSRT54

ASRT@RSNA 2016: Multi Planar Imaging: Anatomical Variation Around the Ischial Tuberosity During Sitting Using Magnetic Resonance Imaging

Thursday, Dec. 1 11:45AM - 12:45PM Room: N230B

MK MR

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

Participants
John Cathcart, Newtownabbey, United Kingdom, (j.cathcart@ulster.ac.uk) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Introduce the concept of applying Imaging to non routine diagnostic applications. 2) Report on Pilot work on Multi planar MR on imaging the Ischial Tuberosity antomical area whilst sitting. 3) Highlight why understanding this anatomical variation is of relevance in the development of cushions for wheelchair users.

ABSTRACT

PurposeThe purpose of this work was to determine the capability of seated magnetic resonance imaging to visualise anatomy around the ischial tuberosity involved in sitting. Clear visualisation of anatomy enabled understanding of the anatomical variation across normal and spinal cord injury subjects.MethodsMultiplanar T1 weighted thin slice magnetic resonance imaging was carried out in 3 subjects with spinal cord injury and 4 people without spinal cord injuries, seated in a FONAR 0.6T system. The images were scored for anatomical visualisation, anatomical variation between subjects, and percentage of fat voxels within the gluteus maximus.ResultsSeated magnetic resonance imaging was able to visualise the majority of anatomy around the ischial tuberosity, however, there was significant anatomical variation between all subjects regardless of their spinal cord injury status. It was also shown that mechanical support for sitting is provided by a variety of soft tissues, including gluteus maximus, subcutaneous fat and skin, although the amount and type varied significantly.ConclusionMagnetic resonance imaging was shown to be capable of producing high resolution anatomical data of the anatomy involved in sitting. This data may be used to inform clinicians of pressure ulcer risk.

Handout:John Cathcart

http://abstract.rsna.org/uploads/2016/16000835/RSNA WS V2.pdf

RCC53

Computer-Aided Diagnosis: State-of-the-Art and New-Generation CAD for Precision Medicine

Thursday, Dec. 1 12:30PM - 2:00PM Room: S501ABC

IN

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

Participants
Hiroyuki Yoshida, PhD, Boston, MA, (yoshida.hiro@mgh.harvard.edu) (*Moderator*) Patent holder, Hologic, Inc; Patent holder, MEDIAN Technologies;

LEARNING OBJECTIVES

1) Learn how to effectively integrate state-of-the-art CAD techniques into clinical imaging services; 2) learn emerging radiomics/genomics-based CAD and its prospective role in precision medicine, 3) learn how CAD informatics tools can guide the diagnosis and treatment decision-making processes, and 4) learn prospective roles of new generation CAD in P4 medicine--predictive, preventive, personalized, and participatory medicine.

ABSTRACT

Computer-aided diagnosis (CAD) has become one of the major research subjects in medical imaging and diagnostic radiology. In this refresher course, advanced use of CAD in clinical practice will be presented together with emerging CAD systems and their prospective roles in clinical decision-making processes. The past researches and developments in CAD have led to the quantitative imaging (QI), which involve processes such as segmentation of lesions from normal anatomical background, followed by the analysis of the segmented lesions to yield quantitative measures of pathological, anatomical, or physiological characteristics of the lesions. Many of the techniques that were developed in the CAD fields formed the foundations of the QI analyses. How to effectively integrate the state-of-the-art CAD techniques into clinical imaging services will be first discussed. Currently, CAD is widening its applications into assessment of risk, prognosis, and response to therapies, as well as expanding its horizon to quantitative analyses of "-omics" data including genomics, proteomics, and various phenotypes, often referred to as radiomics. In image-based phenotyping, CAD methods are under active development to quantitatively characterize tumor radiomic features such as tumor morphology and physiology, merge these tumor radiomic features with clinical information to develop diagnostic, prognostic, or predictive imaging biomarkers, correlate imaging phenotypes with genotypes and/or gene expressions. The role of the next-generation CAD, radiomics/genomics-based CAD, in clinical practice will be reviewed in the next lecture. Starting as a computerized tool for highlighting abnormal lesions, CAD is now evolving into an informatics tool that mine various biobanks to retrieve tumors that have similar phenotypes and genotypes to be compared with the tumor in question and to discover imaging biomarkers linked with omics data. The new generation of CAD will have a high promise in becoming an indispensable tool for realizing precision medicine in the era of personalized medicine. The perspectives of the role of the new-generation CAD in P4 medicine will be discussed in the final lecture of the course.

Sub-Events

RCC53A CAD for Imaging Services: Integrating State-of-the-Art CAD into 3D Imaging Services

Participants
Gordon J. Harris, PhD, Boston, MA, (gjharris@partners.org) (*Presenter*) Medical Advisory Board, Fovia, Inc; Stockholder, IQ Medical Imaging LLC;

LEARNING OBJECTIVES

1) How CAD applications can be developed and validated. 2) How CAD applications can transition from a research tool to a clinical product. 3) How CAD applications can be implemented in a clinical workflow environment. 4) How academic and industry groups can partner in developing clinical CAD applications.

Active Handout:Gordon J. Harris

http://abstract.rsna.org/uploads/2016/16005054/ACTIVE RSNA CAD-RCC53A 2016 Harris handouts.pdf

RCC53B Radiomics/Genomics-based CAD: Role of Next-Generation CAD in Clinical Practice

Participants
Hugo Aerts, PhD, Boston, MA (*Presenter*) Stockholder, Genospace LLC
Stephen S. Yip, PhD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn about the motivation and methodology for Computational Imaging & Radiomics. 2) Learn about the existing and future potential role of radiomics with other –omics data and within precision medicine. 3) Learn about radionics-genomics studies in different cancer types.

ABSTRACT

RCC53C Radiomic Clinical Decision Support System: CAD for Precision Medicine

Participants
Daniele Regge, MD, Torino, Italy (*Presenter*) Speakers Bureau, General Electric Company

LEARNING OBJECTIVES

1) To describe the new informatics tools for data collection, data mining and processing of information in the omics era. 2)

1) To describe the new informatics tools for data collection, data mining and processing of information in the omics era. 2) To give examples of how this new vision adapts to the new paradigms of clinical research in the field of oncology. 3) To discuss the role of new generation CAD systems in P4 medicine.

ABSTRACT

MSCA51

Case-based Review of the Abdomen (An Interactive Session)

Thursday, Dec. 1 1:30PM - 3:00PM Room: S406A

GI

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

Participants
Julie H. Song, MD, Providence, RI (*Director*) Nothing to Disclose

Sub-Events

MSCA51A Pancreatic Imaging

Participants
Jay P. Heiken, MD, Saint Louis, MO, (heikenj@wustl.edu) (*Presenter*) Patent agreement, Guerbet SA; Patent agreement, Bayer AG

LEARNING OBJECTIVES

1) Identify the differential imaging features of solid and cystic pancreatic neoplasms. 2) Make appropriate recommendations for characterization, follow-up and/or treatment of an incidentally discovered pancreatic mass. 3) Recognize and appropriately characterize pancreatitis and its complications.

MSCA51B Hepatobiliary Disorders

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) Demonstrate typical and atypical imaging appearances of common hepatobiliary diseases. 2) Illustrate key imaging findings that aid in differential diagnosis. 3) Learn to avoid pitfalls and misdiagnoses of hepatobiliary lesions.

MSCA51C Congenital Abdominal Pathology that Can be Seen in Adults

Participants
Sudha A. Anupindi, MD, Philadelphia, PA, (anupindi@email.chop.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the essential imaging techniques used to diagnose important congenital abdominal pathology seen into adulthood. 2) Identify the imaging features of these entities. 3) Apply this knowledge into their clinical practice.

ABSTRACT

MSCB51

Case-based Review of Breast (An Interactive Session)

Thursday, Dec. 1 1:30PM - 3:00PM Room: S100AB

BR DM

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

Participants
Janie M. Lee, MD, Bellevue, WA, (jmlee58@uw.edu) (*Director*) Research Grant, General Electric Company

LEARNING OBJECTIVES

1) Identify the appropriate application of multimodality breast imaging for routine screening, supplemental screening, and diagnostic indications. 2) Select appropriate methods for imaging-guided percutaneous breast biopsy and perform post-biopsy radiologic-pathologic correlation. 3) Calculate performance measure values for a breast imaging audit and compare with appropriate performance benchmarks.

Sub-Events

MSCB51A Screening: Digital Mammography and Tomosynthesis

Participants
Sarah M. Friedewald, MD, Chicago, IL, (sarah.friedewald@nm.org) (*Presenter*) Consultant, Hologic, Inc; Research Grant, Hologic, Inc; Consultant, C. R. Bard, Inc

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

MSCB51B Supplemental Screening

Participants
Susan Weinstein, MD, Philadelphia, PA (*Presenter*) Consultant, Siemens AG

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

The discussion will review the imaging modalities currently available for supplemental screening. The pros and cons of each modality will be discussed as well as the pertinent literature.

MSCB51C Evaluating the Symptomatic Patient

Participants
Sughra Raza, MD, Boston, MA, (sraza1@partners.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

Honored Educators

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

Sughra Raza, MD - 2015 Honored Educator

PS50

Thursday Plenary Session

Thursday, Dec. 1 1:30PM - 2:45PM Room: E450A

PH

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50

Participants

Sub-Events

PS50A RSNA/AAPM Symposium: Precision Imaging in Medicine

Participants
Paul E. Kinahan, PhD, Seattle, WA (*Moderator*) Research Grant, General Electric Company; Co-founder, PET/X LLC

LEARNING OBJECTIVES

1) To learn what the Precision Medicine Initiative (PMI) is, and how it is evolving as a national program. 2) To learn the current and potential impacts of the the PMI on radiology through quantitative imaging and a focus on outcomes. 3) To learn how radiology can support the PMI through advances in big data analysis and supporting therapy.

PS50B Precision Medicine: Optimizing Imaging Strategies

Participants
Daniel C. Sullivan, MD, Durham, NC (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

During the past two decades, the molecular characterization of disease has revealed that each patient is likely to have a unique combination of genotypic, epigenetic, and phenotypic profiles for their disease. In other words, no two patients with lung cancer or diabetes will have exactly the same molecular profile for their diseases, despite the fact that we currently give them the same clinical diagnosis. Biomarkers--both specimen and imaging--play an increasingly important role in healthcare as physicians try to determine the most appropriate therapy for any patient's molecularly-unique version of disease. This concept is variously called targeted, personalized or precision medicine. The Federal government recently launched the Precision Medicine Initiative, the goal of which is described as tailoring therapies "to you" instead of treating based on averages. For clinical imaging there are three important implications of Personalized Medicine which will be discussed in this presentation. These are (1) the importance of imaging information (biological, functional or anatomic) that reflects the individual's molecular basis of disease, (2) objective, quantitative information that is reproducible and can be incorporated into decision support algorithms, and (3) a focus on therapeutic implications or options as opposed to primarily focusing on diagnosis. Furthermore, these evolutionary shifts in healthcare will inevitably require radiologists to accept more standardization in imaging acquisition protocols and to use structured reporting systems.

PS50C Quantitative Radiomics, Big Data, and Deep Learning in Precision Medicine

Participants
Maryellen L. Giger, PhD, Chicago, IL (*Presenter*) 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;

Abstract

Adapting the Precision Medicine Initiative into imaging research includes studies in both discovery and translation in order to enable the conversion of current radiological interpretation from that of the "average patient" to the precise interpretation and patient-care management decisions specific to the individual. The goal is to individually detect disease, and then give the right person the right treatment at the right time. Discovery is a multi-disciplinary data mining effort involving researchers such as radiologists, medical physicists, oncologists, computer scientists, engineers, and computational geneticists. Similar to how the genomics community approached the big biology of the Cancer Genome project, the radiological community continues to conduct robust collection, annotation, analysis, and evaluation of images of large populations. Advances in computer power and machine learning algorithms are allowing for computer-extracted features, both from clinically-driven computer-extraction systems (such as those from computer-aided diagnosis) and deep learning methods, to yield "radiomics", i.e., the high throughput conversion of image sets into a multi-dimensional feature space. With quantitative imaging, a patient's tumor can be characterized quantitatively via "virtual digital biopsies". Ultimately translation of the discovered relationships will include applications to the clinical assessments of cancer risk, prognosis, response to therapy, and risk of recurrence.

SPRG51

RadioGraphics' Publication Information for Potential Authors

Thursday, Dec. 1 1:30PM - 2:45PM Room: E350

OT

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50

Participants
Jeffrey S. Klein, MD, Burlington, VT, (jklein@rsna.org) (*Presenter*) Nothing to Disclose
Lucinda Foulke, Oak Brook, IL (*Presenter*) Nothing to Disclose
Stephanie Khio, Oak Brook, IL (*Presenter*) Nothing to Disclose
Melissa L. Lohnes, Oak Brook, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Prepare a format- and content-compliant manuscript or Powerpoint™ presentation for possible publication. 2) Use ScholarOne Manuscripts to submit a manuscript for possible publication. 3) Become familiar with the RadioGraphics publication process.

ABSTRACT

The majority of material published in RadioGraphics is derived from solicited education exhibits selected by subspecialty panels at the RSNA annual meeting. This session, conducted by the RadioGraphics peer review and production staff, will review the process of developing a manuscript or Powerpoint presentation (for the Fundamentals and Training section of the online journal) from your solicited exhibit and submitting your material via our online submission and peer review system ScholarOne. The components of a standard RadioGraphics manuscript will be detailed, including the creation of a CME test. There will be ample time for questions to the staff and the editor of RadioGraphics, Dr. Jeffrey Klein.

URL

Handout:Lucinda Foulke

http://abstract.rsna.org/uploads/2016/16001671/2016 Publication Info for Potential AuthorsSPRG51_handout.pdf

VSIO51

Interventional Oncology Series: Management of Hepatic Metastases from Colorectal Cancer, Neuroendocrine Tumors and more

Thursday, Dec. 1 1:30PM - 6:00PM Room: S405AB

GI IR

AMA PRA Category 1 Credits ™: 4.50
ARRT Category A+ Credit: 0

FDA Discussions may include off-label uses.

Participants
Sarah B. White, MD,MS, Philadelphia, PA, (sbwhite@mcw.edu) (*Moderator*) Research support, Guerbet SA; Research support, Siemens AG; Consultant, Guerbet SA; Consultant, IO Rad

LEARNING OBJECTIVES

The overall objective of this session is to get a better understanding of multimodality, multidisciplinary treatment hepatic dominant metastatic disease. We will accomplish this by:1.) Defining the alphabet soup of the cancer treatments2.) Highlighting the general algorithm for the treatment of mCRC and mNETs3.) Briefly discuss the evidence basis behind medical, surgical, radiation and liver directed therapies4.) Exploring the clinical outcomes and adverse events with the different treatment modalities5.) Demonstrate the necessity of multidisciplinary tumor boards for the treatment of patients with dominant hepatic metastases

Sub-Events

VSIO51-01 Setting the Stage: NCCN/ESMO Guidelines for mCRC

Thursday, Dec. 1 1:30PM - 1:45PM Room: S405AB

Participants
Emily Bergsland, MD, San Francisco, CA (*Presenter*) Institutional research support, Lexicon Pharmaceuticals, Inc; Institutional research support, Merck & Co, Inc; Institutional research support, Novartis AG; Consultant, Ipsen SA; Consultant, Lexicon Pharmaceuticals, Inc;

LEARNING OBJECTIVES

1) Review the general approach to the treatment of metastatic colorectal cancer (mCRC). 2) Summarize the current systemic treatment options for mCRC. 3) Identify the clinical and molecular subgroups of patients with mCRC which have implications in terms of choice of therapy. 4) Examine the differences between published guidelines for the care of patients with mCRC.

ABSTRACT

VSIO51-02 Role of PVE in the Surgical Management of Colorectal Liver Metastases

Thursday, Dec. 1 1:45PM - 2:00PM Room: S405AB

Participants
David C. Madoff, MD, New York, NY (*Presenter*) Advisory Board, RenovoRx

VSIO51-03 Advances in the Surgical Toolbox for Colorectal Liver Metastases

Thursday, Dec. 1 2:00PM - 2:15PM Room: S405AB

Participants
T. Clark Gamblin, MD, MS, Milwaukee, WI (*Presenter*) Nothing to Disclose

VSIO51-04 SBRT for Isolated Hepatic Metastases

Thursday, Dec. 1 2:15PM - 2:30PM Room: S405AB

Participants
Mary U. Feng, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

VSIO51-05 Radiation Map Fusion Guided Combination of External Radiation with Thermal Ablation for up to 5 Liver Tumors & Up to 10cm in Diameter

Thursday, Dec. 1 2:30PM - 2:40PM Room: S405AB

Awards
Student Travel Stipend Award

Participants
Hayet Amalou, MD, Bethesda, MD (*Presenter*) Nothing to Disclose
Deborah Citrin, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Sheng Xu, PhD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Holly Ning, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Robert W. Miller, PhD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Bradford J. Wood, MD, Bethesda, MD (*Abstract Co-Author*) Researcher, Koninklijke Philips NV; Researcher, Celsion Corporation; Researcher, BTG International Ltd; Researcher, W. L. Gore & Associates, Inc ; Researcher, Cook Group Incorporated; Patent agreement, VitalDyne, Inc; Intellectual property, Koninklijke Philips NV; Intellectual property, BTG International Ltd; ; ; ;
Victoria L. Anderson, MS, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

External beam radiation therapy (XRT) and thermal ablation (RFA or microwave ablation) have complementary risk profiles and synergistic mechanisms. XRT works better with blood flow, but ablation is impaired by perfusion due to convection. XRT is safer in the porta hepatis, but ablation with hydrodissection is safer adjacent to bowel. XRT is typically not given for liver lesions larger than 6 cm due to integral radiation dose toxicities, and ablation is less effective for > 3cm tumors.

METHOD AND MATERIALS

Inclusion criteria included up to 5 liver tumors, each up to 10 cm in diameter. Patients were treated with 5 total fractions (50 Gy total) of XRT over 2 weeks, and RFA or microwave ablation was between fractions 3 and 4. A navigation system for ablation was developed fusing radiation dose map, multiple imaging modalities, and probe locations. Following multi-modality liver registration, the software populated a planned ablation treatment volume by overlapping the expected ablation zone of each probe to define tumor coverage. 3 patients were enrolled.

RESULTS

Fusion software guidance combines XRT with ablation for synergistic treatment of large and/or multiple liver tumors. This combination allows respecting the limitations, while taking advantage of the strengths, of each modality. Multi-modality registration overlays CT images, radiation dose map, planned ablation probe insertion paths, and expected overlapping ablation treatment volumes from multiple probes. Two patients received spatially synergistic treatment, using XRT and ablation to achieve an overall larger lesion coverage compared to what each modality might achieve alone. One patient received temporally synergistic treatment (RFA and radiation to same volume), which resulted in an ablation volume of 59 cm3 after 12 minutes of RFA, (nearly 3 times greater than the expected volume of 20.5 cm3 seen in porcine studies). On most recent follow-up, one of three patients (1 of 5 tumors) had local recurrence and one hepatocellular carcinoma patient remains disease-free over two years after treatment for a 10 cm tumor.

CONCLUSION

Fusion navigation guided by radiation dose map input may facilitate combination of complementary therapies of XRT and thermal ablation, Both spatial and temporal synergy are feasible but speculative..

CLINICAL RELEVANCE/APPLICATION

Complementary combination therapy with XRT + RFA allows treatment of larger liver lesions in otherwise risky locations.

VSIO51-06 New Angles on Ablating Colorectal Liver Metastases

Thursday, Dec. 1 2:40PM - 2:55PM Room: S405AB

Participants
Paul B. Shyn, MD, Boston, MA, (pshyn@bwh.harvard.edu) (*Presenter*) Research Consultant, Galil Medical Ltd; Research Grant, Siemens AG

LEARNING OBJECTIVES

ABSTRACT

LEARNING OBJECTIVES

1) Assess the indications for and efficacy of image-guided ablation of liver metastases in patients with colorectal cancer. 2) Examine the spectrum of ancillary techniques and ablation technologies that expand eligibility for liver tumor ablation. 3) Assess the capabilities of current liver ablation strategies through case examples.

ABSTRACT

VSIO51-07 Prospective MonoIstitutional Study on Safety and Efficacy of dRug-eluting Microspheres Loaded with Irinotecan in Patients with Colorectal Liver mEtastases (Miracle III Trial)

Thursday, Dec. 1 2:55PM - 3:05PM Room: S405AB

Participants
Giovanni Mauri, MD, Milan, Italy (*Presenter*) Consultant, Esaote SpA
Gianluca M. Varano, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Riccardo Foa, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Maria Zampino, Milan, Japan (*Abstract Co-Author*) Nothing to Disclose
Paola Ravenda, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Paolo Della Vigna, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Lorenzo Monfardini, Brescia, Italy (*Abstract Co-Author*) Nothing to Disclose
Guido Bonomo, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Franco Orsi, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Primary endpoints of the study were the evaluation of the safety of the drug-eluting microspheres loaded with Irinotecan and the liver control rate at three months in patients with colorectal liver metastases. Secondary endpoints were the liver control rate at 6 and 12 months, time to progression and overall survival.

METHOD AND MATERIALS

18 patients with colorectal liver or liver-dominant disease (11 M, 7 F, mean age 62 years, range 47-79) were prospectively enrolled between November 2013 and February 2015. Main characteristics: all patients received > 2 prior lines of systemic therapy (containing Fluoropyrimidines/Oxaliplatin and Irinotecan), 13 were treated with liver surgery or ablation, 14 had extra-hepatic spread at the time of first embolization, 11 had liver bilobar involvement disease with a mean of 9 (range 1-30) hepatic metastases and with mean diameter of 47.6 mm (range 12-161 mm). The study procedure was performed by using 40mm microparticles loaded with 100 mg of Irinotecan and recycled every 4 weeks, at least twice per each lobe and repeated up to

disease progression. Adverse events (AEs) were evaluated according to the NIH-CTC V 4.0 criteria. Response to treatment was evaluated according to RECIST 1.1criteria. Estimated median for time to local tumor progression was calculated using Kaplan-Meyer analysis

RESULTS

Overall, 69 treatments were performed (mean of 3.8/patient, range 2-9);G1/G2 AEs occurred in 42/69 (60.8) procedures while G3, G4 or G5 complications did not occurred.Liver tumor control was achieved in 14/18 (77.8%) patients at 3 months and in 10/18 (55.6%) patients at 6 months. Median time to liver progression was 7 months.

CONCLUSION

Drug-eluting microspheres loaded with Irinotecan are safe and effective in treatment of patients affected by colorectal cancer with predominant hepatic involvement unresponsive to standard therapies.

CLINICAL RELEVANCE/APPLICATION

drug-eluting microspheres loaded with Irinotecan represent a safe and effective option for treating patients with colorectal liver metastases that could be tested in a larger series and early clinical setting.

VSIO51-08 Embolotherapy for CRLM

Thursday, Dec. 1 3:05PM - 3:20PM Room: S405AB

Participants
Michael C. Soulen, MD, Philadelphia, PA, (michael.soulen@uphs.upenn.edu) (*Presenter*) Royalties, Cambridge University Press; Consultant, Guerbet SA; Research support, Guerbet SA; Consultant, BTG International Ltd; Research support, BTG International Ltd; Consultant, Merit Medical Systems, Inc; Speaker, Sirtex Medical Ltd; Consultant, Terumo Corporation; Consultant, Bayer AG

LEARNING OBJECTIVES

1) Learn to select appropriate patients with metastatic colorectal cancer for liver directed therapies. 2) Understand the data for conventional and drug-eluting chemoembolization for treatment of mCRC.

ABSTRACT

VSIO51-09 Detectability of Liver Metastases by Dual Phase Cone-Beam Computed Tomography during Liver-directed Liver Interventions: Comparison with Conventional Contrast-enhanced Computed Tomography

Thursday, Dec. 1 3:20PM - 3:30PM Room: S405AB

Participants
Geert Maleux, MD, PhD, Leuven, Belgium (*Presenter*) Nothing to Disclose
Maria-Louisa Izamis, Best, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Cedric Werbrouck, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Alessandro G. Radaelli, PHD, MS, Best, Netherlands (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Vincent R. Vandecaveye, MD, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the diagnostic performance of intra-arterial dual phase cone-beam computed tomography (DP-CBCT) and contrast-enhanced computed tomography (CE-CT) in accurately characterizing tumor burden in patients with metastatic liver cancer.

METHOD AND MATERIALS

This retrospective study included patients with liver metastases, referred for catheter-directed liver intervention. Demographic and radiological data were gathered, including type of tumor, number, maximum size, type and degree of contrast enhancement of liver metastases.

RESULTS

29 patients with colorectal (n=10), breast (n=9) and neuroendocrine (n=10) liver metastases were included. DP-CBCT and CE-CT were in agreement on number and distribution of liver metastases in 18 out of 29 patients (62%). In 9 out of 11 patients DP-CBCT and CE-CT identified a mean of 7.2 and 10 metastases, respectively (P=0.025). In 2 out of 11 patients DP-CBCT identified less (n=1) or more (n=1) metastases than CE-CT. Metastases were larger in diameter on DP-CBCT than on CE-CT regardless of origin: colorectal: 57 +/- 9.5 mm vs 43 +/- 8.3 mm, P=0.02; breast: 57 +/- 10 mm vs 43 +/- 8.5 mm, P=0.03 and neuroendocrine: 56 +/- 6.3 mm vs 51 +/- 5.8 mm, P= 0.01. In colorectal metastases, rim enhancement appeared in 100% of cases on DP-CBCT, but was variable on CE-CT. In breast metastases, DP-CBCT displayed thick, hyper-dense rims while CE-CT did not, or had rims of variable thickness and density. Neuroendocrine tumors had variable rim enhancement within the same patient and differed between DP-CBCT and CE-CT in 40% of patients.

CONCLUSION

DP-CBCT appears to identify the vast majority of liver metastases, demonstrates a larger diameter and a peripherally enhancing tumoral rim compared to CE-CT; in more than 30% of patients, DP-CBCT identified more tumors than CE-CT. DP-CBCT provides additional information to CE-CT that may impact treatment decisions and dosimetry for catheter-directed liver interventions.

CLINICAL RELEVANCE/APPLICATION

DP-CBCT provides additional information, including number, diameter and pattern of contrast enhancement of liver metastases, to CE-CT which may impact treatment decisions for catheter-directed liver interventions.

VSIO51-10 Y-90 for CRLM

Thursday, Dec. 1 3:30PM - 3:45PM Room: S405AB

Participants
Robert J. Lewandowski, MD, Chicago, IL, (r-lewandowski@northwestern.edu) (*Presenter*) Advisory Board, BTG International Ltd; Advisory Board, Boston Scientific Corporation; Consultant, Cook Group Incorporated; Consultant, ABK Medical Inc

LEARNING OBJECTIVES

1) Learn the evidence for radioembolization in patients with mCRC (salvage setting). 2) Learn the evidence for radioembolization in patients with mCRC (combined with systemic therapy). 3) Discuss optimal timing of radioembolization in patients with mCRC.

VSIO51-11 Differences between Hepatic Distribution of Tc99m MAA and Y-90 Microspheres Could Complicate 3D Image Based Dosimetry

Thursday, Dec. 1 3:45PM - 3:55PM Room: S405AB

Participants
Julien S. Wonderlick, MD, Burlington, VT (*Presenter*) Nothing to Disclose
Christopher A. Ford, MD, Burlington, VT (*Abstract Co-Author*) Nothing to Disclose
Sean Reynolds, MD, Burlington, VT (*Abstract Co-Author*) Nothing to Disclose
Joseph T. Shields, MD, Burlington, VT (*Abstract Co-Author*) Nothing to Disclose
Anant D. Bhave, MD, Richmond, VT (*Abstract Co-Author*) Nothing to Disclose
Marleen Moore, MS, Burlington, VT (*Abstract Co-Author*) Nothing to Disclose
Janusz K. Kikut, MD, Burlington, VT (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Selective internal radiation therapy is radioembolization of malignant tumors in the liver with microspheres carrying Y90. 2 products (SIR-Spheres and TheraSpheres) are approved for use in the USA. Prior to injection of either product, treatment planning scintigraphy is performed by selective arterial injection of Tc99m MAA. MAA distribution is taken into account for dose calculations with a goal of delivering a minimum of 100 Gy to the tumor. There is extensive literature on predictive dosimetry based on the pre-treatment scan. However, such calculations are only valid if the MAA scan is highly predictive of the distribution of SIRT particles post-embolization. A semi-quantitative scale was used to compare the pre-treatment MAA scan to the post-treatment Bremsstrahlung scan in 30 SIRT cases to determine how well the MAA-planned target volume approximated the Treated Liver Volume on Bremsstrahlung SPECT.

METHOD AND MATERIALS

Consecutive 17 SIRsphere (1 HCC,12 colon, 4 carcinoid) and 13 TheraSphere treatments (12 HCC, 1 neuroendocrine) were reviewed from 2012 to present. Comparison of MAA distribution in the liver vs.Y90 TheraSphere and Y90 SIRSphere was done based on the following score:0: TLV-Y90 matches PTV-MAA and are isogenous
1: TLV-Y90 matches PTV-MAA with varying pattern of internal heterogeneity
2: TLV-Y90 smaller than PTV-MAA
3: TLV-Y90 larger than PTV-MAA

RESULTS

MAA and Y90 microsphere distribution matched in 7 (53%) Theraspheres and 2 (12.5%) SIRspheres treatments. In 6 (47%) Theraspheres and 10 (62.5%) SIRspheres treatments the treated volume matched MAA but the implanted Y90 microspheres demonstrated a different pattern of distribution within the volume. In 4 (25%) SIRspheres treatments the treated volume was different from the pretreatment MAA scan.

CONCLUSION

Differences in particle number and injection technique are likely culprits for hepatic distribution of implanted Y90 Theraspheres and SIRspheres inconsistently matching the pretreatment MAA scan. This study supports recommendations for post-treatment imaging with both products and calls into question routine use of MAA Quantitative SPECT scans for voxel by voxel based dosimetry, particularly for SIRspheres.

CLINICAL RELEVANCE/APPLICATION

Significant disagreement between pretreatment MAA and post-treatment Bremsstrahlung scan can lead to less than optimal Y-90 dose for radioembolization.

VSIO51-12 Question and Answer

Thursday, Dec. 1 3:55PM - 4:10PM Room: S405AB

Participants
William S. Rilling, MD, Milwaukee, WI (*Presenter*) Research support, B. Braun Melsungen AG; Research support, Sirtex Medical Ltd; Research support, Siemens AG; Consultant, B. Braun Melsungen AG; Consultant, Cook Group Incorporated ; Consultant, Terumo Corporation; Advisory Board, Terumo Corporation
Sarah B. White, MD,MS, Philadelphia, PA, (sbwhite@mcw.edu) (*Presenter*) Research support, Guerbet SA; Research support, Siemens AG; Consultant, Guerbet SA; Consultant, IO Rad
Emily Bergsland, MD, San Francisco, CA (*Presenter*) Institutional research support, Lexicon Pharmaceuticals, Inc; Institutional research support, Merck & Co, Inc; Institutional research support, Novartis AG; Consultant, Ipsen SA; Consultant, Lexicon Pharmaceuticals, Inc;
David C. Madoff, MD, New York, NY (*Presenter*) Advisory Board, RenovoRx
T. Clark Gamblin, MD, MS, Milwaukee, WI (*Presenter*) Nothing to Disclose
Mary U. Feng, MD, San Francisco, CA (*Presenter*) Nothing to Disclose
Paul B. Shyn, MD, Boston, MA (*Presenter*) Research Consultant, Galil Medical Ltd; Research Grant, Siemens AG
Michael C. Soulen, MD, Philadelphia, PA, (michael.soulen@uphs.upenn.edu) (*Presenter*) Royalties, Cambridge University Press; Consultant, Guerbet SA; Research support, Guerbet SA; Consultant, BTG International Ltd; Research support, BTG International

Ltd; Consultant, Merit Medical Systems, Inc; Speaker, Sirtex Medical Ltd; Consultant, Terumo Corporation; Consultant, Bayer AG
Robert J. Lewandowski, MD, Chicago, IL, (r-lewandowski@northwestern.edu) (*Presenter*) Advisory Board, BTG International Ltd; Advisory Board, Boston Scientific Corporation; Consultant, Cook Group Incorporated; Consultant, ABK Medical Inc

LEARNING OBJECTIVES

1) Discuss real-word cases as part of a multi-discipline team. 2) Understand importance of a multi-discipline approach to cancer care.

VSIO51-13 Setting the Stage mNET

Thursday, Dec. 1 4:10PM - 4:25PM Room: S405AB

Participants
Emily Bergsland, MD, San Francisco, CA (*Presenter*) Institutional research support, Lexicon Pharmaceuticals, Inc; Institutional research support, Merck & Co, Inc; Institutional research support, Novartis AG; Consultant, Ipsen SA; Consultant, Lexicon Pharmaceuticals, Inc;

LEARNING OBJECTIVES

1) Review the epidemiology and classification of gastroenteropancreatic neuroendocrine tumors (GEPNETS). 2) Discuss the role of somatostatin analogs for the treatment of GEPNETS. 3) Summarize the current systemic treatment options for metastatic GEPNETs. 4) Examine commonly applied treatment algorithms/guidelines for advanced GEPNETS.

ABSTRACT

VSIO51-14 Aggressive Surgical Management in mNET

Thursday, Dec. 1 4:25PM - 4:40PM Room: S405AB

Participants
T. Clark Gamblin, MD, MS, Milwaukee, WI (*Presenter*) Nothing to Disclose

VSIO51-15 Intra-arterial Therapies of GEP-NET

Thursday, Dec. 1 4:40PM - 4:55PM Room: S405AB

Participants
William S. Rilling, MD, Milwaukee, WI (*Presenter*) Research support, B. Braun Melsungen AG; Research support, Sirtex Medical Ltd; Research support, Siemens AG; Consultant, B. Braun Melsungen AG; Consultant, Cook Group Incorporated ; Consultant, Terumo Corporation; Advisory Board, Terumo Corporation

VSIO51-16 Comparing cTACE, DEB-TACE and 90Yttrium Radioembolization as Treatment Options for Patients with Neuroendocrine Tumor Liver Metastases

Thursday, Dec. 1 4:55PM - 5:05PM Room: S405AB

Participants
Duc Do Minh, BSc, Berlin, Germany (*Presenter*) Nothing to Disclose
Julius Chapiro, MD, New Haven, CT (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV
Boris Gorodetski, MD, Berlin, Germany (*Abstract Co-Author*) Nothing to Disclose
Susanne Smolka, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Qiang Huang, Hangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Cuihong Liu, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
David Wainstejn, Berlin, Germany (*Abstract Co-Author*) Nothing to Disclose
Ming De Lin, PhD, Cambridge, MA (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Lynn J. Savic, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Todd Schlachter, MD, Farmington, CT (*Abstract Co-Author*) Nothing to Disclose
Bernhard Gebauer, MD, Berlin, Germany (*Abstract Co-Author*) Research Consultant, C. R. Bard, Inc ; Research Consultant, Sirtex Medical Ltd; Research Grant, C. R. Bard, Inc; Research Consultant, PAREXEL International Corporation; Travel support, AngioDynamics , Inc
Jean-Francois H. Geschwind, MD, Westport, CT (*Abstract Co-Author*) Consultant, BTG International Ltd; Consultant, Bayer AG; Consultant, Guerbet SA; Consultant, Sterigenics International LLC; Consultant, Koninklijke Philips NV; Consultant, Jennerex Biotherapeutics, Inc; Grant, BTG International Ltd; Grant, Bayer AG; Grant, Koninklijke Philips NV; Grant, Sterigenics International LLC; Grant, Threshold Pharmaceuticals, Inc; Grant, Guerbet SA; Founder and CEO, PreScience Labs, LLC

PURPOSE

To compare efficacy, survival outcomes and identify prognostic factors of conventional transarterial chemoembolization (cTACE), drug-eluting beads TACE (DEB-TACE), and 90Yttrium-radioembolization (Y90) for the treatment of gastro-entero-pancreatic (GEP) neuroendocrine tumor liver metastases (NELMs).

METHOD AND MATERIALS

This retrospective single center-study included 192 patients (58.6 years mean age, 56% men) with NELM of known GEP origin treated with cTACE (N=122), DEB-TACE (N=26), or Y90 (N=44) between 2000 and 2014. Follow-up imaging studies were compared with baseline imaging to determine the radiologic response. Median overall survival (OS) and hepatic progression-free survival (HPFS) were evaluated. Propensity score analysis (PSA) was performed to minimize selection bias. Survival analysis was calculated using the PS-adjusted Kaplan-Meier method with the PS-adjusted log-rank test and the uni- and multivariate (MVA) Cox proportional hazards model.

RESULTS

Median OS and HPFS were 28.8 and 18.1 months for entire study group, 34.0 and 20.1 months after cTACE, 23.6 and 12.4 months after Y90, 21.7 and 13.3 months after DEB-TACE treatment, respectively. In PSA, cTACE demonstrated significant prolonged

median OS compared to Y90 (p=0.035) but not compared to DEB-TACE (p=0.198). Five-year survival time after first intra-arterial treatment (IAT) for cTACE, DEB-TACE and Y90 were 28.2%, 10.3% and 18.5%, respectively. No significant differences in HPFS were seen among evaluated IAT. MVA of the entire study cohort identified extra-hepatic metastasis (HR, 1.63, p<0.01) and tumor burden >50% (HR, 1.93, p<0.01) as predictive for reduced OS whereas 3≥ embolization sessions were related to prolonged OS (HR, 0.59, p<0.05). Among all IAT options the response rates (RR) and the incidence of adverse effects were not significantly different. In MVA, DEB-TACE corresponded with improved RR compared to cTACE (OR, 1.2, p=0.04).

CONCLUSION

Due to significantly improved OS cTACE revealed to be the preferable IAT option compared to Y90. DEB-TACE vs. cTACE and DEB-TACE vs. Y90 appeared equally effective according to OS. Prospective studies are warranted to determined the optimal IAT option for patients with unresectable NELM.

CLINICAL RELEVANCE/APPLICATION

NELM decreases OS dramatically. IAT appealed as an indispensable mainstay in palliative treatment of unresectable NELM to increase OS. Thus, choice of IAT with greatest improved OS still needs to be investigated.

VSIO51-17 Theranostic Approaches to the Management of Neuroendocrine Tumors

Thursday, Dec. 1 5:05PM - 5:20PM Room: S405AB

Participants
Neeta Pandit-Taskar, MD, New York, NY (*Presenter*) Nothing to Disclose

VSIO51-18 Impact of Experience on Oncologic and Quality Outcomes of Hepatic Artery Embolization for Metastatic Neuroendocrine Tumors

Thursday, Dec. 1 5:20PM - 5:30PM Room: S405AB

Participants
Adrian J. Gonzalez, MD, New York, NY (*Presenter*) Nothing to Disclose
Hooman Yarmohammadi, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Franz E. Boas, MD,PhD, New York, NY (*Abstract Co-Author*) Co-founder, ClariPACS
George I. Getrajdman, MD, New York, NY (*Abstract Co-Author*) Medical Advisory Board, CareFusion Corporation
Etay Ziv, MD, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Joseph P. Erinjeri, MD, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Stephen B. Solomon, MD, New York, NY (*Abstract Co-Author*) Research Grant, General Electric Company
Majid Maybody, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of this study was to evaluate the oncologic and quality outcomes of hepatic artery embolization (HAE) based on the years of experience (YOE) of the operator in patients with liver metastasis from neuroendocrine tumors (NET)

METHOD AND MATERIALS

We collected data on patients with metastatic NET to the liver that underwent HAE from 01/01/2012 to 01/31/2015. Only patients whose treatments were performed by a single operator were included.Demographics, tumor characteristics, % of liver involvement, presence of extrahepatic disease, non-locoregional treatment as well as technical aspects of embolization and complications were captured.YOE was measured in years after completion of IR Fellowship and date of first HAE for each patient. Patients were assigned to one of five groups depending on the years of operator's experience : G1) <5 YOE, G2) 5-10 YOE, G3) 10-15 YOE, G4) 15 to 20 YOE and G5) > 20 YOE.Means were compared using Students T. X2 was used for categorical variables. Kaplan Meier curves and Mantel-Cox statistics were used for TLTP and OS.

RESULTS

91 patients were included. G1, 14 patients; G2, 17 patients; G3, 27 patients; G4, 3 patients; G5, 30 patients.There were no significant differences between groups in terms of demographics, tumor grade, primary site, % of liver involvement, presence of extrahepatic disease and non-locoregional treatments. On technical aspects of embolization G5 used more vials (mean 3.7 vs. G1=2.9, G2=2.1, G3=2.2 and G4= 2.1) of embolization material than the rest (p=0.002). There were no differences on major post HAE complications.OS (days) grouped by YOE was 1786(95%CI: 1139 - 2432) for G1 , 1097(95%CI: 677 - 1516) for G2 , 1893(95%CI: 1534 - 2252) for G3 , 813 (95%CI: 670 - 955) for G4 and 1585 (95%CI: 1160 - 2010) for G5; p = 0.310.TLP(days) grouped by YOE was 372 (95%CI: 238 - 506) for G1, 625(95%CI: 411 - 839) for G2 , 557(95%CI: 354 - 760) for G3 , 440(95%CI: 269 - 968) for G4 and 605 (95%CI: 474 - 736) for G5; p = 0.226.

CONCLUSION

Based on analysis of this population composed of patients with metastatic NET efficiency of treatment, as measured by OS and TTLP was similar for all experience groups indicating no learning curve effect. Additionally, complication rates were similar between different experience groups.

CLINICAL RELEVANCE/APPLICATION

HAE can be performed safely and with similar oncologic and quality outcomes by all experience groups

VSIO51-19 Emerging Data for Embolotherapy of 'other' Metastases

Thursday, Dec. 1 5:30PM - 5:45PM Room: S405AB

Participants
Rajesh P. Shah, MD, Stanford, CA (*Presenter*) Research support, Merit Medical Systems, Inc

LEARNING OBJECTIVES

1.) Describe the different intra-arterial treatments options available for metastatic disease to the liver. 2) Develop an understanding

of which intra-arterial treatment options are best for various different non-colorectal/neuroendocrine metastases to the liver based on available evidence.

VSIO51-20 Question and Answer

Thursday, Dec. 1 5:45PM - 6:00PM Room: S405AB

Participants
William S. Rilling, MD, Milwaukee, WI (*Presenter*) Research support, B. Braun Melsungen AG; Research support, Sirtex Medical Ltd; Research support, Siemens AG; Consultant, B. Braun Melsungen AG; Consultant, Cook Group Incorporated ; Consultant, Terumo Corporation; Advisory Board, Terumo Corporation
Sarah B. White, MD,MS, Philadelphia, PA, (sbwhite@mcw.edu) (*Presenter*) Research support, Guerbet SA; Research support, Siemens AG; Consultant, Guerbet SA; Consultant, IO Rad
Emily Bergsland, MD, San Francisco, CA (*Presenter*) Institutional research support, Lexicon Pharmaceuticals, Inc; Institutional research support, Merck & Co, Inc; Institutional research support, Novartis AG; Consultant, Ipsen SA; Consultant, Lexicon Pharmaceuticals, Inc;
T. Clark Gamblin, MD, MS, Milwaukee, WI (*Presenter*) Nothing to Disclose
Neeta Pandit-Taskar, MD, New York, NY (*Presenter*) Nothing to Disclose
Rajesh P. Shah, MD, Stanford, CA (*Presenter*) Research support, Merit Medical Systems, Inc

RCA54

3D Printing Hands-on with Open Source Software: Advanced Techniques (Hands-on)

Thursday, Dec. 1 2:30PM - 4:00PM Room: S401AB

IN

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

Participants
Michael W. Itagaki, MD, MBA, Seattle, WA (*Moderator*) Owner, Embodi3D, LLC
Beth A. Ripley, MD, PhD, Seattle, WA, (bar23@uw.edu) (*Presenter*) Nothing to Disclose
Tatiana Kelil, MD, Brookline, MA (*Presenter*) Nothing to Disclose
Anish Ghodadra, MD, Pittsburgh, PA, (aghodadramd@gmail.com) (*Presenter*) Nothing to Disclose
Hansol Kim, MD, Boston, MA (*Presenter*) Nothing to Disclose
Steve D. Pieper, PhD, Cambridge, MA (*Presenter*) CEO, Isomics, Inc; Employee, Isomics, Inc; Owner, Isomics, Inc; Research collaboration, Siemens AG; Research collaboration, Novartis AG; Consultant, Wright Medical Technology, Inc; Consultant, New Frontier Medical; Consultant, Harmonus; Consultant, Stryker Corporation; Research collaboration, gigmade;
Dmitry Levin, Seattle, WA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To learn advanced techniques for converting a medical imaging scan into a digital 3D printable model with free and open-source software. 2) To perform advanced customizations to the digital 3D printable model with free software prior to physical creation with a 3D printer.

ABSTRACT

"3D printing" refers to fabrication of a physical object from a digital file with layer-by-layer deposition instead of conventional machining, and allows for creation of complex geometries, including anatomical objects derived from medical scans. 3D printing is increasingly used in medicine for surgical planning, education, and device testing. This advanced hands-on course builds upon the introductory course given by the same faculty. It will teach the learner advanced segmentation techniques used to convert a standard Digital Imaging and Communications in Medicine (DICOM) data set from a medical scan into a 3D printable model. Advanced manipulation of the digital model in preparation for 3D printing will then be discussed. All software used will be free. Methods described will work with Windows, Macintosh, and Linux computers. The learner will be given access to comprehensive resources for self-study before and after the meeting, including an extensive training manual and online video tutorials.

RCB54

Learn Image Segmentation Basics with Hands-on Introduction to ITK-SNAP (Hands-on)

Thursday, Dec. 1 2:30PM - 4:00PM Room: S401CD

IN

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

Participants
Tessa S. Cook, MD, PhD, Philadelphia, PA, (tessa.cook@uphs.upenn.edu) (*Presenter*) Nothing to Disclose
Philip A. Cook, PhD, Philadelphia, PA, (cookpa@mail.med.upenn.edu) (*Presenter*) Nothing to Disclose
Joe C. Wildenberg, MD,PhD, Philadelphia, PA, (joe.wildenberg@gmail.com) (*Presenter*) Nothing to Disclose
Sean Novak, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Guido Gerig, Brooklyn, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To use a free interactive software tool ITK-SNAP to view and manipulate 3D medical image volumes such as multi-parametric MRI, CT and ultrasound.2) To label anatomical structures in medical images using a combination of manual and user-guided automatic segmentation tools.

ABSTRACT

Quantitative analysis of medical imaging data is increasinly relevant in a growing number of radiological applications. Almost invariably, such quantitative analysis requires some structures of interest (organs, tumors, lesions, etc.) to be labeled in the image. Labeling anatomical structures is a complex task, particularly when the imaging data is complex, such as in the case of multi-parametric MRI or fusion of different imaging modalities. ITK-SNAP is a free, open-source, and easy to use interactive software tool that allows users to view multiple image volumes of the same anatomy and label structures using information from all volumes concurrently. For example, ITK-SNAP allows users to label tumors (core, edema, necrosis) using a combination of T1-weighted, contrast-enhanced T2-weighted, T2-weighted and FLAIR MRI. ITK-SNAP provides easy to use user-guided automatic segmentation functionality rooted in statistical machine learning and deformable modeling algorithms, as well as built in tools for manual editing and correction of segmentations. ITK-SNAP runs on Windows, MacOS and Linux platforms. During this hands-on course, the participants will use ITK-SNAP to label organs and tumors in various imaging modalities. After completing the course, participants will be well equipped for performing quantitative analyses of medical image data using ITK-SNAP and other compatible free software tools.

Handout:Guido Gerig

http://abstract.rsna.org/uploads/2016/15003102/handout_exercises.pdf

RCC54

Informatics to Support Imaging 3.0: Unmet Needs, Approaches, and Achievements

Thursday, Dec. 1 2:30PM - 4:00PM Room: S501ABC

IN

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

Participants

Sub-Events

RCC54A Policy and Interpretation Clinical Decision Support to Promote Imaging 3.0

Participants
Giles W. Boland, MD, Boston, MA (*Presenter*) Principal, Radiology Consulting Group; Royalties, Reed Elsevier

RCC54B Annotated Image Mark-Up and Radiomics

Participants
Daniel L. Rubin, MD, MS, Stanford, CA, (daniel.l.rubin@stanford.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the role of image annotations in capuring essential information about images in radiomics. 2) To learn about standards for capturing image annotation information, particularly Annotation and Image Markup (AIM) and DICOM-SR. 3) To see example use cases for image annotation in enabling radiomics research and 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/

Daniel L. Rubin, MD, MS - 2012 Honored Educator
Daniel L. Rubin, MD, MS - 2013 Honored Educator

RCC54C Assisted Clinical Reasoning for Interpretation, Image Ordering, and Outcomes Reporting

Participants
Michael E. Zalis, MD, Boston, MA (*Presenter*) Co-founder, QPID Health Inc Chief Medical Officer, QPID Health Inc Stockholder, QPID Health Inc

SPDL51

RSNA Diagnosis Live™: Peds, IR, Potpourri

Thursday, Dec. 1 3:00PM - 4:00PM Room: E451B

IR PD

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

Participants

Paul J. Chang, MD, Chicago, IL (*Presenter*) Co-founder, Stentor/Koninklijke Philips NV; Researcher, Koninklijke Philips NV; Medical Advisory Board, lifeIMAGE Inc; Advisory Board, Bayer AG
Kate A. Feinstein, MD, Chicago, IL, (kfeinstein@radiology.bsd.uchicago.edu) (*Presenter*) Nothing to Disclose
Brian S. Funaki, MD, Riverside, IL (*Presenter*) Data Safety Monitoring Board, Novate Medical Ltd

LEARNING OBJECTIVES

1) The participant will be introduced to a series of radiology case studies via an interactive team game approach designed to encourage "active" consumption of educational content. 2) The participant will be able to use their mobile wireless device (tablet, phone, laptop) to electronically respond to various imaging case challenges; participants will be able to monitor their individual and team performance in real time. 3) The attendee will receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

SPSH51

Hot Topic Session: Personalized Screening for Breast Cancer

Thursday, Dec. 1 3:00PM - 4:00PM Room: S406B

BR

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

Participants

Sub-Events

SPSH51A Risk Assessment in Breast Imaging

Participants
Emily F. Conant, MD, Philadelphia, PA (*Presenter*) Consultant, Hologic, Inc; Consultant, Siemens AG

LEARNING OBJECTIVES

1) Describe the basics of breast cancer risk assessment. 2)Assess the potential impact of including imaging phenotypes to breast cancer risk assessment.

ABSTRACT

URL

SPSH51B Personalized Screening Paradigms - How Do We Incorporate New Technologies?

Participants
Phoebe E. Freer, MD, Salt Lake City, UT, (phoebe.freer@hsc.utah.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the medical evidence for supplementary screening techniques in high-risk patients. 2) Appraise and apply adjunctive screening paradigms including tomosynthesis, ultrasound, MRI, and emerging technologies to patients based on a patient's breast cancer risk factors. 3) Review the current state of density notification and legislation in the United States.

ABSTRACT

URL

SPSH51C Personalized Treatment of Breast Cancer

Participants
Fiona J. Gilbert, MD, Cambridge, United Kingdom, (fjg28@cam.ac.uk) (*Presenter*) Research Grant, GlaxoSmithKline plc; Research Grant, General Electric Company; Research Grant, Hologic, Inc

LEARNING OBJECTIVES

1. Describe the value of MRI and US in staging the breast and axilla 2. Understand monitoring response with morphological and functional MRI to predict and measure response (size, 2D and volume, DCE, DWI)3. Appreciate the contribution of FDG PET to predict and measure response4. Review the contribution of ER imaging and HER imaging in personalised treatment

SPSH52

Hot Topic Session: Dual Energy Chest CT: Ready for Prime Time?

Thursday, Dec. 1 3:00PM - 4:00PM Room: S402AB

CH CT

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

Participants

Sub-Events

SPSH52A Lung Parenchyma

Participants
Jonathan G. Goldin, MBChB, PhD, Los Angeles, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1. Understand how with use of recently developed dual-energy CT (DECT) techinque, the clinical utility of CT in the management of pulmonary diseases can be expanded.2. Understand how this technology provides novel insights into perfusion and ventilation not possible with conventional CT.3. Understand how use of virtual monochromatic imaging can lead to a new approach to pulmonary imaging.4. Be familiar with the protocols needed for the clinical application of DECT in the chest disease.

SPSH52B Oncology

Participants
Myrna C. Godoy, MD, PhD, Houston, TX, (mgodoy@mdanderson.org) (*Presenter*) Research Grant, Siemens AG

LEARNING OBJECTIVES

1) To review the basic physical principals of dual-energy CT (DECT). 2) To discuss novel applications of DECT in thoracic oncologic imaging.

ABSTRACT

Dual energy CT is a relatively new technique with the main advantage of increased iodine conspicuity (low kVP/kVe imaging) and possibility to obtain material specific imaging (material decomposition). The potential applications of DECT in thoracic oncology include: pulmonary nodule characterization for determination of malignancy, refinement of tumor staging, evaluation of mediastinal masses, evaluation of nodal disease, characterization of pleural disease, preoperative evaluation for prediction of pulmonary function following lung resection, radiotherapy planning, and assessment of tumor response to the therapy.

URL

SPSH52C Vascular

Participants
Moritz H. Albrecht, MD, Charleston, SC (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss dual-energy applications for imaging of pulmonary embolism. 2) Select suitable dual-energy CT image acquisition protocols. 3) Identify post-processing advantages for vascular imaging inherent to dual-energy CT.

SPSH53

Hot Topic Session: Radiation and Immune Therapies: Challenges in Evaluation of Treatment Response

Thursday, Dec. 1 3:00PM - 4:00PM Room: E353B

BQ RO

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

FDA Discussions may include off-label uses.

Participants

Sub-Events

SPSH53A Radiation and Immune Therapy

Participants
Marka R. Crittenden, MD, PhD, Portland, OR, (marka.crittenden@providence.org) (*Presenter*) Advisory Board, Regeneron Pharmaceuticals, Inc; Advisory Board, AstraZeneca PLC; Advisory Board, Pfizer Inc; Researcher, Jounce Therapeutics, Inc; Researcher, Rigel Pharmaceuticals, Inc; Researcher, Bristol-Myers Squibb Company

LEARNING OBJECTIVES

1) Describe the mechansims of synergy between radiation and the immune system. 2) Develop an understanding of how to combine radiation and immune therapy to enhance both local and sytemic responses.

ABSTRACT

That radiation therapy has the capacity to prime immune responses has gained traction in recent years. Various mechanisms of synergy between radiation and adaptive immune responses have been identified in preclinical studies. There are now multiple clinical studies attempting to integrate immunotherapy with RT to extend the effects beyond the primary tumor. However, in addition to these positive stimuli on immunity, RT also initiates suppressive mechanisms in the tumor, which relate to intrinsic processes associated with repair of damaged tissues. A greater understanding of the positive role which radiation plays on adaptive immunity and the negative feedback on inflammation that shuts down these immune responses is needed by radiation oncologists. This input from preclinical models is particularly relevant as we begin to integrate immunologic agents into clinical practice. This educational session will provide an introduction to radiation and immunotherapy broken down into radiation's impact on adaptive immunity and the negative feedback that radiation can cause in the tumor environment and on innate immune cells that may limit the efficacy of radiation combined with immunotherapy. In the process we will identify promising targets for clinical translation and extend the audiences understanding through checkpoint inhibitors and beyond.

URL

SPSH53B Radiation and Immune Therapy in CNS Tumors

Participants
Lia M. Halasz, MD, Seattle, WA, (lhalasz@uw.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the existing data on immunotherapy for treatment of primary and secondary brain tumors. 2) Learn about new areas of study and clinical trials. 3) Recognize challenges for response evaluation.

ABSTRACT

Response of primary and secondary brain tumors to immunotherapy has brought into question the dogma of the central nervous system as an immuno-priveleged site. In this educational session, we will review the clinical data for immunotherapy in the treatment of primary and secondary brain tumors, as well as existing clinical trials. We will also discuss the challenges in determining response and possible toxicities from combined immunotherapy and brain irradiation.

URL

SPSH53C Radiographic Imaging and Cancer Immune Therapy

Participants
Annick D. Van den Abbeele, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

ABSTRACT

URL

SPSH54

Hot Topic Session: Track and Treat - Advancements in Theranostics

Thursday, Dec. 1 3:00PM - 4:00PM Room: E352

MI

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

FDA Discussions may include off-label uses.

Participants
Andrei Iagaru, MD, Stanford, CA (*Moderator*) Research Grant, General Electric Company; Research Grant, Bayer AG; Research Grant, The Piramal Group
Matthias J. Eiber, MD, Muenchen, Germany (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explain the concept of theranostics to referring physicians and patients. 2) Identify current theranostic agents in use for various cancers. 3) Describe emerging theranostic agents and approaches for new cancer applications.

ABSTRACT

An important aspect of Nuclear Medicine is that the same core compound of the administered radiopharmaceutical can be labeled with both diagnostic radioisotopes and therapeutic radioisotopes, allowing for the detection and subsequent targeted treatment of lesions. This concept of theranostics, the combination of therapy and diagnostics, is the basis for new approaches to advanced molecular imaging and targeted radiotherapy for specific tumor biologies. Our session will provide and highlight several examples of current and emerging theranostic applications for various diseases. These applications include: (1) intra-arterial and radioembolization therapies for neuroendocrine tumors, (2) receptor-based therapies for neuroendocrine tumors, (3) novel PET imaging, radioguided surgical and endoradiotherapy approaches using prostate-specific membrane antigen (PSMA) ligands for prostate cancer, and (4) novel imaging and therapeutic approaches which target the chemokine receptor CXCR4.

Sub-Events

SPSH54A SIRT and Intra-arterial Treatment for NET

Participants
Ghassan El-Haddad, MD, Tampa, FL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

URL

SPSH54B NET Theranostics: From Past Present to Future Perfect

Participants
Lisa Bodei, MD, PhD, New York, NY (*Presenter*) Research Consultant, Ipsen SA; Research Consultant, Advanced Accelerator Applications SA

LEARNING OBJECTIVES

View learning objectives under main course title.

SPSH54C PSMA-theranostics - Radioguided Surgery and Radioligand Therapy

Participants
Matthias J. Eiber, MD, Muenchen, Germany (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

SPSH54D CXCR4 as a Promising Theranostic Target

Participants
Ken Herrmann, Essen, Germany, (ken.herrmann@uk-essen.de) (*Presenter*) Co-founder, SurgicEye GmbH; Stockholder, SurgicEye GmbH; Consultant, Sofie Biosciences; Consultant, Ipsen SA; Consultant, Siemens AG; Research Grant, Advanced Accelerator Applications SA; Research Grant, Ipsen SA

LEARNING OBJECTIVES

View learning objectives under main course title.

MSCA52

Case-based Review of Abdomen (An Interactive Session)

Thursday, Dec. 1 3:30PM - 5:00PM Room: S406A

GI ER

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

Participants
Julie H. Song, MD, Providence, RI (*Director*) Nothing to Disclose

Sub-Events

MSCA52A Imaging of Abdominal Trauma

Participants
Michael N. Patlas, MD, FRCPC, Hamilton, ON, (patlas@hhsc.ca) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss common mistakes in interpretation of cases of blunt and penetrating abdominal trauma. 2) Analyze factors leading to errors. 3) Discuss advantages of intraluminal contrast, delayed phase of imaging and multiplanar reconstructions for detection of traumatic injuries.

ABSTRACT

This case-based presentation will focus on uncommon abdominal blunt and penetrating traumatic injuries including bowel, pancreatic, biliary, adrenal, ureteric and vascular injuries. Misses and misinterpretations in the diagnosis of traumatic injuries on MDCT will be illustrated, based on lessons learned from Morbidity & Mortality Rounds. Optimised imaging protocols will be reviewed. Multimodality imaging evaluation of complications related to missed abdominal injuries will be discussed.

MSCA52B Imaging of the Acute Abdomen

Participants
Douglas S. Katz, MD, Mineola, NY, (dkatz@winthrop.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Demonstrate and review a series of challenging cases of CT of the acute abdomen and pelvis, in a case-based review session. 2) Review the differential diagnosis and potential pitfalls in the diagnosis of these entities. 3) Briefly review the further workup/management of these entities.

ABSTRACT

This presentation, in conjunction with several other speakers demonstrating case-based examples of various aspects of abdominal/pelvic imaging, will review a series of challenging CT cases of the acute abdomen and pelvis, with an emphasis on differential diagnosis and potential pitfalls. The literature of these entities - clinical and imaging - will be briefly reviewed, and the optimal management/further workup of these entities will be briefly discussed.

Honored Educators

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

Douglas S. Katz, MD - 2013 Honored Educator
Douglas S. Katz, MD - 2015 Honored Educator

MSCA52C Abdominal Pain in Pregnancy

Participants
Ana P. Lourenco, MD, Providence, RI, (alourenco@lifespan.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe a differential diagnosis for abdominal pain in pregnancy, as well as the best initial imaging study depending upon the leading differential diagnosis. 2) Recognize diagnostic findings across multiple modalities, including US, CT and MRI. 3) Explain some of the imaging pitfalls associated with each modality.

ABSTRACT

In this session, we will review the varied differential of abdominal pain in pregnancy, both gynecologic and non-gynecologic. Cases will be used to illustrate the imaging findings across multiple modalities, highlighting the importance of making the diagnosis at the first opportunity whenever possible.

MSCB52

Case-based Review of Breast (An Interactive Session)

Thursday, Dec. 1 3:30PM - 5:00PM Room: S100AB

BR

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

Participants
Janie M. Lee, MD, Bellevue, WA, (jmlee58@uw.edu) (*Director*) Research Grant, General Electric Company

LEARNING OBJECTIVES

1) Identify the appropriate application of multimodality breast imaging for routine screening, supplemental screening, and diagnostic indications. 2) Select appropriate methods for imaging-guided percutaneous breast biopsy and perform post-biopsy radiologic-pathologic correlation. 3) Calculate performance measure values for a breast imaging audit and compare with appropriate performance benchmarks.

ABSTRACT

Sub-Events

MSCB52A Breast Interventional Cases

Participants
Elissa R. Price, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under the main course title.

MSCB52B Radiologic - Pathologic Correlation

Participants
Heidi R. Umphrey, MD, Birmingham, AL (*Presenter*) Research Grant, General Electric Company; Research Grant, Koninklijke Philips NV

LEARNING OBJECTIVES

View learning objectives under the main course title.

MSCB52C Performance Measures

Participants
Bethany L. Niell, MD, Tampa, FL, (Bethany.niell@moffitt.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC701

Imaging of Pulmonary Fibrosis

Thursday, Dec. 1 4:30PM - 6:00PM Room: E450A

CH CT

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

FDA Discussions may include off-label uses.

Participants
David A. Lynch, MBBCh, Denver, CO (*Moderator*) 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

LEARNING OBJECTIVES

1) Understand the current clinical approach to diagnosis and management of pulmonary fibrosis. 2) Identify the major CT imaging features of the idiopathic interstitial pneumonias based on the revised ATS/ERS diagnostic criteria for IPF. 3) Differentiate idiopathic pulmonary fibrosis from nonspecific interstitial pneumonia and chronic hypersensitivity pneumonitis. 4) Identify important complications of IPF. 5) Recognize the clinical implications of early interstitial abnormalities identified in asymptomatic subjects. 6) Understand evolving role of quantitative CT in assessment of lung fibrosis.

ABSTRACT

Recent clinical trials in idiopathic pulmonary fibrosis (IPF) have resulted in approval of two new treatments for this condition. Given the central role of the radiologist in making the CT diagnosis of IPF, it is critical to understand the diagnostic criteria for this condition, as recently revised by the ATS/ERS, and to distinguish it from other fibrosing interstitial pneumonias including nonspecific interstitial pneumonia (NSIP), connective tissue disease related lung fibrosis (CVD-ILD), and chronic hypersensitivity pneumonitis (HP). Interstitial lung abnormalities on CT. The radiologist also has an important role in identifying complications of lung fibrosis including acute exacerbations and lung cancer. Substantial advances have been made in developing CT techniques for quantification of lung fibrosis, which correlate with clinical severity and with mortality.This course will begin with a discussion by an expert pulmonologist of the clinical approach to diagnosis of lung fibrosis. This will be followed by a description of the imaging features of the fibrosing interstitial pneumonias. The course will review evolving diagnostic criteria for UIP and provide guidance for dealing with asymptomatic early interstitial abnormalities identified on CT. The methodology, value and limitations of quantitative assessment methods will be discussed.

Sub-Events

RC701A Advances in Management of Pulmonary Fibrosis

Participants
Imre Noth, MD, Chicago, IL (*Presenter*) Speakers Bureau, Sumitomo Dainippon Pharma Co, Ltd; Speakers Bureau, F. Hoffmann-La Roche Ltd ; Speakers Bureau, Boehringer Ingelheim GmbH; Consultant, ImmuneWorks, Inc; Consultant, Gilead Sciences, Inc; Research Grant, F. Hoffmann-La Roche Ltd; Research Grant, Boehringer Ingelheim GmbH

LEARNING OBJECTIVES

View learning objectives under main course title.

RC701B Fibrosing Interstitial Pneumonia: How to Sort Out the IP´s

Participants
Justus E. Roos, MD, Durham, NC (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RC701C Critical Issues in Imaging of Idiopathic Pulmonary Fibrosis

Participants
David A. Lynch, MBBCh, Denver, CO (*Presenter*) 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

LEARNING OBJECTIVES

View learning objectives under main course title.

RC701D Quantification of Pulmonary Fibrosis

Participants
Joseph Jacob, MBBS, MRCP, London, United Kingdom, (joseph.jacob@nhs.net) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

RC702

Making Learning Stick

Thursday, Dec. 1 4:30PM - 6:00PM Room: S102AB

ED

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

Participants
Petra J. Lewis, MD, Lebanon, NH (*Moderator*) Book contract, Oxford University Press; Consultant, Siemens AG

ABSTRACT

Group ID: 20160068
ABSTRACT (OPTIONAL) Many didactic lectures induce a cognitive load in learners out of proportion to the content that they need to learn (or can learn) during that teaching session. This is due in part to the content, and in part to the way it is displayed or presented. By reducing the cognitive load on our audience, we can increase long term retention of information. This lecture briefly summarizes some of the science behind cognitive load as it relates to presentations, and identifies simple steps to reduce it while maximize learning.
Disclosures:
Petra Lewis Book contract, Oxford University Press Consultant, Siemens Medical B) Effective Course Design
N J McNulty, MD, Lebanon, NH
Disclosures:
Nancy McNulty Book contract, Oxford University Press

Sub-Events

RC702A Brain Friendly Teaching

Participants
Petra J. Lewis, MD, Lebanon, NH (*Presenter*) Book contract, Oxford University Press; Consultant, Siemens AG

LEARNING OBJECTIVES

1) Understand the concept of cognitive load. 2) Determine the factors that affect cognitive load. 3) Identify how Powerpoint or Keynote can inadvertently increase cognitive load. 4) Apply the concept of cognitive overload to revising or developing lectures.

ABSTRACT

Many didactic lectures induce a cognitive load in learners out of proportion to the content that they need to learn (or can learn) during that teaching session. This is due in part to the content, and in part to the way it is displayed or presented. By reducing the cognitive load on our audience, we can increase long term retention of information. This lecture briefly summarizes some of the science behind cognitive load as it relates to presentations, and identifies simple steps to reduce it while maximize learning.

URL

http://youtu.be/zbgWfVGG01o http://youtu.be/XuJA-UM4yzE

RC702B Effective Course Design

Participants
Nancy J. McNulty, MD, Lebanon, NH, (Nancy.J.McNulty@hitchcock.org) (*Presenter*) Book contract, Oxford University Press

LEARNING OBJECTIVES

Core Objective 1) Design a teaching session with Core and Supporting objectives leading to a measurable outcome.
Supporting Objectives 1) Describe the relationship between assessment, learning objectives, and instructional plan. 2) Differentiate between core and supporting objectives. 3) Explain the ideal sequencing to design a teaching session. 4) Summarize the purpose of learning objectives. 5) Draft session learning objectives using the nomenclature of Bloom's taxonomy.

RC703

Imaging Congenital Cardiac Abnormalities

Thursday, Dec. 1 4:30PM - 6:00PM Room: S402AB

CA

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

FDA Discussions may include off-label uses.

Participants
Dianna M. Bardo, MD, Phoenix, AZ, (dbardo@phoenixchildrens.com) (*Moderator*) Speaker, Koninklijke Philips NV; Consultant, Koninklijke Philips NV; Author, Thieme Medical Publishers, Inc

Sub-Events

RC703A Coronary Anomalies

Participants
Smita Patel, MBBS,FRCR, Ann Arbor, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To review the spectrum of congenital coronary artery anomalies. 2) To specially review the hemodynamically significant coronary artery anomalies. 3) To review specific features that have important surgical implications.

ABSTRACT

Coronary CTA has become the standard of reference for evaluation of coronary artery anomalies. CT exquisitely depicts the origin, course and termination of complex coronary artery anomalies because of its excellent spatial resolution. Most anomalies are incidentally detected, though some present with cardiac ischemia or even sudden death, particularly in young athletes. It is important to recognize these anomalies on not only the dedicated cardiac CTA studies, but also on routine chest CT's, as this can affect patient prognosis.This lecture will mainly focus on hemodynamically significant coronary artery anomalies such as the anomalous coronary artery from the opposite sinus of Valsalva with an interarterial or interarterial-intramural course, coronary artery fistulas and coronary artery origin from the pulmonary artery. For hemodynamically significant interarterial coronary artery anomalies, it is important to differenciate between the interarterial vs. interarterial-intramural coronary arteries as these have different surgical approaches.

RC703B Diagnosing Untreated Congenital Heart Disease

Participants
Shi-Joon Yoo, MD, Toronto, ON (*Presenter*) Owner, 3D HOPE Medical; CEO, IMIB-CHD;

LEARNING OBJECTIVES

1) Learn the roles of echocardiogrpahy, CT and MRI in the diagnosis of congenital heart diseases. 2) Learn the imaging findings that are important in decision making process of medical and surgical management of congenital heart diseases. 3) Be familiar with the prinicples and tips of 3D reconstruction of CT and MRI images for surgical planning of congenital heart diseases.

ABSTRACT

Echocardiography is the primary imaging modality in the diagnosis of congenital heart diseases. In complex forms of congential heart diseases, CT and MRI are required for better delineation of complicated anatomy and hemodynamics. Imaging findings should answer whether the pulmonary or systemic circulation is dependant on the patency of ductus arteriosus and whether to opt biventricular or univentricular repair. Imaging, postprocessing and image interpretation should then be tailored to facilitate the intended surgical procedures such as ventricular outflow reconstruction, intraventircular baffling, arterial switch, aortic arch reconstruction, etc. For surgical guidance, 3D reconstruction of the endocardial surface anatomy as well as conventional volume rendered cavitograms is very helpful. With computer aided design tools, surgical patches or baffles can be graphically designed for assessment of the result of the intended procedure in advance. 3D printing is also very helpful in sugical planning and training.

RC703C CT of Complex Congenital Cardiac Anomalies

Participants
Linda B. Haramati, MD, MS, Bronx, NY, (lharamati@gmail.com) (*Presenter*) Spouse, Board Member, Bio Protect Ltd; Spouse, Board Member, OrthoSpace Ltd; Spouse, Board Member, Kryon Systems Ltd

LEARNING OBJECTIVES

1) To recognize complex congenital heart disease on chest CT scans performed for other indications. 2) To tailor cardiac CT protocols and reconstructions to answer specific clinical questions for patients with treated congenital heart disease- specifically tetralogy of Fallot, Ebstein anomaly and transposition of the great arteries. 3) To provide information that guides therapy related to longstanding complications of congenital heart disease and its treatment .

ABSTRACT

Advances in treatment of congenital heart disease has resulted in prolonged survival of patietns with congenital heart disease. These patients present for imaging to radiologists with general chest complaints and for dedicated cardiac imaging to resolve specific clinical questions. This lecture will focus on three complex congenital heart disease diagnoses; tetralogy of Fallot, Ebstein anomaly and transposition of the great arteries.The chest CT findings of complex congenital heart disease should be recognized by

radiologists in practice. Adults with milder spectrum complex congenital heart disease may initially be diagnosed during adulthood. Those who have had successful childhood treatment often fall through the gaps in care during the transition from pediatric to adulthood. Proper recognition of these diagnoses is of great importance and radiologists who are not subspecialized in cardiac imaging have the opportunity to greatly contribute to the care of these patients.Additionally, cardiac CT is a good alternative to MRI in answering crucial questions that arise during clinical care and on echocardiography. Emphasis will be placed on indications for CT, technical tips to achieve diagnostic images and on demonstrating complications that require intervention.

RC703D Role of MRI in Adult CHD Management

Participants
Mini V. Pakkal, FRCR,MBBS, Toronto, ON, (mini.pakkal@uhn.ca) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1.To be familiar with the strengths and weaknesses of cardiac MRI in comparison with other imaging modalities such as echo, CT, conventional catheter angiogram2. To look at the role of MRI in four specific adult congenital heart diseases - tetralogy of Fallot, coarctation, d transposition.a. What to look for?b.Protocols as recommended by various guidelinesc. Frequency of examinations

ABSTRACT

AbstractDiagnosis and monitoring of adult congenital heart disease(ACHD) relates to 1. Monitoring post-surgical changes 2. For pre surgical planning3. For prognostication4. Late initial diagnosis of previously unsuspected ACHDTransthoracic echocardiography remains the first line imaging modality in ACHD but struggles with comprehensive anatomical coverage of extra cardiac structures, optimal assessment of the right sided cardiac chambers and tissue characterization. Cardiac MRI provides useful information regarding anatomy including that of extra cardiac vascular anatomy, functional assessment particularly of the right sided cardiac chambers and valves and tissue characterization without the use of ionizing radiation.This presentation will focus on the role of CMR in three ACHD most commonly encountered in practice - coarctation, tetralogy of Fallot and transposition of the great arteries

Active Handout:Mini Vithal Pakkal

http://abstract.rsna.org/uploads/2016/16001409/RC703D RSNA2016v3handout (1).pdf

RC704

Musculoskeletal Pain Management Injections

Thursday, Dec. 1 4:30PM - 6:00PM Room: S406B

MK CT IR MR

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

FDA Discussions may include off-label uses.

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

LEARNING OBJECTIVES

Sub-Events

RC704A Steroids and Anesthetics: Pick Your Poison

Participants
Peter J. MacMahon, MD, Dublin 7, Ireland, (pmacmahon@mater.ie) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the commonest corticosteroid preparations. 2) Examine the adverse effects associated with corticosteroids, highlighting severe neurological complications. 3) Appraise the various excipients (e.g. benzyl alcohol) used in corticosteroid formulations. 4) Assess the adverse effects associated with local anesthetics. 5) Explain the recent warnings and consensus statements relevant to spine injections.

ABSTRACT

RC704B Non-Spine Injections: Ultrasound Versus Fluoroscopy

Participants
Theodore T. Miller, MD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) The learner will be able to describe the advantages and disadvantages of ultrasound guided and fluoroscopically guided injections.

RC704C MR Spine: Intervention Correlation

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

LEARNING OBJECTIVES

1) Correlation of clincial symptoms with MR findings helps to differentiate active pain generators from nonpainful structural abnormalities. 2) Corticosteroid treatment success depends on whether symptoms result from inflammation, inflammation is reversible and drug reaches the inflamed tissue. 3) In the U.S., corticosteroid injection represents off-label usage because the FDA has not approved corticosteroids for epidural injection.

RC704D Spine Injections: Fluoroscopic Guidance

Participants
Humberto G. Rosas, MD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the advantages and disadvantages of fluoroscopically versus CT guided spine injections. 2) Describe practices that minimize radiation dose in physicians and patients during imaging-guided interventions.

RC704E Spine Injections: CT Guidance

Participants
Nicolas Amoretti, MD, Nice, France, (amorettinicolas@yahoo.fr) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Evaluate the usefulness of CT scan guidance, in applying existing infiltrations techniques to some innovative indications, allowed by the use of such an imaging guiding tool. 2) Evaluate the clinical effectiveness of these novel indications. 3) Emphasize on the importance of the clinical aspects of Interventional pain management. 4) Show that CT guidance is an added value to any procedures as it allows safe, precise , reproducible,accurate and effective needle placement in most procedures

ABSTRACT

RC704F Panel Discussion

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

RC705

Next-Generation Neuroradiology: Techniques & Applications

Thursday, Dec. 1 4:30PM - 6:00PM Room: E353C

NR MR

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

FDA Discussions may include off-label uses.

Participants
Srinivasan Mukundan, MD, PhD, Boston, MA (*Moderator*) Institutional research support, Siemens AG Institutional research support, Toshiba Corporation Consultant, Toshiba Corporation

LEARNING OBJECTIVES

1) Describe the 3 processes involved in the creation of brain MR elastograms. 2) Classify focal brain lesions based on their viscoelastic properties and brain adhesion measured by slip interface imaging. 3) Explain the future role of brain MR elastography in differentiating diffuse neurologic diseases including the common causes of dementia. 4) Understand the limitations of current diagnostic algorithms for intracranial vascular disease. 5) Understand the techniques, applications and value of intracranial vessel wall imaging. 6) Understand future directions of vessel wall imaging. 7) Understand recent developments in simultaneous MR/PET imaging of the brain. 8) Evaluate outstanding technical challenges, including MR attenuation correction, image-derived arterial input functions, and workflow. 9) Review the role of simultaneous MR/PET for common neurologic diseases, such as dementia, cerebrovascular disease, and tumors.

Sub-Events

RC705A MR Elastography: Palpating the Brain

Participants
John Huston III, MD, Rochester, MN, (jhuston@mayo.edu) (*Presenter*) Stockholder, Resoundant, Inc

LEARNING OBJECTIVES

1) Describe the 3 processes involved in the creation of brain MR elastograms. 2) Classify focal brain lesions based on their viscoelastic properties and brain adhesion measured by slip interface imaging. 3) Explain the future role of brain MR elastography in differentiating diffuse neurologic diseases including the common causes of dementia.

RC705B Intracranial Vessel Wall Imaging

Participants
Mahmud Mossa-Basha, MD, Seattle, WA, (mmossab@uw.edu) (*Presenter*) Institutional Research Grant, General Electric Company; Institutional Research Grant, Koninklijke Philips NV

LEARNING OBJECTIVES

1) Understand the limitations of current diagnostic algorithms for intracranial vascular disease. 2) Understand the techniques, applications and value of intracranial vessel wall imaging. 3) Understand future directions of vessel wall imaging.

ABSTRACT

RC705C MR/PET in the Brain

Participants
Greg Zaharchuk, MD, PhD, Stanford, CA, (gregz@stanford.edu) (*Presenter*) Research Grant, General Electric Company; Consultant, General Electric Company;

LEARNING OBJECTIVES

1) Understand recent developments in simultaneous MR/PET imaging of the brain. 2) Evaluate outstanding technical challenges, including MR attenuation correction, image-derived arterial input functions, and workflow. 3) Review the role of simultaneous MR/PET for common neurologic diseases, such as dementia, cerebrovascular disease, and tumors.

RC706

Head and Neck Top Five: Important Anatomy, Missed Diagnoses and Imaging Pearls

Thursday, Dec. 1 4:30PM - 6:00PM Room: E451B

HN NR

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

Participants

Sub-Events

RC706A Important Head and Neck Anatomy

Participants
Suresh K. Mukherji, MD, Northville, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the anatomy of five important areas of the extracranial head and neck. 2) Disuss their radiologic landmarks. 3) Explain thei clinical importance.

ABSTRACT

This presentation will discuss some of the complex anatomy of the head adn neck. Specifically, this presentation will review the anatomy of five important areas of the extracranial head and neck, disxuss their radiologic landmarks and explain their clinical importance.The atendee will gain a better understanding of these areas and will be able to provide more value in their reports.

RC706B Missed Diagnoses in the Head and Neck

Participants
Patricia A. Hudgins, MD, Atlanta, GA, (phudgin@emory.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Common diagnoses that are missed when interpreting CECT and MRI of the Head and Neck will be reviewed. 2) Why some lesions are often not detected by experienced radiologists will be discussed. 3) The need for clinical history is critical in Head and Neck Imaging, and incomplete knowledge of signs, symptoms, and physical exam findings greatly contribute to "missed" diagnoses. Examples will be presented.

ABSTRACT

It is widely acknowledge that Head and Neck Imaging is difficult. Even experienced radiologists may struggle with CT or MRI of H & N lesions. There are some tips that can help detect a subtle or even occult lesion, and these will be presented in this Course.There are some settings when the radiologist should clearly state, in the dictation, whether they did or did not have access to the clinical status of the patient. These too will be presented.

RC706C Head and Neck Imaging Pearls

Participants
Christine M. Glastonbury, MBBS, San Francisco, CA, (christine.glastonbury@ucsf.edu) (*Presenter*) Author with royalties, Reed Elsevier

LEARNING OBJECTIVES

1) To learn the key points that create a succinct imaging differential diagnosis while appreciating the 'big picture' in H&N imaging. 2) To recognize the imaging findings of critical disease and what to do or recommend next with your patient.

ABSTRACT

This session will review some important pearls in head and neck imaging. These tips and tricks will review some important aspects of imaging in the head and neck to help with protocoling studies, as well as techniques for imaging and interpretation. Important imaging differentials will also be reviewed and discussed.

RC707

Renal Cell Carcinoma: How Imaging Can Be Used to Select among Treatment Options and Monitor Response

Thursday, Dec. 1 4:30PM - 6:00PM Room: E352

GU

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

Participants

Erick M. Remer, MD, Cleveland, OH, (remere1@ccf.org) (*Coordinator*) Nothing to Disclose
Steven S. Raman, MD, Santa Monica, CA (*Presenter*) Nothing to Disclose
Raghunandan Vikram, MBBS, FRCR, Houston, TX (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) The attendee will learn how imaging can be used to predict renal tumor subtype and grade. 2) Imaging findings that guide renal tumor management toward percutaneous tumor ablation, partial, and radical nephrectomy will be described. 3) The use of imaging to evaluate patients after tumor ablation and nephrectomy will be reviewed. Assessment methods will be compared and complications will be illustrated. 4) Methods for assessing tumor response after chemotherapy such as RECIST, WHO, Choi / Modified Choi, and MASS criteria will be discussed with illustrative examples. Imaging appearances of post therapy complications will be reviewed.

ABSTRACT

Honored Educators

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

Raghunandan Vikram, MBBS, FRCR - 2012 Honored Educator

RC708

Imaging of the Extremities (An Interactive Session)

Thursday, Dec. 1 4:30PM - 6:00PM Room: E350

MK ER

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

Participants

Sub-Events

RC708A Shoulder

Participants
Manickam Kumaravel, MD, FRCR, Houston, TX, (manickam.kumaravel@uth.tmc.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize subtle injuries of the glenohumeral joint, acromioclavicular joint complex, coracoid, scapula and other less recognized injuries around the shoulder. 2) Understand the pathophysiology of shoulder injuries. 3) Learn to use cross-sectional imaging to better evaluate for clinically pertinent injuries. 4) Identify postoperative hardware in treated shoulder injuries. 5) Correlate the clinical significance of various types of injuries around the shoulder, so as to produce reports which will be relevant to the referring clinician.

ABSTRACT

RC708B Pelvis

Participants
Ken F. Linnau, MD, MS, Seattle, WA, (klinnau@uw.edu) (*Presenter*) Royalties, Cambridge University Press; Speaker, Siemens AG

LEARNING OBJECTIVES

1) Identify pelvic ring disruptions and acetabular fractures. 2) Examine emergency department radiographs and CT scans of the pelvis to detect and describe PRD and acetabular fractures. 3) Differentiate PRD associated with a high risk of major pelvic hemorrhage from less severe injuries in order to aide in efficient clinical decision making and patient triage to angiography. 4) Describe acetabular fractures in a way that allows efficient communication with consultants and aid in clinical decision making for treatment.

ABSTRACT

Injuries to the pelvic ring (pelvic ring disruption, PRD) and acetabulum are relatively uncommon. Accordingly, such injuries are often treated at tertiary care centers by highly specialized providers. On the other hand, such injuries are often detected on trauma bay radiographs in the Emergency Department. PRD and acetabular fractures tend to be complex and associated with substantial morbidity and mortality. Pelvic radiographs are common initial studies for detection of PRD and acetabular fractures, but tend to be insufficient for full characterization of them. As a result CT scanning is often performed to aid in treatment decision making and operative planning. The purpose of this interactive presentation is to highlight specific clinical features and settings of such injuries which mandate expedited clinical decision making while the patient is still in the emergency room.

Active Handout:Ken Floris Linnau

http://abstract.rsna.org/uploads/2016/16000649/RC708B RSNA 2016 Linnau pelvic trauma RC708.pdf

RC708C Ankle/Foot

Participants
Claire K. Sandstrom, MD, Seattle, WA, (cks13@uw.edu) (*Presenter*) Royalties, Cambridge University Press; Speaker, Siemens AG

LEARNING OBJECTIVES

1) Detect common clinically significant imaging abnormalities encountered in the foot and ankle in the emergency setting. 2) Detect subtle imaging abnormalities seen in the foot and ankle in the emergency setting. 3) Recommend appropriate follow up for various findings in the foot and ankle in the emergency setting.

ABSTRACT

RC708D Hand/Wrist

Participants
Jonathan A. Flug, MD, MBA, Denver, CO, (jonathan.flug@ucdenver.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Detect imaging abnormalities commonly seen in the hand and wrist in the emergency setting. 2) Identify commonly encountered hand and wrist pathology in the emergency setting. 3) Recommend appropriate follow up for various findings in the hand and wrist in the emergency setting.

ABSTRACT

Radiologists routinely encounter imaging of the hand and wrist in both the general and subspecialty radiology settings. Appropriate recognition of various types of injuries and pathology are crucial for accurate diagnosis and optimal patient care. This lecture will review the various types of pathology the radiologist may encounter in the hand and wrist with an explanation of injury mechanism and appropriate follow up care.

RC709

Advances in Abdominal CT

Thursday, Dec. 1 4:30PM - 6:00PM Room: N227B

GI CT

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

Participants

Sub-Events

RC709A Radiation Dose Reduction in CT

Participants
Amy K. Hara, MD, Scottsdale, AZ (*Presenter*) Royalties, General Electric Company;

LEARNING OBJECTIVES

1) Compare advantages and disadvanatages of various techniques to reduce radiation dose for abdominal CT. 2) Describe how iterative reconstruction techniques work and how they can improve image quality of low dose exams. 3) Develop a strategy to implement low dose techniques in clinical practice.

Active Handout:Amy Kiyo Hara

http://abstract.rsna.org/uploads/2016/15001880/RC709A.pdf

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/

Amy K. Hara, MD - 2015 Honored Educator

RC709B Intravenous Contrast Issues

Participants
Ramit Lamba, MD, Sacramento, CA, (rlamba@ucdavis.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the current status with respect to iodinated contrast medium induced acute kidney injury.2) Understand key concepts with respect to management of moderate and severe acute reactions to iodinated contrast medium.3) Understand key concepts with respect to reducing the volume of injected contrast for CT exams.

ABSTRACT

Active Handout:Ramit Lamba

http://abstract.rsna.org/uploads/2016/16001264/RC709B IV Contrast Issues_RSNA 2016.pdf

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/

Ramit Lamba, MD - 2014 Honored Educator

RC709C Dual Energy CT

Participants
Alvin C. Silva, MD, Scottsdale, AZ (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the basic principles and different approaches for Dual-Energy CT. 2) Review common Dual-Energy CT post-processing displays. 3) Describe strategies for implementing Dual-Energy CT in clinical practice.

ABSTRACT

RC709D Advances in Oncologic Imaging

Participants
Meghan G. Lubner, MD, Madison, WI (*Presenter*) Grant, Koninklijke Philips NV; Grant, Johnson & Johnson;

LEARNING OBJECTIVES

1) Briefly define established size-related oncologic response criteria used in CT. 2) Discuss application of volumetric assessment of tumor burden at diagnosis and in assessing response to therapy. 3) Briefly describe selected examples of response assessment criteria looking at other tumor imaging characteristics such as tumor attenuation or enhancement in addition to size. 4) Examine CT tumor texture analysis as an additional tool to evaluate tumor heterogeneity at baseline and during therapy.

ABSTRACT

Honored Educators

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

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

RC710

Second and Third Trimester Obstetrical Ultrasound

Thursday, Dec. 1 4:30PM - 6:00PM Room: E450B

GU OB US

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

Participants

Sub-Events

RC710A Multiple Gestations

Participants
Anne M. Kennedy, MD, Salt Lake City, UT, (anne.kennedy@hsc.utah.edu) (*Presenter*) Author with royalties, Reed Elsevier

LEARNING OBJECTIVES

1) Determine chorionicity in multiple pregnancies. 2) Recognize the complications of monochorionic placentation particularly twin twin transfusion syndrome, twin reversed arterial perfusion sequence and the consequences of demise of one twin. 3) Recognize discordant twin growth.

ABSTRACT

Active Handout:Anne M. Kennedy

http://abstract.rsna.org/uploads/2016/16000417/RC710A Mutliples RSNA 2016 6 on 1 (1).pdf

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/

Anne M. Kennedy, MD - 2016 Honored Educator

RC710B Fetal Central Nervous System: Strategies for Accurate Diagnosis

Participants
Roya Sohaey, MD, Portland, OR (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Develop an anatomic approach for evaluating the fetal brain at the time of mid-gestation anatomy scan. 2) Differentiate between significant and insignificant subtle findings when evaluating the fetal brain. 3) Develop an anatomy-based differential diagnosis for most brain anomalies. 4) Develop an understanding of which cases would benefit from fetal MR.

ABSTRACT

By the conclusion of this course, the participant will understand the strength of the current standard mid-gestational calvarial views for detecting subtle and obvious brain malformations. Additional scanning strategies are presented for more specific diagnoses once the anomaly is identified. When an accurate diagnosis is made, then the associations with genetic syndromes and other anomalies can be considered. Fetal MR is often additive and its benefits and limitations will be considered.

RC710C Placenta and Cervix

Participants
Sara M. Durfee, MD, Boston, MA, (sdurfee@partners.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the cause of vaginal bleeding in patients with placental abnormalities that include placenta previa and placental abruption. 2) Describe the sonographic features of placenta accreta. 3) Apply practical techniques to a standard transvaginal examination of the cervix in the risk assessment for preterm birth during pregnancy.

ABSTRACT

RC711

Head and Neck Cancer PET Interpretation with Case Examples (An Interactive Session)

Thursday, Dec. 1 4:30PM - 6:00PM Room: S505AB

HN NR CT NM OI

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

Participants

LEARNING OBJECTIVES

Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

Sub-Events

RC711A Practical Approach for Interpreting Head and Neck PET/CT

Participants
Rathan M. Subramaniam, MD, PhD, Dallas, TX (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the value of PET/CT in the care process of managing head and neck cancer. 2) To learn common pathways of tumor spread in head and neck. 3) To review illustrative cases and pitfalls of interpretation.

ABSTRACT

RC711B PET/CT for Head and Neck Cancer: Clinical Applications and Case Studies

Participants
Eric M. Rohren, MD, PhD, Houston, TX, (Eric.Rohren@bcm.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review head and neck anatomy and physiologic sites of FDG uptake. 2) Review the impact of FDG-PET/CT on the management of patients with head and neck malignancies.

ABSTRACT

FDG-PET/CT provides valuable information in the assessment of the patient with cancers of the head and neck. The metabolic information determined by FDG is complimentary and additive to the anatomic information from CT, and can be used to direct surgery, plan radiation therapy, and evaluate response to systemic or localized treatment. In this presentation, the role of FDG-PET/CT in the management of head and neck cancer will be presented, using case examples to illustrate the utility of PET as well as common pitfalls.

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/

Eric M. Rohren, MD, PhD - 2015 Honored Educator

RC711C The Head and Neck Surgeon's Perspective: What I Need to Know

Participants
Nishant Agrawal, MD, Chicago, IL, (nishant.agrawal@uchicago.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the indications of PET/CT in head and neck cancer. 2) Review the impact of PET/CT on staging in head and neck cancer. 3) Review the role of PET/CT in the evaluation of the unknown primary. 4) Review the role of post-treatment PET/CT.

ABSTRACT

RC712

Acute Abdominal Vascular Diseases (An Interactive Session)

Thursday, Dec. 1 4:30PM - 6:00PM Room: N229

GI VA ER

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

Participants
Dominik Fleischmann, MD, Palo Alto, CA, (d.fleischmann@stanford.edu) (*Moderator*) Research support, Siemens AG;

Handout:Dominik Fleischmann

http://abstract.rsna.org/uploads/2016/13012007/Fleischmann_RSNA2016_RC712_Aortic_Branch_Dissections_HANDOUT.pdf

Sub-Events

RC712A Aortic Branch Dissections

Participants
Dominik Fleischmann, MD, Palo Alto, CA (*Presenter*) Research support, Siemens AG;

LEARNING OBJECTIVES

1) Review the epidemiology of aortic side-branch dissections, which can occur as a complication of aortic dissection, or as isolated spontaneous dissections of the visceral or renal arteries. 2) Explain the pathophysiology of side branch malperfusion syndromes in aortic dissection. 3) Present the spectrum of imaging findings in spontaneous aortic branch dissections, including the differential diagnosis (vasculitis, connective tissue diseases, fibromuscular dysplasia, segmental arterial mediolysis).

ABSTRACT

Dissections of aortic side branches is a common complication of Type A and Type B acute aortic dissection which substantially increases mortality. It is important to understand the pathophysiology and the two principle mechanisms of side branch malferfusion in aortic dissection: flow obstruction can be due to (A) local abnormalities, such as occlusive dissection flaps, blind ending false lumen with true lumen occlusion ('windsock'), or frank thrombosis. Side-branch malperfusion may also occur due to (B) limited inflow: The classic situation is complete true lumen collapse in the upstream aorta, resulting in underperfusion of all downstream branches supplied by the true lumen. Wile local obstructions are most commonly treated by stent placement into the diseased side branch, inflow-lesions typically require surgical or endovascular repair of the upstream aorta.
Spontaneous dissections of the celiac, mesenteric, or renal arteries are relatively rare events, and typically present with acute abdominal or flank pain. Dissections of side branch arteries can lead to ischemic complications or to frank rupture with intra- or retroperitoneal hemorrhage. Patients presenting with mesenteric or renal artery dissection require a thorough workup to identify genetic disorders (notably Ehlers Danlos IV), inflammatory conditions (vasculitis), and other entities such as fibromuscular dysplasia and segmental arterial mediolysis (SAM). Imaging findings range from non-obstructive lesions such as intramural hematoma, double-barrel lumen, to partial or complete obstruction ('windsock'). Complications include rupture or ischemia. Spontaneous dissections may heal, or evolve into aortic branch aneurysms.

RC712B Symptomatic Aneurysms

Participants
Phillip M. Young, MD, Rochester, MN, (young.phillip@mayo.edu) (*Presenter*) Nothing to Disclose

ABSTRACT

Symptomatic aneurysms cover the spectrum of arterial aneurysms presenting with a) localized symptoms secondary to aneurysm expansion and possible rupture b) regional symptoms secondary to dissection and embolism and c) systemic cardiovascular dysfunction related to hypotension and organ dysfunction. Common clinical scenarios include aneurysm rupture – most commonly abdominal aortic, popliteal and abdominal visceral aneurysms as well as thoracoabdominal aortic dissection. Symptomatic aneurysms may also occur in patients with known arterial pathology including connective tissue disorders such as Marfan's and Ehlers-Danlos syndrome and Takayasu aortitis/arteritis. Patients with suspected rupture of abdominal aortic or ileofemoropopliteal artery aneurysms may initially be evaluated by sonography. However, in all circumstances, CT angiography due to its robust implementation and high-resolution imaging of the vasculature and regional anatomy that allows for planning of endovascular and surgical intervention is the preferred technique. CT Angiographic protocols appropriate to the suspected anatomic location of the aneurysm that provide an adequate roadmap for endovascular or surgical intervention are employed. Extended coverage is particularly important in patients with suspected thoracoabdominal aortic dissection or aneurysms associated with peripheral embolism. Cardiac gating should be utilized in any patient with a suspected type A aortic dissection or rupture of an ascending aortic aneurysm. Aortic, cardiac and coronary artery imaging are integral to the evaluation and management of these patients. A particular subset of the "symptomatic aneurysm" is post-trauma aortic disruption, usually thoracic in which diagnosis of traumatic aneurysm is critical and the aneurysm is associated with additional sites of soft tissue and skeletal trauma. Guidelines for endovascular or surgical intervention or non invasive management with serial CT Angiographic imaging will be discussed.

RC712C Mesenteric Ischemia

Participants
Iain D. Kirkpatrick, MD, Winnipeg, MB, (kirkpatrick_iain@hotmail.com) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the various categories of mesenteric ischemia (arterial occlusive, embolic, venous thrombotic, and nonocclusive), and

the pathophysiologic basis behind the imaging findings in each case. 2) Understand the basis behind modern CT protocols for mesenteric ischemia, particularly the biphasic examination with CT mesenteric angiography. 3) Demonstrate techniques to rapidly analyze a mesenteric CT angiographic dataset. 4) Review the CT signs of mesenteric ischemia and their sensitivity and specificity. 5) Evaluate the current literature on mesenteric ischemia and discuss optimal diagnostic criteria.

ABSTRACT

Acute mesenteric schema (AMI) is a life-threatening condition said to affect up to 1% of patients presenting with an acute abdomen, and it carries a mortality rate ranging between 59-93% in the published literature. Time to diagnosis and surgical treatment are the only factors which have been shown to improve mortality, and evidence shows that the clear test of choice for AMI is now biphasic CT. Water is preferably administered as a negative contrast agent, followed by CT mesenteric angiography and then a portal venous phase exam. Diagnostic accuracy is significantly improved by analysis of the CT angiogram for arterial stenoses or occlusions, evidence of emboli, or angiographic criteria of nonocclusive ischemia. It is the use of CT angiography in addition to routine portal phase imaging which has pushed the sensitivity and specificity of the test to >90% in recent published articles. Other nonangiographic CT findings that are relatively specific for AMI in the appropriate clinical setting include pneumatosis intestinalis, portal or mesenteric venous gas or thrombosis, and decreased bowel wall enhancement. Bowel wall thickening, mesenteric stranding, ascites, and mucosal hyperenhancement are more nonspecific findings which may also be seen. Nonocclusive schema may be the most difficult form to diagnose, and findings of shock abdomen can aid in identification. Knowledge of the patient's clinical history is critical not only for the selection of an appropriate study protocol but also for interpretation of the imaging findings in context.

RC712D Gastrointestinal Bleeding

Participants
Jorge A. Soto, MD, Boston, MA (*Presenter*) Royalties, Reed Elsevier

LEARNING OBJECTIVES

1) To review the appropriate implementation of CT angiography in the evaluation of patients presenting with acute lower intestinal bleeding. 2) To describe the technical details that are necessary for acquiring good quality CT angiography examinations. 3) Illustrate the characteristic CT angiographic findings of active or recent bleeding with specific examples of multiple etiologies.

ABSTRACT

Acute gastrointestinal bleeding is a serious condiition that may threaten a patient’s life depending on the severity and duration of the event. Precise identification of the location, source and cause of bleeding are the primary objectivse of the diagnostic evaluation. Implementation of colonoscopy in the emergency setting poses multiple challenges, especially the inability to adequately cleanse the colon and poor visualization owing to the presence of intraluminal blood clots. Scintigraphy with technetium 99m–labeled red blood cells is highly sensitive but also has some limitations, such as the inability to precisely localize the source of bleeding and determine its cause. Properly performed and interpreted CT angiography examinations offer logistical and diagnostic advantages in the detection of active hemorrhage. A three-phase examination (non-contrast, arterial and portal venous) is typically performed. Potential technical and interpretation pitfalls should be considered and will be explained. The information derived from CT angiography helps direct therapy and select the most appropriate hemostatic intervention (when necessary): endoscopic, angiographic, or surgical. Precise anatomic localization of the bleeding point also allows a targeted endovascular embolization. The high diagnostic performance of CT angiography makes this test a good alternative for the initial emergent evaluation of patients with acute lower intestinal bleeding.

Honored Educators

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

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

RC713

Pediatric Fetal (An Interactive Session)

Thursday, Dec. 1 4:30PM - 6:00PM Room: S404CD

GU OB PD

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

Participants

Sub-Events

RC713A Fetal Imaging - Looking Outside the Fetus

Participants
Maria A. Calvo-Garcia, MD, Cincinnati, OH, (maria.calvo@cchmc.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) List frequent or important extrafetal conditions potentially encountered during fetal MRI examinations. 2) Apply pattern-recognition guide of these processes during imaging interpretation.

ABSTRACT

An adequate evaluation of the pregnancy with fetal MRI will include not only assessment of the fetus. Major structures that will be analyzed and that could clearly affect the outcome of the pregnancy include the cervix, the placenta and the umbilical cord. In addition, congenital and acquired uterine and other maternal conditions could be encountered. Along the course of this presentation we will review extrafetal anatomic variants and pathologic conditions following a case-based format.

RC713B Fetal GU Imaging

Participants
Ann M. Johnson, MD, Philadelphia, PA, (johnsona@email.chop.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand MRI techniques to characterize complex GU abnormalities in the fetus. 2) Recognize patterns of abnormality to diagnose complex fetal GU abnormalites.

RC713C Fetal Chest Anomalies

Participants
Teresa Victoria, MD, PhD, Philadelphia, PA, (victoria@email.chop.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To discuss the most common fetal lung masses. 2) To identify imaging algorithms and patterns that can be helpful in reaching a diagnosis.

ABSTRACT

RC714

Transplant Interventions

Thursday, Dec. 1 4:30PM - 6:00PM Room: S105AB

GI IR

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

Participants
Brian S. Funaki, MD, Riverside, IL (*Moderator*) Data Safety Monitoring Board, Novate Medical Ltd
Ron C. Gaba, MD, Chicago, IL (*Moderator*) Research Grant, Guerbet SA; Research Grant, NeuWave Medical, Inc

LEARNING OBJECTIVES

1) To familiarize interventional radiologists with patient selection for interventions related to liver, kidney, and pancreas transplantation. 2) To review procedural technique for transplant-related interventions, including tips, tricks, and pitfalls. 3) To describe clinical outcomes of interventional therapies in the setting of organ transplantation.

ABSTRACT

Not applicable.

Sub-Events

RC714A Islet Cell Transplant

Participants
Ron C. Gaba, MD, Chicago, IL (*Presenter*) Research Grant, Guerbet SA; Research Grant, NeuWave Medical, Inc

LEARNING OBJECTIVES

View learning objectives under the main course title.

ABSTRACT

Not applicable.

RC714B Liver: Vascular

Participants
Bulent Arslan, MD, Chicago, IL (*Presenter*) Advisory Board, Nordion, Inc Advisory Board, Angiotech Pharmaceuticals, Inc Speakers Bureau, Nordion, Inc Speakers Bureau, W. L. Gore & Associates, Inc Consultant, Bayer AG

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC714C Liver: Nonvascular

Participants
Nicholas Fidelman, MD, San Francisco, CA (*Presenter*) Research Grant, BTG International Ltd

LEARNING OBJECTIVES

1) To provide an overview of current approaches to diagnosis and treatment of common non-vascular complications following liver transplantation including 1) Biliary stricture; 2) Bile duct leak; 3) Biloma.

ABSTRACT

RC714D Renal

Participants
Ryan P. Lokken, MD, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC715

Interventional Breast Procedures

Thursday, Dec. 1 4:30PM - 6:00PM Room: N228

BR DM

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

RC715A Sonographic Directed Breast Procedures-Optimizing the Patient Experience through Competency, Compassion, and Communication

Participants
Mary S. Soo, MD, Durham, NC, (mary.soo@duke.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Differentiate breast lesions amenable to sonographic directed breast biopsy from those requiring stereotactic guidance or surgical excision. 2) Assess and communicate procedure- and patient-related factors that will optimally prepare patients for sonographically-guided breast biopsy procedures. 3) Identify and apply biopsy techniques that enhance competency and contribute to safe, efficient and accurate sonographically-guided breast biopsies. 4) Critique their skills in providing clear and compassionate communication during biopsy recommendation and delivery of results.

RC715B Mammographic Directed Breast Biopsy: The Emerging Role of DBT Biopsy

Participants
Jules H. Sumkin, DO, Pittsburgh, PA (*Presenter*) Institutional research agreement, Hologic, Inc; Advisory Board, General Electric Company

LEARNING OBJECTIVES

1) Apply the techniques learned to be able to perform an upright DBT directed breast biopsy from a technical perspective. 2) Contrast the advantages and disadvantages of performing DBT directed biopsy Vs Prone Stereotactic biopsy. 3) Identify the types and location of lesions which are best suited for DBT biopsy Vs Prone Stereotactic biopsy. 4) Describe the impact of using DBT directed biopsy on breast center operations.

ABSTRACT

Similar to the need for MRI biopsy capability in a practice that performs breast MRIs, the need for tomosynthesis guided breast biopsies in a practice using tomosynthesis is inevitable as there are certain lesions seen only on tomosynthesis that would be impossible to biopsy utilizing 2D stereotactic guidance. Since the introduction of DBT directed biopsy several years ago it has become apparent that there are certain types and locations of lesions which are most ammenable to DBT directed biopsy Vs traditional prone stereotactic biopsy. This course will review the limited literature on this topic, describe how to perform a DBT directed biopsy, discuss which lesion types and locations are most ammenable to using this technique, and consider what the operational impact the technology has on the breast center.

RC715C The Pathology is Back: What Next?

Participants
Amy S. Campbell, MD, Washington, DC, (amy.s.campbell@gunet.georgetown.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify key information in the pathology report needed to differentiate benign, malignant and high-risk lesions. 2) Examine the process of determining radiologic and pathologic concordance. 3) Describe what constituters a discordant lesion and when to recommend repeat biopsy or surgical excision. 4) Define high-risk lesions and discuss management considerations. 5) Develop a strategy for critical evaluation of the pathology report in conjunction with imaging to render appropriate recommendations.

ABSTRACT

RC716

Service Excellence in Radiology (Sponsored by the RSNA Professionalism Committee) (An Interactive Session)

Thursday, Dec. 1 4:30PM - 6:00PM Room: E353A

LM PR

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

Participants
Kenneth A. Buckwalter, MD, Indianapolis, IN, (kbuckwal@iupui.edu) (*Moderator*) Research Grant, Siemens AG
Brent J. Wagner, MD, Reading, PA, (Brent.Wagner@readinghealth.org) (*Presenter*) Nothing to Disclose
Ella A. Kazerooni, MD, Ann Arbor, MI, (ellakaz@umich.edu) (*Presenter*) Nothing to Disclose
Brandon P. Brown, MD, MA, Indianapolis, IN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand who the customer is in Radiology and why customer satisfaction scores are important. 2) Review how Radiology can document the added value role it plays in the enterprise. 3) Discuss how to onboard new staff members successfully

ABSTRACT

ServiceExcellence in healthcare is used generally to refer to patient or customer satisfaction, and our ability to consistently meet if not exceed the expectations of patients, their families and visitors. It can be more widely expanded to include interactions among staff within a group, across groups or job descriptions or across departments. Inherently it is the concept that healthcare is more than just the technical act of delivering service, in radiology that would be the performance of a diagnostic test for example that hit high marks for classic quality metrics like image quality, radiation dose optimization and clarity and accuracy of the interpretation. Service excellence embraces the notion that healthcare must address the psyche, emotions and worries of those we care for, who come to us for service because they are ill and concerned about their health, the impact of disease on themselves and their families. It is about HOW we deliver the care too. From looking people in the eyes at check in, asking if there is anything else we can do for them, letting then know how they will get their test results, acknoweldging when we can do better without blame, and knowing when and how to say thank you. On a more tangible level, high marks for Service Excellence also translates into higher employee engagement, retention of staff and a drop in time and resources spent doing serivice recovery. Hiring for Service Excellence is important to having the right people in your organization, and sometimes letting those go who cannot live up to those expectations may be necessary to move forward. In the end, a committment to Service Excellence is not about an expensive program delivered by others to you to train to, it is about treating everyone with respect and both setting and often exceeding expectations. With higher patient satifaction scores comes retention of patients/customers, and word of mouth marketing that your program is THE destination for care now and in future.

Honored Educators

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

Ella A. Kazerooni, MD - 2014 Honored Educator

RC717

Emerging Technology: Hyperpolarized MRI - Opportunities and Challenges

Thursday, Dec. 1 4:30PM - 6:00PM Room: S504CD

MI MR

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

FDA Discussions may include off-label uses.

Participants
Daniel M. Spielman, PhD, Stanford, CA, (spielman@stanford.edu) (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the basic principles of hyperpolarized 13C MRS studies of human subjects. 2) Assess the potential of this technology to improve diagnosis and monitor therapy of prostate cancer, brain tumors, and cardiac pathologies.

ABSTRACT

Sub-Events

RC717A Imaging Metabolism using Hyperpolarized 13C MRS

Participants
Dirk Mayer, PhD, Baltimore, MD, (dmayer@som.umaryland.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the basic principles of hyperpolarization/dynamic nuclear polarization. 2) Define the unique challenges applying hyperpolarzed 13C MRS in vivo. 3) Identify the most appropriate acquisition strategies. 4) Compare molecular/metabolic imaging using PET vs hyperpolarized 13C MRS.

Handout:Dirk Mayer

http://abstract.rsna.org/uploads/2016/16001575/RSNA2016_DMayer_13C.pdf

RC717B Hyperpolarized 13C MRS of Prostate Cancer

Participants
Kayvan Keshari, PhD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Comprehend the basic principles of hyperpolarized MRS in the context of human prostate cancer. 2) Assess the potential of using this approach to stage prostate cancer aggressiveness as well as potential for response to therapy.

ABSTRACT

It has been well known that the metabolism of prostate cancer dramatically differs both from surrounding benign prostate as well as with grade. With hyperpolarized MRI as an emerging field, preclinical work has demonstrated that hyperpolarized pyruvate can play a potential role in the study of prostate cancer metabolism non-invasively. These studies have highlighted the use of pyruvate to study aggressiveness as well as response to therapy in the setting of prostate cancer. In this educational lecture, we will discuss the translation of hyperpolarized MRI to the clinic and its application in the setting of human prostate cancer.

RC717C Imaging Glioma with Hyperpolarized 13C-labeled Pyruvate

Participants
Sarah J. Nelson, PhD, San Francisco, CA (*Presenter*) Research Grant, General Electric Company; Research Grant, GlaxoSmithKline plc; Research Grant, Omniox

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC717D Cardiac Application of Hyperpolarized 13C MRS

Participants
Charles H. Cunningham, PhD, Toronto, ON (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under the main course title.

RC718

Imaging Cancer Treatment Complications: New Challenges (An Interactive Session)

Thursday, Dec. 1 4:30PM - 6:00PM Room: S103AB

CH GI MK OI

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

FDA Discussions may include off-label uses.

Participants

Sub-Events

RC718A Pulmonary Complications

Participants
Michelle S. Ginsberg, MD, New York, NY, (ginsberm@mskcc.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To recognize complications in the postoperative thoracic patient in both immediate and late periods. In the immediate period this will include lobar collapse, hemorrhage, pulmonary edema, pneumonia, as well as rarer complications such as bronchopleural fistula, chylothorax and lung torsion. In the later period it is important to follow these patients and to recognize and distinguishing recurrent tumor from treatment changes and new primary tumors.

ABSTRACT

RC718B GI Complications

Participants
Nina Tunariu, MD, Sutton, United Kingdom, (nina.tunariu@icr.ac.uk) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Be familiar with classification of novel targeted and standard anticancer drugs. 2) Able to identify GI toxicity imaging appearances by understanding the mechanisms of action of the chemotherapeutic agents. 3) Be aware that toxicities can be asymptomatic and that radiologists are instrumental in identifying and reporting early manifestations of toxicities. 4) Describe the imaging appearance of GI complications of anti-cancer therapy. 5) Differentiate between post-therapeutic changes and disease progression.

ABSTRACT

RC718C Musculoskeletal Complications

Participants
Hassan Douis, MRCP, FRCR, Birmingham, United Kingdom (*Presenter*) Spouse, Grant, Eisai Co, Ltd; Spouse, Grant, Pharma Mar SA

LEARNING OBJECTIVES

1) To describe common chemotherapy-induced, radiation-therapy induced and surgical complications of the musculoskeletal system2) To recognize early and late musculoskeletal complications of oncological treatment3) To describe the imaging features of common musculoskeletal complications of oncological treatment

ABSTRACT

RC721

Advances in CT: Technologies, Applications, Operations-Special Purpose CT

Thursday, Dec. 1 4:30PM - 6:00PM Room: S103CD

BR MK CT IR PH

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

Participants
Ehsan Samei, PhD, Durham, NC (*Coordinator*) Research Grant, General Electric Company; Research Grant, Siemens AG
Norbert J. Pelc, ScD, Stanford, CA (*Coordinator*) Research support, General Electric Company; Research support, Koninklijke Philips NV; Consultant, Varian Medical Systems, Inc; Consultant, NanoX; Scientific Advisory Board, RefleXion Medical Inc; Scientific Advisory Board, Prismatic Sensors AB; Medical Advisory Board, OurCrowd, LP ;

Sub-Events

RC721A Breast

Participants
John M. Boone, PhD, Sacramento, CA (*Presenter*) Research Grant, Siemens AG; Royalties, Wolters Kluwer nv;

RC721B MSK

Participants
Wojciech Zbijewski, PhD, Baltimore, MD, (wzbijewski@jhu.edu) (*Presenter*) Research Grant, Carestream Health, Inc

LEARNING OBJECTIVES

1) Describe the special prupose CT systems for musculoskeletal (MSK) imaging. 2) Compare the capabilities of special purpose MSK CT systems to conventional modalities. 3) Identify diagnostic applications enabled by special purpose MSK CT.

ABSTRACT

RC721C Interventional

Participants
Charles M. Strother, MD, Madison, WI (*Presenter*) Research Consultant, Siemens AG Research support, Siemens AG License agreement, Siemens AG

RC722

MRI: Imaging for Radiation Treatment Planning

Thursday, Dec. 1 4:30PM - 6:00PM Room: E351

MR RO PH

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

Participants
Eric Paulson, Milwaukee, WI (*Moderator*) Nothing to Disclose

ABSTRACT

Sub-Events

RC722A MRI for Anatomical Definition

Participants
Eric Paulson, Milwaukee, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the advantages of MRI simulation for anatomical delineation in both external beam radiation therapy and brachytherapy. 2) Understand the differences between images obtained during MRI simulation versus diagnostic MRI. 3) Understand the current solutions to address technical challenges of using MRI for anatomical delineation in Radiation Oncology.

ABSTRACT

MRI is rapidly emerging as a primary imaging modality in Radiation Oncology, fueled by innovations in MRI-guided treatment delivery, MRI simulation systems, and the role of MRI in individualizing and adapting radiation therapy. This course will discuss the advantages and technical challenges of using MRI for anatomical definition in radiation treatment planning. Current solutions to tailor MRI to the unique demands of Radiation Oncology will be explored. Clinical examples illustrating the use of MRI for anatomical delineation in both external beam radiation therapy and brachytherapy will be presented.

Active Handout:Eric Paulson

http://abstract.rsna.org/uploads/2016/15001743/RC722A PaulsonES_MRForAnatomicalDefinition.pdf

RC722B MRI for Functional Definition

Participants
Uulke A. van der Heide, PhD, Amsterdam, Netherlands (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Get an overview of the most relevant functional MRI modalities are available. 2) Understand how they can be used to improve target definition. 3) Understand their limitations and specific concerns for use in radiation oncology.

ABSTRACT

In addition to anatomical imaging, MRI affords a range of functional techniques. Diffusion-weighted MRI images the restriction of water mobility in tissue, thus probing microanatomy. This is used to identify tumors and monitor response to treatment. Dynamic contrast-enhanced MRI shows the tracer kinetics of contrast agents and reflects the characteristics of the microvasculature, such as flow and permeability. These and other techniques can be used to improve target definition, and to characterize tumor tissue for radiotherapy dose painting.

RC723

Molecular Imaging Mini-Course: Clinical Applications of Molecular Imaging-Neuro

Thursday, Dec. 1 4:30PM - 6:00PM Room: S504AB

NR MI OI PH

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

Participants

Sub-Events

RC723A Oncology Applications

Participants
Hyunsuk Shim, PhD, Atlanta, GA, (hshim@emory.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To learn about the potential of combining an advanced spectroscopic MR imaging with standard MR images to reduce the recurrence rate in glioblatomas.

ABSTRACT

Radiation therapy (RT) is as good as the images that guide RT planning. RT based on conventional MRIs may not fully target tumor extent in glioblastomas (GBM), which may, in part, account for high recurrence rates (60-70 percent at 6 months). Magnetic resonance spectroscopy, a molecular imaging modality that quantifies endogenous metabolite levels without relying on perfusion, leakage and diffusion of injected material, may better define extent of actively proliferating tumor. In addition, advances in this technology now permit acquisition of whole-brain high-resolution 3D spectroscopic MRI (sMRI) in 12-14 minutes. We correlated state-of-the-art sMRI metabolite maps and their ratio maps with tissue histopathology to validate further its use for identifying non-enhancing and infiltrating tumors that may not be fully imaged by conventional MRI sequences and provide support for its adjunctive use in tumor contouring for RT planning. Integration of histologically-verified, whole brain 3D sMRI into RT planning is feasible and may considerably modify target volumes. Thus, RT planning for GBMs may be augmented by sMRI potentially leading to reduced or delayed recurrence rates.

RC723B Functional Applications

Participants
Satoshi Minoshima, MD, PhD, Salt Lake City, UT (*Presenter*) Royalties, General Electric Company; Research Consultant, Hamamatsu Photonics KK; Research Grant, Hitachi, Ltd; Research Grant, Nihon Medi-Physics Co, Ltd;

RC724

Communicate for Success

Thursday, Dec. 1 4:30PM - 6:00PM Room: N226

OT PR

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

Participants
David P. Fessell, MD, Ann Arbor, MI (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Compare helpful and unhelpful styles of communication and their impact. 2) Describe ACR 3.0 recommendations regarding communication. 3) Develop strategies for successful communication.

ABSTRACT

Radiologists cannot excel unless they communicate effectively, yet communication often does not receive the attention it deserves in medical education. In this course, we explore frequently neglected but vitally important principles of communication, including self communication, the role of communication in the future of radiology, and the longer-term objectives of excellence in communication.

Sub-Events

RC724A Self-Communication

Participants
David P. Fessell, MD, Ann Arbor, MI, (fessell@umich.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Compare helpful and unhelpful styles of communication and their impact. 2) Describe ACR 3.0 recommendations regarding communication. 3) Develop strategies for successful communication.

ABSTRACT

RC724B Communication 3.0

Participants
Bibb Allen JR, MD, Birmingham, AL (*Presenter*) Nothing to Disclose

RC724C Communicate to Connect

Participants
Richard B. Gunderman, MD, PhD, Indianapolis, IN (*Presenter*) Nothing to Disclose

ABSTRACT

Radiologists cannot excel unless they communicate effectively, yet communication often does not receive the attention it deserves in medical education. In this course, we explore frequently neglected but vitally important principles of communication, including self-communication, the role of communication in the future of radiology, and the longer-term objectives of excellence in communication

RC725

Computational Perception

Thursday, Dec. 1 4:30PM - 6:00PM Room: E353B

IN PH

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

Participants

Sub-Events

RC725A Status of CAD in Clinical Radiology

Participants
Maryellen L. Giger, PhD, Chicago, IL (*Presenter*) 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;

LEARNING OBJECTIVES

1) Provide an overview of the types & applications of CAD being developed & used today. 2) Summarize the evidence & controversies regarding clinical impact of CAD. 3) Describe future trends in CAD research.

RC725B Intersection of Imaging Informatics and Perception

Participants
Katherine P. Andriole, PhD, Dedham, MA (*Presenter*) Advisory Board, McKinsey & Company, Inc;

LEARNING OBJECTIVES

1) Provide a basic overview of imaging informatics. 2) Describe the importance of data visualization for practitioners. 3) Assess ways imaging informatics can impact image interpretation.

RC725C Review the Effects on Radiologist Interpretation of Reading Paradigms and Visualization Methods in CT Colonography CAD

Participants
Ronald M. Summers, MD, PhD, Bethesda, MD, (rms@nih.gov) (*Presenter*) Royalties, iCAD, Inc; ;

LEARNING OBJECTIVES

1) Review the time & resource constraints radiologists face clinically. 2) Discuss the role of non-radiologists interpreting radiographic images. 3) Describe crowd-sourcing & how it can apply to radiology.

ABSTRACT

RC727

Clinical Decision Support and Utilization Management: Preparing for the New CMS Mandate

Thursday, Dec. 1 4:30PM - 6:00PM Room: E451A

HP IN

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

Participants
Keith J. Dreyer, DO, PhD, Boston, MA (*Moderator*) Medical Advisory Board, IBM Corporation
Keith J. Dreyer, DO, PhD, Boston, MA (*Coordinator*) Medical Advisory Board, IBM Corporation
Mark D. Hiatt, MD, MBA, Salt Lake City, UT, (mark.hiatt@regence.com) (*Presenter*) Medical Director, Regence BlueCross BlueShield; Board Member, RadSite; Former Officer, HealthHelp, LLC
Daniel Durand, MD, Baltimore, MD (*Presenter*) Consultant, National Decision Support Company;
Bob Cooke, Redding, CT (*Presenter*) Vice President, National Decision Support Company

LEARNING OBJECTIVES

1) Explain the need for assuring the appropriateness of ordered exams. 2) Know the role of utilization management in reducing inappropriate and unnecessary tests. 3) Identify the advantages and limitations of clinical decision support. 4) Recognize how payers are considering meeting the CMS mandate for pre-order decision support.

ABSTRACT

This course will discuss the 2017 CMS mandate for pre-order decision support for MRI, CT, and PET, including the need for assuring the appropriateness of ordered exams, the roles of utilization management and clinical decision support in reducing inappropriate and unnecessary tests, the advantages and limitations of methods to manage utilization, and how payers are considering meeting the CMS mandate for pre-order decision support.

RC729

Pancreatic Imaging Update: Spotlight on MRI (An Interactive Session)

Thursday, Dec. 1 4:30PM - 6:00PM Room: N230B

GI MR

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

Participants

LEARNING OBJECTIVES

1) Discuss a systematic approach to diagnosing and staging pancreatic cancer and discuss template reporting for preoperative planning. 2) Discuss potential mimics and pitfalls related to diagnosis and staging of solid pancreatic neoplasms. 3) Describe the imaging features of pancreatic cysts and the impact of multidisciplinary approach to diagnosis and management. 4) To review the imaging features of a vast array of inflammatory conditions that may involve the pancreas..Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

Sub-Events

RC729A Systematic Approach to Pancreatic Cancer

Participants
Elizabeth M. Hecht, MD, New York, NY, (eh2560@cumc.columbia.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss a systematic approach to diagnosing and staging pancreatic cancer and discuss template reporting for preoperative planning. 2) Discuss potential mimics and pitfalls related to diagnosis and staging of solid pancreatic neoplasms

ABSTRACT

Treatment of pancreas cancer requires a multidisciplinary approach. Imaging interpretation and reports play a critical role in managing patients with pancreatic pathology. Accurate staging of pancreatic neoplasms is paramount to determining management and imaging plays a central role in stratifying patients for treatment. The goal of surgery is to achieve resection margins free of tumor to maximize survival benefit. Unnecessary surgery and accompanying morbidity need be minimized in patients with no added survival benefit from resection. Structured reporting and standardized terminology enhances communication with the clinic team and imparts key elements into a diagnostic report that will help determine appropriate management.

RC729B Pancreatic Cyst: A Multidisciplinary Approach to Diagnosis and Management

Participants
Ihab R. Kamel, MD, PhD, Baltimore, MD (*Presenter*) Research Grant, Siemens AG

LEARNING OBJECTIVES

1) Describe the imaging features of pancreatic cysts and the impact of multidisciplinary approach to diagnosis and management.

ABSTRACT

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/

Ihab R. Kamel, MD, PhD - 2015 Honored Educator

RC729C The Inflamed Pancreas: Pearls and Perils

Participants
Koenraad J. Mortele, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To review the imaging features of a vast array of inflammatory conditions that may involve the pancreas.

RC731

Common Spinal Injection Procedures for Diagnosis and Treatment of Back Pain (Hands-on)

Thursday, Dec. 1 4:30PM - 6:00PM Room: E263

MK NR IR

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

Participants
A. Orlando Ortiz, MD, MBA, Mineola, NY (*Presenter*) Nothing to Disclose
Bassem A. Georgy, MD, MSc, San Diego, CA (*Presenter*) Consultant, Johnson & Johnson; Consultant, DFINE, Inc; Stockholder, DFINE, Inc ; Stockholder, Spine Solutions, Inc; ;
Afshin Gangi, MD, PhD, Strasbourg, France, (gangi@unistra.fr) (*Presenter*) Proctor, Galil Medical Ltd
Todd S. Miller, MD, Bronx, NY, (tmiller@montefiore.org) (*Presenter*) Nothing to Disclose
Stanley Golovac, MD, Coral Gables, FL, (sgolovac@mac.com) (*Presenter*) Nothing to Disclose
Allan L. Brook, MD, Bronx, NY (*Presenter*) Nothing to Disclose
Michele H. Johnson, MD, New Haven, CT (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe and demonstrate methods for patient selection, evaluation and technique for Image-guided injection procedures used in spine pain management. 2) These procedures will include epidural steroid injections, nerve root blocks, facet blocks, sacroiliac joint injections, lumbar synovial cyst therapy, radiofrequency ablations. 3) Review procedural complications and how to avoid them. 4) Discuss pertinent anatomy, instruments and pharmacology. 5) These objectives will be accomplished using didactic lectures complemented by procedure videos, supervised hands on lab work with training models and round table case discussions.k

ABSTRACT

Neck and back pain complaints are very common in the general population. Radiologists can contribute to the diagnosis and management in patients who are not responding to conservative management. Spine injection procedures can frequently be performed on an outpatient basis with a brief recovery phase. These procedures are performed with imaging guidance, such as a multi-directional fluoroscope or under CT guidance, in order to correctly localize the specifice anatomic sites in or about the spine for diagnostic and or therapecutic needle localization. An understanding of patient selection, indications and contraindications, are paramount to the safety and success of these procedures. The diagnostic and therapeutic potential of these procedures is also facilitated by a thorough evaluation of the spine, with respect to both anatomy and potential pathology, with cross sectional imaging techniques as well as other radiologic tests. Communication of these results between the Radiologist and the spine proceduralist will contribute to optimal patient outcomes.

RC732

Mentoring Future Leaders

Thursday, Dec. 1 4:30PM - 6:00PM Room: S502AB

LM

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

Participants

Sub-Events

RC732A Considerations and Suggested Approaches to Implementing Formal Mentoring

Participants
Alexander M. Norbash, MD, San Diego, CA (*Presenter*) Consultant, Stryker Corporation; Shareholder, Boston Imaging Core Laboratories, LLC;

LEARNING OBJECTIVES

1) Recognize representative methods and the current state of formal systemic mentoring in academic and private radiology practices. 2) Understand both the reasons supporting and the potential advantages of formal systemic mentoring systems. 3) Appreciate the resources and manpower investments necessary to practically configure and deploy formal systemic mentoring.

RC732B Mentors, Mentees and Mentoring in Radiology

Participants
James V. Rawson, MD, Augusta, GA (*Presenter*) Nothing to Disclose

ABSTRACT

Mentoring relationships can range from very structured to informal. Other features include duration and focus. Mentoring has been shown to increase faculty retention, career satisfaction, improved teaching and clinical.

RC732C Mentoring in the Culture of Multigenerational Workforce and Diversity

Participants
Vijay M. Rao, MD, Philadelphia, PA, (vijay.rao@jefferson.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand how mentor-mentee relationship and expectations are changing in the current environment of multigenerational workforce and diversity. 2) Learn what leadership skills are needed to become good mentors. 3) Understand what to do and what not to do when you are looking fror a mentor.

ABSTRACT

n/a

RC750

MR Imaging-guided Breast Biopsy (Hands-on)

Thursday, Dec. 1 4:30PM - 6:00PM Room: E260

BR MR

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

Participants

Amy D. Argus, MD, Cincinnati, OH (*Presenter*) Nothing to Disclose
Rifat A. Wahab, DO, Cincinnati, OH (*Presenter*) Nothing to Disclose
Vandana M. Dialani, MD, Boston, MA (*Presenter*) Nothing to Disclose
Deepa Sheth, MD, Chicago, IL, (dsheth@radiology.bsd.uchicago.edu) (*Presenter*) Nothing to Disclose
Michael R. Aho, MD, Atlanta, GA, (maho@emory.edu) (*Presenter*) Nothing to Disclose
Lara D. Richmond, MD, Toronto, ON (*Presenter*) Nothing to Disclose
Gary J. Whitman, MD, Houston, TX (*Presenter*) Book contract, Cambridge University Press
Kirti M. Kulkarni, MD, Chicago, IL, (kkulkarni@radiology.bsd.uchicago.edu) (*Presenter*) Nothing to Disclose
Carol M. Dell, MD, Lexington, KY (*Presenter*) Nothing to Disclose
Amy L. Kerger, DO, Columbus, OH, (amy.kerger@osu.edu) (*Presenter*) Nothing to Disclose
Jill J. Schieda, MD, Cleveland, OH (*Presenter*) Nothing to Disclose
Jiyon Lee, MD, New York, NY, (Jiyon.Lee@nyumc.org) (*Presenter*) Nothing to Disclose
Mitva J. Patel, MD, Columbus, OH (*Presenter*) Nothing to Disclose
Wade C. Hedegard, MD, Rochester, NY (*Presenter*) Nothing to Disclose
Amado B. del Rosario, DO, Mesa, AZ (*Presenter*) Nothing to Disclose
Karla A. Sepulveda, MD, Houston, TX (*Presenter*) Nothing to Disclose
Jamie G. Giesbrandt, MD, Albuquerque, NM, (Jamie.Giesbrandt@xraynm.com) (*Presenter*) Nothing to Disclose
Wendi A. Owen, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose
Laurie R. Margolies, MD, New York, NY, (laurie.margolies@mountsinai.org) (*Presenter*) Research Consultant, FUJIFILM Holdings Corporation;
Mitra Noroozian, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Anika N. Watson, MD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Establish criteria for MR Image-guided breast biopsy patient selection. 2) Cultivate a working understanding of MR Image-guided biopsy and needle localization instrumentation and implementation. 3) Basic MR Image-guided biopsy and needle localization parameters and requirements for coil, needle and approach selection. 4) Discuss practice integration issues. 5) Discuss pearls and pitfalls associated with successful MR Image-guided biopsy.

ABSTRACT

This course is intended to provide both basic didactic instruction and hands-on experience in the application of MRI guided breast biopsy. MRI provides greater sensitivity for detecting breast cancer compared with mammography and ultrasound, although with imperfect specificity. MRI guided biopsy is required to confirm or exclude maligancy for MRI only findings.This course will be devoted to the understanding and identification of the following pertaining to MRI guided biopsy:1) appropriate patient selection2) optimal positioning for biopsy3) target selection and confirmation4) various biopsy technologies and techniques5) potential problems and pitfalls.

RC752

US-guided Interventional Breast Procedures (Hands-on)

Thursday, Dec. 1 4:30PM - 6:00PM Room: E264

BR US

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

Participants

Jocelyn A. Rapelyea, MD, Washington, DC (*Presenter*) Speakers Bureau, General Electric Healthcare Company; Research consultant, Q-view LLC.; Research consultant, QTUS
Margaret M. Szabunio, MD, Lexington, KY, (Margaret.szabunio@uky.edu) (*Presenter*) Nothing to Disclose
Shambhavi Venkataraman, MD, Boston, MA, (svenkata@bidmc.harvard.edu) (*Presenter*) Nothing to Disclose
Angelique C. Floerke, MD, Washington, DC (*Presenter*) Consultant, Becton, Dickinson and Company
Rachel F. Brem, MD, Washington, DC (*Presenter*) Board of Directors, iCAD, Inc; Board of Directors, Dilon Technologies LLC; Stock options, iCAD, Inc; Stockholder, Dilon Technologies LLC; Consultant, U-Systems, Inc; Consultant, Dilon Technologies LLC; Consultant, Dune Medical Devices Ltd
Karen S. Johnson, MD, Durham, NC (*Presenter*) Nothing to Disclose
Nicole S. Lewis, MD, Washington, DC (*Presenter*) Nothing to Disclose
Kathleen R. Gundry, MD, Atlanta, GA (*Presenter*) Nothing to Disclose
Michael N. Linver, MD, Albuquerque, NM (*Presenter*) Scientific Advisory Board, Hologic, Inc; Scientific Advisory Board, Real Imaging Ltd; Scientific Advisory Board, Seno Medical Instruments, Inc
Christina G. Marks, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose
Caroline M. Ling, MD, Darby, PA (*Presenter*) Nothing to Disclose
Jessica Torrente, MD, Washington, DC (*Presenter*) Nothing to Disclose
Tilden L. Childs III, MD, Fort Worth, TX (*Presenter*) Stockholder, Pfizer Inc
Evguenia J. Karimova, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the equipment needed for ultrasound guided interventional breast procedures. 2) Review the basic principles of ultrasound guidance and performance of minimally invasive breast procedures. 3) Practice hands-on technique for ultrasound guided breast interventional procedures.

ABSTRACT

This course is intended to familiarize the participant with equipment and techniques in the application of US guided breast biopsy and needle localization. Participants will have both basic didactic instruction and hands-on opportunity to practice biopsy techniques on tissue models with sonographic guidance. The course will focus on the understanding and identification of: 1) optimal positioning for biopsy 2) imaging of adequate sampling confirmation 3) various biopsy technologies and techniques 4) potential problems and pitfalls

RC753

Monitoring Radiation Exposure: Standards, Tools and IHE REM

Thursday, Dec. 1 4:30PM - 6:00PM Room: S403B

IN SQ

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

Participants

Kevin O'Donnell, Pacifica, CA (*Moderator*) Employee, Toshiba Corporation;
Kevin O'Donnell, Pacifica, CA (*Presenter*) Employee, Toshiba Corporation;
Michael F. McNitt-Gray, PhD, Los Angeles, CA (*Presenter*) Institutional research agreement, Siemens AG Research support, Siemens AG
Tessa S. Cook, MD, PhD, Philadelphia, PA, (tessa.cook@uphs.upenn.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn key radiation exposure concepts and metrics, such as CTDI, and how to interpret them. 2) Learn about radiation exposure monitoring methods and tools including 2a) Capturing x-ray dose information with the DICOM Radiation Dose SR (RDSR) standard. 2b) (NEW) Capturing radiopharmaceutical dose information with DICOM Radiopharmaceutical Radiation Dose SR (R-RDSR) 2c) Managing RDSR objects with the IHE Radiation Exposure Monitoring (REM) and REM-NM Profiles. 2d) Integrating "CT dose screens" from legacy systems into RDSR. 2e) Pre-scan dose pop-ups on the CT console defined by the MITA Dose Check standard and AAPM guidance on their use. 3) Learn how to specify the above features when purchasing and integrating Radiology Systems. 4) Learn about practical issues and components of a site dose management program such as protocol optimization and participation in the ACR Dose Registry. 5) Learn about dose reporting requirements such asCalifornia SB-1237 and Medicare reimbursement linkage to MITA XR-29.

RC754

The IHE Process

Thursday, Dec. 1 4:30PM - 6:00PM Room: S404AB

IN

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

Participants
Bradley J. Erickson, MD, PhD, Rochester, MN, (bje@mayo.edu) (*Moderator*) Stockholder, OneMedNet Corporation; Stockholder, VoiceIt Technologies, LLC; Stockholder, FlowSigma
Brad Genereaux, Waterloo, ON (*Presenter*) Employee, Agfa-Gevaert Group
Harry Solomon, Highland Park, IL (*Presenter*) Former Employee, General Electric Company
Bradley J. Erickson, MD, PhD, Rochester, MN, (bje@mayo.edu) (*Presenter*) Stockholder, OneMedNet Corporation; Stockholder, VoiceIt Technologies, LLC; Stockholder, FlowSigma

LEARNING OBJECTIVES

1) Understand the process by which IHE profiles are created. 2) Understand how to become involved with IHE.

ABSTRACT

The purpose of this session is to demonstrate how an idea that addresses some informatics problem becomes an IHE profile. We start by describing what an IHE profile is, and how it differs from a standard, such as DICOM. Next, we will describe the type of ideas that are good candidates for profiles, and ones that may fit better in some other effort such as DICOM. Finally, the process for creating an IHE profile from initial proposal through testing and implementation is described.

RCA55

The Cancer Imaging Archive: Using 'Big Data' for the study of Cancer Radiomics, Proteomics, Genetics and Pathology (Hands-on)

Thursday, Dec. 1 4:30PM - 6:00PM Room: S401AB

BQ IN

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

Participants
Justin Kirby, Bethesda, MD (*Moderator*) Stockholder, Myriad Genetics, Inc
Justin Kirby, Bethesda, MD (*Presenter*) Stockholder, Myriad Genetics, Inc
Lawrence R. Tarbox, PhD, Little Rock, AR (*Presenter*) Nothing to Disclose
C. Carl Jaffe, MD, Boston, MA (*Presenter*) Nothing to Disclose
Brenda Fevrier-Sullivan, BA, Bethesda, MD (*Presenter*) Nothing to Disclose
Fred W. Prior, PhD, Little Rock, AR (*Presenter*) Stockholder, Siemens AG
John B. Freymann, BS, Rockville, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn what data sets are available in The Cancer Imaging Archive (TCIA). 2) Identify and download existing TCIA data sets which match your research interests. 3) Collaborate with other researchers using Shared Lists and Digital Object Identifiers. 4) Identify metadata and support resources that include the TCIA helpdesk, FAQs, and system documentation.

ABSTRACT

Access to large, high quality data is essential for researchers to understand disease and precision medicine pathways, especially in cancer. However HIPAA constraints make sharing diagnostic clinical images outside an individual institution a complex process. The NCI's Cancer Imaging Archive (TCIA) addresses this challenge by providing hosting and de-identification services which take the burden of data sharing off researchers. TCIA now contains over 59 unique data collections of more than 28 million images. Recognizing that images alone are not enough to conduct meaningful research, most collections are linked to rich supporting data including patient outcomes, treatment information, genomic / proteomic analyses, and expert image analyses (segmentations, annotations, and radiomic / radiogenomic features). This hands-on session will teach the skills needed to fully access TCIA's existing data as well as learn how to submit new data for potential inclusion in TCIA.

RCC55

RadLex®: Standardized Terminology and the RadLex Playbook for Radiology Reporting and Procedure Coding

Thursday, Dec. 1 4:30PM - 6:00PM Room: S501ABC

IN SQ

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

Participants
Kenneth C. Wang, MD, PhD, Ellicott City, MD (*Moderator*) Co-founder, DexNote, LLC;

LEARNING OBJECTIVES

1) Describe the RadLex system of standard terms for radiology. 2) Access RadLex content through the web. 3) Identify the role of standard terminology in radiology reporting and information retrieval. 4) Explain the RadLex Playbook system for naming and coding radiology exams. 5) Define the use of Playbook codes in the ACR Dose Index Registry. 6) Develop an approach to incorporating RadLex terms and Playbook codes into clinical practice.

Sub-Events

RCC55A Introduction to RadLex®: Structure and Content

Participants
Kenneth C. Wang, MD, PhD, Ellicott City, MD (*Presenter*) Co-founder, DexNote, LLC;

LEARNING OBJECTIVES

1) Define the goals of the RadLex terminology. 2) Characterize the scope and organization of RadLex terms. 3) Access RadLex content through the web.

ABSTRACT

RCC55B 'RadLex Inside': Using RadLex for Information Retrieval, Radiology Reporting, and Beyond

Participants
Charles E. Kahn JR, MD, MS, Philadelphia, PA, (charles.kahn@uphs.upenn.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn how the RadLex lexicon enables applications in radiology research, education, and clinical practice. 2) Describe how RadLex enables information retrieval. 3) Define the role of RadLex in RSNA's structured reporting initiative. 4) Discover new applications of RadLex in radiology education and decision support.

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/

Charles E. Kahn JR, MD, MS - 2012 Honored Educator

RCC55C RadLex® Playbook: Systematic Naming and Coding for Imaging Procedures

Participants
Curtis P. Langlotz, MD, PhD, Menlo Park, CA, (langlotz@stanford.edu) (*Presenter*) Shareholder, Montage Healthcare Solutions, Inc; Spouse, Consultant, Novartis AG;

LEARNING OBJECTIVES

1) Identify the challenge related to procedure code matching across institutions. 2) Describe the RadLex Playbook. 3) Explain how the RadLex Playbook can be used to harmonize data across institutions. 4) Show how RadLex Playbook simplifies registry submission and health information exchange 5) Learn how the RadLex/LOINC playbook can be used when converting to a new radiology information system (RIS). 6) Learn about plans for making the RadLex Playbook a national standard for radiology exam codes.

RCC55D Playbook and the ACR Dose Index Registry: Implementation Challenges and Strategies

Participants
Kalpana M. Kanal, PhD, Seattle, WA, (kkanal@uw.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) What is the ACR CT Dose Index Registry (DIR). 2) Identify the challenges in ACR CT DIR. 3) What are some of the Mapping Challenges. 4) Additional Benefits of DIR.