Thursday

Program subject to change until 12/16/2019.

RSNA® 2019
SEE POSSIBILITIES — TOGETHER

105TH Scientific Assembly and Annual Meeting
December 1–6 | McCormick Place, Chicago

SPDL50

Keeping Radiology Weird: Spot Diagnoses from the Pacific Northwest (Case-based Competition)

Thursday, Dec. 5 7:15AM - 8:15AM Room: E451B

GI MI MK NM

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

Participants
Barry G. Hansford, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Elena K. Korngold, MD, Portland, OR (*Presenter*) Nothing to Disclose
Nadine Mallak, MD, Portland, OR (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

Hansford@ohsu.edu

korngold@ohsu.edu

mallak@ohsu.edu

Special Information

This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

LEARNING OBJECTIVES

1) Be introduced to a series of musculoskeletal, abdominal radiology and nuclear medicine case studies via an interactive game approach designed to encourage "active" consumption of education material. 2) 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) Receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance.

SPSC50

Controversy Session: AI: Is it Ready for Your Practice

Thursday, Dec. 5 7:15AM - 8:15AM Room: E351

AI

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

Participants
Adam E. Flanders, MD, Narberth, PA (*Moderator*) Nothing to Disclose
Katherine P. Andriole, PhD, Chestnut Hill, MA (*Moderator*) Research funded, NVIDIA Corporation; Research funded, General Electric Company; Research funded, Nuance Communications, Inc; ; ; ;
J. R. Geis, MD, Fort Collins, CO (*Presenter*) Nothing to Disclose
Marc D. Kohli, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

adam.flanders@jefferson.edu

kandriole@bwh.harvard.edu

LEARNING OBJECTIVES

1) To learn about the concerns of bias in data cohorts used in the training of machine learning models. 2) To hear both sides of the issues around data democratization and concern for patient privacy in data sharing. 3) To be aware of medico-legal issues that may be encountered with the use of AI in healthcare.

ABSTRACT

Is AI Intelligent, or just Artificial? This lively session will present you two sides to the questions. For radiologists on the assembly line, pumping out cases at a higher rate each day, what does AI really mean? Will they be fancy tools that get in the way, waste time to monitor them, and not get reimbursed using them? Will they offload some work, and if so, will they take jobs or make our jobs easier? Who will make money from radiology AI? Will it be radiologists, or instead some big tech company, or the hospital? And if radiology data are the new oil, how do I get my share for making those data?This session will provide a point-counterpoint debate around the ethical considerations associated with the use of artificial intelligence in radiology.

SPSH50

Hot Topic Session: Practical Pearls in Acute Ischemic Stroke Imaging

Thursday, Dec. 5 7:15AM - 8:15AM Room: E353A

NR

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

Participants
Max Wintermark, MD, Lausanne, Switzerland (*Moderator*) Consultant, More Health; Consultant, Magnetic Insight; Consultant, icoMetrix NV; Consultant, Nines; Consultant, Subtle Medical; Consultant, Nous;

LEARNING OBJECTIVES

1) To review advanced neuroimaging techniques applied to stroke. 2) To discuss potential applications of artificial intelligence for stroke imaging. 3) To discuss the role of advanced neuroimaging for stroke treatment.

Sub-Events

SPSH50A Stroke and Carotid Artery Plaque Imaging: Lights and Shadows

Participants
Luca Saba, MD, Cagliari, Italy (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To learn about imaging techniques to analyse carotid vulnerable plaque, the features of risk and the level of evidences. 2) To critically review the influence of plaque composition on actual treatment guidelines. 3) To discuss the possible future role of carotid plaque imaging for treatment decision making.

ABSTRACT

Carotid atherosclerosis plays a fundamental part in the occurrence of ischaemic stroke. Current guidelines for prevention of stroke in patients with carotid plaques are based on quantification of the percentage reduction in luminal diameter due to the atherosclerotic process to select the best therapeutic approach. However, better strategies for prevention of stroke are needed because some subtypes of carotid plaques can predict the occurrence of stroke independent of the degree of stenosis. The evolution of imaging techniques has allowed for the routine characterization of carotid plaque features and the traditional concept of using degree of luminal stenosis as the sole imaging marker for the selection of the optimal therapeutic approach is challenged by evidences that some types of plaques, so-called "vulnerable plaques", have a high likelihood to cause ischemic stroke, independent of the degree of stenosis. Intra-plaque haemorrhage, plaque volume, neo-vascularisation, and inflammation are promising as biomarkers of carotid plaque vulnerability and these biomarkers could change current management strategies based merely on the degree of stenosis. In this lecture the first main topic will be to present the radiological method to analyze vulnerable plaques, the features of risk and the levels of evidence. The second main topic will be the influence of plaque composition on actual treatment guidelines whereas in the last main topic the possible future role of carotid plaque imaging for treatment decision making will be discussed together with the unmet needs that should guide future research.

SPSH50B MR Mapping of Cerebrovascular Reactivity: How and Why?

Participants
Daniel M. Mandell, MD,PhD, Toronto, ON (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

danny.mandell@uhn.ca

LEARNING OBJECTIVES

1) Understand the clinical role of cerebrovascular reactivity mapping ('brain stress testing'). 2) Understand how to implement BOLD MRI mapping of cerebrovascular reactivity. 3) Appreciate the advantages and pitfalls of BOLD MRI for mapping of cerebrovascular reactivity.

SPSH50C Computational Hemodynamics: The Role of Advanced Imaging in Risk Stratification for Stroke

Participants
Warren Chang, MD,MBA, Pittsburgh, PA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

warren.chang@ahn.org

LEARNING OBJECTIVES

1) Understand the current methods of analyzing and displaying hemodynamic data (computational fluid dynamics and 4D-Flow). 2) Describe the advanced PC-MRA techniques currently in use for assessment of neurovascular pathology. 3) Explain the role of hemodynamic parameters such as pressure, wall shear stress, and velocity in the setting of ischemic stroke. 4) Understand the role of hemodynamics in intracranial stenosis and their role in ischemic stroke. 5) Understand the role of hemodynamics in the

pathogenesis and risk stratification of aneurysms and arteriovenous malformations. 6) Understand the role of emerging techniques such as 3D printing and AI in the neurovascular space.

SPSH50D AI for Stroke-Are We There Yet?

Participants
Elizabeth Tong, MD, Stanford, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Overview of artificial intelligence in neuroradiology and its applications in stroke. 2) Detection of acute stroke with artificial intelligence. 3) Prediction of ischemic core with artificial intelligence. 4) Prediction of clinical outcome with artificial intelligence. 5) Clinical deployment of artificial intelligence for stroke management.

Printed on: 10/29/20

MSRT51

ASRT@RSNA 2019: Alcohol and Cancer Risk: Is Moderate Consumption Safe

Thursday, Dec. 5 8:00AM - 9:00AM Room: N230B

RS

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

Participants
Kevin R. Clark, RT, Houston, TX (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

KRClark@mdanderson.org

LEARNING OBJECTIVES

1) Identify the types of cancers that are associated with consuming alcohol. 2) State recommendations from multiple cancer prevention organizations regarding alcohol consumption and cancer risk. 3) Explain medical imaging's role in the identification and treatment of various cancers. 4) Apply strategies to educate patients and inform the general public about alcohol-related cancers.

ABSTRACT

The association between alcohol consumption, even low and moderate amounts of drinking, and an increased risk of cancer development is not widely known. However, literature suggests that consuming alcohol is linked to cancers of the mouth, pharynx (throat), larynx (voice box), esophagus, liver, colon and rectum, and female breast. Generally speaking, the more alcohol consumed, the higher the cancer risk. It is vital that health care providers understand what current literature says about alcohol-related cancers so they can provide proper education and better quality care to the patients they serve.

MSCM51

Case-based Review of Magnetic Resonance (Interactive Session)

Thursday, Dec. 5 8:30AM - 10:00AM Room: S100AB

MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Jorge A. Soto, MD, Boston, MA (*Director*) Royalties, Reed Elsevier

For information about this presentation, contact:

jorge.soto@bmc.org

LEARNING OBJECTIVES

1) Review key MR imaging findings of common and infrequent conditions of various organs in adult and pediatric patients. 2) Highlight key MR imaging features that are useful to narrow the differential diagnosis. 3) Increase confidence in the interpretation of complex MR studies.

Sub-Events

MSCM51A MRI of the Brain

Participants
Carlos H. Torres, MD,FRCPC, Ottawa, ON (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

catorres@toh.ca

LEARNING OBJECTIVES

1) Review key MR imaging findings of common and infrequent conditions in the adult brain. 2) Highlight key features that are useful to narrow the differential diagnosis. 3) Increase confidence in the interpretation of complex MR studies of the brain.

MSCM51B MRI of the Spine

Participants
Pia C. Maly Sundgren, MD, PhD, Lund, Sweden (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review key MR imaging findings of common and infrequent conditions in the pediatric and adult spine. 2) Highlight key features that are useful to narrow the differential diagnosis. 3) Increase confidence in the interpretation of MR studies of the spine.

MSCM51C Synovial Linings Playbook

Participants
Bruce B. Forster, MD, Vancouver, BC (*Presenter*) Stockholder, Canada Diagnostic Centres; Travel reimbursement, Sectra AB

For information about this presentation, contact:

bruce.forster@vch.ca

LEARNING OBJECTIVES

1) Appreciate a range of synovial pathologies imaged on various imaging modalities. 2) Understand when additional diagnostic information is gained with the use of intra-articular and intravenous contrast. 3) Identify features typical of aggressive and malignant synovial lesions.

MSCM51D MRI of the Pelvis and Hips

Participants
Donna G. Blankenbaker, MD, Fitchburg, WI (*Presenter*) Consultant, Reed Elsevier Royalties, Reed Elsevier

LEARNING OBJECTIVES

1) Review the MR imaging appearance of specific hip conditions. 2) Develop the differential diagnosis for common and uncommon hip/pelvis pathology. 3) Understand characteristic imaging patterns in diagnosis.

MSCS51

Case-based Review of Musculoskeletal Radiology (Interactive Session)

Thursday, Dec. 5 8:30AM - 10:00AM Room: S406A

MK US

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

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

For information about this presentation, contact:

ssmith@bwh.harvard.edu

LEARNING OBJECTIVES

1) Learn current techniques and advances in Musculoskeletal imaging and intervention. 2) Become familiar with current guidelines for diagnosis and management of Musculoskeletal imaging findings. 3) Review critical Musculoskeletal disorders/disease physiology and pathology as it is depicted by multiple modalities. 4) Understand the vital role of imaging in the broad array of Musculoskeletal disorders in order to achieve optimum patient care.

ABSTRACT

This course is designed to highlight the vital role multimodality imaging plays in the assessment and diagnosis of Musculoskeletal disorders. Special emphasis will be placed on technical advances including MRI, MSK Ultrasound, CT, including DECT, and interventional guidance. A wide range of anatomic topics will be covered during this course including: shoulder, ankle/foot, knee, hand and wrist, including soft tissue/bone lesions and sports imaging. Our goal is to provide a broad update in the field while addressing new opportunities and challenges for everyday practice in the Musculoskeletal arena.

Sub-Events

MSCS51A Shoulder

Participants
Laura W. Bancroft, MD, Venice, FL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review essential imaging characteristics of post-traumatic and sports-related shoulder injuries. 2) Review salient multimodality imaging features of various shoulder pathologies in a case based format.

MSCS51B Soft Tissue/Bone Lesions

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

MSCS51C MSK Ultrasound

Participants
Akira M. Murakami, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

akira.murakami@bmc.org

ABSTRACT

The presentation will be a case based approach to review ultrasound appearances of common musculoskeletal pathologies of the upper and lower extremity including the use of dynamic imaging and doppler. Potential pitfalls will be reviewed as well as the importance of other imaging modalities and how they are complimentary to ultrasound.

MSCS51D Intervention

Participants
Glenn C. Gaviola, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

ggaviola@bwh.harvard.edu

LEARNING OBJECTIVES

1) Using an image-rich, case-based format, recognize the importance of imaging guidance in musculoskeletal interventions and the importance of proper work-up of musculoskeletal lesions prior to the intervention.

MSES51

Essentials of Neuro Imaging

Thursday, Dec. 5 8:30AM - 10:00AM Room: E450A

HN NR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Sub-Events

MSES51A Acute Face and Neck Infections

Participants
Wayne S. Kubal, MD, Tucson, AZ (*Presenter*) Author, Reed Elsevier; Editor, Reed Elsevier

LEARNING OBJECTIVES

1) To diagnose acute face and neck infections on CT. 2) To characterize the nature of the infection. 3) To localize the infection and its spread. 4) To appreciate the potential complications that may result from the infection. 5) To recognize underlying abnormalities that may predispose to face and/or neck infections.

MSES51B A Case-based Approach to Evaluating a New Head and Neck 'Mass'

Participants
Tabassum A. Kennedy, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

tkennedy@uwhealth.org

LEARNING OBJECTIVES

1) Formulate a systematic approach to evaluating a new head and neck mass. 2) Generate a short differential of a new head and neck mass, based on anatomic location.

MSES51C Image Guided Interventions for Head and Neck Pain

Participants
Vikas Agarwal, MD, Pittsburgh, PA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

agarwalv@upmc.edu

LEARNING OBJECTIVES

1) Analyze relevant imaging and relate clinical information to determine appropriateness for various interventions to treat head/neck pain. 2) Identify the risks and benefits of various interventional procedures for head/neck pain as well as potential complications. 3) Competently and safely perform various interventions for head/neck pain using image guidance.

MSES51D Non-traumatic Face Lesions

Participants
Christopher A. Potter, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

cpotter3@bwh.harvard.edu

LEARNING OBJECTIVES

1) Identify common and uncommon non traumatic abnormalities of the face. 2) Recognize their imaging appearance in various modalities. 3) Diagnose potential complications.

ABSTRACT

Nontraumatic facial abnormalities include infections of the paranasal sinuses, inflammation and infection in the orbits, cavernous sinus lesions, salivary gland and dental abnormalities. We will discuss relevant anatomy, common and uncommon abnormalities, and differential considerations in these troublesome lesions.

RC601

Pulmonary Vascular Imaging

Thursday, Dec. 5 8:30AM - 10:00AM Room: S103CD

CH CT MR VA

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Ioannis Vlahos, MRCP,FRCR, Houston, TX (*Moderator*) Director, Grayscale Ltd; Co-owner, Grayscale Ltd

LEARNING OBJECTIVES

1) Highlight practical applications, best current practice, and state of the art multimodality CT and MRI practice with regards to pulmonary vascular imaging. 2) Review acute and chronic pulmonary embolism, pulmonary hypertension, and pulmonary arteriovenous malformations.

Sub-Events

RC601A Imaging of Acute Pulmonary Embolism

Participants
Ioannis Vlahos, MRCP,FRCR, Houston, TX (*Presenter*) Director, Grayscale Ltd; Co-owner, Grayscale Ltd

LEARNING OBJECTIVES

1) Overview current imaging strategies and key facts in acute pulmonary embolism imaging. 2) Provide an update on current issues and challenges in acute pulmonary embolism imaging.

RC601B Imaging of Chronic Pulmonary Embolism and Pulmonary Hypertension

Participants
Elsie Nguyen, MD, Toronto, ON (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the classification of pulmonary hypertension. 2) List CT and MRI features of PH. 3) Describe imaging characteristics of chronic pulmonary embolism.

RC601C Imaging of Pulmonary Arteriovenous Malformations

Participants
Kristopher W. Cummings, MD, Scottsdale, AZ (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explain the role MDCT plays in the evaluation of suspected hereditary hemorrhagic telangiectasia. 2) List the most important information provided by MDCT for management of pulmonary arteriovenous malformations.

RC601D Pulmonary MRA: Practical Applications

Participants
Christopher J. Francois, MD, Madison, WI (*Presenter*) Departmental research support, General Electric Company;

For information about this presentation, contact:

cfrancois@uwhealth.org

LEARNING OBJECTIVES

1) Identify roles for magnetic resonance angiography (MRA) in imaging patients with pulmonary artery disease, particularly on the use of MRA in pulmonary embolism. 2) Describe techniques and protocols for robust, clinical pulmonary MRA. 3) Summarize the evidence supporting the use of pulmonary MRA for pulmonary embolism.

ABSTRACT

1) Pulmonary MRA is appropriate for imaging patients suspected of having pulmonary embolism who have contra-indications to CTA, particularly those in whom avoiding iodinated contrast (due to allergy or decreased renal function) or minimizing radiation exposure (younger patients) would be beneficial. 2) Current, commercially available MRA sequences that take advantage of newer parallel imaging techniques help ensure consistent pulmonary MRA in a clinical setting in under ten minutes. 3) Although older, multi-center studies using MRA techniques and protocols suggested pulmonary MRA may not be accurate enough for routine clinical use, more recent studies using commercially available accelerated image acquisition techniques indicate that pulmonary MRA is effective in identifying clinically significant pulmonary embolism.

RC602

Reporting Skills: Improving Our Reports and Those of Others (Interactive Session)

Thursday, Dec. 5 8:30AM - 10:00AM Room: S102CD

ED IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Gregory M. Grimaldi, MD, Manhasset, NY (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

ggrimald@northwell.edu

Special Information

This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

Sub-Events

RC602A Improving Reports: Perspectives of the Stakeholders

Participants
Gregory M. Grimaldi, MD, Manhasset, NY (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

ggrimald@northwell.edu

LEARNING OBJECTIVES

1) Define the components of a radiology report pertinent to the stakeholders. 2) Develop strategies to incorporate key information into a radiology report. 3) Describe the benefits of template reporting.

RC602B Disease-specific Structured Reporting: Necessary Next Level to Stay Relevant

Participants
Olga R. Brook, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

obrook@bidmc.harvard.edu

LEARNING OBJECTIVES

1) To learn about benefits of disease-specific structured reporting.

ABSTRACT

Disease-specific structured reporting is the next step in the evolution of radiology reporting. Simple structured reporting (organ level, paragraph style) is great solution for normal or near normal studies. However, when dealing with a specific disease entity, a tailored report serves better needs of referral physicians, as it provides all pertinent negative and positive findings needed to make a clinical decision.

RC602C Using Change Management Strategies to Implement Structured Reporting

Participants
Shlomit Goldberg-Stein, MD, Bronx, NY (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

sgoldberg@montefiore.org

LEARNING OBJECTIVES

1) Apply change management models to the adaptive challenges of structured reporting. 2) Implement a practical methodology for successful adoption of structured reporting in your organization.

RC602D Importance of Our Lexicon/Conveying Certainty in Our Reports

Participants
Thomas W. Loehfelm, MD, PhD, Atlanta, GA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

twloehfelm@ucdavis.edu

LEARNING OBJECTIVES

1) Identify factors that cause unclear communication. 2) Explain benefits of controlled lexicons for communicating degree of certainty.

Printed on: 10/29/20

RC603

Nonischemic Cardiomyopathies: Role of Cardiac MRI

Thursday, Dec. 5 8:30AM - 10:00AM Room: S103AB

CA MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Phillip M. Young, MD, Rochester, MN (*Moderator*) Consultant, Arterys Inc

LEARNING OBJECTIVES

1) To recognize MRI appearance of the most common right ventricular cardiomyopathies. 2) To describe the phenotypic spectrum of morpho-functional and tissue abnormalities of hypertrophic cardiomyopathy. 3) To review different faces and phases of the disease reflecting its natural history. 4) To analyze critical role of CMR tissue characterization of the differential diagnoses of hypertrophic CMPs, from phenotype to genotype. 5) To review T1 and T2 tissue mapping variations in different clinical scenarios. 6) To analyze prognostic implications of CMR in HCM. 7) Describe the relevant clinical findings of patients with restrictive cardiomyopathy. 8) Define the role of cardiac MR (CMR) in the evaluation of patients with restrictive cardiomyopathy. 9) Discuss the different patterns of myocardial enhancement and other ancillary imaging findings as they relate to narrowing the differential diagnosis in patients with restrictive cardiomyopathy. 10) Identify the different forms of Dilated Cardiomyopathies (DCM). 11) Apply the most common Cardiac Magnetic Resonance (CMR) techniques to differentiate between the various DCM etiologies. 12) Assess the Pros & Cons of different CMR techniques for the DCM evaluation.

Sub-Events

RC603A Arrhythmogenic Right Ventricular Cardiomyopathies

Participants
Karen G. Ordovas, MD, Seattle, WA (*Presenter*) Advisor, Arterys Inc;

LEARNING OBJECTIVES

1) To recognize MRI appearance of the most common right ventricular cardiomyopathies.

RC603B Role of MRI in Hypertrophic Cardiomyopathy

Participants
Marco Francone, MD,PhD, Rome, Italy (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To describe the phenotypic spectrum of morpho-functional and tissue abnormalities of hypertrophic cardiomyopathy. 2) To review different faces and phases of the disease reflecting its natural history. 3) To analyze critical role of CMR tissue characterization of the differential diagnoses of hypertrophic CMPs, from phenotype to genotype. 4) To review T1 and T2 tissue mapping variations in different clinical scenarios. 5) To analyze prognostic implications of CMR in HCM.

RC603C Restrictive Cardiomyopathy and Amyloidosis

Participants
Daniel Vargas, MD, Denver, CO (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

Daniel.vargas@ucdenver.edu

LEARNING OBJECTIVES

1) Describe the relevant clinical findings of patients with restrictive cardiomyopathy. 2) Define the role of cardiac MR (CMR) in the evaluation of patients with restrictive cardiomyopathy. 3) Discuss the different patterns of myocardial enhancement and other ancillary imaging findings as they relate to narrowing the differential diagnosis in patients with restrictive cardiomyopathy.

RC603D Role of MRI in Dilated Cardiomyopathies

Participants
Matthias Gutberlet, MD, PhD, Leipzig, Germany (*Presenter*) Speaker, Siemens AG Speaker, Koninklijke Philips NV Speaker, Bayer AG Speaker, Bracco Group Author, Thieme Medical Publishers, Inc

LEARNING OBJECTIVES

1) Identify the different forms of Dilated Cardiomyopathies (DCM). 2) Apply the most common Cardiac Magnetic Resonance (CMR) techniques to differentiate between the various DCM etiologies. 3) Assess the Pros & Cons of different CMR techniques for the DCM evaluation.

RC604

Musculoskeletal Series: Applying Artificial Intelligence to Musculoskeletal Imaging

Thursday, Dec. 5 8:30AM - 12:00PM Room: N228

AI MK

AMA PRA Category 1 Credits ™: 3.00
ARRT Category A+ Credits: 3.50

Participants
Martin Torriani, MD, Boston, MA (*Moderator*) Nothing to Disclose
Michael P. Recht, MD, New York, NY (*Moderator*) Nothing to Disclose
Christopher F. Beaulieu, MD, PhD, Stanford, CA (*Moderator*) Nothing to Disclose
Avneesh Chhabra, MD, Flowermound, TX (*Moderator*) Consultant, ICON plc; Consultant, Treace Medical Inc; Author with royalties, Wolters Kluwer nv; Author with royalties, Jaypee Brothers Medical Publishers Ltd

Sub-Events

RC604-01 Principles of Machine Learning in Diagnostic Imaging

Thursday, Dec. 5 8:30AM - 8:50AM Room: N228

Participants
Martin Torriani, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

mtorriani@mgh.harvard.edu

LEARNING OBJECTIVES

1) Familiarize the audience with basic concepts in machine learning. 2) Discuss methods used for basic pattern recognition using AI/ML. 3) Discuss applications/limitations of such methods.

RC604-02 Machine Learning for Bone Tumors

Thursday, Dec. 5 8:50AM - 9:10AM Room: N228

Participants
Christopher F. Beaulieu, MD, PhD, Stanford, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe important prior work on computer aided diagnosis of bone tumors. 2) Discuss current applications of machine learning and AI to bone tumors. 3) Identify challenges and opportunities through application of ML tools in the clinical setting.

RC604-03 Machine Learning for Muscle

Thursday, Dec. 5 9:10AM - 9:30AM Room: N228

Participants
Avneesh Chhabra, MD, Flowermound, TX (*Presenter*) Consultant, ICON plc; Consultant, Treace Medical Inc; Author with royalties, Wolters Kluwer nv; Author with royalties, Jaypee Brothers Medical Publishers Ltd

For information about this presentation, contact:

Avneesh.chhabra@utsouthwestern.edu

LEARNING OBJECTIVES

1) Learn the current status and utility of skeletal muscle imaging. 2) Gain knowledge of the techniques of muscle segmentation and role of machine learning in that domain. 3) Discuss the role of muscle texture analysis and surrogate imaging markers for sarcopenia and patient functional status.

RC604-04 Automated Analysis of Muscle Quantitative Imaging Biomarkers for Muscle Quantity and Quality Using Convolutional Neural Networks

Thursday, Dec. 5 9:30AM - 9:40AM Room: N228

Participants
Dustin P. Brown, MD, PhD, La Jolla, CA (*Presenter*) Nothing to Disclose
Brian Hurt, MD,MS, San Diego, CA (*Abstract Co-Author*) Consultant, Arterys Inc; Consultant, IBM Corporation
Brady K. Huang, MD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Leon Lenchik, MD, Winston-salem, NC (*Abstract Co-Author*) Nothing to Disclose
Robert D. Boutin, MD, Davis, CA (*Abstract Co-Author*) Nothing to Disclose
Albert Hsiao, MD,PhD, La Jolla, CA (*Abstract Co-Author*) Founder, Arterys, Inc; Consultant, Arterys, Inc; Shareholder, Arterys, Inc; Speaker, Bayer AG; Research Grant, Bayer AG; Speaker, General Electric Company; Research Grant, General Electric Company;

For information about this presentation, contact:

dpbrown@ucsd.edu

PURPOSE

To automate quantification of muscle quantity and quality using a cascaded system of convolutional neural networks (CNNs) applied opportunistically to chest and abdominal CT.

METHOD AND MATERIALS

A combination of public and internal non-contrast CT scans were used to train CNNs. 328 public low-dose chest CT scans from the National Lung Screening Trial (NLST) and 258 internal abdomen and pelvis CT scans of healthy kidney donors were collected. Hand-drawn left paraspinal muscle (LPSM) segmentations at the level of T12 were created using custom software. 80% of the scans were used to train and 20% were used for validation. A fully automated system of cascaded CNNs was developed to (1) identify the axial location of the T12 slice from sagittal slices, and (2) predict the axial T12 left paraspinal muscle segmentation. Axial slice selection performance was evaluated against the mean absolute error, and segmentations were evaluated on dice scores. LSPM segmentations yielded the following muscle quantitative imaging biomarkers (mQIBs): skeletal muscle cross sectional area (SMA), muscle radiation attenuation (SMRA), percentage muscle (SMT), lean muscle (SML), fatty muscle (SMF) and intermuscular adipose (IMAT). Agreement between manual and predicted mQIB metrics was analyzed using Bland-Altman analysis. Composite network performance metrics and mQIB metrics were compared using two-tailed unpaired Student's t-tests to determine if cohort means were significantly different ($p<0.05$).

RESULTS

Mean absolute T12 axial slice selection error for the NLST (21.7 mm +/- 10.9 mm) and internal data (18.9 mm +/- 8.3 mm) were significantly different. There was no significant difference between T12 LSPM dice scores for the NLST (0.92 +/- 0.03) and internal data (0.93 mm +/- 0.03). SMA, SMRA, SMT, and SML values were significantly greater and SMF and IMAT values were significantly lower for the internal dataset when compared to those from the NLST dataset reflecting higher muscle quantity and quality.

CONCLUSION

Convolutional neural networks are a feasible approach for automating quantification of muscle mass and quality, and are able to distinguish between healthy and older patients with chronic disease at risk for sarcopenia.

CLINICAL RELEVANCE/APPLICATION

The quantification of mQIBs reflecting skeletal muscle mass and quality can be fully-automated using a cascaded system of CNNs, and should facilitate the diagnosis of sarcopenia.

RC604-05 Deep Learning Workflow for Automated Body Composition on CT: From Slice Detection to Multi-Tissue Segmentation

Thursday, Dec. 5 9:40AM - 9:50AM Room: N228

Participants
Colleen G. Buckless, MS, Boston, MA (*Presenter*) Nothing to Disclose
Andrew Tsao, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Benjamin Wang, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Martin Torriani, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

mtorriani@mgh.harvard.edu

PURPOSE

To develop a deep convolutional neural network (CNN) to [a] automatically detect the L4 vertebral level from an abdomen CT, and [b] automatically segment an axial image at L4 for body composition measures. We hypothesized a deep CNN approach would achieve high accuracy in each task individually and combined.

METHOD AND MATERIALS

We manually segmented vertebral bodies in 516 midline sagittal CT reconstructions from clinical abdomen CTs. Manual segmentation labeled background, sacrum, L5, L4, L3 and L2. Next, we manually segmented axial CT images at L4 in 220 subjects labeling background, muscle, bone, bowel/solid organs, visceral and subcutaneous fat. Segmentation accuracy was separately tested using 40 new sagittal images for level detection and 22 new axial images for body composition. Images were processed for histogram equalization and data augmentation [N=3,000 (spine) and 4,000 (L4 image)]. We trained models from scratch on Keras/Tensorflow using 80/20 training/validation split and U-Net architecture (8 batch, 50 epochs, dropout 0.2-0.3, learning rate 0.0001, softmax). Dice (F1) scores assessed similarity between manual vs. CNN- predicted segmentation. Performance of entire workflow was tested on 60 abdomen CTs, yielding rate of correct L4 level detection, segmentation Dice scores for body composition at L4, and time to complete each case.

RESULTS

Segmentation Dice scores for vertebral bodies were: background 99%, sacrum 80%, L5 85%, L4 86%, L3 85%, and L2 81%. Segmentation Dice scores for body composition at L4 were: background 98%, muscle 94%, subcutaneous fat 96%, visceral fat 93%, bone 89%, and other/bowel 94%. Evaluation of entire workflow on test dataset of 60 abdomen CTs showed L4 was correctly detected in 95% of test cases (57/60) and segmentation Dice scores for body composition at L4 were background 98%, muscle 93%, subcutaneous fat 97%, visceral fat 89%, bone 88%, and other/bowel 86%. Mean time to analyze one full abdomen CT was 13 seconds. Total time to analyze all 60 test full abdomen CTs was 12min 57sec.

CONCLUSION

Our results show accurate automated L4 level detection and segmentation for body composition using a deep CNN algorithm on abdominal CTs.

CLINICAL RELEVANCE/APPLICATION

This workflow will support large-scale population studies that require accurate and time-efficient automated body composition measures.

RC604-06 Machine Learning for Articular Cartilage

Thursday, Dec. 5 9:50AM - 10:10AM Room: N228

Participants
Jacob C. Mandell, MD, Waltham, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

jmandell@bwh.harvard.edu

LEARNING OBJECTIVES

1) Provide an overview of current developments in machine learning applications in musculoskeletal imaging, within broad categories of: Detection/identification of abnormalities, segmentation of structures, grading and classification of abnormalities, and ancillary utilities. 2) Describe how the practice of MSK radiology can be changed or enhanced by these recent developments.

RC604-07 Machine Learning for Musculoskeletal Trauma

Thursday, Dec. 5 10:40AM - 11:00AM Room: N228

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

For information about this presentation, contact:

mrich@uw.edu

LEARNING OBJECTIVES

1) Be aware of the recent advances of machine learning in musculoskeletal trauma. 2) Know some of the more promising ways machine learning will be able to aid in detection of traumatic MSK injuries. 3) Know some of the more likely ways machine learning can be used to improve the workflow of interpreting MSK trauma cases.

RC604-08 Highly Accelerated Knee MRI Using a Novel Deep Convoluted Neural Network Algorithm: A Multi-Reader Comparison Study

Thursday, Dec. 5 11:00AM - 11:10AM Room: N228

Participants
Naveen Subhas, MD, Shaker Heights, OH (*Presenter*) Research support, Siemens AG
Hongyu Li, Buffalo, NY (*Abstract Co-Author*) Nothing to Disclose
Joshua M. Polster, MD, Shaker Heights, OH (*Abstract Co-Author*) Nothing to Disclose
Carl S. Winalski, MD, Rocky River, OH (*Abstract Co-Author*) Institutional service agreement, Medical Metrics, Inc Institutional service agreement, BioClinica, Inc Institutional service agreement, PAREXEL International Corporation Institutional service agreement, CartiHeal Ltd Shareholder, Pfizer Inc Spouse, Shareholder, General Electric Company
Nancy A. Obuchowski, PhD, Cleveland, OH (*Abstract Co-Author*) Research Consultant, Siemens AG; Research Consultant, IBM Corporation; Research Consultant, Elucid Bioimaging Inc; Research Consultant, FUJIFILM Holdings Corporation
Mingrui Yang, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Kenji Mamoto, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Xiaojuan Li, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Leslie Ying, Buffalo, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Previous work has shown the feasibility of reconstructing diagnostic quality images from a highly undersampled knee MRI acquisition to achieve a 6-fold acceleration with a novel machine learning algorithm using a 15-layer deep convolutional neural network (DCNN). The purpose of this study was to assess the interchangeability of highly accelerated images reconstructed using DCNN and a standard 3-layer CNN with non-accelerated images for evaluating internal derangement of the knee.

METHOD AND MATERIALS

2D fat-saturated (fs) sagittal proton-density weighted (PD) and non-fs PD coronal sequences from knee MRIs in 40 patients were reconstructed with DCNN and CNN techniques. 3 MSK radiologists, blinded to the technique, independently evaluated the menisci, ligaments, articular cartilage, bones and image quality on the DCNN, CNN and standard images. Interchangeability was measured by comparing the frequency of agreement between 2 readers both evaluating the standard images (intramodality agreement) with the frequency of agreement between 1 reader evaluating the accelerated images and the other reader evaluating the standard images (intermodality agreement). The mean difference in intramodality and intermodality agreement was calculated with 95% confidence intervals (CI). A non-inferiority margin of 10% excess disagreement when using accelerated images was used.

RESULTS

Intramodality agreement between standard images and intermodality agreement between standard and DCNN and CNN images were very similar for all of the evaluated structures. The increased disagreement (mean, [95% CI])when standard images were replaced with DCNN and CNN images was, respectively,: medial meniscus tears -2.5% [-6.1,+1.1%] and 0% [-5.7%,+5.7%]; lateral meniscus tears +1.6% [-4.4%,+7.8%] and 0% [-5.7%,+5.7%]; ACL tears -0.8% [-2.4%, +0.8%] and -0.8% [-2.4%, +0.8%]; articular cartilage +2.2% [-0.7%,+5.1%], +3.0% [-0.1%, +6.1%]. The image quality using standard, DCNN, and CNN images was graded as excellent or acceptable in 97.5%, 95% and 60% of cases, respectively.

CONCLUSION

A highly accelerated knee MRI reconstructed using a novel machine learning DCNN is diagnostically interchangeable with a standard

knee MRI with acceptable to excellent image quality in most cases.

CLINICAL RELEVANCE/APPLICATION

Machine learning reconstruction techniques to acheive highly accelerated MRI acquisitions provide the opportunity to increase access and reduce costs of knee MRIs.

RC604-09 Using AI to Improve Case Finding of Vertebral Fractures in the Fracture Liaison Service Setting

Thursday, Dec. 5 11:10AM - 11:20AM Room: N228

Participants
Ramy Mansour, MD, Oxford OX3 9DU , United Kingdom (*Presenter*) Nothing to Disclose
Rachel Eckert, RN, Oxford OX3 7HE , United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Eldad Elnekave, MD, Shefayim, Israel (*Abstract Co-Author*) Employee, Zebra Medical Vision Ltd
Sarah Connacher, RN, Oxford OX3 7HE , United Kingdom (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Identifying patients with fragility fractures allows for the administration of effective secondary fracture prevention. Case findings is reliant on manual, time-consuming review and a high frequency of radiological reporting, which is typically low. This study evaluates the impact of an automated algorithm for retrospective identification of vertebral fractures on routine CT scans to improve case finding in the FLS setting.

METHOD AND MATERIALS

11,012 eligible CT chest or abdominal scans performed for other clinical indications of patients aged > 50 years old were retrospectively analysed by an automated algorithm trained to detect compression fractures. Scans detected as positive for fracture were reviewed by FLS nurses who underwent specific radiological training on VCF detection and were confirmed by a radiologist or rheumatologist locally. Patients with a confirmed VCF were contacted by the FLS nurses and offered further assessment and subsequent treatment as appropriate. Recruitment to the FLS was reported along with outcomes of follow up patients.

RESULTS

1,305 scans were detected as positive by the algorithm, of which 24.3% (317) were confirmed as positive by the FLS. 50% of scans in patients >75 had a fracture vs. 32% in patients aged 50-75 ($p<0.01$). Of 55 negative cases reviewed, none had a VCF. Of 80 confirmed VCF cases reviewed by the FLS team, 49% (39) were not mentioned in the radiology report. Of 50 confirmed cases of VCF detected by the algorithm, 41% went on the receive Denosumab, 7% received oral bisphosphonates, 7% were referred to the metabolic bone clinic, 20% treatment was decided by their GP, and the remainder either refused, died before follow up or did not require treatment.

CONCLUSION

An automated algorithm is an effective and scalable method to increase recruitment fracture prevention programmes and can increase the number of patients commencing secondary fracture prevention.

CLINICAL RELEVANCE/APPLICATION

Vertebral compression fractures are frequently under-reported on CT scans performed for other indications and represent a valuable source of FLS case-finding.

RC604-10 Development and Validation of a Deep Learning Multi-Task Model for Severity Grading of Radiographic Hip Osteoarthritis Features

Thursday, Dec. 5 11:20AM - 11:30AM Room: N228

Participants
Claudio E. Von Schacky, Munich , Germany (*Presenter*) Nothing to Disclose
Jae Ho Sohn, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Felix Liu, BS, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Eugene Ozhinsky, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Sarah C. Foreman, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Magdalena Posadzy, MD, Poznan, Poland (*Abstract Co-Author*) Nothing to Disclose
Pia M. Jungmann, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Lorenzo Nardo, MD, Sacrameto, CA (*Abstract Co-Author*) Nothing to Disclose
Michael C. Nevitt, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Thomas M. Link, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Research Grant, General Electric Company; Research Consultant, General Electric Company; Research Consultant, InSightec Ltd; Research Grant, InSightec Ltd; Consultant, Springer Nature; Research Consultant, Pfizer Inc;
Valentina Pedoia, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

claudio.vschacky@gmail.com

PURPOSE

To develop and to validate a multi-task deep learning model for grading radiographic hip OA features and compare its performance to attending-level radiologists.

METHOD AND MATERIALS

We included 15364 hip joints on 7738 weight-bearing anterior-posterior pelvic radiographs from the Osteoarthritis Initiative cohort. Femoral osteophytes (FOS), acetabular osteophytes (AOS), joint space narrowing (JSN) were graded as absent, mild, moderate, severe according to the OARSI atlas. Subchondral sclerosis (SUBSCL) and subchondral cysts (SUBCYST) were graded for presence

or absence. The data was split 80%/10%/10% for training, validation, and testing. The images were cropped around the femoro-acetabular joint through a RetinaNet. The multi-task neural network was based on a Densenet-161 that served as a shared convolutional features extractor trained with a multi-task loss function. Fully connected layers for each feature were fine-tuned separately. Model performance was evaluated on a test set from the Osteoarthritis Initiative and an external test set consisting of clinical routine radiographs. Grading reliability was assessed with linearly weighted Cohen's Kappa and compared to two attending-level radiologists.

RESULTS

The RetinaNet for hip joint localization correctly placed bounding boxes around the joint in 100% of the cases with excellent intersection over union of 0.91±0.068 and 0.91±0.063 for validation and test set, respectively. Moderate to excellent grading reliability was achieved for the assessment of radiographic OA features on the external test set with FOS 0.78 (95% CI: 0.67, 0.88), AOS 0.76 (95% CI: 0.67, 0.86), JSN 0.85 (95% CI: 0.78, 0.93), SUBSCL 0.92 (95% CI: 0.80, 1.0), SUBCYST 0.46 (95% CI: 0.14, 0.77) and was comparable to those of attending-level radiologists (Figure A). Figure B shows an example of a heatmap for grading FOS.

CONCLUSION

This study demonstrates the feasibility of a multi-task deep learning model to assess radiographic hip OA features with attending-level grading reliability.

CLINICAL RELEVANCE/APPLICATION

A deep learning model might aid radiologists or non-radiologist-clinicians in reading hip radiographs to improve workflow and grading reliability.

RC604-11 Automatic Detection of Osteoarthritis Progression in Knee Radiographs: Proof of Concept for Using Siamese Neural Networks for Change Detection in Medical Imaging

Thursday, Dec. 5 11:30AM - 11:40AM Room: N228

Participants
Matthew D. Li, MD, Boston, MA (*Presenter*) Nothing to Disclose
Ken Chang, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Andrew Beers, Charlestown, MA (*Abstract Co-Author*) Nothing to Disclose
Katharina V. Hoebel, BSC,MD, Charlestown, MA (*Abstract Co-Author*) Nothing to Disclose
Jay B. Patel, Charlestown, MA (*Abstract Co-Author*) Nothing to Disclose
Connie Y. Chang, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Ambrose J. Huang, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
William E. Palmer, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jayashree Kalpathy-Cramer, MS, PhD, Portland, OR (*Abstract Co-Author*) Research support, General Electric Company; Research support, F. Hoffmann-La Roche Ltd;

For information about this presentation, contact:

mdli@mgh.harvard.edu

PURPOSE

The detection of change is an important and common task in radiology. Siamese neural networks employ parallel neural networks with shared weights to rank similarity between input images. We develop and test a Siamese neural network architecture to automatically detect change in medical images, applied to the progression of osteoarthritis in knee radiographs.

METHOD AND MATERIALS

Knee radiographs from 3026 patients longitudinally followed in the Multicenter Osteoarthritis Study (MOST) were collected, from which 43,164 unique within-patient comparisons were generated. The data was partitioned at the patient level, with 80, 10, and 10% of patients used for algorithm training, validation, and testing respectively. A convolutional Siamese network was built using twinned ResNet18 networks, with a contrastive loss function. This algorithm takes paired knee radiographs as inputs and calculates the Euclidean distance between the twinned network outputs, giving a measure of image similarity. Binary change predictions (i.e. change versus no change) were assigned by setting a Euclidean distance threshold. The algorithm was trained to detect binary change in Kellgren-Lawrence (KL) grade for osteoarthritis at different time points. Performance was evaluated on the separate test set.

RESULTS

The algorithm achieved a receiver operator characteristic area under the curve (AUC) of 0.91, accuracy of 88%, and Cohen's Kappa of 0.55, when evaluated on the test set for detecting change in KL grade in paired knee radiographs at different time points. Prediction accuracy was higher for larger changes and for no change in KL grade. Lower accuracy was seen for KL grade changes from grades 0 to 1 and 3 to 4. The Siamese network output (Euclidean distance) was correlated with the magnitude of KL grade change (Spearman rank correlation = 0.52).

CONCLUSION

By using a Siamese neural network architecture, changes between medical images can be detected with high performance as demonstrated with osteoarthritis in knee radiographs. The output of the algorithm correlates with the magnitude of change, despite not training explicitly on that magnitude.

CLINICAL RELEVANCE/APPLICATION

A specialized neural network architecture can detect change between medical images, with potential application to any disease involving imaging at multiple time points (e.g. cancer, vascular imaging).

RC604-12 Machine Learning for Optimizing MRI Pulse Sequences

Thursday, Dec. 5 11:40AM - 12:00PM Room: N228

Participants
Michael P. Recht, MD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the potential advantages of machine learning MR image reconstruction. 2) Understand some of the challenges and unsolved problems with machine learning MR image reconstruction.

Printed on: 10/29/20

RC605

High Yield Pediatric Neuroradiology

Thursday, Dec. 5 8:30AM - 10:00AM Room: E450B

NR PD

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Birgit B. Ertl-Wagner, MD, Toronto, ON (*Moderator*) Spouse, Stockholder, Siemens AG; Author, Springer Nature;

For information about this presentation, contact:

BirgitBetina.Ertl-Wagner@sickkids.ca

Sub-Events

RC605A Congenital Disorders of the Brain: My Top Five Tips

Participants
A. James Barkovich, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To be able to identify the most likely disorders responsible for the patients' symptoms based upon the imaging characteristics seen on the MRI. 2) To understand the malformation type by using a standard approach to assess 6 areas of the brain.

RC605B Brain Tumor Imaging in the Molecular Era: My Top Five Tips

Participants
Zoltan Patay, MD, PhD, Memphis, TN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Familiarize with new concepts introduced in the 2016 update of the WHO Classification of Tumors of the Central Nervous System and explain their relevance for the practicing radiologist. 2) Review strategies to use imaging biomarkers to characterize pediatric brain tumors based on their histoarchitectural and pathophysiological features. 3) Explain the role of radiomics and imaging genomics in pediatric brain tumors in the molecular era.

RC605C Imaging of Spinal Dysraphisms: My Top Five Tips

Participants
Andrea Rossi, MD, Genova, Italy (*Presenter*) Nothing to Disclose

RC605D Metabolic Disorders: My Top Five Tips

Participants
Birgit B. Ertl-Wagner, MD, Toronto, ON (*Presenter*) Spouse, Stockholder, Siemens AG; Author, Springer Nature;

For information about this presentation, contact:

BirgitBetina.Ertl-Wagner@sickkids.ca

LEARNING OBJECTIVES

1) Appreciate the importance of the topographic distribution (e.g. centrifugal, centripetal, spatial gradients of involvement) of signal abnormalities in common metabolic disorders of the brain. 2) Describe important additional discriminating features to distinguish common metabolic disorders of the brain. 3) Differentiate common metabolic disorders of the brain based on their imaging pattern.

RC605E Hypoxic Ischemic Disorders: My Top Five Tips

Participants
Nilesh K. Desai, MD, Sugar Land, TX (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn to correlate patterns of hypoxic-ischemic brain injury as seen by MRI with a. gestational age of the neonate, b. duration and c. severity of injury. 2) Discuss contributing factors including maternal infection, placental complications, congenital heart disease, and possible maternal and/or fetal metabolic challenges.

RC606

Horse or Zebra? Case-based Review of Common Mimics in the Head and Neck (Interactive Session)

Thursday, Dec. 5 8:30AM - 10:00AM Room: S402AB

HN NR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Sub-Events

RC606A Vestibular Schwannoma or Mimic?

Participants
Jared Steinklein, MD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review anatomy and imaging techniques of the internal auditory canal, inner ear, and nearby posterior skull base. 2) Describe clinical presentation, radiographic findings and varied treatment options of vestibular schwannoma. 3) Display examples of several mimicking diagnosis in an interactive Q&A format with the audience. 4) Discuss and summarize imaging appearance of vestibular schwannomas, and when to think outside the box and consider an alternate diagnosis.

RC606B Nasal Polyp or Mimic?

Participants
Jennifer J. Gillespie, MBBS, Brisbane, Australia (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify features that are consistent with a benign sinonasal polyp. 2) Critically assess sinonasal lesions to detect polyp mimics. 3) Identify changes in skull base foramina or bony margins that may alert to more sinister pathological processes.

RC606C Lymph Node or Mimic?

Participants
Bronwyn E. Hamilton, MD, Loma Linda, CA (*Presenter*) Editor, Reed Elsevier

RC606D Pituitary Adenoma or Mimic?

Participants
Eugene Yu, MD,FRCPC, Toronto, ON (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

eugene.yu@uhn.ca

LEARNING OBJECTIVES

1) Identify the normal anatomic structures of the sella/parasellar region. 2) Describe the key radiographic features of pituitary adenoma. 3) Differentiate between pituitary adenoma and other lesions arising in the sella/parasellar region.

RC607

A Case-based Audience Participation Session (Genitourinary) (Interactive Session)

Thursday, Dec. 5 8:30AM - 10:00AM Room: S105AB

GU

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Peter S. Liu, MD, Solon, OH (*Presenter*) Nothing to Disclose
Erica B. Stein, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Tristan Barrett, MBBS, Cambridge, United Kingdom (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

liup3@ccf.org

Special Information

This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

LEARNING OBJECTIVES

1) To be introduced to a series of Genitourinary case studies via an interactive team game approach designed to encourage 'active' consumption of educational content. 2) To be able to use their mobile wireless device (tablet, phone, laptop) to electronically respond to various Genitourinary case challenges; participants will be able to monitor their individual and team performance in real time. 3) To receive a personalized self-assessment report via email that will review the case material presented during the session along with individual and team performance.

ABSTRACT

The extremely popular audience participation educational experience is back! GU Diagnosis Live is an expert-moderated session featuring a series of interactive Genitourinary case studies that will challenge radiologists' diagnostic skills and knowledge. Building on last year's successful Diagnosis Live premiere, GU Diagnosis Live is a lively, fast-paced game format: participants will be automatically assigned to teams who will then use their personal mobile devices to test their knowledge of GU radiology in a fast-paced session that will be both educational and entertaining. After the session, attendees will receive a personalized self-assessment report via email that will review the case material presented durinig the session, along with individual and team performance.

RC608

Emergency Radiology Series: Contemporary Topics in Imaging of Trauma

Thursday, Dec. 5 8:30AM - 12:00PM Room: S401CD

CT ER GI

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

Participants
Ferco H. Berger, MD, Toronto, ON (*Moderator*) Speaker, Siemens AG
Michael N. Patlas, MD,FRCPC, Hamilton, ON (*Moderator*) Speaker, Springer Nature
Felipe Munera, MD, Key Biscayne, FL (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

patlas@hhsc.ca

fmunera@med.miami.edu

fhberger@gmail.com

Sub-Events

RC608-01 Whole Body CT of Trauma

Thursday, Dec. 5 8:30AM - 9:00AM Room: S401CD

Participants
Ferco H. Berger, MD, Toronto, ON (*Presenter*) Speaker, Siemens AG

For information about this presentation, contact:

fhberger@gmail.com

LEARNING OBJECTIVES

1) To be familiar with currently worldwide accepted protocols in polytrauma CT imaging. 2) To know clinical conditions requiring whole-body CT. 3) To comprehend the selection of trauma patients for targeted CT examinations.

ABSTRACT

In the western world, polytrauma is the major cause of mortality in people under 45 years of age. Furthermore, it is a major contributor to loss of quality of life and ability to work. The setting of polytrauma is almost always chaotic, not a favourable environment to come to timely diagnosis and treatment. To decrease morbidity and mortality, time is everything. It is our job as radiologist to contribute to the trauma team and help facilitate timely diagnosis - and in many cases, also timely treatment by interventional radiology. To reach the best treatment strategy for the patient as quickly and accurately as safely possible, is the goal. In this update on imaging of polytrauma patients, the focus is on the role of CT to achieve this goal. With the progress in CT scanner development, different protocol options arise. Which CT protocols are being used and what factors do they depend upon? In addition, there is a widespread increase in use of whole body CT internationally, is this a good thing or should we be more selective? What is the current evidence to select patients for targeted CT examinations in polytrauma? A lot of these questions have not been definitively resolved. This lecture aims to provide an update of the current insights into the use of CT for trauma care, with the goal to choose wisely on how to investigate the polytrauma patient in a timely and meaningful fashion.

Active Handout:Ferco H. Berger

http://abstract.rsna.org/uploads/2019/19000911/Active RC608-01.pdf

RC608-02 Whole-Body Trauma Completion CT for Transfer Patients: Impact on Injury Detection

Thursday, Dec. 5 9:00AM - 9:10AM Room: S401CD

Participants
Jeffrey Y. Shyu, MD, Boston, MA (*Presenter*) Nothing to Disclose
Reza Askari, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Roger Lacson, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Aaron D. Sodickson, MD,PhD, Boston, MA (*Abstract Co-Author*) Institutional research agreement, Siemens AG; Speaker, Siemens AG; Speaker, General Electric Company
Ali Salim, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Bharti Khurana, MD, Brookline, MA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

jshyu@bwh.harvard.edu

PURPOSE

Indications for whole-body trauma CT are unclear. This study evaluates patients transferred to a level 1 trauma center, who had

selective CT at the originating hospital and completion whole-body CT at the accepting hospital, to determine if additional CT imaging detects clinically significant injury.

METHOD AND MATERIALS

This was a single center study at a level 1 trauma center with a dedicated Emergency Radiology division. 243 consecutive trauma patients transferred from outside hospitals were included from 9/6/2015 to 12/20/2015. A review of the patient's acute traumatic injuries was obtained from chart reviews, radiology reports, and abbreviated injury scale (AIS). Whole-body CT was defined as CTs of the head, cervical spine, chest, abdomen, and pelvis. A patient is considered to have had 'completion' CT imaging if she or he obtained some of the whole-body CT components at the outside institution, and the rest at the accepting institution. Injuries that were detectable with radiographs (such as extremity fractures) were excluded.

RESULTS

35 received whole-body CT at the outside institution, and 45 received completion CT at the accepting institution. Of those who received completion CT, 13 (29%) had additional injuries on completion CTs that were not detected on CTs or radiographs from the outside institution. An additional 9 patients had indeterminate injuries in the radiology report that were not given a corresponding AIS. The additional injuries with AIS scores were subdural hemorrhage (1 patient), rib fractures (5), clavicle fracture (1), and thoracic (4) and lumbar (5) spine fractures. One patient who died in the trauma completion group had a lumbar spine fracture found on completion imaging, not considered to be the primary cause of death. Average ISS of transfer patients who received whole-body CTs at the outside institution was 13.9, compared to 10.6 for the completion group. A statistically significant difference between ISS was found between the transfer whole-body group and completion CT group ($p = 0.044$).

CONCLUSION

Completion whole-body CT for trauma transfer patients detects additional injuries in 29% of patients. Rib and spinal fractures are the most commonly detected injuries. Further work is needed to determine if this increase in diagnostic yield translated into patient management changes.

CLINICAL RELEVANCE/APPLICATION

This study clarifies the role of whole-body completion CT for patients with major trauma.

RC608-03 Unsupervised Detection of Multiple Traumatic Lesions in Severe Trauma Patients on Whole-Body CT Using Anomaly Detection with Generative Adversarial Networks (GANs)

Thursday, Dec. 5 9:10AM - 9:20AM Room: S401CD

Participants
Yura Ahn, MD, Seoul , Korea, Republic Of (*Presenter*) Nothing to Disclose
Gil-Sun Hong, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyun-Jin Bae, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Co-founder, Promedius Inc; CEO, Promedius Inc
Jihye Yun, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Namkug Kim, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Stockholder, Coreline Soft, Co Ltd; Stockholder, Anymedi, Inc
Younghwa Byeon, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sungwon Park, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Young Ji Song, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Won-Jung Chung, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

foryourmiracle@gmail.com

PURPOSE

Supervised learning has limitation in that it requires a large amount of annotated data. The purpose of this study is to determine if anomaly detection with generative adversarial networks (AnoGANs) are useful for detecting multiple various traumatic lesions on whole-body CT (WBCT) in an unsupervised manner.

METHOD AND MATERIALS

We trained a Progressive Growing of GAN (PGGAN) to generate realistic artificial CT images, using the training set of 11,775 normal chest and/or abdominopelvic CT scans (172,249 chest slices and 301,584 abdominopelvic slices). Test set consisted of total 200 axial slices of WBCT images (100 abnormal and 100 normal images) in trauma patients. Using our simplified AnoGAN model, PGGAN-trained generator yields a corresponding realistic fake image to a given test image by minimizing mean square error between the fake and the test images. The differences between the fake and the test image on attention maps can detect and localize abnormal findings. For evaluation of the detection performance, we defined 7 clinically significant traumatic lesions (hemothorax, hemomediastinum, pneumothorax, pneumomediastinum, hemoperitoneum, hemoretroperitoneum and pneumoperitoneum). If the attention map partially included the traumatic lesions, it was considered a positive detection.

RESULTS

Total sensitivity per slice was 95.0% (95/100) and total sensitivity per lesions was 94.4% (135/143). For each traumatic lesion, sensitivity was 100% for hemothorax, 95.2% for hemomediastinum, 95.5% for pneumothorax, 93.3% for hemoperitoneum, 84.6% for hemoretroperitoneum, and 100% for pneumoperitoneum. Evaluation of other parameters of performance was limited due to difficult quantification and calculation of non-pathologic false positives.

CONCLUSION

We suggest that unsupervised learning of GANs using healthy dataset can be used to detect multiple traumatic lesions on unseen data and has high sensitivity to detect anomalies.

CLINICAL RELEVANCE/APPLICATION

We propose that this model can be useful to develop deep learning algorithm to screen emergency or traumatic patients with multiple various lesions.

RC608-04 Incidence of Blunt Cerebrovascular Injuries and Anoxic Brain Injury in the Setting of Self-Inflicted Hanging

Thursday, Dec. 5 9:20AM - 9:30AM Room: S401CD

Participants
Jean Mutambuze, BS, Indianapolis, IN (*Presenter*) Nothing to Disclose
Stephen F. Kralik, MD, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose
Scott D. Steenburg, MD, Zionsville, IN (*Abstract Co-Author*) Institutional research collaboration, IBM Corporation

For information about this presentation, contact:

ssteenbu@iuhealth.org

PURPOSE

Near hanging injuries are included as a high risk mechanism for the development of blunt cerebrovascular injuries (BCVI), despite there being a paucity of evidence-based data in support of this practice. As a result, this group of patients has been coalesced under the BCVI group which includes a myriad of different mechanisms of injury. The purpose of this study was to determine the incidence of BCVI in a large series of self-inflicted hanging patients who received neck CTA, and to guide appropriate diagnostic imaging in this specific group.

METHOD AND MATERIALS

A 10-year retrospective review of self-inflicted hanging patients who received neck CTA at two urban Level 1 trauma centers was performed. The medical record was used to confirm self-inflicted hanging mechanism of injury, as well as key demographic data, airway status, physical exam findings, neurological status and deficits, drug screen results, and mortality. Neck CTA were evaluated for neck arterial injuries, cervical spine fractures and signs of ligamentous injury. CT Head and/or MRI brain exams performed during hospitalization were evaluated for infarction and ischemic brain injury. A Fisher's exact test was used to compare variables associated with patients with positive versus negative neck CTA exams with $p < 0.05$ considered statistically significant.

RESULTS

A total of 151 patients (mean age 31.6 years) of which 113 were male (74.8%) were included for analysis. Five patients (3.3%) were diagnosed with BCVI. A total of 74% had abnormal neck examination, 64% had abnormal drug screen, 63% had GCS <15, 33% were intubated, 30% had abnormal neurologic examination, 15.2% had anoxic brain injury resulting in death, and 0% had cervical spine fracture or ligamentous injury. Neurological deficit (p=0.027), and mortality (p=0.03) were significantly higher in CTA positive patients, while abnormal neck examination (p=1.0), positive drug screen (p=1.0) and intubation (p=0.33) were not significantly different.

CONCLUSION

The incidence of BCVI among patients with self-inflicted hanging was 3.3%. A total of 15% of patients died due to anoxic brain injury.

CLINICAL RELEVANCE/APPLICATION

The incidence of BCVI in the setting of self-inflicted hanging is similar to that seen in other high risk mechanisms of injury. Thus including hanging injuries as a high risk mechanism for screening neck CTA remains prudent. Death due to anoxic brain injury poses a greater risk than that of BCVI.

RC608-05 Follow-up CT Imaging Post Liver Trauma: When is the Best Time to Image?

Thursday, Dec. 5 9:30AM - 9:40AM Room: S401CD

Participants
Aurelio Cosentino, MD, Torino, Italy (*Abstract Co-Author*) Nothing to Disclose
Dylan Lewis, MBBCh, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Bhavna Batohi, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Lisa M. Meacock, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Adeel E. Syed, FRCR,MBBS, London, United Kingdom (*Presenter*) Nothing to Disclose

PURPOSE

The purpose of the study is to determine the value of liver injury CT grade in predicting the potential for subacute/late complications, and to determine the ideal timing of follow-up (FU) CT imaging to detect complications.

METHOD AND MATERIALS

From August 2017 to July 2018, 58 major trauma patients (Pts) were diagnosed with liver injury. In this retrospective observational study, the admission CT and relevant clinical data were available for 53 Pts (43 male, 10 female; mean age 37.2 years ±18.2). Hepatic injuries detected on the admission CT were graded by two trauma radiologists using the AAST grading system. Mechanism of injury, liver-related subacute/late complications, and timing of follow-up CT imaging were reviewed.

RESULTS

The mechanisms of injury were as follows: vehicle incident/collision (n=25), fall >2 m (n=16), fall <2 m (n=1), penetrating trauma (n=10), rugby injury (n=1). There were 6 grade I liver injuries, 14 grade II, 14 grade III, 15 grade IV, and 4 grade V. Two Patients died within 30 days from presentation. Liver-related complications were observed in 10 patients (see Table) and included bilomas, biliary stricture and vascular complications. A statistically significant correlation between penetrating trauma and the occurrence of complications was observed (p<0.014). No correlation was observed between the injury grade and the trauma mechanism or the occurrence of complications. In 50% of cases, the complication was identified at FU CT within 7 days from the trauma (mean 6 days, range 5-7), in 50% of cases it was identified at further FU CT (mean 14 days, range 9-55).

CONCLUSION

Independent of the CT injury grade, a higher incidence of liver related complications occured with penetrating than a blunt

mechanism of trauma. An initial follow-up CT between 5 and 7 days after the trauma is adequate to reveal early liver-related complications, but a subsequent FU CT within 15 days is recommended to detect complications in those patients with high grade liver injury.

CLINICAL RELEVANCE/APPLICATION

A follow-up CT 5-7 days after traumatic liver injury is adequate to reveal early complications, a FU CT within 15 days is recommended in patients with high-grade injury and in penetrating liver trauma

RC608-06 Diaphragmatic Trauma

Thursday, Dec. 5 9:40AM - 10:10AM Room: S401CD

Participants
Michael N. Patlas, MD,FRCPC, Hamilton, ON (*Presenter*) Speaker, Springer Nature

For information about this presentation, contact:

patlas@hhsc.ca

LEARNING OBJECTIVES

1) To review the radiological and surgical literature of the potential pitfalls in diagnosis of diaphragmatic injuries. 2) To describe direct and indirect signs of blunt and penetrating diaphragmatic injury. 3) To highlight factors affection detection of diaphragmatic injuries.

RC608-07 Bowel and Mesenteric Trauma

Thursday, Dec. 5 10:20AM - 10:50AM Room: S401CD

Participants
Michael E. O'Keeffe, MBBCh, Vancouver, BC (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

dr.meokeeffe@gmail.com

LEARNING OBJECTIVES

1) Review imaging pearls and pitfalls in the assessment of mesenteric injury in trauma patients. 2) Focus on the anatomy of the small and large bowel mesentery, patterns of mesenteric injury, and their appearance on MDCT. 3) Review specific CT appearance of isolated mesenteric injury and polytrauma cases.

ABSTRACT

The small and large bowel mesentery are all too frequently underestimated as potential sites of significant injury in the trauma patient. In fact many would now argue that the mesentery itself has enough individual anatomical components and physiological roles to be considered a separate organ within the human body . As such we need to review the mesentery as a unique anatomical entity . It demonstrates a recognizable pattern of injury on CT imaging. These "fingerprints of trauma" can be searched or in every case and provide a valuable guide to potentially serious bowel and vascular injury.

RC608-08 Role of CT in Predicting Therapeutic Operative Intervention in Cases of Suspected Bowel and Mesenteric Injuries Due to Blunt Abdominal Trauma

Thursday, Dec. 5 10:50AM - 11:00AM Room: S401CD

Participants
Muhammad O. Afzal, MD, MBBS, Memphis, TN (*Presenter*) Nothing to Disclose
Lou J. Magnotti, MD, Memphis, TN (*Abstract Co-Author*) Nothing to Disclose
Sridhar S. Shankar, MD, MBA, Memphis, TN (*Abstract Co-Author*) Equipment support, Clarius Mobile Health Corp
Dina Filiberto, MD, Memphis, TN (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

CT plays an important role in the workup of stable patients after blunt trauma. Suspected bowel or mesenteric injuries (BBMI) often present with subtle and inconsistent imaging findings. Various radiographic signs have been used to predict the presence of these injuries. However, the optimal predictor for BBMI remains controversial. It is our contention that one of the best predictors is the overall impression of the reviewing radiologist. Thus, the purpose of this study was to identify radiographic predictors of therapeutic operative intervention in patients after blunt abdominal trauma.

METHOD AND MATERIALS

Patients with a discharge diagnosis of a mesenteric injury after blunt trauma were identified over a 5-year period. Admission CT scans were reviewed for potential predictors of BBMI, including mesenteric hematoma, acute arterial extravasation, bowel wall hematoma, bowel devascularization, fecalization of small bowel, free air, fat pad injury. In addition, the overall impression of the scan by the reviewing radiologist was recorded. Patients were then stratified by therapeutic laparotomy and compared. Multivariable logistic regression (MLR) was then used to identify predictors of therapeutic laparotomy.

RESULTS

Over the study, 114 patients underwent operative intervention: 75 patients (66%) underwent therapeutic laparotomy. After adjusting for the above predictors including the overall impression of the radiologist, MLR identified the impression of the radiologist (OR 3.14; 95%CI 1.19-8.27, p=0.021), fat pad injury (OR 3.5; 95%CI 1.24-9.99, p=0.018) and bowel devascularization (OR 8.2; 95%CI 0.962-9.91, p=0.054) as independent predictors of therapeutic laparotomy. Interestingly, the overall impression of the radiologist had a positive predictive value of 82.1%.

CONCLUSION

CT remains vital in the evaluation of patients suspected of having bowel and mesenteric injuries after blunt trauma. An experienced radiologist remains invaluable in assessing often subtle signs of BBMI. A simplified scoring system utilizing these predictors could potentially aid the radiologist and surgeons in identifying those patients that would benefit from early operative intervention.

CLINICAL RELEVANCE/APPLICATION

CT helps identify stable patients suspected of mesenteric/bowel injuries who would benefit from early operative intervention.

RC608-09 Damage Control Surgery CT: An Analysis in Diagnosing Abdominopelvic Surgically Significant Injuries

Thursday, Dec. 5 11:00AM - 11:10AM Room: S401CD

Participants
Zohaib Ahmad, MD, Boston, MA (*Presenter*) Nothing to Disclose
Arthur Baghdanian, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jorge A. Soto, MD, Boston, MA (*Abstract Co-Author*) Royalties, Reed Elsevier
Stephan W. Anderson, MD, Cambridge, MA (*Abstract Co-Author*) Research Grant, General Electric Company Research Grant, Koninklijke Philips NV
Armonde Baghdanian, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

zohaib.ahmad@bmc.org

PURPOSE

To evaluate the incidence in diagnosis and misses of surgically relevant abdominopelvic injuries on computed tomography (CT) imaging in the Damage Control (DC) patient.

METHOD AND MATERIALS

This retrospective study was IRB approved and HIPAA compliant. Informed consent was waived. Patients aged 18 and older who sustained blunt or penetrating trauma requiring DC surgery without a prior CT at Boston Medical Center 2/21/2005 - 9/26/2018 were included. 59 patients met inclusion criteria (52 male, 4 female, mean age of 29). A CT was obtained 24 hours after the initial surgery. Each study was assessed by a single blinded fellowship trained radiologist. Outcomes were evaluated through failed surgical repair warranting surgical intervention, a clinically significant injury discovered on CT in a surgically explored area, a clinically significant injury discovered on CT in a surgically unexplored area, and a clinically significant injury missed on the initial CT but found on later surgery/imaging. These categorical variables were evaluated by percentages.

RESULTS

In a cohort of 57 patients, a total of 7 (12.5%) patients had a failed surgical repair discovered on initial CT (12.3%); of those 7 patients, 3 (42.8%) had failed repair of the liver. 6 (10.7%) patients had a clinically significant injury discovered on CT in a surgically explored area; of those 6 patients, 2 (33.3%) had injury of the kidney. 6 (10.7%) patients had a clinically significant injury discovered on CT in a surgically unexplored area. 9 (16.1%) patients who had a clinically significant injury that was missed on the initial CT; of those 9 patients, 3 (33.3%) had a missed injury to the large bowel.

CONCLUSION

As a staged surgical process in a critically traumatic injured patient, Damage Control (DC) surgery is a burgeoning life-saving method to address both traumatic and metabolic derangements in a timely manner. Further knowledge of common surgically and radiographically missed injuries is important to provide accurate diagnoses in these patients especially in the retroperitoneum and gastrointestinal system.

CLINICAL RELEVANCE/APPLICATION

Accurate interpretation of computed tomography (CT) imaging during this process is vital to assessing for any surgically missed injury or assessment of repair in the critically ill DC patient.

RC608-10 Diagnostic Performance of Triple-Contrast versus Single-Contrast Multi-Detector Computed Tomography for the Evaluation of Penetrating Bowel Injury

Thursday, Dec. 5 11:10AM - 11:20AM Room: S401CD

Participants
Fabio M. Paes, MD, Miami, FL (*Presenter*) Nothing to Disclose
Anthony M. Durso, MD, Miami, FL (*Abstract Co-Author*) Nothing to Disclose
Kim M. Caban, MD, Miami , FL (*Abstract Co-Author*) Nothing to Disclose
Brian Covello, MD, Miami, FL (*Abstract Co-Author*) Nothing to Disclose
Daniel Suarez, MD, Bogota, Colombia (*Abstract Co-Author*) Nothing to Disclose
Douglas S. Katz, MD, Mineola, NY (*Abstract Co-Author*) Nothing to Disclose
Felipe Munera, MD, Key Biscayne, FL (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

fpaes@med.miami.edu

PURPOSE

Selecting low risk penetrating trauma patients to forego laparotomy can be challenging. Bowel injury may prevent nonoperative management. Our goal is to compare the diagnostic performance of triple-contrast (oral, rectal, and IV) against IV contrast only CT in detecting bowel injury from penetrating abdominopelvic trauma, using surgical diagnosis during exploratory laparotomy as standard.

METHOD AND MATERIALS

997 patients who underwent CT for penetrating trauma between 2009-2016 were enrolled in this IRB-approved retrospective cohort study. A total of 143 patients, including 15 females (ages 16-41), and 123 males (ages 14-83) underwent preoperative CT followed by exploratory laparotomy. Of these, 56 patients received triple-contrast CT. CT examinations were reviewed by 2 attending radiologists, blinded to surgical outcome and clinical presentation. Direct and indirect signs of bowel injury were documented. Results were stratified by contrast type and mechanism of injury and subsequently compared based upon diagnostic performance indicators of sensitivity, specificity, NPV, and PPV. AUCs were analyzed for determination of diagnostic accuracy.

RESULTS

Bowel injury was present in 45 out of 143 patients. Specificity and accuracy were higher with triple-contrast CT (98% specific [0.95, 1.00]), 97-99% accurate) compared to IV contrast only CT (66% specific [0.56, 0.75], 78-79% accurate). Sensitivity was highest with IV contrast only CT (91% sensitive [0.85, 0.98]) compared with triple-contrast CT (75% sensitive [0.56, 0.94]), although not statistically significant. Triple contrast CT increased diagnostic accuracy for both reviewers regardless of mechanism of injury. For reader 1, diagnostic accuracy with triple contrast CT versus IV contrast only CT was (99% [0.98, 1.00]) vs. 80% [0.62, 0.97]) for stab wounds and (100% vs. 76%[0.61, 0.91]) for gunshot wounds. For reader 2, diagnostic accuracy with triple-contrast CT versus IV contrast only CT was (99% [0.98, 1.00] vs. 74%, [0.55, 0.92]) for stab wounds and (95% [0.85, 1.00] vs. 79% [0.66, 0.92]) for gunshot wounds.

CONCLUSION

In our retrospective study, triple-contrast CT had greater accuracy, specificity, and NPV when compared to IV contrast only CT in evaluating for bowel injury from penetrating wounds.

CLINICAL RELEVANCE/APPLICATION

Triple-contrast CT has greater accuracy, specificity, and NPV when compared to IV contrast only CT in evaluating for bowel injury from penetrating trauma.

RC608-11 Multi-Institutional Observational Study of Detection, Treatment and Outcomes of Splenic Vascular Injuries Discovered at CT

Thursday, Dec. 5 11:20AM - 11:30AM Room: S401CD

Participants
James T. Lee, MD, Lexington, KY (*Presenter*) Nothing to Disclose
Christina A. LeBedis, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Emily Slade, PhD, Lexington, KY (*Abstract Co-Author*) Nothing to Disclose
Armonde Baghdanian, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Nagaramesh Chinapuvvula, MBBS, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Richard Tsai, MD, St. Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Ken F. Linnau, MD, Seattle, WA (*Abstract Co-Author*) Royalties, Cambridge University Press Research Grant, Siemens AG
Scott D. Steenburg, MD, Zionsville, IN (*Abstract Co-Author*) Institutional research collaboration, IBM Corporation
Suzanne T. Chong, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Arthur Baghdanian, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Demetrios A. Raptis, MD, Frontenac, MO (*Abstract Co-Author*) Nothing to Disclose
Kathirkamanathan Shanmuganathan, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

jtlee3@uky.edu

PURPOSE

Report trends for treating splenic injuries from 8 US trauma centers over 7 years Evaluate the frequency of reported splenic vascular injuries Evaluate factors influencing surgeon's decision to invasively treat (surgery or embolization) or conservatively manage

METHOD AND MATERIALS

IRB approved, retrospective review of splenic injuries recorded from Level 1 trauma registries over 7 years from 8 institutions. Inclusion: Adults (>=18) with blunt splenic trauma, CT within 12 hours of admission Exclusion: penetrating trauma to the abdomen/pelvis, splenectomy prior to CT, left AMA, CT <16 detector, and death before splenic treatment. Descriptive statistics as well as regression analysis was performed, adjusting for multiple covariates.

RESULTS

918 subject were identified, 776 met inclusion criteria. 268 female. Original CT reports indictated active splenic hemorrhage (ASH) in 25%. 36% received invasive treatment (14% IR, 22% OR) and 64% were managed conservatively. A steady increase in IR management of splenic injuries and respective decrease in operative and conservative management over the study period. Multinomial logistic regression was performed for multiple outcomes including odds of recieving embolization or operative treatment and length of stay. Not surprisingly, AIS spleen, AIS Head/Neck and ISS scores showed significant increase in odds for invasive treatment. Presence of ASH on CT report was extremely predictive of invasive treatment when compared to conservative observation: Odds ratios for embolization: 22.063 and for operative 9.374 (while controlling for gender, age, synchronous major organ injury, vital signs, hemoglobin, INR, Platelets and if blood products received at admission). Regarding length of stay, on average, for every one unit increase in ISS, the length of stay increases by 1.031 days. Interestingly, on average, ASH demonstrated a 0.933 days longer than those without ASH; however this was not statistically significant (p=0.961).

CONCLUSION

We observed changing trends in treatment of splenic vascular injuries over the study period, as well as institutional differences in utilization of embolization versus operative management. Radiologic description of active splenic extravasation was highly predictive of embolization

CLINICAL RELEVANCE/APPLICATION

Radiologist detection of active hemorrhage or contained vascular injury is highly predictive of invasive treatment of blunt splenic

injury

RC608-12 Pancreatic Trauma

Thursday, Dec. 5 11:30AM - 12:00PM Room: S401CD

Participants
Jorge A. Soto, MD, Boston, MA (*Presenter*) Royalties, Reed Elsevier

For information about this presentation, contact:

jorge.soto@bmc.org

LEARNING OBJECTIVES

1) Review key direct and indirect CT findings of blunt pancreatic trauma. 2) Highlight potential pitfalls in diagnosis of pancreatic trauma. 3) Understand proper utilization of MR in patients with suspected pancreatic injuries.

RC609

Case Review: Rectal MRI (Interactive Session)

Thursday, Dec. 5 8:30AM - 10:00AM Room: E451B

GI MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Special Information

Participants will review cases on their own devices and answer questions. The cases will then be reviewed by the presenters. Note: this activity is best done on a laptop or tablet. Although phones will work, their small size limits optimal image view.

Sub-Events

RC609A Rectal MR Cases - Set 1

Participants
David H. Kim, MD, Middleton, WI (*Presenter*) Shareholder, Cellectar Biosciences, Inc; Shareholder, Elucent Medical;

LEARNING OBJECTIVES

1) Identify key anatomic landmarks that are helpful in rectal cancer staging at MR. 2) Critically evaluate whether tumor is contained or extends past the muscularis propria of the rectum. 3) State the criteria for regional lymph node positivity at MR.

RC609B Rectal MR Cases - Set 2

Participants
Elena K. Korngold, MD, Portland, OR (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

korngold@ohsu.edu

LEARNING OBJECTIVES

1) To interactively view rectal MRI cases and incorporate salient teaching points, with self and group evaluation during the process, building towards an understanding of practical rectal MRI for rectal cancer staging. 2) To gain working knowledge of anatomy and MRI findings to optimally interpret and report on rectal cancer staging and features.

RC609C Rectal MR Cases - Set 3

Participants
Zahra Kassam, MD, London, ON (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

zahra.kassam@sjhc.london.on.ca

LEARNING OBJECTIVES

1) Provide overview of MR imaging in rectal cancer staging. 2) Highlight pearls and pitfalls in technique and interpretation, to increase staging accuracy. 3) Review reporting guidelines pertinent to rectal MR staging.

RC609D Rectal MR Cases - Set 4

Participants
Mukesh G. Harisinghani, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

MHARISINGHANI@MGH.HARVARD.EDU

LEARNING OBJECTIVES

1) Provide overview of MR imaging in rectal cancer staging. 2) Highlight important technical pointers for accurate staging.

RC610

Abdominal Doppler: What You Need to Know

Thursday, Dec. 5 8:30AM - 10:00AM Room: E351

GI US VA

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Sub-Events

RC610A Ultrasound Evaluation of the Aorta and Mesenteric Arteries

Participants
Leslie M. Scoutt, MD, Essex, CT (*Presenter*) Speaker, Koninklijke Philips NV

For information about this presentation, contact:

leslie.scoutt@yale.edu

LEARNING OBJECTIVES

1) Discuss the role of ultrasound in screening for abdominal aortic aneurysms and following endograft repair. 2) Describe the ultrasound appearance of aortic and superior mesenteric artery dissections. 3) Discuss the role of ultrasound in the evaluation of mesenteric ischemia.

ABSTRACT

This presentation will review the role of ultrasound in evaluation of common aortic and mesenteric artery pathology. The focus will be on how and why to screen for abdominal aortic aneurysms and the evolving role of ultrasound in the follow up of endograt aortic repair. The role of ultrasound in the evaluation of clinically suspected aortic dissections and in the evaluation of mesenteric ischemia will also be described. More unusual aortic and mesenteric vascalar pathology as well as mimics will also be briefly presented as challenge cases.

RC610B Liver/TIPS Doppler

Participants
Mark E. Lockhart, MD, Birmingham, AL (*Presenter*) Author, Oxford University Press; Author, Reed Elsevier; Editor, John Wiley & Sons, Inc; Deputy Editor, Journal of Ultrasound in Medicine

LEARNING OBJECTIVES

1) To gain an understanding of normal Doppler appearance of hepatic vessels. 2) To gain an understanding of the sonographic appearance of common liver diseases. 3) To review the normal and abnormal Doppler criteria related to TIPS shunts.

ABSTRACT

This lecture will initially review basic Doppler concepts related to the liver and cover basic appearance of liver vessel flow. It will then describe the Doppler appearance of the most common hepatic disease processes and their sonographic appearance. Finally, the lecture will depict several examples of abnormalities associated with TIPS shunts and their Doppler criteria for diagnosis.

RC610C Renal Doppler

Participants
Deborah J. Rubens, MD, Rochester, NY (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

Deborah_rubens@urmc.rochester.edu

LEARNING OBJECTIVES

1) Discuss the applications of Doppler US in renal vascular as well as parenchymal disease. 2) Review the critical technical parameters which enable accurate diagnoses. 3) Highlight the important pitfalls in renal Doppler imaging.

ABSTRACT

This presentation will explore the use of Doppler ultrasound in the assessment of the kidney and its vascular supply. Doppler technique will be reviewed with particular attention to artifacts and pitfalls which may enhance or detract from diagnostic efficacy. The role of ultrasound imaging in assessment of acute as well as chronic renal dysfunction will be addressed. The performance of Doppler ultrasound will be highlighted regarding vascular stenosis and occlusion, parenchymal perfusion, and diagnosis of renal masses and stones. Doppler techniques to avoid false negative and false positive studies will be emphasized. Surgical emergencies will be highlighted and the role of correlative imaging with CT, MR and/or angiography will be presented.

RC610D Understanding Hepatic Transplants: Not Just Chopped Liver

Participants

Jonathan D. Kirsch, MD, Branford, CT (*Presenter*) Consultant, FUJIFILM Holdings Corporation

For information about this presentation, contact:

jonathan.kirsch@yale.edu

LEARNING OBJECTIVES

1) Gain an understanding of the indications and contraindications for liver transplant. 2) Know the relevant post-operative anatomy for orthotopic liver transplant. 3) Be able to recognize and diagnose common vascular, biliary, and parenchymal complications related to the liver transplant in the postoperative period.

ABSTRACT

Liver transplantation has become the treatment of choice and standard of care for end-stage liver disease. As liver transplants become more commonly seen outside specialized academic centers, it becomes imperative to be familiar with the imaging related to liver transplantation. This talk will review the indications and contraindications of liver transplant, the post-operative anatomy seen for orthotopic liver transplants, and review the imaging findings of common post-operative vascular, biliary, and parenchymal complications that can be seen.

Printed on: 10/29/20

RC611

Head and Neck PET/CT: Clinical Approach

Thursday, Dec. 5 8:30AM - 10:00AM Room: S504CD

CT HN MR NR NM

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Sub-Events

RC611A Oropharyngeal Cancer: Evolving Challenges-Clinician's Perspective

Participants
Colette J. Shen, MD,PhD, Chapel Hill, NC (*Presenter*) Speaker, Nanobiotix

LEARNING OBJECTIVES

1) To understand how radiological interpretation of pre-treatment and post-treatment imaging studies influences the management of patients with head and neck cancer. 2) Using PET to delineate the radiation target. 3) Can we OMIT treatment of the PET negative neck? 4) 3 month Post-Treatment PET/CT response assessment.

RC611B CT and MRI Anatomy and Interpretation

Participants
Valerie L. Jewells, DO, Chapel Hill, NC (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Provide radiologists with the tools to access CT and MRI imaging for head and neck cancer. 2) Teach attendees how to address the images in a manner that will assist the ENT surgeon for staging and surgical planning. 3) Address the principles for critical thinking and analysis as well as preparation and skill development for a head and neck tumor board.

ABSTRACT

A successful multidisciplinary head and neck tumor board requires coordination and imaging review on the part of radiology to assist the surgeon, radiation oncolcogist and medical oncologist. The goal is to reach the best option for each individual patient depending upon tumor type, staging and underlying medical conditions. Appropriate imaging and interpretation is key to this endeavor. These topics will be addressed through discussion of selective CT and MRI cases from our weekly tumor board. References: 1. Heineman T, St John MA, Wein RO and Weber RS. It takes a village: The importance of multidisicplinary care. Otoloaryngol Clin North Am 2017 Aug;50(4):679-687. 2. Liao CT, Kang CJ, Lee LY et al. Association between multidisciplinary team care approach and survival rates in patients with oral cavity squamous cell carcinoma. Head Neck 2016 Apr;38 Suppl 1:E5444-53. 3. Shah BA, Qureshi MM, Jalisi et al. Analysis of decision making at a multidisciplinary head and neck tumor board incorporating evidence-based National Cancer Comprehensive Network (NCCN) guidelines. Pract Radiat Oncol 2016 Jul-Aug;6(4):248-54.

RC611C FDG-PET/CT: Applications and Interpretation

Participants
Terence Z. Wong, MD, PhD, Chapel Hill, NC (*Presenter*) Consultant, Lucerno Dynamics, LLC;

LEARNING OBJECTIVES

1) Describe applications for FDG-PET/CT for initial evaluation and follow up of patients with head and neck cancer. 2) Learn the value of combining metabolic findings on FDG-PET findings with morphology on CT and endoscopic appearance. 3) Understand potential etiologies of false positive and false negative studies.

ABSTRACT

Optimal evaluation of patients with head and neck malignancies requires a multidisciplinary approach. Correlation of FDG-PET, CT, direct visualization, and clinical examination is important to provide the best management of these patients.

RC611D Panel Discussion: Q&A

Participants
Terence Z. Wong, MD, PhD, Chapel Hill, NC (*Presenter*) Consultant, Lucerno Dynamics, LLC;
Valerie L. Jewells, DO, Chapel Hill, NC (*Presenter*) Nothing to Disclose
Colette J. Shen, MD,PhD, Chapel Hill, NC (*Presenter*) Speaker, Nanobiotix

LEARNING OBJECTIVES

1) To discuss case examples which highlight the value of multidisciplinary approaches for managing patients with head and neck cancer.

RC612

Vascular Series: CT Angiography-New Techniques and Their Application

Thursday, Dec. 5 8:30AM - 12:00PM Room: S405AB

CT VA

AMA PRA Category 1 Credits ™: 3.00
ARRT Category A+ Credits: 3.50

FDA Discussions may include off-label uses.

Participants
Jill E. Jacobs, MD, New York, NY (*Moderator*) Nothing to Disclose
W. Dennis Foley, MD, Milwaukee, WI (*Moderator*) Nothing to Disclose
Russell H. Angle, MD, Potomac, MD (*Moderator*) Nothing to Disclose

Sub-Events

RC612-01 Relationship between Contrast Dose and Radiation Dose in CTA

Thursday, Dec. 5 8:30AM - 9:00AM Room: S405AB

Participants
Mannudeep K. Kalra, MD, Lexington, MA (*Presenter*) Research Grant, Siemens AG; Research Grant, Riverain Technologies, LLC;

For information about this presentation, contact:

mkalra@mgh.harvard.edu

LEARNING OBJECTIVES

1) Understand scan factors that affect both radiation dose and intravenous contrast administration in CT angiography (CTA). 2) Understand how scan factors should be adjusted to reduce radiation dose and/or contrast volume for CTA. 3) Understand how CT technology affects radiation dose and contrast media administration in CTA.

ABSTRACT

NA

RC612-02 The Utility of Test Bolus for Improving Low Iodine Dynamic 4D CTA in the Diagnosis of Lower Extremity Peripheral Vascular Disease

Thursday, Dec. 5 9:00AM - 9:10AM Room: S405AB

Participants
Terri J. Vrtiska, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Yong Lee, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Nikkole Weber, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Ahmed Halaweish, PhD, Rochester, MN (*Abstract Co-Author*) Employee, Siemens AG
Irene Duba, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Eric E. Williamson, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Shuai Leng, PHD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Cynthia H. McCollough, PhD, Rochester, MN (*Abstract Co-Author*) Research Grant, Siemens AG
Joel G. Fletcher, MD, Rochester, MN (*Abstract Co-Author*) Grant, Siemens AG; Consultant, Medtronic plc; Consultant, Takeda Pharmaceutical Company Limited; Grant, Takeda Pharmaceutical Company Limited; ;
Akitoshi Inoue, MD,PhD, Higashioumi, Japan (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

fletcher.joel@mayo.edu

PURPOSE

To determine the diagnostic accuracy of low iodine 4D dynamic CTA (4D CTA) with a test bolus in lower extremity peripheral vascular disease (PVD).

METHOD AND MATERIALS

68 pts with suspected PVD underwent dynamic 4D CTA of the lower extremities with 40mL Iohexol 350 using either fixed delay (of 13 sec, n=34) or with test bolus (10 cc of Iohexol 350, n=34). Subsequent conventional CTA using a weight-base protocol served as the reference standard. 4D-CTA exams (± test bolus) consisted of 11 low-radiation-dose acquisitions. A vascular radiologist interpreted thin temporally-resolved MIPs (tMIPs) of each lower extremity, a dynamic series displaying the 4D temporal runoff, and thick tMIPs with and without calcium removal. For each lower extremity, arterial stenoses in each of 7 vascular segments was compared to conventional CTA, and was graded as <50%, 50 -70%, >70% or occluded.

RESULTS

Runoff to the level of the ankle was observed for 76% (26/34) patients using 4D CTA with fixed delay compared to 97% (33/34)

with test bolus. In patients with runoff to the ankle, overall accuracy for peripheral vascular disease (requiring identical stenosis grading per segment) was 89.6% (326/364; 95% CI: 86 - 95%) for 4D CTA with fixed delay compared to 94.0% (355/378; 95% CI: 91 - 96%) using the test bolus. For stenosis > 70%, 4D CTA demonstrated a sensitivity of 90.3% (56/62; 95% CI: 86 - 95%) with a fixed delay and 90.4% (104/115; 95% CI: 82 - 98%) with a test bolus. For patients with runoff to the ankle, 4D temporal runoff images provided useful information about asymmetrical or collateral flow in 5/26 cases (19.2%) and in 9/32 cases (28.1%), respectively, with one technical failure to generate temporally resolved images in the test bolus arm. Thick tMIPs, with calcium displayed or removed, were only helpful in 15% (4/26) cases with fixed delay, but were helpful in the majority of patients with test bolus 63% (20/32).

CONCLUSION

Using a test bolus, low iodine dynamic 4D-CTA results in high accuracy for the prediction of PVD. It increases the number of patients with runoff to the ankles compared to fixed delay techniques, and provides additional information about asymmetric and collateral flow.

CLINICAL RELEVANCE/APPLICATION

Low iodine dynamic 4D CTA results in accurate prediction of significant peripheral vascular disease, with a test bolus improving runoff to the ankles and providing additional temporal information compared to fixed delay techniques.

RC612-03 Reduced Contrast Agent Volume and Radiation Dose Using a Heartrate-Dependent Scanning Protocol in Computed Tomography Angiography (CTA) of Lower Extremity Artery for Patients with Diabetes

Thursday, Dec. 5 9:10AM - 9:20AM Room: S405AB

Participants
Peiji Song, Liaocheng , China (*Presenter*) Nothing to Disclose
Nan Wang, Liaocheng , China (*Abstract Co-Author*) Nothing to Disclose
Wenbo Guo, Liaocheng , China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the feasibility of a personalized CT scanning protocol that was tailored to patients' heart rate for lower extremity CTA of diabetic patients.

METHOD AND MATERIALS

A total of 40 diabetic patients who need to undergo lower extremity CTA were prospectively randomized into two groups (patients with vascular occlusion were excluded). For each patient in Group A (n = 20), a total of 70 mL contrast agent (Iopamidol 370) was injected with a rate of 3 mL/s. By monitoring the distal end of bilateral superficial femoral artery, the CTA scan was manually triggered according to the patient's heart rate (HR): HR > 80 bmp, the CTA was triggered manually 25-28 seconds after the injection of contrast agent and initiated automatically with a delay of 6 s; HR = 60-80bmp, trigger time was 30-33 s with a delay of 8 s; HR<60bmp, trigger time was 35-38 s with a delay of 10 s. For each patient in Group B (n = 20), a total of 85 mL contrast agent (Iopamidol 370) was injected with a rate of 3 mL/s. The routine auto-trigger protocol was applied by setting the distal abdominal aorta threshold as 180 HU. All CTAs were performed on a 16-cm wide-detector CT (Revolution CT, GE).The CT values of the bilateral femoral arteries, the superficial femoral artery, the popliteal artery, the anterior and posterior tibial arteries and the peroneal arteries were measured and compared between the two groups using paired t-test. Two experienced radiologists evaluated the image quality using a 5-point scale (1-unassessble to 5-excellent) and the image quality was compared using chi-square test. Radiation doses were also recorded and compared using t-test.

RESULTS

No difference was found between the two groups in either of the CT values(Ps > 0.05, Table1). Subjective ratings of image quality were not statistically different($X2=1.086$, $P = 0.896$, Table 2). The radiation dose was significantly lower in Group A than in Group B (7.1 mSv vs. 8.1 mSv, $t = 2.162$, $P = 0.037$).

CONCLUSION

By adopting a heart-rate dependent protocol, the radiation dose and contrast medium dose were both reduced in lower extremity CTA for patients with diabetes, while the image quality was remained comparable to those acquired with routine CTA protocol.

CLINICAL RELEVANCE/APPLICATION

The personalized, heart-rate dependent CTA protocol can reduce the use of contrast medium and the radiation dose. This is especially beneficial for patients with diabetes who have potential renal insufficiency.

RC612-04 Automatic Detection of Aortic Dissection Using Contrast X-Ray Computed Tomography (CT)

Thursday, Dec. 5 9:20AM - 9:30AM Room: S405AB

Participants
Arkadiusz Sitek, PhD, Cambridge, MA (*Presenter*) Employee, IBM Corporation
Yiting Xie, Cambridge, MA (*Abstract Co-Author*) Employee, IBM Corporation
Mark Bronkalla, BSC, MBA, Hartland, WI (*Abstract Co-Author*) Employee, IBM Corporation
Benedikt Graf, PhD, Cambridge, MA (*Abstract Co-Author*) Employee, IBM Corporation
Manikanta Srikar Yellapragada, New York, NY (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

arek@ibm.com

PURPOSE

Aortic dissection is a serious event associated with a high mortality. Untreated death rates of 40% on initial presentation and increase >1% per hour have been reported (Ann Emerg Med. 1996;28:278-288). Improvement in survival is dependent on rapid diagnosis in emergency department (ED). CT with contrast is frequently used for diagnosis of aortic dissection in ED. We have

developed a fully automatic approach to detect aortic dissection on volumetric CT image. This can be used to worklist prioritization in order to expedite the diagnosis and treatment. The worklist can be that of the PACS and /or a notification within the EMR. The algorithm examines CT volumes and if dissection found alerts radiologist or other parties that the study needs immediate attention/review.

METHOD AND MATERIALS

The method consists of two steps. In the first, a machine learning algorithm was used to determine a centerline of aorta in each CT volume. Eight hundred CT volumes obtained from various public sources were used to train the centerline algorithm. Based on the centerline we extracted N transverse to aorta centerline image patches encompassing the detected outermost perimeter of the aorta plus a margin along the extent of the aorta in the field of view. These patches formed image sequence that was used as input to recurrent neural network and used for classification of the presence of a dissection. Classification algorithm was trained and validated using a retrospective multi-institution, multi-vendor set 695 CT volumes. There were 319 contrast CT scans without dissection and a set of 376 contrast CT scans with dissection, 80/20 split was used for training/testing. Studies that were used as positive for dissection were selected based on positive findings in the radiology reports. The set was different than data used to train algorithm for finding the centerline.

RESULTS

Fully automated algorithm achieved performance of 0.982 (95% CI: 0.955-0.998) of area under ROC curve (AUC) for detection of dissection in contrast CT studies.

CONCLUSION

The detection of aortic dissection and prioritization of the study for formal reading can now be automated with high accuracy. The detection of this relatively rare (<1:10000 studies) but deadly malady without inducing high false positive indications is now possible. This functionality can then be integrated into the clinical workflow: whether triggering an earlier, prioritized read by a staff radiologist, off-loading the study to a teleradiology practice or notifying the ED attending physician.

CLINICAL RELEVANCE/APPLICATION

The algorithm has the potential to significantly decrease the time to diagnosis and therefore treatment of aortic dissection in ED and is critical for facilities without in-house 24-hour radiologist reading coverage.

RC612-05 Dual-energy and Low kVp CTA

Thursday, Dec. 5 9:30AM - 10:00AM Room: S405AB

Participants
Shuai Leng, PHD, Rochester, MN (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

leng.shuai@mayo.edu

LEARNING OBJECTIVES

1) Assess impact of low kVp on image quality and radiation dose in CTA. 2) Select appropriate kVp for CTA exams to achieve optimal diagnosis at lowest radiation dose. 3) Understand basic principles of dual energy CT and various technical implementations. 4) Understand dual energy processing methods and various types of dual energy images in CTA.

RC612-06 Roles for CTA in Interventional Radiology

Thursday, Dec. 5 10:30AM - 11:00AM Room: S405AB

Participants
Jonathan J. Keung, MD, Bethesda, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the uses of CT angiography in interventional radiology. 2) Describe pertinent CT angiographic findings associated with pre-procedural planning for intervention. 3) Compare pre-procedural CT angiographic findings with intraprocedural angiographic findings.

RC612-07 Quantitative Evaluation of a Feasibility Using Dynamic CTA for Diagnosis of Lower Legs Muscle Ischemia

Thursday, Dec. 5 11:00AM - 11:10AM Room: S405AB

Participants
Da-Ming Zhang, MD, Beijing, China (*Presenter*) Nothing to Disclose
Xueyan Zhou, Chicago , IL (*Abstract Co-Author*) Nothing to Disclose
Zhengyu Jin, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Xiaobing Fan, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

cadina1984@163.com

PURPOSE

To quantitatively evaluate lower leg muscle ischemia using dynamic computed tomographic angiography (CTA) and compare with clinical standard CTA diagnosis outcome.

METHOD AND MATERIALS

The study was HIPPA compliant and approved by our IRB. Patients (n=35) with known peripheral arterial occlusive disease were

enrolled. Dynamic CTA (dyn-CTA) of calves (9 phases, 2.5s×5 cycles, 5s×4 cycles, 70 kVp, 80 mAs, 30 mL Iopromide) was performed first. 5 minutes later, a standard runoff CTA (s-CTA) of lower extremity was performed. Runoff score was given for s-CTA. For each of four lower leg artery segments, a score of '0' is assigned for vessel with <20% stenosis, '1' for 21-49% stenosis, '2' for 50-99% stenosis, '2.5' for a vascular occlusion less than half of its length, and '3' for an occlusion greater than half of the length. The score for the popliteal artery is multiplied by 3 and 1 is added before adding all 4 vessel scores together. Dyn-CTA muscle signal intensity as function of time (S(t)) was analyzed between the 10th to 80th slices. For each pixel, a sum of S(t) was calculated between 2.5 to 10 s, and then sorted from low to high. Top 25th, 10th, and 5th percentile of pixels were used to calculate the average S(t). Quantitative kinetic parameters, E1(initial enhancement), Epeak(peak enhancement), and SER(signal enhancement ratio) were calculated for average S(t): E1=(S1-S0)/S0, Epeak=(Speak-S0)/S0, and SER=(S1-S0)/(Slast-S0), where S0, S1, Speak and Slast is baseline, the 1st, the peak, and the last signal intensity, respectively.

RESULTS

Based on s-CTA diagnosis, all legs were divided into a normal group (n=22) with each vessel segment score <=1 and runoff score <=7; and an abnormal group with ischemia (n=48). On average, the E1 and Epeak for normal group were significantly higher than abnormal group, but not for the SER. There were weak correlations between runoff scores and E1 (Epeak). The ROC analysis between the two groups had area under the curve of 0.77 for E1 (25%).

CONCLUSION

There were significant differences between normal and ischemic leg muscle for quantitative kinetic parameters calculated from dyn-CTA.

CLINICAL RELEVANCE/APPLICATION

There is clinical potential application of quantitative analysis of lower extremity dyn-CTA for diagnosis of muscle ischemia besides the vessel anatomical illustration.

RC612-08 3D Morphologic Features for Predicting Late Adverse Events in Uncomplicated Type B Aortic Dissection

Thursday, Dec. 5 11:10AM - 11:20AM Room: S405AB

Participants
Lewis D. Hahn, MD, Stanford, CA (*Presenter*) Research Consultant, Arterys Inc
Gabriel Mistelbauer, Vienna, Austria (*Abstract Co-Author*) Research Grant, cool IT GmbH
Kai Higashigaito, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Anna M. Sailer, MD,PhD, West Hollywood, CA (*Abstract Co-Author*) Nothing to Disclose
Martin J. Willemink, MD,PhD, Mountain View, CA (*Abstract Co-Author*) Research Grant, American Heart Association; Research Grant, Koninklijke Philips NV; Consultant, Arterys Inc
Martin Koci, MD , Prague 5, Czech Republic (*Abstract Co-Author*) Nothing to Disclose
Craig Miller, Stanford, CA (*Abstract Co-Author*) Research collaboration, Edwards Lifesciences Corporation Research collaboration, Abbott Laboratories Research collaboration, Medtronic plc
Michael Fischbein, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Dominik Fleischmann, MD, Stanford, CA (*Abstract Co-Author*) Research Grant, Siemens AG

PURPOSE

Predicting the risk of late adverse events (LAE) in patients with uncomplicated Type B aortic dissection is highly desired for optimizing treatment strategy. Morphologic risk factors extracted from imaging data are almost universally 2D measurements such as maximum aortic diameter and cannot capture the complex geometry of aortic dissection. We sought to identify 3D quantitative features of aortic dissection and explore their relationship with LAE.

METHOD AND MATERIALS

CT angiograms from the initial hospitalization of 41 patients with uncomplicated type B aortic dissection were retrospectively identified and manually segmented into true lumen, false lumen, and background voxels (TeraRecon). Patients were followed for a median of 1501 days (IQR 648-2224). 18 LAE - predominantly driven by aneurysm formation >55mm - were observed during the study period. Centerlines of the true lumen (TL), false lumen (FL), aorta, and dissection flap were extracted from the segmentation masks using a sequential thinning skeletonization technique. Centerlines were determined by approximating the longest paths with 3D cubic B-splines. For each centerline, physical length, tortuosity, and parameters related to curvature and torsion were obtained using the Frenet-Serret formulas. Volume of the TL and FL were calculated. In total, 35 3D parameters were extracted. Maximum aortic diameter was also measured for comparison. Cox regression analysis was used to evaluate associations between candidate morphologic features and the occurrence of LAE after considering the correlations among variables.

RESULTS

Univariate analyses showed that multiple features were associated with LAE including TL, FL, and aortic centerline tortuosity (all $p<0.05$). A multivariable model with conventional maximum aortic diameter and all non-correlating features with $p<0.15$ showed that only true lumen tortuosity was independently associated with LAE (HR 7.8 [95% confidence interval 1.0-480.8], $p=0.04$).

CONCLUSION

Our results suggest that currently unexploited 3D morphologic features extracted from imaging date such as true lumen tortuosity may be independent predictors of LAE in patients with initially uncomplicated type B aortic dissection.

CLINICAL RELEVANCE/APPLICATION

This work demonstrates the feasibility of deriving 3D morphologic parameters of type B aortic dissection and finds an association between true lumen centerline tortuosity and late adverse events.

RC612-09 Advanced Visualization of Peroneal Artery Perforators Prior to Autologous Transplantation in Head and Neck Surgery by Dual-Energy CT and Multiplanar Vessel Unfolding

Thursday, Dec. 5 11:20AM - 11:30AM Room: S405AB

Participants
Matthias S. May, MD, Erlangen, Germany (*Presenter*) Speakers Bureau, Siemens AG
Matthias Wetzl, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Wolfgang Wust, MD, Erlangen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG
Rafael Heiss, Erlangen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG
Christoph Treutlein, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Markus Kopp, Erlangen, Germany (*Abstract Co-Author*) Speakers Bureau, Siemens AG
Michael Uder, MD, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

matthias.may@uk-erlangen.de

PURPOSE

Our aim was to improve pre-surgical visualization of peroneal artery perforators prior to fibula osteomyocutaneus flap for mandible reconstruction.

METHOD AND MATERIALS

CT angiography of the lower limbs was performed in 33 patients using dual-energy acquisitions from a third generation dual-source CT and a high iodine flux (7 ml/sec, 350 mg/ml). Low monoenergetic reconstructions (40keV) were automatically reconstructed from the scanner and used for semi-automatic centerline labeling of the peroneal artery and its' perforators on a post-processing console using a vascular workflow. Multiplanar unfolding was done using a prototype software application. Image quality was evaluated as vessel contrast and vessel continuity using a five point Likert scale in comparison to standard dual energy reconstructions (mixed images).

RESULTS

Vessel contrast was rated high or very high in 92 % of all patients in the 40 keV reconstructions and in 69% of the mixed images. Multiplanar vessel unfolding was successful in all patients. Mean number of slices was substantially reduced using vessel unfolding (3) compared to maximum intensity projections (13) or standard multiplanar reconstruction (35) in coronal plane. Continuity was rated high or very high in more than 90% of all vessels using 40 keV reconstructions and significantly lower in the mixed images.

CONCLUSION

Low monoenergetic reconstructions allow for very good representation of small perforator vessels of the peroneal artery. Multiplanar vessel unfolding is feasible and considerably eases and improves the visualization for pre-surgical planning.

CLINICAL RELEVANCE/APPLICATION

Best reproduction of peroneal perforator vessels prior to fibula osteomyocutaneus flap for mandible reconstructioncan be obtained with vessel unfolding and virtual monoenergetic reconstructions from Dual-Energy CT acquisitions.

RC612-10 CTA Artifacts and Post-Processing

Thursday, Dec. 5 11:30AM - 12:00PM Room: S405AB

Participants
Elliot K. Fishman, MD, Owings Mills, MD (*Presenter*) Institutional Grant support, Siemens AG; Institutional Grant support, General Electric Company; Co-founder, HipGraphics, Inc

RC613

Pediatric Series: Pediatric Safety and Quality

Thursday, Dec. 5 8:30AM - 12:00PM Room: S502AB

MR PD SQ

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

Participants
David B. Larson, MD, MBA, Stanford, CA (*Moderator*) Grant, Siemens AG Grant, Koninklijke Philips NV
Brian D. Coley, MD, Cincinnati, OH (*Moderator*) Royalties, Reed Elsevier; Travel support, Canon Medical Systems Corporation; Travel support, Koninklijke Philips NV; Board of Directors, NeoView Ltd; Departmental Research support, Canon Medical Systems Corporation; Departmental Research support, Koninklijke Philips NV; Departmental Research Support, Siemens AG
Marta Hernanz-Schulman, MD, Nashville, TN (*Moderator*) Nothing to Disclose
Lynn A. Fordham, MD, Chapel Hill, NC (*Moderator*) Nothing to Disclose

Sub-Events

RC613-01 MRI Safety: Risks Unique to a Pediatric Environment

Thursday, Dec. 5 8:30AM - 8:50AM Room: S502AB

Participants
Douglas C. Rivard, DO, Kansas City, MO (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand unique elements of the pediatric MRI environment. 2) Review fundamentals of MRI safety. 3) Discuss how a ferro free program works and how to implement.

ABSTRACT

no abstract

RC613-02 Impacts of 3.0 Tesla Magnetic Resonance Imaging Noise on Hearing Function in Children with Hearing Protection

Thursday, Dec. 5 8:50AM - 9:00AM Room: S502AB

Participants
Huifang Zhao, Xian, China (*Presenter*) Nothing to Disclose
Chao Jin, Xian, China (*Abstract Co-Author*) Nothing to Disclose
Yannan Cheng, BS,BS, Xi'an , China (*Abstract Co-Author*) Nothing to Disclose
Peiyao Chen, Xian, China (*Abstract Co-Author*) Nothing to Disclose
Heng Liu, PhD, Xi'an, China (*Abstract Co-Author*) Nothing to Disclose
Jian Yang, Xian, China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

zhaohf810@163.com

PURPOSE

Although 3.0T MRI has been increasingly used for children, the strong noise remains a great concern. By using Distortion product OAE (DPOAE), this study aimed to investigate the effect of MRI noise on children' cochlear function.

METHOD AND MATERIALS

131 ears of 72 patients with no hearing impairment were enrolled and underwent a 3.0T brain MRI examination(Table 1). The subjects were divided into three groups(0-1, 2-5 and 6-12 years old) according to the development of auditory system. Two DPOAE measurements were performed before MRI and the first (test1) was recorded as baseline. The third DPOAE measurement (test3) was performed within 30 minutes after MRI. DPOAE amplitudes at frequency of 1.5~9.0 kHz were recorded. All statistical analysis were performed by SPSS 18.0 (SPSS, Chicago, IL, USA); $P<0.05$ was considered as statistically significant difference.

RESULTS

As for the paired t test, there was significant increase of 1.06dB at 3kHz in DPOAE amplitude following exposure to MRI noise for 0-1 years old group ($P<0.05$; Figure 1). The standard deviations (SD) of DPOAE amplitudes change between test2 and test1, between test3 and test1 were calculated. In contrast to those before MRI, the SD of DPOAE amplitudes change at frequencies of 1.5~9.0 kHz remarkably increased after MRI(Figure 2). This effect represented the increase of DPOAE amplitude variability and with a maximum effect in 6-12 age group(Figure 3).

CONCLUSION

Our results found a subtle reaction of cochlear function in children after exposure to 3.0T MRI noise with hearing protection. And we also observed that the younger group is likely to be more sensitive to acoustic noise.

CLINICAL RELEVANCE/APPLICATION

The effect of the MRI noise on children with immature auditory system development has thus prompted the concern of noise-induced hearing loss after MRI. Thus efficient hearing protection and noise reduction techniques are necessary to improve the safety of MRI examinations.

RC613-03 Finding "Just right": The Goldilocks of MRI Sequences in Pediatric PET/MRI

Thursday, Dec. 5 9:00AM - 9:10AM Room: S502AB

Participants
Mary Ellen I. Koran, MD, PhD, Stanford, CA (*Presenter*) Nothing to Disclose
Helen R. Nadel, MD, Palo Alto, CA (*Abstract Co-Author*) Consultant, ICON plc

For information about this presentation, contact:

hnadel@stanford.edu

PURPOSE

The challenge for pediatric PET/MRI is to optimize MRI sequences and PET acquisition without prolonging sedation and examination time. As yet, there are no standard protocols utilized in pediatric PET/MRI. Utilizing the 'one-stop shop' method as has been done in PET/CT with contrast enhanced CT for attenuation correction and diagnostic evaluation would undervalue the ability of specialized MRI sequences to provide additional important information based on tumor type or disease status. The goal of this study is to correlate lesion identification on multiple MRI sequences with PET imaging, with the hopes of streamlining and optimizing pediatric PET/MRI studies.

METHOD AND MATERIALS

Over 100 known (based off of released report) lesions were categorized as visualized or not visualized on the individual images from FDG/PET, T2-weighted coronal (T2), diffusion weighted (DWI), and T1-post contrast (T1+) MRI series independently. These included staging, response assessment, and surveillance lesions of lymph nodes, lung, bone, soft tissue, and solid organ disease.

RESULTS

Independently, FDG/PET, T1+, DWI, and T2 MRI images were able to identify 86, 73, 68, and 67 percent of the lesions. A total of 3, 4, and 5 lesions were identified on T1+, T2, and DWI MRI, respectively, and not on PET. Conversely, 14, 21, and 20 lesions were identified on PET and not on T1+, T2, and DWI MRI, respectively. T1+, T2, and DWI provided data beyond the other two MRI sequences in 23, 16, and 23 cases respectively. T2 provided information beyond that attained by the T1+ in only 3 cases.

CONCLUSION

After analysis of our first 100 lesions, we believe that the optimal PET/MRI screening sequence would be dependent upon the type of primary tumor, with DWI adding important information for bony disease, and T2 and T1+ adding important information for nodal disease. Interestingly, the added data from T1+ and T2 overlaps, showcasing an area for improvement in MRI protocol.

CLINICAL RELEVANCE/APPLICATION

Optimizing MRI sequences for pediatric PET/MRI acquisition is beneficial for both the child and the imaging center, in order to obtain the best diagnostic information while coupled with minimal exam time and complexity.

RC613-04 Whole-Body Diffusion Weighted MRI Compared to 18F?FDG PET/CT in Initial Staging and Therapy Response Assessment of Hodgkin's Lymphoma in Pediatric Patients

Thursday, Dec. 5 9:10AM - 9:20AM Room: S502AB

Participants
Gali Shapira Zaltsberg, MD, Ottawa, ON (*Presenter*) Nothing to Disclose
Nagwa M. Wilson, MD, PhD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Maria Esther Perez Trejo, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Lesleigh Abbott, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Stephen Dinning, MD,FRCPC, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Jorge Davila, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Cassandra Kapoor, BSC, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Barry Smith, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Elka Miller, MD, Nepean, ON (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

Shapira.gali1979@gmail.com

PURPOSE

Lymphomatous lesions have low ADC values. With treatment, there is a decrease in cellularity and subsequent increased diffusion on DWI. Whole-body diffusion weighted MRI (WB-DWI-MRI) has been shown as a sensitive and specific method for assessing treatment response in adult lymphoma patients; however, numerous small studies in pediatric patients have shown inconsistent results. The aim of our study was to compare the diagnostic performance of WB- DWI-MRI to FDG-PET/CT in the assessment of initial staging and treatment response in pediatric patients with Hodgkin's lymphoma, assessing both nodal and extra-nodal disease.

METHOD AND MATERIALS

This prospective study comprised 11 children with Hodgkin's lymphoma. WB-DWI-MRI and FDG-PET/CT were obtained prior to initiation of treatment and after completion of two cycles of chemotherapy. Two radiologists measured the ADC values of the nodal and extra-nodal sites of involvement agreed upon in consensus and one nuclear medicine physician assessed the PET/CT. Reliability of radiologists' ratings was assessed by intra-class correlation coefficients based on a two-way random model (ICC2,1). ADC ratios (defined as ADCpost/ADCpre) were assessed. The SUVmax at baseline and at follow-up of the nodal and extra-nodal sites considered positive was assessed. The patients were staged (based on the Ann Arbor staging system) according to both

modalities. Therapeutic response for PET/CT was based on the Lugano classification. The same size criteria used in the Lugano classification were used for therapeutic response on MRI. Since no guidelines are available for assessment of therapeutic response based on DWI, for this study, we defined ADC ratio < 1-0.2SD as progressive disease, 1-0.2 SD< ADC ratio <=1+0.5SD as stable disease, 1+0.5SD < ADC ratio <=1+1.5SD as partial response, and ADC ratio > 1+1.5SD as complete response.

RESULTS

There was good agreement between the two raters for both nodal and extra-nodal ADC measurements. DW-MRI determined correct tumor stage in 8/11(72.7%) examinations, underrating three patients (27.3%). Response to treatment based on DWI and PET showed concordance in all patients (100%).

CONCLUSION

Our experience showed that WB-DWI-MRI is inferior to PET/CT for initial staging of Hodgkin lymphoma in pediatric patients, however, it has the potential to be sensitive enough to assess response to treatment in lieu of PET/CT.

CLINICAL RELEVANCE/APPLICATION

WB-DWI-MRI can potentially be a radiation free alternative to PET/CT in assessing response to treatment of Hodgkin lymphoma in pediatric patients.

RC613-05 Reassessing the Risk of Acute Kidney Injury After Intravenous Contrast Media Administration for CT Imaging in Children

Thursday, Dec. 5 9:20AM - 9:30AM Room: S502AB

Participants
Juan Calle Toro, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Bernarda Viteri, MD, Philadelphia, PA (*Abstract Co-Author*) Spouse, Employee, Bristol-Myers Squibb Company
Ammie M. White, MD, Flourtown, PA (*Abstract Co-Author*) Nothing to Disclose
Madhura Pradhan, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Christian A. Barrera, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Hansel J. Otero, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Suraj D. Serai, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

juan53670@gmail.com

PURPOSE

Recently, the concept of post-contrast acute kidney injury (AKI) has been challenged in the adult literature. However, there is no similar data pertaining to children. Hence, we aim to determine whether intravenous iodinated contrast administration for computed tomography (CT) in children is independently associated with increased risk for AKI by comparing the incidence of AKI in patients receiving contrast to the incidence in those that did not.

METHOD AND MATERIALS

This IRB approved HIPAA-compliant retrospective cohort analysis was performed at a large, urban, academic stand-alone children's hospital. From January 2008 to January 2018 all children in whom creatinine levels were available before and within 48 hours after undergoing CT with or without contrast. The primary outcome was the incidence of AKI according to the Acute Kidney Injury Network (AKIN) definition and the "Kidney Disease: Improving Global Outcomes" (KDIGO) guidelines. Patients with history of renal disease or dysfunction prior to CT were excluded. Odds ratios were calculated between groups and within group controlling for gender, age and weight.

RESULTS

Of over 54,000 CT studies during the study period, 19,441 studies were included in the analysis; 8,872 (45.6%) studies used contrast and the remaining 10,569 (54.4%) did not. The incidence of AKI using the AKIN definition was 25% in the contrast group vs. 34% in the non-contrast group (p 0.09). According to the KDIGO guidelines the incidence of AKI was 7% in the contrast group vs. 11% in the non-contrast group (p 0.17). We found no significant difference in the OR when comparing groups (OR 1.3, CI 95% 0.9-1.4, p 0.17) nor when stratified by gender, age and weight.

CONCLUSION

In agreement with recent adult literature, we found that intravenous iodinated contrast was not associated with an increased incidence of AKI in children.

CLINICAL RELEVANCE/APPLICATION

Recently, the concept of post-contrast acute kidney injury (AKI) has been challenged in the adult literature. However, there is no similar data pertaining to children. Here we found no association of contrast with AKI.

RC613-06 Risk Factors of Post-Contrast Acute Kidney Injury: A Retrospective Study in Pediatric Patients

Thursday, Dec. 5 9:30AM - 9:40AM Room: S502AB

Participants
Liya Ma, MD, Wuhan, China (*Presenter*) Nothing to Disclose
Zhen Li, MD, PhD, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Yaqi Shen, PhD, MD, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Xuemei Hu, MD, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Daoyu Hu, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

maria19871003@163.com

PURPOSE

To investigate risk factors of post-contrast acute kidney injury (PC-AKI) in pediatric patients and the correlation between PC-AKI and age.

METHOD AND MATERIALS

We performed a retrospectively study of inpatients under 18 years. CT examinations, serum creatinine (SCr) values and clinical information of each subject was searched. Then 1:1 matching of PSM (propensity score matching) was performed on risk factors between enhanced and unenhanced group, and age stratification of PC-AKI was performed. Two kinds of threshold of PC-AKI was used: an increase in SCr by more than 25% or 44 μmol/L (named CIN, contrast-induced nethropathy), or 50% or 44 μmol/L (named AKI, acute kindney injury).The incidence of AKI/CIN before and after matching was analyzed between two groups and among different age groups.

RESULTS

A total of 1380 cases were extracted (1081 and 299 cases in unenhanced and enhanced group respectively). 524 cases were obtained by 1:1 PSM, 262 cases in the two group respectively. After matching, the distribution of propensity score between the two groups was more similar (Figure 1). Before matching, risk factors were statistically different between two groups, including age, congenital heart disease, renal tumor, renal surgery, heart surgery, and chemotherapy, and after matching there was no significant difference in all risk factors. The total incidence of CIN and AKI before matching was 1.2% (1.1% in unenhanced group, 1.7% in enhanced group) and 6.8% (7.4% in unenhanced group, 4.7% in enhanced group) respectively, both without significant difference. After matching, the incidence of total CIN was 1.3% (1.1% in the unenhanced group, 1.4% in enhanced group) and AKI was 5.9% (7.3% in unenhanced group, 4.6% in enhanced group), also without significance. Several risk factors, such as congenital heart disease and cardiac surgery was positive correlated with CIN, and urinary calculus was negative correlated with AKI. There was no significant difference in the incidence of PC-AKI among different age groups.

CONCLUSION

For pediatric inpatients, some risk factors (congenital heart disease, cardiac surgery, urinary calculus) may have correlation with PC-AKI. The use of iodinated contrast agent did not have correlation with PC-AKI. There was no significance in the incidence of PC-AKI among age groups.

CLINICAL RELEVANCE/APPLICATION

The use of iodinated contrast agent is safe in CT examination of pediatric patients.

RC613-07 Providing Expert Pediatric Teleradiology Services Around the Globe: The World Federation of Pediatric Imaging Experience

Thursday, Dec. 5 9:40AM - 9:50AM Room: S502AB

Participants
Hansel J. Otero, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Daphine C. Grassi, MD, Barueri, Brazil (*Abstract Co-Author*) Nothing to Disclose
Savvas Andronikou, MBBS, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Cicero J. Silva, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

oteroh@email.chop.edu

PURPOSE

To descriptively analyze the utilization, case characteristics, and referrers' opinion of a pediatric-specific teleradiology portal for low- and middle income countries.

METHOD AND MATERIALS

This is a retrospective analysis of all cases referred to the WFPI pro-bono second-opinion teleradiology service between October 2014 and October 2018. Basic case and patient characteristics as well as feedback on usefulness and satisfaction from referrers.

RESULTS

A total of 668 cases (352 boys, 316 girls) with a median age 1 year 4 months (range 1 day - 18 years) were reviewed over a period of 4 years by a team of 45 volunteer pediatric radiologists. The majority (n=548) of the cases came from a single referral center (Lao Friends Hospital for Children, 82%); while the remaining 120 cases came from nine additional centers, distributed among Asia (6.7%), Africa (87.5%) and The Americas (5.8%). The median delay between receiving the case and its allocation to a radiologist was 0.73 hours (IQR: 0.26-1.87 hours). The median time delay to the first radiologist response was 5.53 hours (IQR: 2.14- 13.19 hours). The most common imaging modality submitted for interpretation was radiography (n=559, 83.7%), followed by computed tomography (n=78, 11.7%), ultrasound (n=58, 8.7%) and MRI (n=5, 0.7%). Referrers provided feedback on 94 cases (14.1%), which was overwhelmingly positive

CONCLUSION

Teleradiology offers a viable and well received option in centers with access to imaging but limited access to pediatric radiology expertise from around the world with reasonable delays in terms of time to first radiologist's response

CLINICAL RELEVANCE/APPLICATION

The WFPI pediatric teleradiology platform provides pediatric radiology expertise, offering services among a wide range of modalities and from a variety of international referring institutions.

RC613-08 Strategies to Reduce Pediatric MRI Scan Time and Sedation

Thursday, Dec. 5 9:50AM - 10:10AM Room: S502AB

Participants
Michael S. Gee, MD, PhD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify strategies to reduce MRI scan time in children. 2) Develop strategies to decrease the use of sedation/anesthesia in pediatric MRI.

ABSTRACT

None.

RC613-09 Tools for Successful and Sustainable Quality Improvement Projects

Thursday, Dec. 5 10:20AM - 10:40AM Room: S502AB

Participants
Lane F. Donnelly, MD, Palo Alto , CA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

lane.donnelly@stanford.edu

LEARNING OBJECTIVES

1) To learn key tools, processes, and key drivers to increase the likelihood of success for improvement projects.

RC613-10 Children are Not Small Adults: Assessment of ACR TI-RADS in Pediatric Thyroid Nodules

Thursday, Dec. 5 10:40AM - 10:50AM Room: S502AB

Participants
Danielle M. Richman, MD, MS, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Carol B. Benson, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Peter M. Doubilet, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Elizabeth Asch, MD, Winchester, MA (*Abstract Co-Author*) Nothing to Disclose
Ari Wassner, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jessica Smith, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Christine Cherella, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Mary C. Frates, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

DMRichman@partners.org

PURPOSE

To assess the reliability of the American College of Radiology (ACR) Thyroid Imaging, Reporting and Data System (TI-RADS) criteria, designed for use in adults, for guiding decisions whether or not to biopsy thyroid nodules in pediatric patients.

METHOD AND MATERIALS

We determined the ACR TI-RADS score of each thyroid nodule in our database of patients <19 years of age who underwent ultrasound-guided fine needle aspiration (FNA) between January 2004 and July 2017. For each nodule, we determined whether the TI-RADS criteria would have led to a recommendation to biopsy, follow, or not follow the nodule.

RESULTS

There were 404 thyroid nodules in 314 patients in our database, and 77 of the nodules (19.1%) were malignant. The majority of cancers were papillary carcinoma (68/77, 88.3%). Among the 77 cancers, 64 (83.1%) cancers had a TI-RADS score in the moderately suspicious category 4 or highly suspicious category 5. Based on TI-RADS criteria, only 60 of the 77 malignant nodules (77.9%) would have undergone FNA, while 10 of 77 (13.0%) would have been assigned follow-up without FNA, and 7 of 77 (9.1%) would have had neither follow-up or FNA. Of the 7 cancers that would have had no follow up, 2 nodules were scored as benign TI-RADS category 1, 4 as not suspicious category 2, and 1 as mildly suspicious category 3. Of the 10 cancers that would have been followed, 1 scored as mildly suspicious category 3, 4 as moderately suspicious category 4 but too small for FNA, and 5 as highly suspicious category 5 but too small for FNA.

CONCLUSION

The use of ACR TI-RADS criteria in our pediatric thyroid nodules would have resulted in a high percentage (22.1%) of cancers not biopsied at initial visit, including a high percentage (9.1%) of cancers missed entirely (not biopsied or followed up). This suggests that ACR TI-RADS is not reliable for guiding decisions in pediatric patients.

CLINICAL RELEVANCE/APPLICATION

To determine whether management of pediatric thyroid nodules by the ACR TI-RADS criteria would affect the timely diagnosis of cancer.

RC613-11 Potential Cost Implications of a Clinical Decision Support System on Emergency CT Head Examinations at a Quaternary Pediatric Hospital

Thursday, Dec. 5 10:50AM - 11:00AM Room: S502AB

Participants
Shireen Hayatghaibi, MA, MPH, Houston, TX (*Presenter*) Nothing to Disclose
Varsha Varghese, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Andrew Sher, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the cost implications using time-driven activity-based costing for CT Head examinations ordered from the Emergency Center and graded as 'usually not inappropriate' by a commercially available Clinical Decision Support (CDS) tool.

METHOD AND MATERIALS

CT head without contrast is the most commonly ordered CT examination from our pediatric Emergency Department. Following the implementation of a CDS tool (CareSelect; National Decision Support Co., Madison, WI) into the EHR, all CT examinations from September 18, 2018 through February 28, 2019 received a score based on appropriateness as per the ACR Appropriate Use Criteria. Orders were scored with the following scale: 1-3: usually not appropriate, 4-6: may be appropriate, and 7-9: usually appropriate. The CDS tool was run in silent mode (i.e. without displaying appropriateness grades to ordering providers). A micro-costing assessment was subsequently conducted on CT Head examinations receiving a grade of 1-3 using time-driven activity-based costing (TDABC). Process maps were created through shadowing 20 encounters and EHR time-stamp review of 150 patient records. Capacity cost rates for personnel, equipment, facilities, and supplies were established from institutional accounting data. The cost of each process step was determined by multiplying step-specific capacity cost rates by the mean time required to complete the step. Total pathway cost was computed by summing the costs of all steps through the process pathway.

RESULTS

Of 1877 CT examinations ordered from the EC, 24% (445/1877) were scored 'usually not appropriate'; CT Head without contrast studies accounted for 76% (339/445) of these examinations. Utilizing TDABC, the mean total CT pathway time for a CT Head without contrast was calculated to be 42 minutes and the mean total cost of the examination was $198 (Figure 1). Based on the 339 CT Head without contrast examinations that were graded as 'usually not appropriate', the potential cost savings extrapolated annually amounts to $134,244.

CONCLUSION

Implementation of a clinical decision support tool may have significant utilization effects on imaging studies ordered from pediatric emergency departments and result in substantial cost savings.

CLINICAL RELEVANCE/APPLICATION

As reimbursement models transition to value-based health care, implementation of CDS to determine appropriate imaging utilization may assist in deriving high value health care.

RC613-13 Dose Line Integral (DLI) for Tracking Cumulative Dose from Multiple Multi-Sequence CT Exams with Tube Current Modulation in Children

Thursday, Dec. 5 11:10AM - 11:20AM Room: S502AB

Participants
Azadeh Tabari, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Xinhua Li, PhD, Boston, MA (*Abstract Co-Author*) Spouse, Employee, Juniper Pharmaceuticals; Employee, Constellation Pharmaceuticals
Kai Yang, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Bob Liu, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Michael S. Gee, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Sjirk J. Westra, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

atabari@mgh.harvard.edu

PURPOSE

We introduce Dose Line Integral (DLI), a new metric that allows adding radiation dose in children undergoing multiple multi-series CT scans obtained with tube current modulation (TCM) with different z-axis coverage

METHOD AND MATERIALS

Our institutional review board approved study included children in four different age categories who underwent multiple CT (3-5) of the abdomen on various scanner platforms within 1 year from 2017-2018. All patients were scanned with fixed kV and TCM. In each series, mA was recorded for each slice to evaluate the cross-sectional average dose along the z-axis. With a multi-series examination, the dose at each z-location was accumulated over all acquisition series. This method was applied to 13 clinical CT examinations (16 acquisition, patient age; 0-1 (n=2), 5-6 (n=2), 10-11 (n=4), 15-16 (n=5) yrs-old). DLI profile of each acquisition was compared with conventional dose parameters CTDIvol, and SSDE, and the sum of all recorded doses as a function of z-axis location was compared with DLP

RESULTS

We generated a graphic display of mA and dose as a function of the z-axis location for each acquisition series and for the whole exam. Differences ranging from 32.4% (23.1 vs 7.5 mGy) and 48.3% (25.1 vs 12.1 mGy) were observed between the maximum value of the accumulated dose profile and the conventional CTDIvol and SSDE, respectively. The sum of all DLIs per patient exceeded the sum of all DLPs by an average of more than 100% (438,94,564,1057 mGy.cm vs 148,39,273 and 545 mGy.cm, respectively)

CONCLUSION

The graphic overall dose profile gives a complete description of z-axis dose distribution for the studied CT examinations under a wide range of patient variables and acquisition conditions, including multiple acquisition series. Visualization of the dose profiles across and beyond the scan ranges provided a more valid tool for CT dose optimization than simple arithmetic summations of CTDIvol, SSDE and DLP

CLINICAL RELEVANCE/APPLICATION

We present a new way to calculate cumulative doses from multiple multi-phase CT scans obtained with tube current modulation, which better satisfies legal requirements and serves as a tool for individual long term dose monitoring in children

RC613-14 Impact of Patient Off-Centering on Organ Radiation Doses in Pediatric CT of the Head and Trunk

Thursday, Dec. 5 11:20AM - 11:30AM Room: S502AB

Participants
Andre Euler, MD, Zurich, Switzerland (*Presenter*) Nothing to Disclose
Natalia Saltybaeva, PhD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Hatem Alkadhi, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the impact of patient positioning on organ dose of head and trunk CT in a pediatric phantom.

METHOD AND MATERIALS

An anthropomorphic phantom simulating a 5-year-old child was used. Semiconductor dosimeters were placed in various organs of the head and trunk. CT of the head and trunk using automatic tube current modulation (ATCM) and default bowtie filters were performed. The phantom was imaged repeatedly at vertical table positions ranging from -6 to +6 cm from the 0-position. Tube current time products, organ doses, and image noise were recorded. Scatter radiation was measured in the thyroid for head CT. The effect of ATCM and bowtie filters was assessed.

RESULTS

Depending on patient position, organ doses differed up to 22% for the supratentorial brain, 34% for the infratentorial brain, 19% for the eyes, 28% for the lungs, 25% for the stomach, and 22% for the liver compared to the 0-position. The relation between position and dose was linear and mainly affected by the bowtie filter in head CT while it was quadratic and affected by ATCM and bowtie filter in trunk CT. It further depended on the relative position of each organ to the isocenter. Image noise was inversely related to organ dose. Scatter radiation in the thyroid was not significantly related to patient position (P=0.21).

CONCLUSION

In pediatric CT, vertical patient positioning had a substantial impact on radiation dose with differences of up to 34%. This effect depended on the body region and location of each individual organ.

CLINICAL RELEVANCE/APPLICATION

Proper patient positioning is crucial in the pediatric population to avoid unintended irradiation of radiosensitive organs.

RC613-15 Accurate Camera-Based Positioning of Pediatric Patients Undergoing Chest, Abdominal and Pelvic CT Examinations

Thursday, Dec. 5 11:30AM - 11:40AM Room: S502AB

Participants
Marilyn J. Siegel, MD, Saint Louis, MO (*Abstract Co-Author*) Speakers Bureau, Siemens AG Spouse, Consultant, General Electric Company
Juan Carlos Ramirez-Giraldo, PhD, Cary, NC (*Abstract Co-Author*) Employee, Siemens AG
Philipp Hoelzer, PhD,DIPLENG, Malvern, PA (*Presenter*) Employee, Siemens AG

PURPOSE

To compare vertical isocenter offsets and its impact on radiation exposure of manually versus automated 3d-camera-based positioning for pediatric body CT exams

METHOD AND MATERIALS

In this retrospective, IRB approved study, vertical isocenter offsets and radiation exposures of pediatric patients undergoing body CT exams (chest, abdomen-pelvis, and chest-abdomen-pelvis) between Nov 2, 2018 and February 20, 2019 were retrospectively analyzed using dose tracking software. The patient cohort included CT exams of a total of 413 patients ranging from 3 years to 24 years. Automatic positioning was achieved with the help of a 3d camera (FAST 3D Camera, Siemens) that captures the depth profile of the patient lying on the patient bed and through an Artificial Intelligence algorithm automatically adjusts the table vertically. Patient's effective diameter (in mm), isocenter offset (in mm) and, CTDIvol (in mGy) were recorded. Patients were categorized as either manually or automatically positioned with the 3d camera. Unpaired statistical comparisons were performed.

RESULTS

A total of 33 patients were automatically positioned with the camera, while the other 380 patients were positioned manually. The isocenter offset was smaller for patients automatically positioned with the camera with a median [25th to 75th quartile] -0.6 [-4.2 to 4.2] mm versus manually positioned patients with -10.9 [-21.9 to -2.2] mm (P? 0.05).

CONCLUSION

The use of the 3d camera significantly reduced patient off-centering in the vertical direction for pediatric CT examinations of the body.

CLINICAL RELEVANCE/APPLICATION

Our results suggest that 3d-camera based positioning can lead to consistent patient centering that is expected to reduce variability in radiation exposure and image quality in pediatric body CT examinations. Future studies with larger sample sizes should look into the impact of the camera on radiation exposure and image quality.

RC613-16 Engaging Patients and Families in Pediatric Radiology

Thursday, Dec. 5 11:40AM - 12:00PM Room: S502AB

Participants
Nadja Kadom, MD, Atlanta, GA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

nkpiano@gmail.com

LEARNING OBJECTIVES

1) Identify opportunities for patient engagement in pediatric radiology. 2) Develop patient-centered initiatives in pediatric radiology.

ABSTRACT

n/a

Printed on: 10/29/20

RC614

Interventional Series: Non-Vascular Interventions

Thursday, Dec. 5 8:30AM - 12:00PM Room: N227B

IR

AMA PRA Category 1 Credits ™: 3.00
ARRT Category A+ Credits: 3.50

FDA Discussions may include off-label uses.

Participants
Ramona Gupta, MD, Chicago, IL (*Moderator*) Nothing to Disclose
Bill S. Majdalany, MD, Atlanta, GA (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

bmajdal@emory.edu

Sub-Events

RC614-01 Treating Ascites: Paracentesis, TIPs, PleuRx, Denver Shunt: Which One and Why?

Thursday, Dec. 5 8:30AM - 8:45AM Room: N227B

Participants
David C. Madoff, MD, New York, NY (*Presenter*) Advisory Board, RenovoRx Consultant, General Electric Company Consultant, Terumo Corporation Consultant, Argon Medical Devices, Inc Consultant, Abbott Laboratories Consultant, Embolx, Inc

LEARNING OBJECTIVES

1) To briefly review the pathophysiology related to the development of ascites. 2) To describe the minimally invasive treatment options currently available in the management of ascites. 3) To assess data to optimize which treatment strategy is most appropriate for a specific indication.

RC614-02 Transthoracic Biopsy Considerations

Thursday, Dec. 5 8:45AM - 9:00AM Room: N227B

Participants
Ramona Gupta, MD, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review techniques and considerations when planning and performing trans-thoracic biopsy. 2) Review common complications and their management. 3) Review newer technologies.

RC614-03 Video Augmented Reality Navigation with Virtual Needle Tracking Provides Sub-Millimeter Accuracy without Radiation Exposure for Pulmonary Nodule Needle Localization

Thursday, Dec. 5 9:00AM - 9:10AM Room: N227B

Participants
John M. Racadio, MD, Cincinnati, OH (*Presenter*) Institutional research agreement, Koninklijke Philips NV
Nicole Hilvert, Cincinnati, OH (*Abstract Co-Author*) Institutional research agreement, Koninklijke Philips NV
Alexander Haak, PhD, Best, Netherlands (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Neil D. Johnson, MD, Cincinnati, OH (*Abstract Co-Author*) Institutional research agreement, Koninklijke Philips NV
Manish N. Patel, DO, Cincinnati, OH (*Abstract Co-Author*) Institutional research agreement, Koninklijke Philips NV
Daniel von Allmen, MD, Cincinnati , OH (*Abstract Co-Author*) Institutional research agreement, Koninklijke Philips NV
Mark Steenbakkers, Best, Netherlands (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Rami Nachabe, PhD, Best, Netherlands (*Abstract Co-Author*) Employee, Koninklijke Philips NV

For information about this presentation, contact:

john.racadio@cchmc.org

PURPOSE

To assess feasibility and accuracy of video augmented reality (AR) navigation with virtual needle tracking for percutaneous pulmonary nodule localization following intra-operative C-arm cone beam CT (CBCT) in a live porcine model.

METHOD AND MATERIALS

This is an IACUC approved study. A total of 34 pulmonary nodules were created by percutaneous injection of silicone-based material through a 19G needle into 5 (38±4 kg) pigs under general anesthesia. A CBCT of the lungs was acquired under anesthesia-induced breath hold and a skin to nodule needle path was planned. A single interventional radiologist localized each pulmonary nodule with a 21G, 9cm, Kopans localization needle using video AR and virtual needle tracking integrated into a flat detector C-arm

angio/interventional system. The AR system allows real-time virtual needle display superimposed over a CBCT volume from which imaging slices are displayed dynamically along the needle trajectory. A post-needle localization verification CBCT was obtained to evaluate accuracy of the needle localization with respect to the targeted pulmonary nodule. Accuracy was defined as the closest distance between the needle and the edge of the nodule. Additional measured variables included: nodule size; distance of nodule from skin surface, pleural surface, and diaphragm; and time required for each localization.

RESULTS

All results are expressed as mean and standard deviation. Accuracy was 0.9±1.3 mm; nodule size was 6.2±1.3 mm; distances of nodule from skin surface, pleural surface, and diaphragm were 38.9±5.9 mm, 8.2±5.1 mm, and 48.7±26.2 mm, respectively. Time required for localization was 115±83 seconds. There was no correlation between accuracy and depth of the nodule or proximity to the diaphragm.

CONCLUSION

Video augmented reality navigation with virtual needle tracking provides sub millimeter accuracy without radiation exposure for pulmonary nodule needle localization.

CLINICAL RELEVANCE/APPLICATION

Video augmented reality navigation with virtual needle tracking integrated into a C-arm angio/interventional system allows accurate needle localization of pulmonary nodules without radiation exposure.

RC614-04 Refractory Abscess Management

Thursday, Dec. 5 9:10AM - 9:25AM Room: N227B

Participants
Claire Kaufman, MD, Salt Lake City, UT (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the various etiologies and risk factors for refractory abscesses. 2) Review treatment options. 3) Understand the role of the interventionalist in the management of refractory abscesses. 4) Review complications that can occur with refractory abscesses.

RC614-05 Percutaneous Enterocutaneous Fistula Repair

Thursday, Dec. 5 9:25AM - 9:40AM Room: N227B

Participants
Jeffry S. Kriegshauser, MD, Phoenix, AZ (*Presenter*) Research support, General Electric Company

RC614-06 MRI Analysis of Alcohol Distribution and Side-Effects after Sympathicolysis

Thursday, Dec. 5 9:40AM - 9:50AM Room: N227B

Participants
Benjamin Reichardt, Essen, Germany (*Presenter*) 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
Sam Sedaghat, MD, Bochum, Germany (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

Benjamin.Reichardt@uk-essen.de

PURPOSE

Sympathicolyses are third line treatments in patient with complex regional pain syndrome and peripheral occlusive disease. To avoid structure damage CT needle guidance is the most often used procedure when performing an alcohol sympathicolysis. Alcohol can cause minor and major complications such as ureter strictures, retroperitoneal bleeding and irritation of peripheral nerves. However, the frequency, mechanism, spread and atypical dilution of injected alcohol is unknown. This is the first 3T-MRI based study for visualization the distribution and diffusion behavior of alcohol at the area of injection and affection of the neighboring tissue.

METHOD AND MATERIALS

14 patients with CRPS or PAOD were treated with a diagnostic sympathetic block at the Level L3 or L4 and CT guided alcohol sympathicolysis with 1.5ml. All patient received 3 MRI Neurography of the lumbar sympathetic chain prior and after block and following the alcohol injections with T1 sequences in all direction for visualization of the anatomy, edema and fluid sensitive sequences for detection of tissue changes. We calculated fluid volumes and distribution around the injection area anterior to the vertebra, dorsal of Aorta/IVC and around the psoas. Diffuse edema in muscle, fat, nerves and organs were analyzed for each single CT and MRI and time points.

RESULTS

All cases had effective sympathicolysis and pain relief. Minor sideeffects were peripheral paresthesia cand a retroperitoneal bleeding. No-one had detected erythrocytes in urine as a sign of ureter strictures. Despite small volume injection of 1.5ml alcohol MRI showed high signal changes caused by edema in soft tissues and vessel- and ureter walls in all patients. Neurolytic sympathetic ganglia showed an increase of size and proton signal in MRI in 4 patients.

CONCLUSION

All interventions lead to an effective sympathicolysis and pain relief.Detected changes and injuries had no clinical consequences. A prediction of distribution of applicated alcohol and its performance is not possible. Therefore after alcohol sympathicolysis patients must be clinical monitored.

CLINICAL RELEVANCE/APPLICATION

Sympathicolysis can be performed effectively with 1ml of alcohol. Nevertheless despite correct needle placement and small volumes of injected alcohol, an unexpected alcohol dilution may lead to permanent nerve damage. However the frequency of a potential harmful spread of injected alcohol is unknown.

RC614-07 Celiac Plexus Blocks

Thursday, Dec. 5 9:50AM - 10:05AM Room: N227B

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

LEARNING OBJECTIVES

1) Identify important anatomy for celiac plexus blockade. 2) Describe the technique and approach for celiac plexus blocks. 3) Recognize the major and minor complications from neurolysis of the celiac plexus.

RC614-08 Primary Biliary Stenting

Thursday, Dec. 5 10:35AM - 10:50AM Room: N227B

Participants
Joseph P. Erinjeri, MD,PhD, New York, NY (*Presenter*) Advisory Board, AstraZeneca PLC; Advisory Board, BTG International Ltd; Consultant, Jounce Therapeutics, Inc; Consultant, Canon Medical Systems Corporation

RC614-09 Custom-Made Retrievable and Non-Retrievable Biliary Stenting in Liver Transplantation Patients

Thursday, Dec. 5 10:50AM - 11:00AM Room: N227B

Participants
Ramazan Kutlu, MD, Malatya, Turkey (*Presenter*) Nothing to Disclose
Mehmet S. Buruk, Malatya, Turkey (*Abstract Co-Author*) Nothing to Disclose
Sinan Karatoprak, MD, Malatya, Turkey (*Abstract Co-Author*) Nothing to Disclose
Mehmet Demirbas, MD, Malatya, Turkey (*Abstract Co-Author*) Nothing to Disclose
Burak Isik, MD, Malatya, Turkey (*Abstract Co-Author*) Nothing to Disclose
Sezai Yilmaz, MD, Malatya, Turkey (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

ramazan.kutlu@inonu.edu.tr

PURPOSE

To evaluate the effectiveness of custom-made biliary stents made from drainage catheters and present preparation and implantation technique.

METHOD AND MATERIALS

Non-retrievable custom-made biliary stents (NRCMBS) were prepared from various 7, 8, and 10 F drainage catheters by cutting the catheters after adjusting the length of catheter according to the common bile duct. Retrievable custom-made stents (RCMBS) were also prepared from drainage catheters in the same fashion but a suture is tied proximal end of stent and the suture is tied around the external portion of biliary drainage catheter that was placed during or before stent placement. RCMBS were removed percutaneously using the suture.

RESULTS

A total of 113 liver transplant patients (75 males and 38 females, mean age: 52 years (1-76 years)) were included in to the study. Except 4 liver donor patients (3.5%) the remaining patients were liver recipients. A total of 142 stenting procedures (122 NRCMBS (86%) and 20 RCMBS (14%)) were performed. In 8, multiple procedures in different sessions were performed. In 19, multiple stents in a single session were placed. In addition to stenting 50 balloon dilatations and 14 biliary calculi and sludge removal procedures were performed. In 9 patients stent repositioning with snare and balloon were done. In two patients, stents were migrated to the duodenum and they were removed in the same session through orogastric route by snares, and new stents were placed. No stent deformation or biliary leak were observed. Technical success was 100%. Nine of the patients were expired during the follow-up unrelated to the procedure. The effectiveness of procedure was assessed by total bilirubin (cut-off:1.2) and direct bilirubin (cut-off:0.5) values before and one week after the stent placement. In patient who are asymptomatic during the following 3 months and with bilirubin levels within the normal limits, the procedure was accepted as successful. ERCP were performed before custom-made biliary stenting in 40 patients.NRCMS were exchanged or removed by ERCP. All RCMBS were removed successfully through percutaneous route.

CONCLUSION

Percutaneous placement of custom-made biliary stents is and effective, safe and low-cost procedure for the treatment of biliary problems in even in liver transplanted patients.

CLINICAL RELEVANCE/APPLICATION

Custom-made biliary stenting is an effective and low cost solution for biliary problems in even transplanted patients.

RC614-10 Cholecystostomy Free Life after Acute Cholecystitis: Precautious Cholecystoscopy and Cholelithotripsy are the Key Components

Thursday, Dec. 5 11:00AM - 11:10AM Room: N227B

Participants
Nariman Nezami, MD, New Haven, CT (*Presenter*) Nothing to Disclose

Todd Schlachter, MD, New Haven, CT (*Abstract Co-Author*) Research Grant, Guerbet SA
Jessica M. Lee, MD, Madison, CT (*Abstract Co-Author*) Nothing to Disclose
Igor Latich, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Once diagnosis of acute cholecystitis is established and cholecystostomy catheter is placed in the patients with contraindication for cholecystectomy, a significant number of the patients have to live with this tube till end of their life. We aimed to report safety, feasibility, and early clinical outcome of the new lithoVau cholecystoscope and laser/mechanical cholelithotripsy for the management of symptomatic cholelithiasis.

METHOD AND MATERIALS

This is a retrospective analysis of 18 cases with acute calculus cholecystitis, who underwent cholecystostomy catheter placement. Single use flexible 9.5 F cholecystoscopy (LithoVue, Boston Scientific, Marlborough, MA) was used in combination with laser/mechanical cholelithotripsy and mechanical retrograde and balloon assisted antrograde stone extraction to clean the gallbladder and common bile duct from stones. Surgical contraindications were cardiac or pulmonary disease, and cirrhosis. Timing of cholecystostomy, cholecystoscopy, basket stone extraction, complications, time interval between the first cholecystoscopy and removal of cholecystostomy, technical and clinical success were assessed.

RESULTS

Seven males and 11 female were enrolled. The mean age was 76.44 years. The median time interval from cholecystostomy to cholecystoscopy and cholelithotripsy was 58 days, after average of two tube check and exchange sessions. Technical and clinical success were achieved on all patients, by reaching to stone free gallbladder and removing cholecystostomy tube. In average, 3 sessions of cholecystoscopy, laser and mechanical cholelithiotripsy were required for complete gallstone extraction. The mean interval time between the first cholelithiotripsy session and removal of cholecystostomy was 71 days. There was no procedure related complications.

CONCLUSION

Percutaneous cholecystoscopy by LithoVue, a single use cholecystoscopy in combination of laser/mechanical cholelithotripsy is a feasible and safe treatment option to finally remove the cholecystostomy tube in the patients with contraindication to cholecystectomy.

CLINICAL RELEVANCE/APPLICATION

Percutaneous cholecystoscopy using LithoVue, a single use cholecystoscopy, in combination with laser/mechanical cholelithotripsy could be safely used to finally remove the cholecystostomy tube in the patients with contraindication to cholecystectomy.

RC614-11 Thoracic Duct Embolization

Thursday, Dec. 5 11:10AM - 11:25AM Room: N227B

Participants
Bill S. Majdalany, MD, Atlanta, GA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

bmajdal@emory.edu

LEARNING OBJECTIVES

1) Understand components of lymphatic anatomy and imaging techniques. 2) Discuss etiologies of chylothorax, indications for thoracic duct embolization, and technical approaches. 3) Review literature results of thoracic duct embolization.

RC614-12 The Assessment of the Anatomical Configuration of Thoracic Duct at the Jugulo-Subclavian Junction Using Magnetic Resonance Thoracic Ductography

Thursday, Dec. 5 11:25AM - 11:35AM Room: N227B

Participants
Itsuko Okuda, MD, Minato-Ku, Japan (*Presenter*) Nothing to Disclose
Shigeru Kiryu, MD, Chiba, Japan (*Abstract Co-Author*) Nothing to Disclose
Masaaki Akahane, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Keiichi Akita, MD, PhD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Masaki Ueno, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Harushi Udagawa, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The anatomical configuration of the thoracic duct (TD) is essential information to perform an intervention to treat the chylothorax. However, the detailed knowledge of TD configuration at the jugulo-subclavian junction (JSJ) is not available so far. In this study, we assessed the TD configuration at the JSJ using magnetic resonance thoracic ductography (MRTD).

METHOD AND MATERIALS

The institutional review board approved this study in our institutions. Eighty subjects were enrolled in this study. We performed MRTD on a 1.5-T MRI system with 3D-turbo spin echo sequence combined with 2D-prospective acquisition correction without contrast agent. We assessed the following three items: "the running course of TD at JSJ," "the direction seen from the above at which TD flows into the venous angle after the thoracic outlet," and "minor variations."

RESULTS

The running courses of TD were classified into the following four types: sharp curve (33.7%); shallow curve (32.6%); horizontal course (18.0%); and ascending course (15.7%). The direction at which TD flows into the venous angle was classified as follows; 5 to 6 o'clock (1.5%); 6 to 7 o'clock (9.2%); 7 to 8 o'clock (38.5%); 8 to 9 o'clock (38.5%); and 9 to 10 o'clock (9.2%); 10 to 11

o'clock (1.5%); 11 to 12 o'clock (1.5%). We found the meandering (18.8%) and divergence pattern (11.3%) as minor variations.

CONCLUSION

Using MRTD, we succeeded in the classification of the anatomical configuration of TD non-invasively. This classification may be useful to perform the intervention of TD safely.

CLINICAL RELEVANCE/APPLICATION

MRTD provides the anatomical information of TD noninvasively. Acquired the classification of TD may be useful to perform the intervention of TD safely.

RC614-13 Image-Guided Percutaneous Gastrostomy Tube Placement: Safety and Costs as an Outpatient Procedure

Thursday, Dec. 5 11:35AM - 11:45AM Room: N227B

Participants
Ryan S. Dolan, MD, Atlanta, GA (*Presenter*) Nothing to Disclose
Richard Duszak JR, MD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Janice M. Newsome, MD, Alexandria, VA (*Abstract Co-Author*) Nothing to Disclose
Zachary Bercu, MD, Decatur, GA (*Abstract Co-Author*) Nothing to Disclose
Nima Kokabi, MD, Atlanta, GA (*Abstract Co-Author*) Research support, Sirtex Medical Ltd

For information about this presentation, contact:

ryan.dolan@emory.edu

PURPOSE

Historically, patients undergoing image-guided percutaneous gastrostomy tube placement have been admitted overnight with feeds commencing 12-24 hours post-procedure. With new expedited feeding protocols starting 4 hours post-procedure (primarily for endoscopically placed tubes), same day discharge is possible. The purpose of this study was to evaluate the safety, as well as costs, of image-guided gastrostomy tube placement as an outpatient versus inpatient procedure.

METHOD AND MATERIALS

In this retrospective study, 131 patients (age 63.9±11.6, 34% female) underwent gastrostomy tube placement as an outpatient procedure with expedited feeding protocol vs. 40 (age 61.3±12.6, 38% female) as an inpatient procedure with traditional feeding protocol at 24 hours. Using chi-square tests, complications within 90 days of procedure (mortality related to procedure, bleeding, aspiration pneumonia, bowel perforation/abdominal abscess, gastrostomy site cellulitis requiring treatment, surgical consultation, and tube malposition/dislodgement/break) were compared for outpatients vs. inpatients. Using a subgroup of 33 consecutive patients, procedural costs (defined as total combined insurer and patient payments for both professional and hospital and services) for outpatients vs. inpatients were compared.

RESULTS

Complication rates were similar (p=0.81) for gastrostomy tubes placed as outpatients (0.18 complications/procedure: 4 bleeding, 2 aspiration pneumonia, 2 bowel perforation/abdominal abscess, 6 cellulitis, 1 surgical consult, 9 dislodged/malpositioned/broken tubes) and inpatients (0.20 complications/procedure: 4 cellulitis, 1 surgical consult, 3 dislodged). Total combined insurer and patient payments were similar ($2,701/inpatient vs. $2,193/outpatient; p=0.52).

CONCLUSION

Outpatient image-guided percutaneous gastrostomy tube placement with an expedited feeding protocol is a safe and cost-comparable alternative to traditional overnight admission. Further prospective investigation with a larger sample is warranted.

CLINICAL RELEVANCE/APPLICATION

Percutaneous gastrostomy tube placement in the outpatient setting is safe and may be less expensive than that in the traditional inpatient setting.

RC614-14 Advanced Feeding Tube Placement

Thursday, Dec. 5 11:45AM - 12:00PM Room: N227B

Participants
Adam N. Plotnik, MBBS,FRANZCR, Los Angeles, CA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

aplotnik@mednet.ucla.edu

LEARNING OBJECTIVES

1) Understanding of the multiple techniques of placement of percutaneous feeding tubes, including Gastrostomy, Gastrojejunostomy and jejunostomy tubes. 2) Essential pre and post procedural management for percutaneous feeding tube placements. 3) Review of the complications of percutaneous feeding tube placements and their management. 4) Tips and tricks for placing percutaneous feeding tubes in more complex anatomy, e.g., post partial gastrectomy, interposition of colon.

RC615

Tomosynthesis: Case-based Interactive Challenge (Interactive Session)

Thursday, Dec. 5 8:30AM - 10:00AM Room: E350

BR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Liane E. Philpotts, MD, Madison, CT (*Moderator*) Consultant, Hologic, Inc

For information about this presentation, contact:

liane.philpotts@yale.edu

zuleyml@upmc.edu

Special Information

This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

LEARNING OBJECTIVES

1) Understand how to deal with the increased information provided in digital breast tomosynthesis exams while optimizing workflow. 2) Appraise DBT artifacts. 3) Recognize potential pitfalls in DBT interpretation.

ABSTRACT

Using interactive cases, various aspects of digital breast tomosynthesis mammography will be presented to highlight tips in interpretation, optimize workflow, and reduce errors by recognizing pitfalls.

Sub-Events

RC615A The '3-D's' of Tomosynthesis: Density, Dots, and Distortions

Participants
Michael N. Linver, MD, Alexandria, VA (*Presenter*) Medical Advisory Board, Three Palm Software; Scientific Advisory Board, Real Imaging Ltd; Scientific Advisory Board, Seno Medical Instruments, Inc

For information about this presentation, contact:

mammomike@aol.com

LEARNING OBJECTIVES

1) Appreciate the added value of Tomosynthesis in the detection of subtle breast cancers. 2) Assess the advantages and shortcomings of Tomosynthesis in the evaluation of breast calcifications. 3) Discern the value of Tomosynthesis in eliminating unnecessary recalls of areas of dense tissue seen on screening mammograms.

RC615B Understand the Artifacts and Optimize Your Workflow

Participants
Sarah M. Friedewald, MD, Chicago, IL (*Presenter*) Consultant, Hologic, Inc; Research Grant, Hologic, Inc;

RC615C Pitfalls in Interpretation

Participants
Liane E. Philpotts, MD, Madison, CT (*Presenter*) Consultant, Hologic, Inc

For information about this presentation, contact:

liane.philpotts@yale.edu

LEARNING OBJECTIVES

1) Reduce perceptual errors in DBT. 2) Accurately localize lesions on tomosynthesis. 3) Differentiate architectural distortion from pseudo-architectural distortion. 4) Analyze fat-containing lesions.

RC616

Mitigating Unconscious Bias in Recruitment and Hiring

Thursday, Dec. 5 8:30AM - 10:00AM Room: N229

LM

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

Participants
Nolan J. Kagetsu, MD, New York, NY (*Moderator*) Spouse, Employee, Pfizer Inc

For information about this presentation, contact:

laurabancroftmd@gmail.com

Sub-Events

RC616A Using Behavioral Interviews to Improve Your Hiring Decisions

Participants
Nolan J. Kagetsu, MD, New York, NY (*Presenter*) Spouse, Employee, Pfizer Inc

For information about this presentation, contact:

nkagetsu@gmail.com

LEARNING OBJECTIVES

1) To become familiar with the advantages of the behavioral interview (for both interviewers and interviewees). 2) To learn the strategy of creating behavioral interview questions. 3) To review some behavioral questions and answers. 4) To convince attendees to try this approach at home.

ABSTRACT

Most interviews are conducted as a conversation. Interviewers assess the candidates ability to make a 'first impression' While this may be an important skill for some jobs e.g. salesperson, ideally hiring managers should aspire to assess skills that are relevant to the job. Interviewers tend to like applicants like themselves. We will briefly touch on the history of behavioral interviews (created by Noblel prize winner/creator of behavioral economics Daniel Kahneman) We will review the evidence for behavior interviews and why companies such as Google have adopted them. We will address the concern that medicine is different (spoiler alert we are not) One common bias is that most interviewers are over confident about their ability to assess candidates (you may think you do not need to attend this session!) A companion website for this session can be found at this url: https://sites.google.com/site/neuroradiologyprimer/home

RC616B Resident Recruitment: Best Practices

Participants
Carolynn M. DeBenedectis, MD, Natick , MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

carolynn.debenedectis2@umassmemorial.org

LEARNING OBJECTIVES

1) Understand what groups of Radiology are underrepresented. 2) Learn how to make your residency attractive to applicants of all different backgrounds. 3) Learn how to review applications and rank to get a diverse residency program.

RC616C Faculty Recruitment: Best Practices

Participants
Richard Strax, MD, Houston, TX (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

richard.strax@BCM.edu

LEARNING OBJECTIVES

1) Create a departmental climate that values diversity. 2) Assemble a diverse search committee which can review potential candidates objectively. 3) Attract diverse candidates who fulfill long-term departmental needs. 4) Develop a program that retains excellent and diverse faculty.

Active Handout:Richard Strax

http://abstract.rsna.org/uploads/2019/19001496/Active RC616C.pdf

RC617

Emerging Technology: Elastography of the Liver - Update 2019

Thursday, Dec. 5 8:30AM - 10:00AM Room: S505AB

GI MR US

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Richard L. Ehman, MD, Rochester, MN (*Moderator*) CEO, Resoundant, Inc; Stockholder, Resoundant, Inc;

LEARNING OBJECTIVES

1) To understand how elastography measurements are integrated into the management of patients with chronic liver disease. 2) To learn imaging techniques and protocols of ultrasound and MR elastography. 3) To compare US and MR elastography in assessing liver fibrosis. 4) To review emerging clinical indications of US and MR elastography. 5) To understand limitations of current elastography techniques.

Sub-Events

RC617A Elastography of the Liver: Why Clinicians Use It

Participants
Alina Allen, Rochester, MN (*Presenter*) Research support, Gilead Sciences, Inc

For information about this presentation, contact:

allen.alina@mayo.edu

LEARNING OBJECTIVES

1) Recognize the importance of fibrosis estimation in liver disease. 2) Assess the role of elastography in clinical practice.

RC617B MR Elastography: Update 2019

Participants
Richard L. Ehman, MD, Rochester, MN (*Presenter*) CEO, Resoundant, Inc; Stockholder, Resoundant, Inc;

LEARNING OBJECTIVES

1) To be able to understand the basic physical principles of MR Elastography (MRE). 2) To be able to describe the clinical indications for MRE in liver disease. 3) To be able to describe published evidence on the diagnostic performance of MRE in assessing liver fibrosis. 4) To be able to compare ultrasound based elastography to MRE. 5) To be able to describe the current limitations of MRE.

RC617C Ultrasound Elastography: Update 2019

Participants
Richard G. Barr, MD, PhD, Campbell, OH (*Presenter*) Consultant, Siemens AG; Consultant, Koninklijke Philips NV; Research Grant, Siemens AG; Research Grant, SuperSonic Imagine; Speakers Bureau, Koninklijke Philips NV; Research Grant, Bracco Group; Speakers Bureau, Siemens AG; Consultant, Canon Medical Systems Corporation; Research Grant, Esaote SpA; Research Grant, BK Ultrasound; Research Grant, Hitachi, Ltd

LEARNING OBJECTIVES

1) Understand the clinical indications of ultrasound elastography (USE). 2) Learn about the various techniques and imaging protocols of USE. 3) Review the diagnostic accuracy of USE in the assessment of elasticity in liver fibrosis and other clinical applications in the body. 4) Compare USE with MR elastography. 5) Understand current limitations of USE.

ABSTRACT

Ultrasound elastography (USE) is a general term for various techniques available for objectively and quantitatively assessing tissue stiffness using ultrasonic techniques, creating noninvasive images of mechanical characteristics of tissues. Elastography is based on the fact that the elasticity of a tissue is changed by pathological or physiological processes. For example, cancer or fibrosis associated with various disease processes including chronic liver disease or chronic pancreatitis result in increased tissue stiffness.Recently, various USE techniques have been cleared by the FDA and all major ultrasound companies offer different approaches of measuring tissue stiffness on their ultrasound machines.The objective of this talk is to familiarize the audience with the clinical indications, imaging techniques and protocols, interpretation, diagnostic accuracy, and limitations of the various USE technique for assessment of tissue stiffness, with special focus on assessment of fibrosis in chronic liver disease.

RC618

Tumor Imaging Metrics: Is it Time to Invest in a Service?

Thursday, Dec. 5 8:30AM - 10:00AM Room: S404AB

BQ OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Michelle S. Ginsberg, MD, New York, NY (*Moderator*) Nothing to Disclose

Sub-Events

RC618A Current Response Assessment Tools in Clinical Trials

Participants
Les R. Folio, MPH,DO, Bethesda, MD (*Presenter*) Institutional research agreement, Carestream Health, Inc

For information about this presentation, contact:

Les.Folio@nih.gov

LEARNING OBJECTIVES

1) Comprehend objective tumor assessment criteria, such as RECIST 1.1, in a variety of clinical trials. 2) Exploit existing and evolving PACS along with other available image processing tools to improve tumor assessment consistency and workflow efficiency. 3) Optimize radiology report value with more consistent tumor quantification.

ABSTRACT

Cancer patients enrolled in clinical trials require objective imaging criteria (e.g. RECIST 1.1) rarely included (in the US) in routine radiologists' clinical reports. With oncologists' need for consistent target lesion selection and measurements many cancer centers have tumor assessment core labs consisting of various radiology personnel dedicated to image processing for consistent tumor measurements, organ/lesion segmentation for volumetric quantification, display (3D) and/or density/texture analysis. There are a variety of approaches and challenges to successfully support oncologists' needs for consistent quantification. This presentation addresses the balance between measurements made in PACS that are included in radiology reports and those that are used in objective tumor assessments by core labs supporting oncologists. By comprehending the tumor assessment requirements and process, radiology reports can be more valuable to oncologists when target lesion selection and measurements are concordant with oncologists' records used to assess therapeutic response. Consistent application of existing and evolving tools, such as line, two-diameter and volumetric segmentations, can improve report value and radiology services to include tumor imaging core labs. Understanding tumor assessment terminology (e.g. response categories, such as 'Stable Disease' or 'Partial Response') can also enhance report value while minimizing the need to addend reports. A familiar example involves using words in the impression such as 'disease progression' or 'stable disease' where radiologists are usually not aware of pertinent information. For example, may not know the previously established target lesions, the criteria used, baseline date or nadir. Without this information, progressive or stable disease often cannot be concluded. Between radiologists and oncologists, communication beyond the standard radiology report can further improve with use of PACS tools such as key images and bookmark tables to label target lesions while also establishing a workflow with more consistent and concordant measurements. Improved efficiency can result from minimizing duplication in disparate systems where data does not automatically transfer (e.g. from PACS to RIS to EMR to cancer database).

RC618B Developing Robust Imaging Biomarkers for Use in Drug Development

Participants
Nina Tunariu, MD, Sutton, United Kingdom (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To be able to understand and differentiate different types of imaging biomarkers. 2) Achieve an understanding of the use and value of imaging-based biomarkers in the various phases of clinical drug development. 3) Have a better understanding of the barriers and opportunities for using robust quantitative imaging biomarkers in oncological drug development.

RC618C Should Every Radiology Department Invest in a Quantitative Imaging Lab?

Participants
Gordon J. Harris, PhD, Boston, MA (*Presenter*) Medical Advisory Board, Fovia, Inc; Member, IQ Medical Imaging LLC; Member, Novometrics, LLC; ;

For information about this presentation, contact:

gjharris@partners.org

LEARNING OBJECTIVES

1) Assess the pros and cons of establishing a Quantitative Imaging Lab for clinical trials image assessments. 2) Explain to Radiology Department leadership the benefits of establishing a Quantitative Imaging Lab. 3) Specify the requirements and evaluate options for implementing a Quantitative Imaging Lab.

ABSTRACT

Managing oncology clinical trials imaging assessment requests can be very difficult for radiologists, especially with the increasing complexity of protocols and modifications to tumor response criteria. There may be hundreds of active clinical trials enrolling patients at cancer centers, each with specific protocol modifications among dozens of assessment criteria. Challenges for radiologists include maintaining protocol compliance so that each patient is assessed with the correct specific criteria and keeping up with the requirements for rapid turnaround times prior to patient office visits. Furthermore, all trial data must be assessed accurately and be available for data locks, monitoring visits, and audits to avoid protocol violations. These challenges can be addressed through a Quantitative Imaging Lab that provides quality reviews, assessment criteria training, and consistent tumor metrics data. This presentation will discuss our 15 years of experience in developing such a service, the Tumor Imaging Metrics Core (TIMC) as a shared resource of the Dana-Farber/Harvard Cancer Center (DF/HCC), as well as our informatics and image assessment platform that we developed to manage this complex workflow, Precision Imaging Metrics. The TIMC uses this web-based platform to manage over 1,000 active clinical trials and performs over 15,000 time point image assessments per year, with turnaround available in as little as one hour after scanning is completed, and the majority of assessments completed on the day of the scan. In addition, eight NCI-designated Cancer Centers around the US have implemented the Precision Imaging Metrics platform developed by TIMC at DF/HCC to manage their clinical trials image assessments. In this presentation, we will discuss the pros and cons for a radiology department to implement a Quantitative Imaging Lab for managing clinical trials image assessments.

Printed on: 10/29/20

RC621

Innovations in Medical Imaging Physics with Deep Learning

Thursday, Dec. 5 8:30AM - 10:00AM Room: E353B

AI PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Guang-Hong Chen, PhD, Madison, WI (*Coordinator*) Research funded, General Electric Company
Lifeng Yu, PhD, Rochester, MN (*Coordinator*) Nothing to Disclose

For information about this presentation, contact:

yu.lifeng@mayo.edu

gchen7@wisc.edu

LEARNING OBJECTIVES

1) To cover machine learning demystified from a physicist's perspective. 2) Teach 'machine' to reduce image noise in CT. 3) Teach 'machine' to remove image artifacts in CT. 4) Teach 'machine' to reconstruct images.

ABSTRACT

In this presentation, we will share with audience on how we can leverage the power of deep learning computational framework to improve image quality in CT fields. We will cover four aspects in this presentation to help audience get some sense on machine learning, deep learning, artificial intelligence in medical CT.

Sub-Events

RC621A Applications of Deep Learning in CT Image Formation

Participants
Guang-Hong Chen, PhD, Madison, WI (*Presenter*) Research funded, General Electric Company

RC621B Applications of Deep Learning in MRI and PET/MRI Image Formation

Participants
Fang Liu, PhD, Madison, WI (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

fliu37@wisc.edu

LEARNING OBJECTIVES

1) Present a technical overview of DL in medical imaging and discuss some recent DL applications that successfully translate new learning-based approaches into performance improvement in MR and PET/MR imaging workflow. 2) Draw tightly connections between fundamental DL concepts and technical challenges in medical imaging. 3) Cover rapid image acquisition and reconstruction to image post-processing such as image segmentation and synthesis in MR and PET/MR. 4) Discuss open problems in DL that are particularly relevant to medical imaging and the potential challenges and opportunities in this emerging field.

ABSTRACT

Medical imaging is a research field that remains lots of technical and clinical challenges. The recent development of Artificial Intelligence, particularly Deep Learning (DL), has demonstrated great potentials to resolve such challenges.

RC621C Applications of Deep Learning in CT Image Quality Evaluation

Participants
Lifeng Yu, PhD, Rochester, MN (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

yu.lifeng@mayo.edu

LEARNING OBJECTIVES

1) Review the state-of-the-art CT image quality evaluation methods and challenges. 2) Review the applications of deep learning-based methods in CT image quality evaluation.

RC622

Functional MR Imaging for Tumor Targeting in Radiotherapy

Thursday, Dec. 5 8:30AM - 10:00AM Room: E353A

MR PH RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Kristy K. Brock, PhD, Houston, TX (*Moderator*) License agreement, RaySearch Laboratories AB; Grant support, RaySearch Laboratories AB; Research support, Mirada Medical Ltd; ;

Sub-Events

RC622A State of the Art in Functional MR Imaging for Tumor Targeting

Participants
R. Jason Stafford, PhD, Houston, TX (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

jstafford@mdanderson.org

LEARNING OBJECTIVES

1) Identify some advanced and emerging MRI techniques which inform on tumor physiology and metabolism. 2) Explain the relevance of functional MR observations to basic underlying tumor physiology and biology. 3) Understand key limitations and tradeoffs of functional MR techniques for tumor assessment.

RC622B Clinical Need for Functional MR Imaging for Tumor Targeting in Radiation Therapy

Participants
Michelle M. Kim, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the major limitations of anatomic imaging for tumor target delineation in radiation therapy. 2) Identify key physiologic and functional MRI techniques of value in radiation treatment planning. 3) Explain emerging concepts of radiation treatment-individualization using advanced MRI techniques. 4) Discuss the generalizability and application of advanced MRI techniques for radiation treatment planning.

RC622C Technical Challenges in the Integration of Functional MR Imaging for Tumor Targeting into Radiotherapy

Participants
Ning Wen, PHD, Detroit, MI (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

nwen1@hfhs.org

LEARNING OBJECTIVES

This presentation is going to review the technical challenges to integrate the functional MR Imaging into radiotherapy including the following aspects: 1) tumor characterization among different imaging modalities; 2) reproducibility of functional imaging across different institutions/scanners/protocols; 3) interpretation of imaging features extracted in the deep machine learning algorithms 4) precision to identify the boundary of the targets; 5) reliable imaging biomarkers to predict treatment response.

RC623

Optimization and Technology in Interventional Radiology

Thursday, Dec. 5 8:30AM - 10:00AM Room: S503AB

CT IR PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Thaddeus A. Wilson, PhD, Madison, WI (*Coordinator*) Nothing to Disclose
William F. Sensakovic, PhD, Scottsdale, AZ (*Coordinator*) Founder, Telerad Physics Teaching, LLC

For information about this presentation, contact:

wfsensak@gmail.com

LEARNING OBJECTIVES

1) Apply techniques to optimize dose in the interventional setting. 2) Identify opportunities where ionizing radiation can be replaced by ultrasound to guide interventional procedures. 3) To familiarize attendees with new CT interventional techniques that will open new fields of interventional procedures.

Sub-Events

RC623A Dose Optimization in the Interventional Suite

Participants
Robert G. Dixon, MD, Chapel Hill, NC (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

Bob_Dixon@med.unc.edu

LEARNING OBJECTIVES

1) Review the importance of dose optimization in the angiography suite. 2) Discuss basic concepts that will help to build a culture of safety at your institution. 3) Identify simple, practical steps that operators can take to protect patients, staff and themselves in the IR suite.

RC623B Using Ultrasound in Place of CT and Fluoroscopy in the Interventional Suite

Participants
Patrick Warren, MD, Columbus, OH (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss skills, techniques, and pitfalls of invasive sonography. 2) Discuss basic skills involved in utilizing ultrasound guidance in lieu of CT fluoroscopy or conventional fluoroscopy during minimally invasive percutaneous procedures in order to minimize radiation exposure to patients and healthcare providers. 3) Incorporate these component skill sets into further life-long learning for expansion of competency and implementation into clinical interventional practice.

RC623C Advances in Interventional Use of CT

Participants
Frank Dong, PhD, Beachwood, OH (*Presenter*) Equipment support, Siemens AG; Software support, Siemens AG

LEARNING OBJECTIVES

1) To familiarize attendees with new CT interventional techniques that will open new fields of interventional procedures. 2) To describe the potential benefits of Cone Beam CT (CBCT) navigation to perform imaging guided tumor ablations. 3) To compare the radiation doses between CBCT used in interventional procedures and conventional CT.

RC624

Best Cases from the AIRP (In Conjunction with the American Institute for Radiologic Pathology) (Interactive Session)

Thursday, Dec. 5 8:30AM - 10:00AM Room: S404CD

CH GI GU MK NR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Mark D. Murphey, MD, Silver Spring, MD (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

mmurphey@acr.org

laurabancroftmd@gmail.com

Special Information

This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

LEARNING OBJECTIVES

1) Describe the importance of radiologic-pathologic correlation in evaluation of lesions involving the chest, nervous system, abdomen and musculoskeletal regions. 2) Identify imaging features that can limit our radiologic differential diagnosis based on radiologic-pathologic correlation using a case-based interactive learning environment. 3) Understand the pathologic basis for the distinct imaging appearances utilizing the best cases from the AIRP.

Sub-Events

RC624A Thoracic

Participants
Jeffrey R. Galvin, MD, Baltimore, MD (*Presenter*) Nothing to Disclose

RC624B Neuroradiology

Participants
Kelly K. Koeller, MD, Rochester, MN (*Presenter*) Nothing to Disclose

RC624C Genitourinary

Participants
Darcy J. Wolfman, MD, Washington, DC (*Presenter*) Nothing to Disclose

RC624D Gastrointestinal

Participants
Maria A. Manning, MD, Silver Spring, MD (*Presenter*) Nothing to Disclose

RC624E Musculoskeletal

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

For information about this presentation, contact:

mmurphey@acr.org

RC625

Radiomics: Informatics Tools and Databases

Thursday, Dec. 5 8:30AM - 10:00AM Room: E352

BQ PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Sandy Napel, PhD, Stanford, CA (*Coordinator*) Medical Advisory Board, Fovia, Inc; Scientific Advisor, EchoPixel, Inc; Scientific Advisor, RADLogics, Inc

LEARNING OBJECTIVES

1) Understand the role of challenges in facilitating reproducible radiomics research. 2) Learn about past challenges and lessons learned. 3) Learn about best practices based on experiences from multisite challenges. 4) Review the meaning and importance of interoperability for quantitative image analysis tools. 5) Review specific use cases motivating interoperable communication of the analysis results. 6) Learn about the tools that support interoperable communication of the analysis results using the DICOM standard. 7) Understand the importance of open science methods to facilitate reproducible radiomics research. 8) Become familiar with publicly available sites where you can download existing radiomic data sets, request to upload new radiomic/radiogenomic data sets, and manage your research projects, and learn about data citations and new data-centric journals which help enable researchers to receive academic credit for releasing well-annotated data sets to the public.

Sub-Events

RC625A The Role of Challenges and Their Requirements

Participants
Jayashree Kalpathy-Cramer, MS, PhD, Portland, OR (*Presenter*) Research support, General Electric Company; Research support, F. Hoffmann-La Roche Ltd;

For information about this presentation, contact:

kalpathy@nmr.mgh.harvard.edu

LEARNING OBJECTIVES

1) Understand the role of challenges in facilitating reproducible radiomics research. 2) Learn about past challenges and lessons learned 3) Learn about best practices based on experiences from multisite challenges

RC625B Quantitative Image Analysis Tools: Communicating Quantitative Image Analysis Results

Participants
Andriy Fedorov, PhD, Cambridge, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

andrey.fedorov@gmail.com

LEARNING OBJECTIVES

1) Review the meaning and importance of interoperability for quantitative image analysis tools. 2) Review specific use cases motivating interoperable communication of the analysis results. 3) Learn about the tools that support interoperable communication of the analysis results using the DICOM standard.

RC625C Public Databases for Radiomics Research: Current Status and Future Directions

Participants
Justin Kirby, Rockville, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the importance of open science methods to facilitate reproducible radiomics research. 2) Become familiar with publicly available sites where you can download existing radiomic data sets, request to upload new radiomic/radiogenomic data sets, and manage your research projects. 3) Learn about data citations and new data-centric journals which help enable researchers to receive academic credit for releasing well-annotated data sets to the public.

ABSTRACT

Lack of reproducibility in scientific research, particularly in healthcare, has become an increasing issue in recent years. The National Institutes of Health (NIH) and many major publishers have since called for increased sharing of raw data sets so that new findings can be easily validated. This is especially important in the emerging field of radiomics where large data sets and huge numbers of image features lead to an increased risk of spurious correlations which are not driven by biology. A number of public tools and databases such as The Cancer Imaging Archive (TCIA) have since been created by governments and other organizations to help facilitate the sharing of data sets. Publishers have developed new 'data journals' and services specifically designed to encourage researchers to annotate and share their data sets. It is now up to the imaging research community to begin taking advantage of

these resources. Other disciplines such as genomics and proteomics are significantly leading imaging in the adoption of these new open science workflows. Engagement with NIH and other organizations providing open databases and related services is critical to enabling imaging researchers to successfully shift to a culture of data sharing and transparency.

Printed on: 10/29/20

RC627

Physician Payment Reform and Radiology: Where Do We Stand and Where Are We Going?

Thursday, Dec. 5 8:30AM - 10:00AM Room: S504AB

HP

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

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

For information about this presentation, contact:

rosena23@nyumc.org

LEARNING OBJECTIVES

1) To describe recent federal legislation seeking to implement healthcare payment reform by linking physician payment to the quality and value of care. 2) To recognize the specific impact of such legislation on radiologists and how radiologists can best prepare for the legislation's implementation. 3) To explore examples of how such federal policy may be applied in breast imaging, interventional radiology, and quality and safety in radiology.

ABSTRACT

Recent federal legislation aims to reform Medicare's traditional fee-for-service approach through new payment models that will eventually base the large majority of physician payments on quality and value. Of note, the Medicare Access and CHIP Reauthorization Act (MACRA) of 2015 implements a new federal Quality Payment Program (QPP) through which physicians will be paid through Advanced Alternative Payment Models or the Merit-Based Incentive Payment System (MIPS). The QPP will result in physicians being subject to potentially substantial payment bonuses or penalties depending on their performance in new physician-focused evaluation systems. The QPP will grant special considerations in performance evaluation to physicians with unique practice patterns, such as radiologists. However, physicians will need to have a robust understanding of the legislation and prepare accordingly in order to achieve favorable outcomes. This session will provide background of recent federal physician payment reform as relevant to radiology and also actions that radiology practices should pursue, both generally and in specific contexts within radiology, to ultimately attain success in the new system.

Sub-Events

RC627A The Need for Transparency in Radiology and How to Achieve It

Participants
David C. Levin, MD, Philadelphia, PA (*Presenter*) Consultant, HealthHelp, LLC Board Member, Outpatient Imaging Affiliates, LLC

For information about this presentation, contact:

david.levin@jefferson.edu

LEARNING OBJECTIVES

1) Understand the issue of price transparency and why it is a problem for radiologists, especially those working in hospitals. 2) Be aware of the misleading information that patients are receiving from commercial web sites and various state all-payer claims databases. 3) Identify steps radiologists can take to assure that their patients receive accurate information about what the actual costs of their imaging exams will be.

RC627B Quality and Safety: A Policy Perspective

Participants
Nadja Kadom, MD, Atlanta, GA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To be familiar with the radiology quality and safety metrics on the cms.gov compare site. 2) To explain some of the organizational resources available to the radiologist to measure and report quality and process improvement. 3) To explore how quality in radiology will be measured under emerging physician performance evaluation models.

RC627C Breast Screening Bundled Payments

Participants
Geraldine B. McGinty, MD, MBA, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe how bundled payments are created and how they are believed to impact health outcomes. 2) Describe how bundled payments have impacted imaging reimbursement. 3) Describe a potential model for a bundled payment for breast screening.

RC627D MACRA and the MIPS: Impact for Radiology

Participants
Gregory N. Nicola, MD, River Edge, NJ (*Presenter*) Founder, N2 Health Insights; Consultant, CMO Neutigers

For information about this presentation, contact:

gnnicola@yahoo.com

LEARNING OBJECTIVES

1) Summarize major provisions in MACRA concentrating on those that impact radiologists. 2) Review final regulatory updates regarding MIPS for the 2020 performance year. 3) Explore strategies to maximize performance in MIPS.

Printed on: 10/29/20

RC629

Machine Learning and Radiomics in MRI

Thursday, Dec. 5 8:30AM - 10:00AM Room: E451A

AI MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Sub-Events

RC629A Basics of Radiomics Applied to MRI

Participants
Olivier Gevaert, PhD, Stanford, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) How to use radiomics for multi-modal MR imaging with examples using brain MRI. 2) How to develop robust radiomics pipeline from MRI data by using normalization approaches. 3) How to place radiomics in the era of deep learning and convolutional neural networks for MRI data.

RC629B Basics of Machine Learning

Participants
Tarik K. Alkasab, MD,PhD, Boston, MA (*Presenter*) Consultant, Nuance Communications, Inc

RC629C Applications of Machine Learning for Image Reconstruction

Participants
Hersh Chandarana, MD, New York, NY (*Presenter*) Equipment support, Siemens AG; Software support, Siemens AG; ;

LEARNING OBJECTIVES

1) Brief review of state-of-art MR acquisition and reconstruction schemes. 2) Examine why deep learning is of interest in MR image reconstruction. 3) Explore some of the novel proposed methods for image reconstruction and discuss potential applications.

ABSTRACT

Machine learning or deep learning is a powerful tool that is already impacting or will impact the entire imaging life cycle. In this talk we will focus on the role of machine learning (specifically deep learning) in MR image generation (reconstruction).

RC629D MRI Applications of Machine Learning for Cancer Diagnosis

Participants
Andrea G. Rockall, FRCR,MRCP, London, United Kingdom (*Presenter*) Speaker and Chairman, Guerbet SA

LEARNING OBJECTIVES

1) To be familiar with some key examples of clinical development of machine learning tools in MRI in oncology. 2) To know about many of the challenges related to MRI oncology datasets. 3) To be aware of methods of clinical validation of machine learning tools in MRI in oncology.

RC631

Common Spinal Injection Procedures for Diagnosis and Treatment of Back Pain (Hands-on)

Thursday, Dec. 5 8:30AM - 10:00AM Room: E263

MK NR IR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
A. Orlando Ortiz, MD, MBA, Bronx, NY (*Presenter*) Nothing to Disclose
Bassem A. Georgy, MD, San Diego, CA (*Presenter*) Consultant, Merit Medical Systems, Inc; Consultant, Medtronic plc; Stockholder, Spine Solutions, Inc; ;
Todd S. Miller, MD, White Plains, NY (*Presenter*) Nothing to Disclose
Allan L. Brook, MD, Bronx , NY (*Presenter*) Nothing to Disclose
Michele H. Johnson, MD, New Haven, CT (*Presenter*) Scientific Advisory Board, iSchemaView, Inc; Medical Advisory Board, iSchemaView, Inc
Afshin Gangi, MD,PhD, Strasbourg, France (*Presenter*) Consultant, AprioMed AB

For information about this presentation, contact:

ortizo@nychhc.org

LEARNING OBJECTIVES

1) To introduce common spinal injection procedures that are used for the diagnosis and treatment of neck and back pain disorders. 2) To learn the indications and contraindications for these procedures. 3) To understand how imaging guidance is used to perform these procedures. 4) To introduce some of the equipment and techniques that are helpful in performing spine injection procedures in a hands on format with an opportunity for attendees to address their specific questions and concerns with the course faculty.

ABSTRACT

Image guided spine interventions can be used for the diagnosis and/or treatment of painful conditions of the spinal access. Diagnostic procedures often include specific nerve blocks that can be performed with anesthetic agents. Facet joint and sacroiliac joint pain syndromes can likewise be managed with spine interventional techniques. Epidural steroid injections can be performed using interlaminar, caudal or transforaminal techniques in the management of focal back or neck pain with an associated radicular pain component. More advanced longer lasting treatments inclued radiofrequency neuolysis which can also be used to manage facet or sacroiliac joint related pain that temporarily responds to diagnostic median branch blocks or specific joint injections. Spinal cord stimulator placement is another advanced technique that can be used to manage chronic pain syndromes. The workshop emphasizes patient selection, imaging evaluation, procedure indication and contraindications in order to optimize treatment outcome.

RC632

Clinical Optimization: Current and Future States

Thursday, Dec. 5 8:30AM - 10:00AM Room: N226

LM

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Melissa A. Davis, MD, Atlanta, GA (*Moderator*) Stockholder, Nines Radiology

LEARNING OBJECTIVES

1) Overview of optimization of radiology practices through the use of RAs and other non-MD support. Course participants will gain an understanding of how their practices can use these personnel for higher value/intellectual capital endeavors. 2) Optimization of radiology practices through technology. Course participants will gain an understanding of workflow management, electronic health record integration, and implementation of new systems through capital deployment. 3) Optimization of radiology through practice evaluation and redesign. Course participants will be presented with innovative ways to assess and optimize radiologist's time and workflows. 4) Describe the history and qualifications of radiology extenders. 5) Define the current role of radiology extenders in the practice of radiology. 6) Learn the legal and billing requirements of different types of radiology extenders. 7) Gain an understanding of how technology can aid in optimization of radiology practices. 8) Develop practical strategies to implement technology to improve practice efficiency.

Sub-Events

RC632A Optimization of Radiology Practices through the Use of RAs and Other Non-MD Support

Participants
Catherine J. Everett, MD, New Bern, NC (*Presenter*) Shareholder, Radiology Partners; President, Eidetico Radiology Solutions

LEARNING OBJECTIVES

1) Describe the history and qualifications of radiology extenders. 2) Define the current role of radiology extenders in the practice of radiology. 3) Learn the legal and billing requirements of different types of radiology extenders.

RC632B Optimization of Radiology Practices through Technology

Participants
Amy L. Kotsenas, MD, Rochester, MN (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

kotsenas.amy@mayo.edu

LEARNING OBJECTIVES

1) Gain an understanding of how technology can aid in optimization of radiology practices. 2) Develop practical strategies to implement technology to improve practice efficiency.

RC632C Optimization of Radiology through Practice Evaluation and Redesign: Full Analysis of Radiologist Time and How to Optimize It

Participants
Melissa A. Davis, MD, Atlanta, GA (*Presenter*) Stockholder, Nines Radiology

RC650

Fallopian Tube Catheterization (Hands-on)

Thursday, Dec. 5 8:30AM - 10:00AM Room: E260

GU OB IR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Amy S. Thurmond, MD, Portland, OR (*Presenter*) Nothing to Disclose
Ronald J. Zagoria, MD, San Francisco, CA (*Presenter*) Consultant, ReCor Medical, Inc
A. van Moore JR, MD, Charlotte , NC (*Presenter*) Nothing to Disclose
Anne C. Roberts, MD, La Jolla, CA (*Presenter*) Nothing to Disclose
David M. Hovsepian, MD, Stanford, CA (*Presenter*) Nothing to Disclose
James E. Silberzweig, MD, New York, NY (*Presenter*) Nothing to Disclose
Lindsay S. Machan, MD, Vancouver , BC (*Presenter*) Stockholder, Analytics for Life, Inc Stockholder, Calgary Scientific, Inc Stockholder, Harmonic Medical Stockholder, IKOMED Technologies Inc Stockholder, Innovere Medical Inc Stockholder, Confluent Medical Inc
Maureen P. Kohi, MD, San Francisco, CA (*Presenter*) Advisory Board, Boston Scientific Corporation; Advisory Board, Medtronic plc ; Consultant, Medtronic plc; Consultant, Koninklijke Philips NV

For information about this presentation, contact:

lindsay.machan@vch.ca

LEARNING OBJECTIVES

1) Obtain hands-on experience with fallopian tube catheterization using uterine models and commercially available catheters and guidewires. 2) Review the history and evolution of interventions in the fallopian tubes, including tubal recanalization and tubal occlusion. 3) Learn safe techniques for fallopian tube recanalization for promoting fertility. 4) Discuss the outcomes regarding pregnancy rate and complications. 5) Appreciate ways to improve referrals from the fertility specialists and expand your practice. 6) Understand the importance of hysterosalpingography in the evaluation of the infertile couple.

ABSTRACT

More couples and at a younger age are seeking fertility treatment all over the world. Hysterosalpingraphy which has been done for over a hundred years, is the only imaging technique which depicts the delicate structure of the fallopian tube, the anatomy of which is key for determining optimal fertility treatment. Noninvasive access to this structure for promoting pregnancy has been sought for 170 years. Fluoroscopic Fallopian tube catheterization is currently used predominantly to dislodge debris from the proximal tube in women with infertility. This hands-on course allows participants to understand the anatomy, and to use commercially available catheters and devices in plastic models for fallopian tube catheterization. Fallopian tube catheterization using fluoroscopic guidance is a relatively easy, inexpensive technique within the capabilities of residency trained radiologists. World experts are available to answer your questions and to provide individualized guidance for your practice setting.

Printed on: 10/29/20

RC652

Live Ultrasound Interventional Procedures: Joint Injections, Cyst Aspiration, Abscess Drainage, Vascular Access, Core Biopsy, and Foreign Body Removal (Hands-on)

Thursday, Dec. 5 8:30AM - 10:00AM Room: E264

MK IR US

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants

Leah E. Braswell, MD, Columbus, OH (*Moderator*) Nothing to Disclose
Veronica J. Rooks, MD, Honolulu, HI (*Presenter*) Nothing to Disclose
Stephen C. O'Connor, MD, Boston, MA (*Presenter*) Nothing to Disclose
James W. Murakami, MD, Columbus, OH (*Presenter*) Nothing to Disclose
Kal Dulaimy, MD, Springfield, MA (*Presenter*) Nothing to Disclose
Hisham A. Tchelepi, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Christian I. Carlson, MD, MS, Jbsa Ft Sam Houston, TX (*Presenter*) Nothing to Disclose
Horacio M. Padua JR, MD, Boston, MA (*Presenter*) Nothing to Disclose
Ebonee Carter, MD, Fort Stewart , GA (*Presenter*) Nothing to Disclose
Eric Royston, DO, MPH, Tripler Army Med Ctr, HI (*Presenter*) Nothing to Disclose
Shankar Rajeswaran, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Mabel Garcia-Hidalgo Alonso, MD, Majadahonda, Spain (*Presenter*) Nothing to Disclose
Nikhil Madhuripan, MD, Springfield, MA (*Presenter*) Nothing to Disclose
Jonathan R. Wood, MD, Honolulu, HI (*Presenter*) Nothing to Disclose
Timothy S. Wulfestieg, DO, Honolulu, HI (*Presenter*) Nothing to Disclose
Adam S. Young, MD, MBA, Los Angeles, CA (*Presenter*) Independent Contractor, Voxel Cloud Inc
Samuel Douglass, DO, Tacoma, WA (*Presenter*) Nothing to Disclose
Carmen Gallego, MD, Madrid, Spain (*Presenter*) Nothing to Disclose
Nathan Fagan, MD, Columbus, OH (*Presenter*) Nothing to Disclose
Allison S. Aguado, MD, Wilmington, DE (*Presenter*) Nothing to Disclose
Michael E. Click, MD, Olympia, WA (*Presenter*) Nothing to Disclose
Jennifer L. Nicholas, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

ronirooks@gmail.com

LEARNING OBJECTIVES

1) Identify basic skills, techniques, and pitfalls of freehand invasive sonography. 2) Define and discuss technical aspects, rationale, and pitfalls involved in musculoskeletal interventional sonographic care procedures. 3) Successfully perform basic portions of hands-on US-guided MSK procedures in a tissue simulation learning module, including core biopsy, small abscess drainage, cyst aspiration, soft tissue foreign body removal, vascular access, and intraarticular steroid injection. 4) Incorporate these component skill sets into further life-long learning for expansion of competency and preparation for more advanced interventional sonographic learning opportunities.

RC653

Secure Image Sharing for Education and Patient Care in Radiology

Thursday, Dec. 5 8:30AM - 10:00AM Room: S501ABC

ED IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Jason M. Hostetter, MD, Baltimore, MD (*Presenter*) Founder, Pacsbin.com
Saad Ranginwala, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Wyatt M. Tellis, PhD, San Francisco, CA (*Presenter*) Officer, EyePACS, LLC

LEARNING OBJECTIVES

1) Learn about the advantages of using mobile devices for sharing radiological images, both for education and patient care. 2) Know about the risks involved in sharing personal data when using public messaging services like WhatsApp. 3) Learn about the strategies and techniques to share medical images safely and securely. 4) Know about the existing regulations for protection of privacy and personal data.

RC654

Deep Learning & Machine Intelligence in Radiology

Thursday, Dec. 5 8:30AM - 10:00AM Room: S406B

AI IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Paul J. Chang, MD, Chicago, IL (*Moderator*) Co-founder, Koninklijke Philips NV; Researcher, Koninklijke Philips NV; Researcher, Bayer AG; Advisory Board, Bayer AG; Advisory Board, Aidoc Ltd; Advisory Board, EnvoyAI; Advisory Board, Inference Analytics; Advisory Board, Subtle Medical

For information about this presentation, contact:

pchang@radiology.bsd.uchicago.edu

LEARNING OBJECTIVES

1) A 'realistic' perspective on how machine learning and artificial intelligence can add value to radiology will be discussed. 2) The significant challenges with respect to practical implementation of machine learning/artificial intelligence offerings by existing radiology workflow and existing IT infrastructure will be reviewed. 3) Strategies for preparing the radiology department and IT for machine learning/artificial intelligence will be discussed.

ABSTRACT

Current and near future requirements and constraints will require radiology practices to continuously improve and demonstrate the value they add to the healthcare 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. There has been great interest (as well as fear and hype) regarding the application of machine learning and other artificial intelligence approaches to help improve the radiology value proposition. This session will attempt to provide a "reality check" on how these potentially promising technologies might be used by radiology and the significant challenges involved. Topics that will be covered include: • How can we best apply machine learning/artificial intelligence to add "true value?" • How do we confidently validate the performance of these technologies? • How can our existing IT systems "feed and consume" these technologies efficiently and at scale? • How can we best harmonize the human radiologist with these machine agents?

Sub-Events

RC654A Introduction to Deep Learning

Participants
Luciano M. Prevedello, MD, MPH, Dublin, OH (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the principles of knowledge extraction from data (Machine Learning). 2) Understand main intuitions behind deep machine learning models (Deep Learning). 3) Understand how Deep Learning can be applied to medical image analysis and the main challenges associated to the application of Deep Learning in this domain.

RC654B Deep Learning and AI in Radiology: A Reality Check

Participants
Paul J. Chang, MD, Chicago, IL (*Presenter*) Co-founder, Koninklijke Philips NV; Researcher, Koninklijke Philips NV; Researcher, Bayer AG; Advisory Board, Bayer AG; Advisory Board, Aidoc Ltd; Advisory Board, EnvoyAI; Advisory Board, Inference Analytics; Advisory Board, Subtle Medical

For information about this presentation, contact:

pchang@radiology.bsd.uchicago.edu

LEARNING OBJECTIVES

1) A "realistic" perspective on how deep learning and machine intelligence can add value to radiology will be discussed. 2) The significant challenges with respect to practical implementation of deep learning/machine intelligence offerings by existing radiology workflow and existing IT infrastructure will be reviewed. 3) Strategies for preparing the radiology department and IT for deep learning/machine intelligence will be discussed.

ABSTRACT

Current and near future requirements and constraints will require radiology practices to continuously improve and demonstrate the value they add to the healthcare 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. There has been great interest (as well as fear and hype) regarding the application of deep learning and other machine intelligence approaches to help improve the radiology value proposition. This session will attempt to provide a 'reality check' on how these potentially promising technologies might be used by radiology and the significant challenges involved. Topics that will be covered include: • How can we best apply deep learning/machine intelligence to add 'true value?' • How do we confidently validate the

performance of these technologies? • How can our existing IT systems 'feed and consume' these technologies efficiently and at scale? • How can we best harmonize the human radiologist with these machine agents?

RC654C Deep Learning: How to Get Started

Participants
Abdul Hamid Halabi, Santa Clara, CA (*Presenter*) Developer, NVIDIA Corporation; Spouse, Employee, Covenant Pathology

RC654D Radiologist Workflow and AI: Challenges and Opportunities

Participants
William W. Boonn, MD, Penn Valley, PA (*Presenter*) Former Chief Medical Information Officer, Nuance Communications, Inc; Shareholder, Nuance Communications, Inc

For information about this presentation, contact:

wboonn@gmail.com

Printed on: 10/29/20

RCA51

How to Prepare 3D Models to Develop Multi-material 3D Printed Vascular Phantoms (Hands-on)

Thursday, Dec. 5 8:30AM - 10:00AM Room: S401AB

IN VA

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Ciprian N. Ionita, PhD, Buffalo, NY (*Moderator*) Grant, Canon Medical Systems Corporation;
Ciprian N. Ionita, PhD, Buffalo, NY (*Presenter*) Grant, Canon Medical Systems Corporation;
Kelsey N. Sommer, East Amherst, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn how to simplify complex vascular trees in order to create a 3D printed phantom with manageable flow conditions. 2) Learn how to use multiple objects for multimaterial 3D printing. 3) Learn how to create vessel wall structures. 4) Learn how to add support structure to allow facile use of the phantom in a bench-top simulation.

ABSTRACT

Development of 3D printed vascular models can be challenging since it involves more complex 3D mesh manipulations following standard segmentation. For example, imaging procedures such as CT angiography can provide vessel geometry and vascular disease morphology such as vascular atherosclerosis. These 3D structure are essential but not sufficient to develop a 3D printed model which could be used for flow simulations and endovascular procedures simulations. In this hands-on session we will show how to manipulate post-segmentation a coronary tree in order to develop a flow phantom. We will use a MeshMixer which is a freeware available for download for all users. A 3D coronary geometry which includes an atherosclerotic plaque will be available for the user. Using this geometry the attendants will go through the steps of creating the model.

RCC51

Artificial Intelligence: Beyond Interpretive Considerations

Thursday, Dec. 5 8:30AM - 10:00AM Room: E353C

AI IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Saurabh Jha, MD, Philadelphia, PA (*Moderator*) Speakers Bureau, Canon Medical Systems Corporation

Sub-Events

RCC51A Value of Triage of Head CT Using AI

Participants
Saurabh Jha, MD, Philadelphia, PA (*Presenter*) Speakers Bureau, Canon Medical Systems Corporation

RCC51B How to Build a Medical AI Company

Participants
Hugh Harvey, MBBS, London, United Kingdom (*Presenter*) Clinical Director, Kheiron Medical Technologies Ltd

LEARNING OBJECTIVES

1) Understand the fundamentals of embarking on setting up a company in the AI space, including, but not limited to: finding the right team, engaging relevant stakeholders, accessing data, building compute and infrastructure, algorithmic validation, regulation, integration and marketing.

RCC51C Beyond ROC: Methods to Judge Real-life Performance of Algorithms

Participants
Stephen M. Borstelmann, MD, Boca Raton, FL (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

contact@n2value.com

LEARNING OBJECTIVES

1) To review the classical confusion matrix and derivatives as a starting point in AI metric evaluation. 2) To analyze the ROC, or AUC (Area Under the Curve) metric along with its pearls and pitfalls. 3) To compare other relevant metrics for AI evaluation. 4) To assess future considerations for radiologist-relevant metrics and computational improvements.

RCC51D How the FDA Regulates AI

Participants
H. Benjamin Harvey, MD, JD, Nahant, MA (*Presenter*) Nothing to Disclose

Printed on: 10/29/20

MSRT52

ASRT@RSNA 2019: CT Dose Awareness and Reduction

Thursday, Dec. 5 9:15AM - 10:15AM Room: N230B

CT SQ

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

Participants
Jia Wang, PhD, Stanford, CA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

wangjia@stanford.edu

LEARNING OBJECTIVES

1) To learn the basic CT acquisition factors that can affect CT Dose. 2) To learn CT dose reduction techniques, including automatic exposure control, tube current modulation, iterative reconstruction and more. 3) To learn regulatory requirements on CT dose management and tools to help monitor and raise awareness of CT dose for patient safety.

Printed on: 10/29/20

MSCM52

Case-based Review of Magnetic Resonance (Interactive Session)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S100AB

MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Jorge A. Soto, MD, Boston, MA (*Director*) Royalties, Reed Elsevier

For information about this presentation, contact:

jorge.soto@bmc.org

LEARNING OBJECTIVES

1) Review key MR imaging findings of common and infrequent conditions of various organs in adult and pediatric patients. 2) Highlight key MR imaging features that are useful to narrow the differential diagnosis. 3) Increase confidence in the interpretation of complex MR studies.

Sub-Events

MSCM52A MRI of the Pediatric MSK

Participants
Kirsten Ecklund, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

kirsten.ecklund@childrens.harvard.edu

LEARNING OBJECTIVES

1) Recognize manifestations of normal skeletal development that may be confused with disease. 2) Identify common benign pediatric bone and soft tissue lesions that mimic aggressive neoplasms.

ABSTRACT

Pediatric Musculoskeletal Cases

MSCM52B MRI of the Liver

Participants
Jay P. Heiken, MD, Rochester, MN (*Presenter*) Patent agreement, Guerbet SA; Patent agreement, Bayer AG

For information about this presentation, contact:

heiken.jay@mayo.edu

LEARNING OBJECTIVES

1) Identify the MR imaging features of select benign and malignant liver masses. 2) Discuss the indications for MRI hepatobiliary contrast agents. 3) Apply basic principles of LI-RADS categorization of liver observations in patients with cirrhosis.

MSCM52C MRI of the Kidneys, Adrenals, and Retroperitoneum

Participants
Avneesh Gupta, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

avgupta@bmc.org

LEARNING OBJECTIVES

1) Describe the pros and cons of MRI versus other imaging modalities for diagnosis of conditions that affect the kidneys, adrenals and retroperitoneum. 2) Define the MRI sequences that are used in imaging of the kidneys, adrenals and retroperitoneum. 3) Understand the strengths, weaknesses and specific uses of various MRI sequences. 4) Utilize different MRI sequences to accurately diagnose renal, adrenal and retroperitoneal disease processes.

ABSTRACT

This educational session will emphasize MRI as a valuable tool for diagnosis of a variety of conditions that affect the kidneys, adrenals and retroperitoneum. The utility of individual MRI sequences for diagnosis will be discussed, as well as how MRI is used alongside other imaging modalities in the radiologist's armamentarium.

MSCM52D MRI of the Female Pelvis

Participants
Marcia C. Javitt, MD, Haifa, Israel (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize imaging patterns of benign and malignant disease. 2) Identify, analyze, and interpret key findings that enable an informed evaluation. 3) Be mindful of the need for accurate, safe, and efficient patient management.

ABSTRACT

This case based review of female pelvic imaging will emphasize the process of triage, appropriate selection of diagnostic imaging tools, lesion detection, characterization, and differential diagnosis. The complimentary role of Ultrasound, CT, and MRI will be emphasized with a discussion of the utility of each modality, the clinical impact on medical decision making, and the need for cost minimization.

Printed on: 10/29/20

MSCS52

Case-based Review of Musculoskeletal Radiology (Interactive Session)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S406A

MK

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

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

For information about this presentation, contact:

ssmith@bwd.harvard.edu

LEARNING OBJECTIVES

1) Learn current techniques and advances in Musculoskeletal imaging and Intervention. 2) Become familiar with current guidelines for diagnosis and management of MSK imaging findings. 3) Review critical Musculoskeletal disorders/disease physiology and pathology as it is depicted by multiple modalities. 4) Understand the vital role of imaging in the broad array of Musculoskeletal disorders in order to achieve optimum patient care.

ABSTRACT

This course is designed to highlight the vital role multimodality imaging plays in the assessment and diagnosis of Musculoskeletal disorders. Special emphasis will be placed on technical advances including MRI, MSK Ultrasound, CT, including DECT, and interventional guidance. A wide range of anatomic topics will be covered during this course including: shoulder, foot/ankle, knee, hand and wrist, including soft tissue/bone lesions and sports imaging. Our goal is to provide a broad update in the field while addressing new opportunities and challenges for everyday practice in the Musculoskeletal arena.

Sub-Events

MSCS52A Foot and Ankle

Participants
Hilary R. Umans, MD, Ardsley, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn to identify common pathology encountered in imaging the ankle / hind-foot, mid- and forefoot; cases will be selected to encompass common osteochondral, ligamentous, myotendinous capsular and soft tissue pathology.

MSCS52B Sports Imaging

Participants
Abdullah Alkhayat, MBBCh,FFR(RCSI), Kuwait City, Kuwait (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

dr.abhk@gmail.com

MSCS52C Hand and Wrist

Participants
Jenny T. Bencardino, MD, Jericho, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn current techniques and advances in Musculoskeletal imaging and Intervention. 2) Become familiar with current guidelines for diagnosis and management of MSK imaging findings. 3) Review critical Musculoskeletal disorders/disease physiology and pathology as it is depicted by multiple modalities. 4) Understand the vital role of imaging in the broad array of Musculoskeletal disorders in order to achieve optimum patient care.

ABSTRACT

This course is designed to highlight the vital role multimodality imaging plays in the assessment and diagnosis of Musculoskeletal disorders. Special emphasis will be placed on technical advances including MRI, MSK Ultrasound, CT, including DECT, and interventional guidance. A wide range of anatomic topics will be covered during this course including: shoulder, foot/ankle, knee, hand and wrist, including soft tissue/bone lesions and sports imaging. Our goal is to provide a broad update in the field while addressing new opportunities and challenges for everyday practice in the Musculoskeletal arena

Active Handout:Jenny T. Bencardino

http://abstract.rsna.org/uploads/2019/18001557/Active MSCS52C.pdf

MSCS52D Knee

Participants
Jonathan A. Flug, MD, MBA, Phoenix, AZ (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To review educational cases of meniscal, ligamentous and osteochondral conditions affecting the native and postoperative knee assessed on MR imaging.

Printed on: 10/29/20

MSES52

Essentials of Genitourinary Imaging

Thursday, Dec. 5 10:30AM - 12:00PM Room: E450A

GU

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Sub-Events

MSES52A Ultrasound Evaluation of Scrotal Emergencies

Participants
Leslie M. Scoutt, MD, Essex, CT (*Presenter*) Speaker, Koninklijke Philips NV

For information about this presentation, contact:

leslie.scoutt@yale.edu

LEARNING OBJECTIVES

1) Discuss technique and ultrasound findings of testicular torsion. 2) Describe the ultrasound appearance of acute epididymitis with or without orchitis as well as other less common scrotal infections. 3) Discuss the role of ultrasound in the evaluation of patients with testicular trauma.

ABSTRACT

Ultrasound is commonly used to evaluate patients presenting with acute scrotal pain with a primary goal of differentiating between testicular torsion and epididymitis.as clincial presentation is often non-specific. Accurate diagnosis is key as testicukar torsion is a surgical emergency and epididymitis is treated conservatively with antibiotics. This presentation will discuss how to differentiate these two entities as well as common mimics. In addition, the role of ultrasound in the evaluation of patients with acute trauma will be discussed. The role of ultrasound in the detection of unsuspected neoplasms in patients presenting with acute scrotal pain will be emphasized.

MSES52B Gynecologic Emergencies

Participants
Robin B. Levenson, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the utility of pelvic ultrasound for non-pregnant, premenopausal women in the acute setting. 2) Describe imaging findings of various gynecologic emergencies, including adnexal torsion, complex cysts, pelvic inflammatory disease, fibroid-related. 3) Identify pearls and pitfalls in diagnosis.

ABSTRACT

Premenopausal women with acute pelvic pain can represent a diagnostic challenge in the emergency setting; the differential diagnosis includes multiple clinical conditions with signs and symptoms that overlap. Symptoms may be nonspecific and the differential diagnosis broad, including both gynecological and nongynecological entities (gastrointestinal, genitourinary, etc). Imaging plays an important role not only in diagnosis, but in differentiation between urgent surgical and nonsurgical conditions. Radiologist awareness of imaging findings in gynecologic emergencies is key for appropriate diagnosis and to help guide management.

MSES52C Acute and Emergency Conditions of First Trimester Pregnancy

Participants
Mariam Moshiri, MD, Bellevue, WA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

moshiri@uw.edu

LEARNING OBJECTIVES

1) Learn about various emergent medical conditions that occur commonly in the first trimester of pregnancy. 2) Learn current recommendation for imaging of such conditions based on ACR criteria as well as published data. 3) Learn current recommendations for imaging of trauma in pregnancy.

ABSTRACT

Imaging of known or suspected acute abdominal and pelvic conditions during pregnancy can be problematic, due to controversies in selection of a preferred imaging modality. We will discuss current imaging recommendations for acute abdominal and pelvic medical conditions during the first trimester of pregnancy such as appendicitis, ureteral calculus, ovarian torsion, acute bowel disease, etc. Trauma to the mother and fetus are also addressed emergently, and may require special considerations in the utilization of specific imaging modalities.

MSES52D Participants

Cystic Renal Masses

Gary M. Israel, MD, Madison, CT (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

gary.israel@yale.edu

LEARNING OBJECTIVES

1) To review a method of characterizing cystic renal masses and to understand the nuances of using CT and MRI in cystic renal mass evaluation.

ABSTRACT

Cystic renal masses, are common, often incidental findings, with a range of etiologies spanning from simple cysts to renal cell carcinomas. CT and MRI have proven useful in primarily evaluating these masses, and has also proven useful in problem solving when US is not definitive in diagnosis. Evaluation of renal cyst is based on the thickness and enhancement characteritics of the wall of the cyst, the presence, number, thickness, and enhancement of any septa present within the cyst, the presence and amount of calcification within the wall or septa, and the presence or absence of any enhancing soft tissue components. While many renal cysts can be diagnosed as benign or malignant, evaluation of some cysts is not straight foward and require follow up imaging to demonstrate stability over time. We will focus on those renal cysts which prove to be difficult to diagnose at imaging and demonstrate the nuances of this evaluation.

Printed on: 10/29/20

MSRT53

ASRT@RSNA 2019: Hip Imaging Update

Thursday, Dec. 5 10:30AM - 11:30AM Room: N230B

MK

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

Participants
Laura W. Bancroft, MD, Venice, FL (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

laurabancroftmd@gmail.com

LEARNING OBJECTIVES

1) Review normal anatomy of the hip. 2) Identify imaging features of congenital hip abnormalities, arthritis, trauma, labral tears and hip impingement.

RCA52

Work Smarter, Not Harder: Reading Room Efficiencies and Ergonomics (Hands-on)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S401AB

IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Puneet Bhargava, MD, Shoreline, WA (*Moderator*) Editor, Reed Elsevier

For information about this presentation, contact:

bhargp@uw.edu

LEARNING OBJECTIVES

1) Outline how to organize your personal workspace for optimal reading room productivity. 2) Outline work related pathologies that develop with poor use of ergonomics; elucidate suggestions for optimum ergonomics to prevent work-related injuries. 3) Using available hardware and software scripting tools to adapt the system to the radiologist and minimize inefficiency caused by repetitive tasks embedded in the workflow.

Sub-Events

RCA52A Reading Room Efficiencies: Applying Personal Productivity Techniques to Optimize Reading Room Productivity

Participants
Puneet Bhargava, MD, Shoreline, WA (*Presenter*) Editor, Reed Elsevier

For information about this presentation, contact:

bhargp@uw.edu

RCA52B How About Reading Room Ergonomics: Solutions to Preserve Your Body and Eyes

Participants
Omer A. Awan, MD, Baltimore, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Outline work related pathologies that develop with poor use of ergonomics. 2) Elucidate suggestions for optimum ergonomics to prevent work related injuries.

ABSTRACT

n/a

RCA52C Clickonomics: Leveraging Readily Available Hardware and Software Tools to Eliminate Wasteful Repetitive Tasks Embedded in Routine Workflow

Participants
Nicholas Said, MD, MBA, Chapel Hill, NC (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn about readily available hardware and software tools that can minimize inefficiency caused by repetitive tasks embedded in the Radiology workflow. 2) Learn how to use these tools both independently and synergistically.

ABSTRACT

Radiology workflow is often riddled with inefficiencies requiring Radiologists to perform repetitive tasks as they adapt to complex systems. The presentation will highlight readily available software and hardware tools that can be leveraged to curtail repetitive micro-inefficiencies littered through a typical radiology workday. We will discuss how tools can be synergistically employed to curtail inefficiency and increase daily productivity.

Active Handout:Nicholas Said

http://abstract.rsna.org/uploads/2019/19020409/Active RCA52C.pdf

RCC52

Applications and Simulations in 3D Medical Printing

Thursday, Dec. 5 10:30AM - 12:00PM Room: E451B

IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Peter C. Liacouras, PhD, North Potomac, MD (*Moderator*) Nothing to Disclose
Nicole Wake, PhD, Bronx, NY (*Moderator*) In-kind support, Stratasys, Ltd; Consultant, General Electric Company

For information about this presentation, contact:

nwake@montefiore.org

Sub-Events

RCC52A 3D Printing in Military Medicine: Past, Present, and Future

Participants
Peter C. Liacouras, PhD, North Potomac, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explain how the 3D Medical Applications Center at Walter Reed National Military Medical Center utilizes an array of digital and additive technology to improve the care and well-being of our wounded warriors. 2) Give examples of current 3D printing applications within the Department of Defense. 3) Understand the provider interaction needed for 3D model manufacturing. 4) Understand the many advantages 3D printing provides.

ABSTRACT

The 3D Medical Applications Center at Walter Reed National Military Medical Center utilizes an array of digital and additive technology to improve the care and well-being of our wounded warriors. Over the past decade, the 3D Medical Application Center has evolved from supplying pre-surgical models and custom implant templates to providing custom titanium implant, surgical guides, facial prosthetics molds, prosthetic attachments, assistive technology devices, and simulation task trainers. There are many aspects of a wounded warrior's care and life that may require a device not currently on the market. Additive manufacturing allows each provider the freedom work with a design team to tailor an implant or device to meet their overall objectives and more importantly the patient's needs. This presentation will highlight some the past and recent achievements of the 3D Medical Applications Center, as well as, future initiatives.

RCC52B 3D Printing from MRI Data

Participants
Nicole Wake, PhD, Bronx, NY (*Presenter*) In-kind support, Stratasys, Ltd; Consultant, General Electric Company

For information about this presentation, contact:

nwake@montefiore.org

LEARNING OBJECTIVES

1) Explain the basics of 3D printing from MRI data. 2) Describe MR sequences used for the generation of 3D printed models. 3) Discuss segmentation techniques used to work up MRI data for 3D printing. 4) Review case types where MRI may be the optimal imaging modality for creating 3D printed models. 5) Specify the challenges of 3D printing from MRI data.

ABSTRACT

Although 3D printed anatomic models can be created from any volumetric image dataset with sufficient contrast, CT images are generally used due to the relative ease of image post-processing. MRI is an attractive alternative, since it offers superior soft-tissue characterization, flexible image contrast mechanisms, and avoids the use of ionizing radiation or iodinated contrast. This presentation will provide an overview of 3D printing from MRI data. Specifically, MR sequences and basic segmentation principles for the generation of 3D printed models will be described. Case examples will be reviewed to demonstrate how 3D models can be created from MRI data and when MRI may be the optimal imaging modality. Finally, the challenges of 3D printing from MRI data will be presented.

RCC52C 3D Printing and Augmented Reality in Interventional Cardiology

Participants
Jan S. Witowski, Krakow, Poland (*Presenter*) Former Employee, MedApp SA

For information about this presentation, contact:

jwitos@gmail.com

LEARNING OBJECTIVES

1) To describe state-of-the-art of 3D printing and augmented reality in cardiology. 2) To apply and choose from augmented reality versus 3D printing in interventional cardiology in proper scenarios. 3) To develop 3D printed models in a low-cost approach. 4) To assess and estimate how these technologies can affect patient outcomes.

RCC52D 3D Printing Applications in Education

Participants
Summer J. Decker, PhD, Tampa, FL (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

sdecker@health.usf.edu

LEARNING OBJECTIVES

1) Explain why training in 3D Printing and 3D Technologies are critical to the future of clinical radiology. 2) Identify potential applications for 3D Printing in Medical Education. 3) Develop specific content and rotations for training medical students, residents and fellows in 3D Printing.

RCC52E 3D Printing Simulations for Surgical Training: Congenital Heart Disease

Participants
Shi-Joon Yoo, MD, Toronto, ON (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

Shi-joonyoo@sickkids.ca

LEARNING OBJECTIVES

1) To identify the need for and currently applicable methods of surgical simulation in congenital heart surgery training. 2) To describe the 3D printing process in development of surgical simulation models. 3) To describe how surgical simulation is performed and how the outcome of the training is assessed. 4) To describe the current limitations of surgical simulation using 3D print models in congenital heart surgery. 5) To explain future directions of 3D printing in congenital heart surgery simulation.

RCC52F 3D Printing Vascular Research

Participants
Nicholas S. Burris, MD, Ann Arbor, MI (*Presenter*) Royalties, Imbio, LLC

For information about this presentation, contact:

nburris@med.umich.edu

LEARNING OBJECTIVES

1) Describe methods that can be used to generate multi-material models of the thoracic aorta and aortic valve to better characterize disease. 2) Review applications of color 3D printing to depict maps of aortic growth. 3) Highlight potential uses for 3D printed models of aortic disease to both facilitate communication between imagers and proceduralists and to advance education of patients undergoing aortic surgical procedures.

SPAI51

RSNA AI Deep Learning Lab: Data Science: Data Wrangling

Thursday, Dec. 5 10:30AM - 12:00PM Room: AI Showcase, North Building, Level 2, Booth 10342

AI IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Katherine P. Andriole, PhD, Chestnut Hill, MA (*Presenter*) Research funded, NVIDIA Corporation; Research funded, General Electric Company; Research funded, Nuance Communications, Inc; ; ; ;

Special Information

In order to get the best experience for this session, it is highly recommended that attendees bring a laptop with a keyboard, a decent-sized screen, and the latest version of Google Chrome. Additionally, it is recommended that attendees have a basic knowledge of deep learning programming and some experience running a Google CoLab notebook. Having a Gmail account is also helpful. Here are instructions for creating and deleting a Gmail account.

ABSTRACT

This session will include a deeper dive into data preparation and analysis tasks required to obtain the best results from your deep learning system. It will include a discussion of data cohort makeup, different options for representing the data, how to normalize the data, particularly image data, the various options for data labeling / image annotation and the benefits of each option. Model performance metrics will also be examined. We will discuss the 'after training' aspects of deep learning including validation and testing to ensure that the results are robust and reliable.

Printed on: 10/29/20

SSQ01

Breast Imaging (Radiomics and Radiogenomics)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S406B

AI BR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Katja Pinker-Domenig, MD, New York, NY (*Moderator*) Speakers Bureau, Siemens AG ; Advisory Board, Merantix Healthcare GmbH
Stamatia V. Destounis, MD, Scottsville, NY (*Moderator*) Advisory Committee, Hologic, Inc; Medical Advisory Board, iCad, Inc

Sub-Events

SSQ01-01 Radiomics Analysis of Textural Kinetics Features and Enhancement Parameters for Prediction of the Malignity in an Ultrafast Breast DCE-MRI Sequence

Thursday, Dec. 5 10:30AM - 10:40AM Room: S406B

Participants
Saskia Vande Perre, Paris, France (*Presenter*) Nothing to Disclose
Loic Duron, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Audrey Milon, MD, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Julie Poujol, PhD, Vandoeuvre-les-Nancy, France (*Abstract Co-Author*) Employee, General Electric Company
Daniel Balvay, DiplPhys, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Laure S. Fournier, MD,PhD, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Isabelle Thomassin-Naggara, MD, Paris, France (*Abstract Co-Author*) Researcher, General Electric Company; Research funded, General Electric Company; Researcher, Canon Medical Systems Corporation; Research funded, Canon Medical Systems Corporation; Research funded, Hologic, Inc; Research funded, Siemens AG; Research funded, Guerbet SA

For information about this presentation, contact:

s.vandeperre@gmail.com

PURPOSE

To evaluate the performance of radiomic analysis of ultrafast breast MR sequence to distinguish benign from malignant breast lesions.

METHOD AND MATERIALS

117 women (mean age= 54 years old (28-88)) who underwent breast MRI including ULTRAFAST sequence between July 18th 2016 and March 31st 2017 in whom an abnormal enhancing lesion was identified with subsequent pathological analysis (n=174: 68 benign, 7 borderline and 99 malignant lesions) were retrospectively and consecutively included. Two readers classified lesions according to the Breast Imaging Reporting And Data System (BIRADS) on a FAST protocol (T1W, T2W, T1W-fat saturated 2min after injection) and a FULL standard protocol. They independently determined if any lesion was visible on the ultra-fast sequence and what was its time to Enhancement (TTE). Semi-quantitative enhancement parameters were extracted using the Matlab software (n=7) and texture parameters (n=57) and their temporal evolution across each phase of the ULTRAFAST sequence (n=11) (kinetic texture parameters) were calculated using Pyradiomics. Statistical analysis by LASSO-logistic regression and cross validation were performed to build a model.

RESULTS

Regression analysis selected 15 significant variables in a radiomic model named malignant probability score which displayed an AUC=0.876 (Sensitivity (Se) =0.98, Specificity (Spe)= 0.52 Accuracy (Acc) =0.78). An Abbreviated protocol combing FAST analysis, TTE and the malignant probability score increases the diagnostic performance (AUC= 0.882, Se=0.95 , Sp=0.64, Acc=0.82) compared to the BI-RADS from FULL protocol (AUC=0.831, Se=0.98, Sp=0.17 , Acc=0.63) and from FAST protocol (0.800, Se=0.92, Sp=0.28, Acc=0.64).

CONCLUSION

A model based on radiomics parameters including kinetic texture parameters extracted from an ULTRAFAST sequence reach better diagnostic performance than BI-RADS on FAST or FULL standard protocol.

CLINICAL RELEVANCE/APPLICATION

Radiomic analysis on early MR enhancement improves BI-RADS classification on an abbreviated protocol (ULTRAFAST + FAST) and overtakes BI-RADS classification on conventional FULL protocol or FAST protocol..

SSQ01-03 To Develop a Radiomic Nomogram from Multi-Parametric MRI for the Prediction of Breast Cancer

Thursday, Dec. 5 10:50AM - 11:00AM Room: S406B

Participants
Weijing Tao, Nanjing, China (*Presenter*) Nothing to Disclose
Lun Zhao, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

Xiuli Li, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Guangming Lu, Nanjing, China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

twjhayy@163.com

PURPOSE

To develop a radiomic nomogram from multi-parametric MRI for the prediction of breast cancer..

METHOD AND MATERIALS

This study involved 200 patients with 211 lesions (145 malignant lesions and 66 benign lesions), who underwent multi-parametric MRI examine including non-enhanced and enhanced T1WI, T2WI, diffusion weighted imaging (DWI) and pharmacokinetic dynamic contrast enhanced magnetic resonance imaging (DCE-MRI) before surgery or puncture. Apparent diffusion coefficient (ADC) map in DWI and quantitative parameter (Ktrans, Kep, Ve, and Vp) maps in pharmacokinetic DCE-MRI were used. Region of interests (ROIs) were sketched in enhanced T1WI map and mapped to other maps in every slice of lesions. A total of 1132 radiomic features were extracted from each MRI parameter map. The radiomic features were further selected and classified by support vector machine (SVM) and logistic regression. Radiomic models were constructed via 10 times 5-folds cross-validation and valuated with the receiver operating characteristic (ROC) curves. The optimal radiomic model was selected by comparing the area under ROC curve (AUC) values of each single and joint parameter. The nomogram based on the optimal radiomics model was built to assess risk of breast cancer in patients.

RESULTS

AUC values of radiomic models of non-enhanced T1WI, enhanced T1WI, T2WI, ADC, Ktrans, Kep, Ve, and Vp maps were 0.79, 0.81, 0.84, 0.83, 0.86, 0.80, 0.78 and 0.82 respectively in diagnosis of breast cancer. The radiomic model of combination of Ktrans, T2WI and ADC maps was considered as the optimal model with an AUC of 0.88. The radiomic nomogram was built from Ktrans, T2WI and ADC to predict malignant risk of breast lesions.

CONCLUSION

Radiomic nomogram based on multi-parametric MRI could be used to predict risk of breast cancer for every patient, and will be beneficial to improve the accuracy of breast cancer diagnosis preoperatively.

CLINICAL RELEVANCE/APPLICATION

The optimal model was constructed by combining radiomic features of Ktrans, T2WI and ADC maps. The nomogram of optimal radiomic model could help to predict malignant risk of breast lesions in clinical.

SSQ01-04 Assessment of Continuous Learning on Radiomic Analysis of Breast Lesions on a Large Clinical DCE-MRI Dataset

Thursday, Dec. 5 11:00AM - 11:10AM Room: S406B

Participants
Hui Li, PHD, Chicago, IL (*Presenter*) Nothing to Disclose
Yu Ji, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Alexandra V. Edwards, Chicago, IL (*Abstract Co-Author*) Research Consultant, QView Medical, Inc Research Consultant, Quantitative Insights, Inc
John Papaioannou, MSc, Chicago, IL (*Abstract Co-Author*) Research Consultant, QView Medical, Inc
Wenjuan Ma, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose
Peifang Liu, MD, PhD, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose
Maryellen L. Giger, PhD, Chicago, IL (*Abstract Co-Author*) Advisor, Qlarity Imaging; Stockholder, Hologic, Inc; Shareholder, Quantitative Insights, Inc; Shareholder, QView Medical, Inc; Co-founder, Quantitative Insights, Inc; Royalties, Hologic, Inc; Royalties, General Electric Company; Royalties, MEDIAN Technologies; Royalties, Riverain Technologies, LLC; Royalties, Mitsubishi Corporation; Royalties, Canon Medical Systems Corporation

For information about this presentation, contact:

huili@uchicago.edu

PURPOSE

To assess the robustness of AI (radiomics with machine learning) analysis methods on MRI examinations in the task of distinguishing malignant from benign breast lesions with continuous learning using augmented training datasets.

METHOD AND MATERIALS

Study included a total of 1979 breast MRI examinations performed within 2015, 2016, and 2017, retrospectively collected under a HIPAA-compliant, IRB approved protocol with1483 malignant and 496 benign lesions based on histopathological testing. The three years of data contained unique patients (no overlap between the years) with average clinical characteristics of 45.8, 46.5, 47.7 years in age, and 1.8, 1.8, 1.7 cm in size. AI radiomic analyses of each lesion included: automatic lesion segmentation, automated extraction of 38 radiomic features, and machine learning classification using support vector machine analysis. Independent training and testing was performed to assess the performance of multiple learning stages on breast lesion classification. Three classification tasks to mimic the clinical setting were performed to evaluate the robustness of continuous AI learning by examining various training:testing dataset arrangements: (1) 2015 cases: 2016 cases, (2) 2015 cases: 2017 cases, and (3) 2015+2016 cases: 2017 cases, respectively, with the latter two serving as an example of a yearly-based continuous learning scenario. Area under the ROC curve (AUC) was used as the figure of merit to assess the classifier performance for all lesions as well as only mass lesions and only non-mass lesions.

RESULTS

AUC values for the three training:testing datasets were 0.88, 0.88, and 0.89, respectively, showing initial high performance and slight improvement with additional training. For masses and non-mass lesions within the three training:testing datasets, AUCs of 0.87, 0.87, and 0.88 and of 0.90, 0.89, 0.90, were obtained, respectively.

CONCLUSION

Statistically improved classification performance was observed with continuous learning using the yearly-augmented datasets. Further study with a larger multi-institutional dataset and smaller learning increments are needed to validate the findings from this study.

CLINICAL RELEVANCE/APPLICATION

The continuous learning of machine learning in radiomic analysis for the classification performance using augmented datasets showed potential to yield improved performance and to be adopted in clinical setting.

SSQ01-05 MRI Background Parenchymal Enhancement (BPE) are Associated with Breast Cancer Recurrence Risk and Metastasis

Thursday, Dec. 5 11:10AM - 11:20AM Room: S406B

Awards
Trainee Research Prize - Fellow

Participants
Dooman Arefan, PhD, Pittsburgh, PA (*Presenter*) Nothing to Disclose
Ruimei Chai, Shenyang, China (*Abstract Co-Author*) Nothing to Disclose
Lei Zhang, PhD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Margarita L. Zuley, MD, Pittsburgh, PA (*Abstract Co-Author*) Investigator, Hologic, Inc
Wendie A. Berg, MD, PhD, Gibsonia, PA (*Abstract Co-Author*) Nothing to Disclose
Jules H. Sumkin, DO, Pittsburgh, PA (*Abstract Co-Author*) Research Grant, Hologic, Inc Research Grant, General Electric Company
Shandong Wu, PhD, MSc, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

wus3@upmc.edu

PURPOSE

Breast tumor-derived radiomic features in breast DCE-MRI have been shown associated with prognosis. DCE-MRI background parenchymal enhancement (BPE) has been reported as a risk marker for breast cancer mainly studied in screening populations. We investigated roles of BPE quantified in cancer-affected breasts in association with breast cancer distant recurrence risk (via Oncotype DX) and breast cancer axillary lymph node (ALN) metastasis.

METHOD AND MATERIALS

A retrospective IRB-approved study was conducted on two independent cohorts of totally 244 breast cancer patients (all unilateral and confirmed by pathology). Cohort I had 127 ER+ and Node- invasive breast cancer patients who had Oncotype DX scores available, while Cohort II had 117 invasive breast cancer patients who had ALN metastasis status available. Tumors were segmented in 3D space on the affected breasts using an interactive MRI segmentation software by an experienced radiologist, and DCE-MRI-based radiomic features (i.e., morphological, texture and contrast enhancement kinetics) were extracted from the segmented tumors. On the tumor-excluded whole breast region, previously validated automated computer algorithms were applied to quantify the absolute volume of BPE and its relative amount over the whole-breast volume, at three different enhancement ratio cut-offs (i.e., 20%, 30%, and 40%). A linear discriminant analysis model with typical feature selection was used to classify 1) High vs Low+Intermediate Oncotype risk categories on Cohort I and 2) ALN metastasis positive vs negative on Cohort II, on tumor-based radiomics alone, BPE measures alone, and their combination. AUC and accuracy were performance metrics.

RESULTS

Tumor-based radiomic model's AUC was 0.76 and 0.88 for Oncotype DX and ALN classification, respectively, while the corresponding AUC was 0.75 and 0.82 on using BPE alone. When combining radiomics and BPE, the corresponding AUC increased to 0.82 and 0.92, respectively, and accuracy increased to 0.80 from 0.76 (Oncotype) and to 0.92 from 0.83 (ALN).

CONCLUSION

Quantitative BPE is associated with breast cancer distant recurrence risk and ALN metastasis and it can enhance the classification when combined with tumor-derived radiomics.

CLINICAL RELEVANCE/APPLICATION

DCE-MRI BPE measures quantified in cancer-affected breasts may provide additional complementary information over tumor-derived radiomics to enhance breast cancer prognosis assessment.

SSQ01-06 Characterization of Breast Lesions by 4D Radiomics of Dynamic Contrast-Enhanced Breast MRI Data

Thursday, Dec. 5 11:20AM - 11:30AM Room: S406B

Participants
Claudia Sodano, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Matthias Dietzel, MBA,MD, Erlangen, Germany (*Presenter*) Nothing to Disclose
Panagiotis Kapetas, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Thomas H. Helbich, MD, Vienna, Austria (*Abstract Co-Author*) Research Grant, Medicor, Inc ; Research Grant, Siemens AG ; Research Grant, C. R. Bard, Inc; Research Grant, Guerbet SA; Research Grant, Novomed GmbH
Pascal A. Baltzer, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

claudia.sodano@meduniwien.ac.at

PURPOSE

To evaluate a temporally and spatially-resolved (4D) radiomics approach on dynamic contrast enhanced (DCE) breast MRI images to

distinguish benign from malignant enhancing breast lesions.

METHOD AND MATERIALS

This retrospective study was approved by the local IRB and informed consent was waived. Consecutive patients with mammographic or US suspicious findings underwent 1.5T breast MRI according to international recommendations (EUSOMA, EUSOBI, ACR). Eligible for this study were lesions with a histologically proven diagnosis by image-guided biopsy. Two blinded readers, supervised by an experienced breast radiologist analyzed all DCE using a commercially available software. This software extracts BI-RADS derived and pharmacokinetic enhancement features (Tofts model) in a voxel-wise manner. The raw data were extracted and further analyzed by principal component analysis (PCA) and artificial neural networks (ANN, multilayer perceptron). The diagnostic accuracy of the extracted features was measured by the area under the receiver operating characteristics curve (AUC).

RESULTS

470 (295 malignant, 175 benign) lesions in 329 patients (mean age 55.3 years, range 15-83) were examined. 72 DCE features were extracted based on automated volumetric lesion analysis. Five independent component features were extracted using PCA; the AUC to differentiate benign from malignant lesions ranged between 0.579-0.799. ANN using a split sample approach (70% training and 30% validation sample) combined these features into a predictive model revealing an AUC of 0.836 (95%-CI 0.799-0.868).

CONCLUSION

The investigated automated 4D Radiomics approach revealed a high diagnostic ability to distinguish between benign and malignant lesions without requiring subjective reader interpretation.

CLINICAL RELEVANCE/APPLICATION

The application of computer aided interpretation of breast MRI images may reduce the workload of radiologists, thereby reducing the overhead associated with breast MRI acquisition and interpretation.

SSQ01-07 Quantitative MRI Radiomics in the Task of Predicting Molecular Classification of Invasive Breast Cancers in a Large Clinical Dataset from China

Thursday, Dec. 5 11:30AM - 11:40AM Room: S406B

Participants
Yu Ji, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Hui Li, PHD, Chicago, IL (*Presenter*) Nothing to Disclose
Alexandra V. Edwards, Chicago, IL (*Abstract Co-Author*) Research Consultant, QView Medical, Inc Research Consultant, Quantitative Insights, Inc
John Papaioannou, MSc, Chicago, IL (*Abstract Co-Author*) Research Consultant, QView Medical, Inc
Wenjuan Ma, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose
Peifang Liu, MD, PhD, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose
Maryellen L. Giger, PhD, Chicago, IL (*Abstract Co-Author*) Advisor, Qlarity Imaging; Stockholder, Hologic, Inc; Shareholder, Quantitative Insights, Inc; Shareholder, QView Medical, Inc; Co-founder, Quantitative Insights, Inc; Royalties, Hologic, Inc; Royalties, General Electric Company; Royalties, MEDIAN Technologies; Royalties, Riverain Technologies, LLC; Royalties, Mitsubishi Corporation; Royalties, Canon Medical Systems Corporation

PURPOSE

To evaluate the potential of quantitative MRI radiomics in the task of predicting molecular classification of invasive breast cancers in a large clinical dataset from China.

METHOD AND MATERIALS

Our research involved a retrospectively acquired clinical DCE-MRI database of 998 invasive breast cancers. Immunohistochemistry molecular classification was performed including estrogen receptor, progesterone receptor, human epidermal growth factor receptor 2, and Ki-67, the molecular subtype (luminal A, luminal B, HER2-enriched, and triple-negative). The average age of the patients were 48.4 years with a standard deviation 9.6 years. Once each tumor was indicated to our radiomics workstation, the machine learning algorithm automatically segmented and extracted radiomic features on the primary tumor, including those from six categories: size, shape, morphology, enhancement texture, kinetics, and enhancement-variance kinetics. Within 5-fold cross validation, feature selection and classification with linear discriminant analyses was conducted. Performance of the classifier model for molecular subtyping was evaluated using receiver operating characteristic analysis.

RESULTS

The resulting radiomic tumor signatures from the radiomics classifier yielded AUC values of 0.75 (se = 0.08), 0.72 (se = 0.05), and 0.76 (se = 0.09) in the tasks of distinguishing between luminal A/luminal B vs. HER2-enriched, luminal A/luminal B vs. triple negative, and HER2-enriched vs. triple negative, respectively. Luminal A/luminal B tumors exhibited smaller sizes as compared to HER2-enriched tumors and higher irregularity compared to triple negative tumors. HER2-enriched tumors showed more irregularity than triple negative tumors.

CONCLUSION

Quantitative MRI radiomics demonstrated promising classification performance in predicting molecular classification of invasive breast cancers in a large clinical dataset from China.

CLINICAL RELEVANCE/APPLICATION

Our computerized radiomic analysis method has potential to yield a quantitative predictive signature for advancing precision medicine.

SSQ01-08 Radiomics of Triple-Negative Breast Cancer: Prediction of Systemic Recurrence

Thursday, Dec. 5 11:40AM - 11:50AM Room: S406B

Participants

Jieun Koh, MD, Seongnam, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sun Huh, MD, Bucheon-si, Korea, Republic Of (*Presenter*) Nothing to Disclose
Hee Jung Moon, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To predict and validate the systemic recurrence free survival of triple-negative breast cancer (TNBC) with radiomics of preoperative breast MRI

METHOD AND MATERIALS

This IRB-approved retrospective study included 231 TNBCs. Radiomics analysis was performed for TNBCs on the preoperative subtracted constrast-enhanced breast MRI. Rad score was generated from the radiomic features. Patients were assigned as the training set (n=182, GE scanner) and the validation set (n=49, Philips scanner). Uni- and multivariate Cox proportional hazard regression was performed for the features to predict the systemic recurrence. External validation with the validation set was performed with the selected features chosen from the multivariate analysis, and C-index was calculated.

RESULTS

Systemic recurrence was observed in 22 (9.5%) cases (training set, n=19; validation set, n=3); among these, 9 died from the recurrence (training set, n=7; validation set, n=2). The rad score was generated with 32 radiomics features. In the training set, the Rad score was significantly higher in the group with systemic recurrence (median, -8.430; interquartile range (IQR), -8.800 to -8.259) than the group without recurrence (median, -9.873; IQR, -10.226 to -9.468, P<0.001). On univariate analysis, pathologic invasive cancer size, lymphovascular invasion status, surgery type, number of metastatic axillary lymph node, and Rad score were significantly associated with the systemic recurrence. Multivariate analysis was performed with the pathologic invasive cancer size, lymphovascular invasion status, surgery type, number of metastatic axillary lymph node, and Rad score, and lymphovascular invasion (P=0.015) and Rad score (P<0.001) remained statistically significant. The C-index predicting the systemic recurrence of the training set with selected five variables was 0.97. When the model was validated with the validation set, the C-index was 0.848.

CONCLUSION

Radiomics of preoperative breast MRI could be used to predict the systemic recurrence of TNBC and the validation showed the compatible result.

CLINICAL RELEVANCE/APPLICATION

Radiomics of preoperative breast MRI could be used to predict the systemic recurrence of TNBC and the validation showed the compatible result.

SSQ01-09 Radiomics of Breast MRI and 18F-FDG PET/CT as a Prognostic Criteria of Invasive Breast Cancer of No Special Type

Thursday, Dec. 5 11:50AM - 12:00PM Room: S406B

Participants
Pavel Gelezhe, MD, Moscow, Russia (*Abstract Co-Author*) Nothing to Disclose
Sergey Morozov, MD,MPH, Moscow, Russia (*Abstract Co-Author*) Nothing to Disclose
Irina Trofimenko, MD, Moscow, Russian Federation (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

gelezhe.pavel@gmail.com

PURPOSE

Breast cancer is a heterogeneous group of tumors with a different prognosis. Nottingham Prognostic Index (NPI) and molecular subtypes of primary tumors are used for predicting patient outcomes. The aims of this study were: - to explore the presence of correlation between apparent diffusion coefficient (ADC), perfusion enhancement integral (PEI) and standardized uptake value (SUV) values and pathological prognostic factors such as Ki-67 and molecular type; - to identify the associations between ADC, PEI and SUVmax values and NPI prognostic groups; - to consider the viability of using DWI and 18F-FDG PET/CT for risk stratification.

METHOD AND MATERIALS

64 patients (mean age 54.1) with invasive breast carcinoma (IBC) were recruited into a retrospective study. Breast MRIs including DWI with ADC maps, DCE perfusion PEI maps and 18F-FDG PET/CT were made with an interval between studies not exceeding 2 weeks. Mean and minimal ADC values, mean PEI and SUVmax of breast tumors were measured. All patients were divided into three risk groups according to NPI and four (luminal A, luminal B, HER2+ and triple-negative) molecular types groups. For assessment of possible association between ADC, SUVmax, PEI and Ki-67 Spearman's correlation coefficient was used. Kruskall-Wallis test was applied for comparison ADCmean, ADCmin, PEImean and SUVmax means in molecular types and NPI prognostic groups.

RESULTS

Negative intermediate correlation between ADCmin, ADCmean values and Ki-67 was revealed. There were statistically significant differences between mean SUVmax and PEImean in NPI prognostic groups and mean ADC values in molecular type groups. Mean ADC values for Luminal A tumors were statistically significant higher than for Luminal B (P=0.02) and triple negative (P=0.039) types. Also, there were significant differences between means SUVmax in tumors with different grade and means ADCmin and PEImean for different stages of regional lymph node metastatic disease.

CONCLUSION

SUVmax, PEI and ADC correlated with prognostic factors and may be used for predicting the prognosis of breast cancer. ADC value can be used as in vivo marker of invasive breast cancer molecular type.

CLINICAL RELEVANCE/APPLICATION

Although the use of SUVmax, ADC and PEI as potential in vivo markers of survival cannot yet replace biopsy, the perspective of a

dynamic assessment of changes in the molecular status of a tumor and metastasis during treatment is of interest.

Printed on: 10/29/20

SSQ02

Science Session with Keynote: Cardiac (Valvular Imaging and Intervention)

Thursday, Dec. 5 10:30AM - 12:00PM Room: E353C

CA IR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Cristina Fuss, MD, Portland, OR (*Moderator*) Spouse, Officer, ViewRay, Inc
Jonathon A. Leipsic, MD, Vancouver, BC (*Moderator*) Speakers Bureau, General Electric Company Speakers Bureau, Edwards Lifesciences Corporation Consultant, Heartflow, Inc Consultant, Circle Cardiovascular Imaging Inc Consultant, Edwards Lifesciences Corporation Consultant, Neovasc Inc Consultant, Samsung Electronics Co, Ltd Consultant, Koninklijke Philips NV Consultant, Arineta Ltd Consultant, Pi-Cardia Ltd

Sub-Events

SSQ02-01 Cardiac Keynote Speaker: Imaging of Transcatheter Mitral Valve Repair

Thursday, Dec. 5 10:30AM - 10:50AM Room: E353C

Participants
Jonathon Leispic, Vancouver, BC (*Presenter*) Nothing to Disclose

SSQ02-03 Aortic Valve Area and Aortic Valve Calcium Score Calculation in Aortic Stenosis Using Computed Tomography: Comparison with Echocardiography

Thursday, Dec. 5 10:50AM - 11:00AM Room: E353C

Participants
Sejin Choi, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Hyun Jung Koo, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Dae-Hee Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Joon-Won Kang, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Dong Hyun Yang, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

radkoo@amc.seoul.kr

PURPOSE

To compare the aortic valve area (AVA) measured on CT and echocardiography and demonstrate the correlation between the aortic valve calcium score and AVA in patients with aortic stenosis.

METHOD AND MATERIALS

A total of 535 patients (66.8 ± 8.8 years of age, 56% men) with aortic stenosis who underwent preoperative cardiac CT and echocardiography for aortic valve replacement were included. The calculated AVA on echocardiography (AVAecho) and CT (AVACT) by obtaining left ventricular outflow tract (LVOT) diameter, AVA measured by planimetry (AVAplani), and the aortic root size by CT were obtained. AVACT was calculated with the mean LVOT diameter from the maximum and minimum diameters measured at 20-30% of the R-R interval. AVC was obtained on unenhanced images. Concordance between AVAecho and AVACT was evaluated. Logistic regression analysis was performed to find clinical and imaging parameters to predict discordance between AVAecho and AVACT.

RESULTS

AVACT and AVAecho showed high correlation (r=0.748, p<0.0001), whereas AVAplani and AVAecho showed moderate correlation (r=0.52, p<0.001). AVACT was larger than AVAecho (difference 0.24 ± 0.35 cm2, p<0.0001). AVC showed poor negative correlation with AVAecho (r=-0.34, p<0.001). After excluding patients with rheumatic valvular disease or bicuspid aortic valve, lnAVC showed mild correlation with AVAecho (r=-0.42, p<0.0001). Using cut-point values of AVACT (<1.2cm2) and AVAecho (<1.0cm2) for diagnosing severe aortic stenosis, patients'characteristics in concordance (AVAecho<1.0 cm2 and AVACT<1.2cm2) and discordance (AVAecho<1.0cm2 but AVACT>1.2cm2) groups were compared. Discordant group had larger body surface area (BSA) (1.6 vs. 1.7 m2, p=0.005), and AVAecho (0.61 vs. 0.80 cm2, p<0.001) and end-diastolic volume index (EDVI) (66.5 vs. 78.0 mL/m2, p=0.02) were larger than concordant group. Aortic annulus size (diameter, perimeter and area) normalized to BSA was larger in discordant group (p<0.05). BSA (odds ratio [OR]:11.83, 95% confidence interval [CI]:1.28-109.17; p=0.03), AVAecho (OR:1.13, 95%CI:1.09-1.17; p<0.001), EDVI (OR:1.02, 95%CI:1.002-1.03; p=0.03), and normalized annulus area (OR:3.68; 95%CI:1.84-7.36; p<0.0001) were significant predictors of discordance between AVAecho and AVACT.

CONCLUSION

AVAecho and AVACT showed high correlation, and AVC was poorly correlated with AVAecho. BSA, AVAecho, EDVI, and annuls size were factors to associate with the discordance between AVAecho and AVACT.

CLINICAL RELEVANCE/APPLICATION

AVACT is larger than AVAEcho, and discrepancies are expected between the two parameters when larger BSA, EDVI, and annulus sizes appear in patients with aortic stenosis.

SSQ02-04 Development of Deep Learning-Based Algorithm for Automatic Detection and Classification for Aortic Valve Calcium

Thursday, Dec. 5 11:00AM - 11:10AM Room: E353C

Participants
Suyon Chang, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Young Joo Suh, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Hwiyoung Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Dong Min Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyunseok Cho, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Byoung Wook Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Quantitative aortic valve calcium (AVC) measured using CT is well correlated with the severity of AS on echocardiography, and has prognositc implications. We aimed to develop a deep learning-based algorithm for fully automated quantification of AVC from non-enhanced cardiac CT scan and to compare its performance to those of radiologist readers for classification of severe AVC.

METHOD AND MATERIALS

A deep learning-based algorithm (modified 3D U-net) was developed using single-center data of 589 CT exams from March 2010 to August 2017; datasets dividing into subsets for training (412 scans): validation (40 scans): test (137 scans). The deep learning algorithm was set to segment AVC volume and to classify severe AVC by quantifying AVC volume based on the segmentation result. Manually measured AVC volume was used as the ground truth. Visual grading system of AVC severity was developed by modification of Rosenhek scoring system, with four categories (mild, moderate, severe and very severe). The cutoff value of AVC volume for >=severe AVC grading was set by the ROC curve. To validate AVC segmentation performance, dice coefficient was evaluated between AVC volume derived by deep learning algorithm and the ground truth. Diagnostic performance of deep learning algorithm for classification of severe AVC was analyzed using accuracy and AUC. Four radiologist readers determined AVC grade in two reading rounds. The diagnostic performance of the deep learning for classifying severe AVC was compared with that of each reader's assessment.

RESULTS

The cutoff value for severe AVC was set as calcium volume >763.6mm3. After applying deep learning algorithm, the Dice coefficient score in test dataset was 0.816. In the test data sets, the deep learning had an accuracy of 93.3% and AUC of 0.983 (95% confidence interval 0.934-0.999) for diagnosis of severe AVC, which was better than any radiologist reader with or without grading system (accuracy 72.7-89.9% and AUC 0.775-0.903, P<0.05 without grading system; accuracy 79.8-92.9% and AUC 0.829-0.924, P<0.05 with grading system).

CONCLUSION

Deep learning-based automated AVC quantification was highly comparable with manual measurements. The diagnostic performance of deep learning algorithm for classification of severe AVC outperforms radiologist readers.

CLINICAL RELEVANCE/APPLICATION

Deep learning-based automated AVC quantification can accurately identify severe AVC and is recommended in the evaluation of AVC.

SSQ02-05 Combined Coronary CT-Angiography and TAVI-Planning: A Contrast-Neutral and Efficient Routine Approach to Exclude Significant Coronary Artery Disease

Thursday, Dec. 5 11:10AM - 11:20AM Room: E353C

Participants
Robin F. Gohmann, MD, Leipzig, Germany (*Presenter*) Nothing to Disclose
Philipp Lauten, Leipzig, Germany (*Abstract Co-Author*) Nothing to Disclose
Patrick Seitz, Leipzig, Germany (*Abstract Co-Author*) Nothing to Disclose
Christian Krieghoff, MD, Leipzig, Germany (*Abstract Co-Author*) Proctor, Edwards Lifesciences Corporation; Speaker, Bracco Group;
Christian Luecke, MD, Leipzig, Germany (*Abstract Co-Author*) Nothing to Disclose
Mohamed Abdel-Wahab, Leipzig, Germany (*Abstract Co-Author*) Nothing to Disclose
David Holzhey, Leipzig, Germany (*Abstract Co-Author*) Nothing to Disclose
Michael Borger, Leipzig, Germany (*Abstract Co-Author*) Nothing to Disclose
Holger Thiele, Leipzig, Germany (*Abstract Co-Author*) Nothing to Disclose
Matthias Gutberlet, MD, PhD, Leipzig, Germany (*Abstract Co-Author*) Speaker, Siemens AG Speaker, Koninklijke Philips NV Speaker, Bayer AG Speaker, Bracco Group Author, Thieme Medical Publishers, Inc

PURPOSE

To analyze the ability of CT coronary angiography (cCTA) to exclude significant coronary artery disease (CAD) during pre-TAVI-evaluation.

METHOD AND MATERIALS

208 consecutive patients undergoing pre-TAVI-evaluation (108 female; mean-age 79.5±7.2 years) were retrospectively included. Patients after CABG had been excluded. All patients were examined with a standard protocol consisting of a retrospectively gated CT scan of the heart, immediately followed by a high-pitch scan of the vascular access route utilizing a single bolus of 70 ml iodinated contrast-medium. No betta-blockers or nitrates were applied. Heart-rate and heart-rate-variability during the scan were 74.5±19.3 and 22.7±33.1 beats-per-minute; attenuation at the ascending was 462.7±138.8 HU. Images were evaluated per segment (18-AHA) for significant CAD (stenosis >=50%); examinations where stenoses could not be excluded were read as positive. Routinely all patients received invasive coronary angiography (ICA) 76.4% (159/208), which was omitted if renal function

was impaired significantly and no significant stenosis could be identified on cCTA. All stenoses visually identified on ICA were graded qualitatively (QCA) with the same cut-off.

RESULTS

cCTA was negative for significant CAD in 43.8% of patients (91/208). Sensitivity, specificity, PPV, NPV and accuracy were 96.5%, 49.0%, 51.4%, 96.2% and 66.0% per patient and 81.3%, 85.9%, 24.4%, 98.8% and 85.6% per segment, respectively. The significant stenoses additionally identified on ICA were most frequently located in side-branches (2/3) or the distal LAD.

CONCLUSION

cCTA and pre-TAVI evaluation can be performed jointly with no need for additional contrast medium or medication. cCTA is able to exclude significant CAD in a relatively high proportion of this high-risk collective.

CLINICAL RELEVANCE/APPLICATION

Severe aortic stenosis is a frequent disease in the elderly and often coincides with significant CAD. The latter is recommended to be excluded or treated before TAVI. Patients with severe aortic stenosis prior to TAVI-implantation are often frail and comorbid with a high incidence of nephropathy. cCTA can reduce the number of ICA and total amount of contrast-medium applied, thereby making pre-procedural-evaluation for TAVI-Planning safer for elderly patients with a high incidence of nephropathy.

SSQ02-06 Gender-Based Dynamic Evaluation Of Mitral Valve Geometry In Primary And Functional Mitral Regurgitation Using Multiphase Computed Tomography: Implications For Transcatheter Mitral Valve Repair

Thursday, Dec. 5 11:20AM - 11:30AM Room: E353C

Participants
Asim Rizvi, MD, Rochester, MN (*Presenter*) Nothing to Disclose
Nikkole Weber, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Shivaram Poigai Arunachalam, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Yugene Guo, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Alexander Williamson, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Emily Sheedy, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
MacKram Eleid, Rochester , MN (*Abstract Co-Author*) Nothing to Disclose
Shuai Leng, PHD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Eric E. Williamson, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

drasimrizvi@gmail.com

PURPOSE

There is lack of data regarding gender-based disparities in dynamic mitral geometry in patients with mitral valve disease. We aimed to compare 3-dimensional CT mitral measurements among male and female patients with primary- (PMR) and functional mitral regurgitation (FMR), and control patients, using prototype mitral evaluation tool.

METHOD AND MATERIALS

Patients were retrospectively identified who underwent multiphase ECG-gated cardiac CT. Data were loaded into prototype mitral evaluation tool. Anatomical parameters recorded throughout the cardiac cycle (0-95%, at 5% increments) included: circumference, planar surface area (PSA), anterior-posterior (A-P) diameter, and anterolateral-posteromedial (AL-PM) diameter. Male and female patients were compared among three groups, with $p<0.01$ considered statistically significant.

RESULTS

A total of 150 subjects (63.5±14.0 years, 64% males) were included: 50 with PMR, 50 with FMR, and 50 control. Mitral dimensions were significantly higher in males compared to females in PMR, FMR and control groups, with circumference (145±13 vs. 142±15, 135±12 vs. 123±14, and 121±10 vs. 112±8mm), and PSA (1550±247 vs. 1468±294, 1309±251 vs. 1083±227, and 1076±173 vs. 929±136mm2), respectively (all $p<0.001$). Additionally, different patterns in annular dimensions were observed among males and females across cardiac phases (Figure).

CONCLUSION

Multiphase ECG-gated cardiac CT showed larger annular dimensions in males compared to females with dramatic variability across the cardiac cycle in different mitral valve diseases.

CLINICAL RELEVANCE/APPLICATION

Our study findings advocate the significance of obtaining multiphase CT measurements for dynamic, pre-procedural evaluation of complex 3-dimensional mitral valve geometry for catheter-guided prostheses, which may vary between male and female patients with various types of mitral valve disease.

SSQ02-07 Assessment of Late Contrast Enhanced Dual-Energy CT Derived Myocardial Scar in Various Aortic Stenosis Groups

Thursday, Dec. 5 11:30AM - 11:40AM Room: E353C

Participants
Pallavi Pandey, MD, Baltimore, MD (*Presenter*) Nothing to Disclose
Ankur Pandey, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Matthew Czarny, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Rani K. Hasan, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Jon Resar, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Stefan L. Zimmerman, MD, Ellicott City, MD (*Abstract Co-Author*) Consultant, Siemens AG Support, Siemens AG

For information about this presentation, contact:

ppandey1@jhmi.eduapandey9@jhmi.edu

PURPOSE

To assess the relationship between myocardial scar (MS) derived from late contrast enhanced dual energy CT (LCE-DECT) and subtypes of aortic stenosis (AS), particularly the "classical (low flow)" and "paradoxical (normal flow)" low gradient subgroups which are challenging to manage clinically.

METHOD AND MATERIALS

Sixty patients with severe AS underwent echocardiography and multiphase CT (MDCT) that included research LCE-DECT sequences for pre-transcatheter aortic valve replacement (TAVR) evaluation. A weighted scar burden was calculated based on the per-segment extent of scar in the entire LV. Patients were grouped into those with and without 'significant' scar (>50% transmural LCE in at least one segment). LV volumes and function from MDCT were analyzed by a semiautomatic software. Patients with AS were grouped into 1)low flow (LF) and normal flow (NF), based upon MDCT derived stroke volume index (SVi) thresholds (LF<=39ml/m2; NF>39ml/m2) previously validated by our group to best correlate with SVi of <= 35 ml/m2 by right heart catheterization and 2) low gradient (LG) and high gradient (HG), based on echocardiographic mean aortic gradient (LG<40mmhg, HG>=40mmhg). Association of clinical and CT derived parameters with MS were assessed using the chi-square test and Wilcoxon rank sum test for categorical and continuous variables. P <0.05 was considered significant.

RESULTS

Twenty-six patients (43%) showed significant myocardial scar. The presence of significant scar was associated with lower LVEF (62% [61, 77] vs. 72% [51, 75]; p=0.02) and lower stroke volume (39 [40.2, 52.3] vs. 44 [36, 46.6] ml/m2, p=0.01). The proportion of patients with significant scar was higher among LF (67%) than NF groups (31%; p=0.007), as well as between AS subgroups (LF-LG, 80%; LF-HG, 54.5%; NF-LG, 37.5%; NF-HG, 26%; p=0.029). The weighted scar burden tended to be higher in the LF-LG group as compared to other AS groups (LF-LG, 7.5 vs. LF-HG, 2 vs. NF-LG 0.5 vs. NF-HG, 2[p=0.256]).

CONCLUSION

Patients with LF-LG AS are more likely to have >50% transmural myocardial scar detected on LCE-DECT than other AS patients, with a tendency toward higher quantitative scar burden.

CLINICAL RELEVANCE/APPLICATION

Patients with LF-LG AS have a worse prognosis than NF AS. More extensive myocardial scar in LF-LG AS patients may contribute to their poor prognosis. Further evaluation is needed to assess whether LCE-DECT scar assessment may help predict improvement after TAVR.

SSQ02-08 Statistical and Textural Analyses in CT Valve Imaging: A New Tool for Identifying Disease Severity in Calcific Degenerative Aortic Valve Stenosis

Thursday, Dec. 5 11:40AM - 11:50AM Room: E353C

Participants
Jose de Arimateia B. Araujo Filho, MD,PhD, Sao Paulo, NY (*Presenter*) Nothing to Disclose
Antonildes N. Assuncao JR, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Roberto V. Torres, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Thamara C. Morais, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Antonio Santis, MD,PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Marcelo L. Vieira, MD,PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Flavio Tarasoutchi, MD,PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Pedro Lemos, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Rodrigo Castaldoni, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
John A. Sims, BEng, Santo Andre - SP, Brazil (*Abstract Co-Author*) Nothing to Disclose
Cesar H. Nomura, MD,PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

ariaraujocg@gmail.com

PURPOSE

To investigate the discriminatory capability of radiomic features, extracted using statistical and textural analyses, in patients with moderate and severe degenerative aortic stenosis (DAS) from CT valve images.

METHOD AND MATERIALS

This unicenter study prospectively enrolled 97 patients with DAS to perform a 320-multidetector CT using low-dose contrast (0.5ml/kg). Fifty-two (55%) and 43 (45%) of patients had severe or moderate DAS, respectively, according to current guidelines. A 10mm maximum intensity projection was created to cover the entire leaflet width. The valve circumference was manually approximated with a circle on each image by defining points at the circle center and radius (Figure 1A). From these points, two masks were defined: a quarter circle area at the valve center (mask 1) and entire valve circle area (mask 2). Using the package "radiomics" in the R programming environment, first order features (FOF), gray level co-occurrence matrix (GLCM), gray level run length matrix (GLRLM), and gray level size zone matrix (GLSZM) features were calculated for the two masks. Four different angles for pixel comparison were used for the second order statistics. Mean differences (expressed in percentage differences) in radiomics features between severe and moderate DAS were performed using Wilcoxson rank-sum test or Student t test accordingly. We also performed ROC analysis to evaluate diagnostic accuracy, with a DeLong confidence interval for Area Under Curve (AUC).

RESULTS

269 (88%) radiomic features were significantly different in patients with moderate and severe DAS. Fifty-four (18%) showed high discriminatory power (AUC>0.8), with the best AUC achieved by FOF followed by GLCM and GLRLM (Figure 1B). Among FOF, the best performers were the measures of shape - Kurtosis and Skewness, applied to the center of valve (mask 1). Patients with

severe disease had lower and broader peaks than those with moderate disease (Figure 1C).

CONCLUSION

The vast majority of radiomic features tested were significantly different in patients with moderate and severe DAS. These features, particularly FOF in the center of valve, can accurately identify hemodynamic severity of aortic stenosis.

CLINICAL RELEVANCE/APPLICATION

The relationship between calcium leaflet distribution and hemodynamic disease severity in calcific degenerative aortic valve stenosis is poorly understood.

SSQ02-09 Structural Mitral Valve Analysis Utilizing a New Fully Automated Analysis Software Package

Thursday, Dec. 5 11:50AM - 12:00PM Room: E353C

Participants
Robert Steinbach, Charleston, SC (*Presenter*) Nothing to Disclose
Simon S. Martin, MD, Charleston, SC (*Abstract Co-Author*) Institutional Research support, Siemens AG
Richard Bayer, Charleston, SC (*Abstract Co-Author*) Institutional Research support, Bayer AG; Institutional Research support, HeartFlow, Inc; Institutional Research support, Siemens AG
Marly van Assen, MSc, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Matthias Renker, MD, Moerfelden-Walldorf, Germany (*Abstract Co-Author*) Speaker, Abbott Laboratories
Pooyan Sahbaee, Mount Pleasant, SC (*Abstract Co-Author*) Employee, Siemens AG
Chris Schwemmer, Erlangen, Germany (*Abstract Co-Author*) Employee, Siemens AG
Maximilian J. Bauer, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Vincenzo Vingiani, MD, Castellammare di Stabia, SC (*Abstract Co-Author*) Nothing to Disclose
Andreas Fischer, MD, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Andres Abadia, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Dante Giovagnoli, MMedSc,MS, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
Akos Varga-Szemes, MD, PhD, Charleston, SC (*Abstract Co-Author*) Research Grant and Travel Support, Siemens AG Research Consultant, Elucid Bioimaging
Todd Hudson, MS, Charleston, SC (*Abstract Co-Author*) Nothing to Disclose
U. Joseph Schoepf, MD, Charleston, SC (*Abstract Co-Author*) Research Grant, Astellas Group; Research Grant, Bayer AG; Research Grant, Bracco Group; Research Grant, Siemens AG; Research Grant, Heartflow, Inc; Research support, Bayer AG; Consultant, Elucid BioImaging Inc; Research Grant, Guerbet SA; Consultant, HeartFlow, Inc; Consultant, Bayer AG; Consultant, Siemens AG; ; ;

For information about this presentation, contact:

schoepf@musc.edu

PURPOSE

The aim of this study was to evaluate a novel fully automated mitral valve analysis software package (Mitral Analysis Prototype, Siemens Healthineers), designed for planning minimally invasive mitral valve procedures based on cardiac CT.

METHOD AND MATERIALS

The study included 53 patients (25 women: 66.8 ± 12.3 years) who had undergone cardiac computer tomography angiography (CCTA) prior to transcatheter mitral valve replacement (TMVR) or surgical mitral valve intervention (replacement or repair). Therapeutically relevant mitral valve annulus parameters (projected area, circumference, trigone-to-trigone (T-T) distance, anterior-posterior (AP) diameter and anterolateral-posteromedial (AL-PM) diameter) were measured. Results of the fully automated mitral valve analysis software package with and without manual adjustments were compared to the reference standard of a user-driven measurement program (3mensio, Pie Medical Imaging). Measurements were assessed for correlation between the fully automated software both with and without manual adjustment and the user driven program. A secondary analysis included the time to obtain all measurements.

RESULTS

Fully automated measurements showed a moderate to strong correlation (circumference, r=0.78; projected area, r=0.82; T-T distance, r=0.66; AP, r=0.69, and AL-PM diameter, r=0.66) compared to the user-driven analysis. There was a strong correlation between fully automated measurement with manual adjustments and user-driven analysis regarding circumference (r=0.91), projected area (r=0.93), T-T distance (r=0.71), AP (r=0.78) and AL-PM diameter (r=0.66). The time required for full mitral valve analysis was significantly lower using the fully automated software compared to the standard assessment (134.4±36.4 sec vs. 304.3±77.7 sec) (P<0.01).

CONCLUSION

The fully automated mitral valve analysis software, when combined with manual adjustments, demonstrated a strong correlation compared to the user-driven software, while maintaining superior time-efficiency for obtaining comprehensive procedure planning measurements.

CLINICAL RELEVANCE/APPLICATION

This novel fully automated mitral valve analysis software allows for a fast and accurate evaluation of mitral valve parameters for planning minimally invasive structural heart disease therapy.

SSQ03

Cardiac (Coronary Artery Disease: CT and MRI Techniques)

Thursday, Dec. 5 10:30AM - 12:00PM Room: E450B

CA CT MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Evan J. Zucker, MD, Stanford, CA (*Moderator*) Nothing to Disclose
Ming-Yen Ng, MBBS, Hong Kong, Hong Kong (*Moderator*) Nothing to Disclose

Sub-Events

SSQ03-01 Iterative Reconstruction in Coronary CT Angiography from Full Coverage Axial Data with Less than 180° of Rotation

Thursday, Dec. 5 10:30AM - 10:40AM Room: E450B

Participants
Wenjing Cao, Shanghai, China (*Abstract Co-Author*) Employee, Shanghai United Imaging Healthcare Co, Ltd
Chunfeng Qian, MD, Shanghai, China (*Abstract Co-Author*) Employee, Shanghai United Imaging Healthcare Co, Ltd
Xiaoming Wu, Shang Hai, China (*Abstract Co-Author*) Employee, Shanghai United Imaging Healthcare Co, Ltd
Yi Wang, Shanghai , China (*Abstract Co-Author*) Employee, Shanghai United Imaging Healthcare Co, Ltd
Stanislav Zabic, PhD, Mayfield Village, OH (*Presenter*) Employee, UIH America, Inc

PURPOSE

This abstract reports diagnostic image quality measurements of coronary CT angiography on a 16cm coverage system with high temporal resolution using model-based iterative reconstruction(MBIR).

METHOD AND MATERIALS

Even in the systems with 0.25s rotation time, it is not guaranteed that a quiet cardiac phase is possible to be captured within 240° of axial projections, which equals approximately 180° +2·γmax(γmax denotes the maximum fan angle) and is the amount of data that FBP requires before limited angle artifacts show up in the image. Using an analytic cardiac vessel phantom, mean square error and structural similarity metrics, we have determined that 135° degrees of axial rotation is a threshold for which MBIR still returns images without limited angle artifacts. Evaluated projection range was between 90° and 240°. Then, MBIR was applied to 48 scans from a clinical trial, using only 135° of data centered at the predetermined quiet cardiac phase. Data was acquired on a 320-row, 16cm CT scanner and MBIR images were compared to the standard protocol reconstruction that uses 240° of data. Average heart rate in the trial was 78.6±16.1 bpm and mean effective dose was 1.5±0.75mSv. Two experienced radiologists evaluated the image quality using a 4-point rating system focusing on motion artifacts. Scores above 3 were considered diagnostic, with 4 being the best.

RESULTS

MBIR cases were rated diagnostic 83.3% of the time, while standard protocol reconstruction was diagnostic only 58.3% of the time. Average rating for MBIR was 3.28 and 3.16 for the two observers and standard cases were rated 2.72 and 2.7 respectively. There was a significant difference in the scores between MBIR and standard cases by both radiologists ($p<0.001$).

CONCLUSION

MBIR improved the diagnostic image quality significantly by allowing stable reconstructions from a shorter scan, thereby increasing temporal resolution by at least 25%. Other improvements in image quality such as low noise and high resolution were also noted.

CLINICAL RELEVANCE/APPLICATION

Stable MBIR reconstruction with less than 180° of projection data can be used to reduce the motion artifacts in coronary CT angiography, improving the scan success rate of the single beat cardiac scans significantly and thereby reducing the need for repeated scanning.

SSQ03-03 Contrast Media Iodine Concentration in the Left Ventricle Affects the Level of Radiation-Induced DNA Damage during CCTA

Thursday, Dec. 5 10:50AM - 11:00AM Room: E450B

Participants
Toon van Cauteren, MSc, Brussels , Belgium (*Presenter*) Nothing to Disclose
Kaoru Tanaka, MD, PhD, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose
Dries Belsack, MD, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose
Gert van Gompel, PhD, Brussel , Belgium (*Abstract Co-Author*) Nothing to Disclose
Veerle Kersemans, Oxford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Kristin Jochmans, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose

Johan de Mey, MD,PhD, Brussels , Belgium (*Abstract Co-Author*) Nothing to Disclose
Nico Buls, DSc, PhD, Jette, Belgium (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

toon.van.cauteren@vub.be

PURPOSE

To investigate the relationship between iodine concentration in the left ventricle and radiation-induced DNA damage in blood lymphocytes during a coronary CT angiography (CCTA).

METHOD AND MATERIALS

This prospective patient study was approved by the institutional ethical committee and written informed consent was obtained. All scans were performed on a Revolution CT (GE Healthcare) using a one heartbeat scan and a patient-tailored contrast media injection protocol, administering Ultravist 370 mg I/mL (Bayer Healthcare) with a patient specific injection volume, depending on the sex, weight and height of the patient. Blood samples (5 mL) were collected, before and after the CCTA, and radiation-induced DNA double-strand breaks were assessed using γH2AX immunofluorescent staining of the blood lymphocytes. An average of 3000 lymphocytes was analyzed for each blood sample. The net amount of induced DNA damage was considered as the difference in the amount of γH2AX foci per cell before and after the CCTA scan, and was normalized to the CTDIvol (mGy). Iodine concentration in the left ventricle was determined by measuring the CT signal (HU) in a 477.5±208.9 mm² ROI and by applying a HU-iodine calibration curve obtained from phantom experiments. Correlation between the iodine concentration in the left ventricle and the CTDIvol normalized amount of DNA damage per cell was investigated using a Spearman's rank-order test.

RESULTS

We report results of the first 15 patients (median age 66 y, 9M/6F) included in the study. Patients were scanned with a median CTDIvol of 10.8 mGy (95% CI: 8.4-15.8 mGy). Due to differences in patient physiology, the left ventricle iodine concentrations ranged from 13,7 till 25,2 mg I/mL. The CCTA scans caused a net increase in DNA damage ranging from 0.00041 to 0.0074 foci/cell. We observed a significant exponential correlation (r=0.55 , p-value=0.035) between dose normalized DNA damage and left ventricle iodine concentration.

CONCLUSION

The amount of iodine contrast concentration in the left ventricle has an impact on the amount of radiation induced DNA double strand breaks.

CLINICAL RELEVANCE/APPLICATION

In CCTA, iodine contrast concentration has an impact on radiation safety. A reduction in iodine concentration reduces radiation induced DNA damage.

SSQ03-04 3D Multiparametric Image Fusion in Coronary Artery Disease

Thursday, Dec. 5 11:00AM - 11:10AM Room: E450B

Participants
Jochen Von Spiczak, MD, Zurich, Switzerland (*Presenter*) Nothing to Disclose
Manoj Mannil, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Hanna Model, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Chris Schwemmer, Erlangen, Germany (*Abstract Co-Author*) Employee, Siemens AG
Sebastian Kozerke, PhD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Robert Manka, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Hatem Alkadhi, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To allow for comprehensive non-invasive diagnostics of coronary artery disease (CAD) by 3D image fusion of CT coronary angiography (CT-CA), CT derived fractional flow reserve (CT-FFR), whole-heart dynamic 3D cardiac MR perfusion (CMR-Perf), and 3D cardiac MR late gadolinium enhancement (CMR-LGE).

METHOD AND MATERIALS

17 patients (54±10 years, one female) who underwent both cardiac CT and CMR imaging due to suspected or known CAD were included. A software facilitating 3D fusion of multimodal, multiparametric cardiac image data was developed. Post processing of CT data included: a) segmentation of the coronary tree and heart contours; b) calculation of CT-FFR values; c) color-coding of the coronary tree according to CT-FFR. Post processing of CMR data included: a) segmentation of the left ventricle (LV) in CMR-Perf and CMR-LGE; b) co-registration of CMR to CT data; c) mathematical projection of CMR-Perf and CMR-LGE values onto the high-resolution LV from CT. Algorithms adopted from the animation movie industry were applied yielding photorealistic rendering. Results from 3D image fusion were compared to separate 2D readouts of CT and CMR.

RESULTS

Image quality of CT-CA, CMR-Perf, and CMR-LGE was rated good to excellent (scores 2.6, 2.6, and 2.5 on four-point Likert scale, 3 = excellent). CT-CA revealed significant stenoses (i.e., >50%) in 7/17 cases (41%). CT-FFR was possible in 16/17 cases (94%) and showed pathologic flow in 7/17 cases (41%). CMR-Perf identified 8/17 patients (47%) with hypoperfusion; average ischemic burden was 17±5%. CMR-LGE showed myocardial scar in 3/17 cases (18%); average scar burden was 7±4%. Conventional 2D readout of all imaging modalities resulted in 9/17 cases (53%) with inconsistent findings. Multimodal 3D image fusion was feasible in all patients. Perfusion deficits and myocardial scar could be correlated to culprit coronary lesions where applicable. Most (7/9=78%) of the problems with separate 2D readout could be solved by 3D image fusion, with two cases remaining controversial or incomplete, respectively.

CONCLUSION

Multimodal, multiparametric 3D cardiac image fusion of CT and CMR image data is feasible and helps for comprehensive non-invasive CAD diagnostics.

CLINICAL RELEVANCE/APPLICATION

Comprehensive, non-invasive diagnostic workup of coronary artery disease involves a multitude of pathologic aspects, which are all combined within one 3D visualization approach for the first time.

SSQ03-05 A Randomized Controlled Clinical Trial of Prolonged Stent Deployment Strategy in Primary Percutaneous Coronary Intervention for ST-Segment Elevation Myocardial Infarction

Thursday, Dec. 5 11:10AM - 11:20AM Room: E450B

Participants
Min Ma, Chengdu, China (*Presenter*) Nothing to Disclose
Ling Wang, Mianyang, China (*Abstract Co-Author*) Nothing to Disclose
Yong He, Chengdu, China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

foundhope@foxmail.com

PURPOSE

The aim of this study was to evaluate whether prolonged inflation would decrease the no-reflow phenomenon in primary percutaneous coronary intervention(PPCI) compared with the conventional strategy.

METHOD AND MATERIALS

This was a prospective, single-center, blinded, randomized controlled trial.The primary outcomes were the number of patients with Thrombolysis in myocardial infarction (TIMI) flow grade 3, the incidence of intraoperative no-reflow/slow flow, the corrected TIMI frame count, the myocardial blush grade(MBG), and the number of patients with ST-segment resolution>50%. The procedural time and radiation exposure time were also assessed. A subset of patients was included in a cardiac magnetic resonance (CMR) examination approximately 3 to 5 days after the index procedure to assess extent of microvascular obstruction (MVO).

RESULTS

Sixty patients were randomized into a prolonged inflation strategy group(A group, n=30) and a rapid inflation/deflation strategy group (B group, n=30). TIMI flow grade 3 was found in 96.7% (29/30) of the A group and 63.3% (19/30) of the B group (p=0.005). The A and B group respectively showed the following parameters: 0% (0/30) VS 30% (9/30) no-reflow or slow flow (p=0.002); 90% (29/30) vs 66.7% (20/30) ST-segment resolution >=50% (p=0.028); 35.6±14.5 frames vs 49.18±25.2 frames on corrected TIMI frame count (p=0.014); and 60% (16/30) vs 20% (6/30) MBG 3 (p=0.001). The major cardiovascular adverse event rate was 3.3% (1/30) in both groups (p=1.0) at one month and 3.3% (1/30) for the A group vs 6.7% (2/30) for the B at one year (p=1.0). There were no statistically significant differences in the procedural time,the radiation exposure time and major bleeding events between the two groups. In the CMR substudy, the presence of MVO was detected in 6.7% (1/15) of patients in the A group and in 50% (5/10) of patients in the B group(p=0.023).

CONCLUSION

The effect of the prolonged inflation strategy could prevent the no-reflow phenomenon and reducing the incidence of MVOs and improve myocardial microcirculation perfusion. In addition, long term follow-up and large-sample, randomized controlled clinical trials with a long-term follow-up period are needed to confirm this preliminary result.

CLINICAL RELEVANCE/APPLICATION

The effect of the prolonged inflation strategy may be an effective way to reduce microvascular obstruction.CMR modality is an effective technique to prove this phenomenon.

SSQ03-06 Implementation of Transdermal versus Sublingual Nitroglycerin Administration to Optimize Coronary CT Angiography Scanner Utilization

Thursday, Dec. 5 11:20AM - 11:30AM Room: E450B

Participants
Jan-Erik Scholtz, MD, Frankfurt, Germany (*Presenter*) Nothing to Disclose
Vinit Baliyan, MBBS, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Sandeep S. Hedgire, MD, Lexington, MA (*Abstract Co-Author*) Nothing to Disclose
Nandini M. Meyersohn, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Frederick R. McNulty JR, RT, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Travis L. Redel, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Katherine Stockton, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Brian B. Ghoshhajra, MD, Boston, MA (*Abstract Co-Author*) Research Grant, Siemens AG

PURPOSE

Coronary CT angiography (CCTA) requires patient preparation including nitroglycerin (NTG) administration, which improves coronary artery assessment. We compared CCTA exam times when using sublingual vs. transdermal NTG administration.

METHOD AND MATERIALS

This retrospective, single center study included outpatients who underwent elective CCTA betweem 4/2016 and 3/2019 and received NTG. Until 5/2018, patients received sublingual NTG tablets (0.6 mg), administered by the supervising physician on the CT scanner table. After 6/2018, patients received transdermal NTG patches (0.8mg/h), placed at least 45 minutes prior to the exam outside the scanner room by a qualified nurse. CCTA time slots were 20 minutes. We compared number of exams exceeding allotted time slots and CCTA exam times subcategorized by room time (patient time inside the scanner suite), preparation time (time from registration to start of room time), and total appointment time (arrival in the radiology department to dismissal) between the two NTG delivery methods by Wilcoxon Rank Sum Test. Severity of coronary artery disease (CAD) burden was also recorded.

RESULTS

The study population included 3,180 patients of whom 2,341 (73.6%) received NTG by tablets and 839 (26.4%) by patches. Mean age was 59.8±13.1 years, 1,388 (43.6%) were females and average BMI was 29.0±6.0 kg/m2. Patient characteristics and CAD burden were not significantly different between NTG delivery methods (>50% luminal coronary stenosis: n=716 [22.5%], p=0.770). Room time was significantly shorter when using NTG patches compared to tablets (18 min [95% confidence interval (CI): 10-37 min], 27 [15-54] min, p<0.001). Preparation time was significantly longer in patients receiving NTG patches compared to tablets (88 [46-135] min, 58 [26-120] min, p<0.001). Total appointment time was significantly longer in patients receiving NTG patches compared to tablets (107 min [68-160] min, 87 [51-151] min, p<0.001). Only 36.6% (n=307) of the exams following patient preparation with NTG patches exceeded the 20-min exam time slot limit compared to 73.0% of exams (n=1,709) using NTG tablets.

CONCLUSION

A workflow using transdermal NTG patches reduce exam times inside the scanner suite and results in less exams exceeding the allotted exam time slot.

CLINICAL RELEVANCE/APPLICATION

Using transdermal NTG patches for patient preparation prior CCTA reduces times in the scanner room and allowed the use of 20-minutes time slots.

SSQ03-07 Automatic Coronary Artery Disease Reporting and Data System (CAD-RADSTM) in Cardiac CT Angiography Using Paired Convolutional Neural Networks

Thursday, Dec. 5 11:30AM - 11:40AM Room: E450B

Participants
Xiang Wang, Wuhan, China (*Presenter*) Nothing to Disclose
Zengfa Huang, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Jianwei Xiao, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Yuanliang Xie, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Yun Hu, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

wangxiang1971@163.com

PURPOSE

The coronary artery disease reporting and data system (CAD-RADSTM) was recently introduced for standard reporting and decision making. We aimed to assess the utility of an automatic post-processing and reporting system based on CAD-RADSTM in suspected coronary artery disease patients.

METHOD AND MATERIALS

A machine learning model was designed for CAD-RADS assessment categories with automatic coronary lumen segmentation algorithm based on convolutional neural networks. The model was trained in a derivation cohort encompassing 2000 patients who underwent coronary computed tomography angiography (CCTA). Patients with bypass grafts, stents were excluded from the training. Then compared to radiologists for classification of CAD-RADS with commercially-available automated segmentation and manual post-processing in a prospective validation cohort.

RESULTS

346 patients were included in the study among 360 patients with three poor CCTA images. Compared with radiologists, the positive predictive value, negative predictive value, sensitivity and specificity of AI for diagnosis of coronary heart disease were 80%, 70%, 80% and 70% respectively. There was no significant difference between the CNN-based CAD-RADS grading and radiologists based CAD-RADS grading in CCTA (P=0.87). The consistency test showed that the Kappa value of the two groups was 0.694 (P<0.05), the consistency was good.

CONCLUSION

The standardized report of CNN-based CAD-RADS in CCTA images can accurately evaluate suspected patients with CAD, and has good consistency with the radiologists.

CLINICAL RELEVANCE/APPLICATION

Report of CNN-based CAD-RADS has good consistency with the radiologists.

SSQ03-08 Use of Salient Features to Optimize a Machine Learning Classifier of Coronary Artery Disease Severity

Thursday, Dec. 5 11:40AM - 11:50AM Room: E450B

Participants
Alexander R. Podgorsak, MS, Buffalo, NY (*Presenter*) Nothing to Disclose
Kelsey N. Sommer, East Amherst, NY (*Abstract Co-Author*) Nothing to Disclose
Vijay Iyer, Buffalo, NY (*Abstract Co-Author*) Nothing to Disclose
Michael F. Wilson, Buffalo, NY (*Abstract Co-Author*) Nothing to Disclose
Umesh Sharmab, Buffalo, NY (*Abstract Co-Author*) Nothing to Disclose
Kanako K. Kumamaru, MD, PhD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Frank J. Rybicki III, MD, PhD, Sudbury, MA (*Abstract Co-Author*) Director, Imagia Cybernetics Inc
Dimitrios Mitsouras, PhD, Ottawa, MA (*Abstract Co-Author*) Research Grant, Canon Medical Systems Corporation;
Erin Angel, PhD, Tustin, CA (*Abstract Co-Author*) Employee, Canon Medical Systems Corporation
Ciprian N. Ionita, PhD, Buffalo, NY (*Abstract Co-Author*) Grant, Canon Medical Systems Corporation;

For information about this presentation, contact:

arpodgor@buffalo.edu

PURPOSE

Machine learning-based methods have been proposed as an alternative to the current gold standard of determining the hemodynamic significance of coronary artery lesions, invasive Fractional Flow Reserve (FFR) measurements. In this work, we look to optimize the performance of a machine learning classifier that used coronary CT angiography image data to determine coronary artery disease severity.

METHOD AND MATERIALS

50 coronary CT angiographies (CTAs) were collected (Aquilion ONE, Canon Medical Systems) at 70% of the R-R cardiac cycle. Straightened curved planar reformations (SCPRs) of different artery branches were generated (Vitrea, Vital Images) using a slice thickness of 5.0 mm considering four rotational views around the vessel centerline per CTA for a total dataset size of 200. The dataset was split into a training cohort numbering 125 and a testing cohort numbering 75. FFR values were measured to create a labeled dataset. A convolutional neural network was developed to classify input SCPRs by the severity of the coronary lesion. The network synthesized class activation maps (CAMs) such that the most salient features (lesion and aorta) in the SCPRs were visualized. SCPR image data were modified such that the aorta was removed, rendering the lesion as the only salient feature present, and the network was re-trained using the optimized data. Network performance on both original and optimized test data was assessed using area under the receiver operating characteristics curve (AUC), classification accuracy, and a Student's T-Test.

RESULTS

Mean AUC was 0.727 (95% confidence interval, 0.675-0.773) and 0.799 (0.761-0.837) using the original and optimized SCPR data respectively. Mean classification accuracy was 68.1% (63.8%-72.4%) and 79.1% (76.1%-82.1%) using the original and optimized SCPR data respectively. There was a statistically significant advantage to using the optimized SCPR data for classification of coronary disease severity in terms of both AUC ($p = 0.001$) and classification accuracy ($p = 0.0001$).

CONCLUSION

This work indicates the potential utility of CAMs for debugging and optimizing a machine learning algorithm to aid in clinical decision making.

CLINICAL RELEVANCE/APPLICATION

Machine learning provides a valuable alternative to invasive FFR measurements for the determination of coronary artery disease severity.

SSQ03-09 Comparison of Post-Surgical Wall Shear Stress Values in Arterial and Venous Coronary Grafts Using Computational Fluid Dynamics Guided by CCTA and 4D Flow MR Imaging

Thursday, Dec. 5 11:50AM - 12:00PM Room: E450B

Participants
Francesca Condemi, PhD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Piero Triverio, PhD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Laura Jimenez-Juan, MD, Toronto, ON (*Presenter*) Nothing to Disclose

PURPOSE

Graft failure is a major complication in coronary artery bypass graft (CABG) surgery, whose root causes are still unknown. In coronary arteries, growing evidence indicates that low and oscillatory values of wall shear stress (WSS) contribute to atherosclerosis plaque progression. The role of WSS in graft failure remains still unclear. In a pilot cohort of patients, we developed a computational fluid dynamics model to obtain WSS non-invasively from CCTA images, and compared WSS values in arterial and venous grafts. Differently from previous works, the study is prospective, with a uniform interval between CABG surgery and WSS analysis of one month. Furthermore, 4D flow MRI is used to incorporate patient-specific flow conditions into the computational model.

METHOD AND MATERIALS

Five participants were scanned using CCTA and 4D flow MRI 30±5 days after CABG surgery. Fluid dynamics simulations with appropriate coronaries and graft material properties were performed with Simvascular (Stanford University, Stanford, CA). WSS was spatially and temporally averaged (spatially-averaged TAWSS) for 5 arterial and 6 venous grafts. The oscillatory shear index (OSI) and the ratio between wall area exposed to adverse TAWSS (< 0.4 Pa) and total graft area were also analyzed.

RESULTS

No significant difference was found in spatially-averaged TAWSS between venous and arterial grafts (2.26±2.12 Pa in venous vs. 5.11±3.48 Pa in arterial grafts, $p=0.079$) and maximum OSI (0.27±0.20 in arterial and 0.25±0.20 in venous grafts, $p=0.456$). The relative area exposed to low TAWSS was significantly higher in venous grafts (22.4±20.0% in venous vs. 0.77±0.98% in arterial grafts, $p=0.022$).

CONCLUSION

One month after surgery, our study found larger areas of abnormal WSS in venous than in arterial grafts. This observation may be related to the higher failure rate of venous grafts.

CLINICAL RELEVANCE/APPLICATION

This work is a step forward towards understanding the root causes of graft failure in CABG patients, and identifying reliable biomarkers for the early prediction of graft failure.

SSQ04

Chest (Interventional/Systemic Vasculature)

Thursday, Dec. 5 10:30AM - 12:00PM Room: E451A

CH IR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Matthew D. Cham, MD, New York, NY (*Moderator*) Nothing to Disclose
Daniel Ocazionez-Trujillo, MD, Houston, TX (*Moderator*) Nothing to Disclose

Sub-Events

SSQ04-01 Imaging Findings Related to Lung Tract Sealant Use in Percutaneous CT-Guided Lung Biopsy

Thursday, Dec. 5 10:30AM - 10:40AM Room: E451A

Participants
Mohamed Soliman, New York City, NY (*Presenter*) Nothing to Disclose
Meghan Cahill, NYC, NY (*Abstract Co-Author*) Nothing to Disclose
Deirdre Sullivan, Long Beach, NY (*Abstract Co-Author*) Nothing to Disclose
Brian T. Sullivan, MD, Andover, MN (*Abstract Co-Author*) Nothing to Disclose
Bradley B. Pua, MD, Pelham, NY (*Abstract Co-Author*) Consultant, BTG International Ltd; Consultant, Medtronic plc; Grant, General Electric Company; Royalties, Oxford University Press

For information about this presentation, contact:

brp9018@med.cornell.edu

PURPOSE

The purpose of this study is to elucidate the short and long-term imaging findings associated with lung tract sealant use.

METHOD AND MATERIALS

Following IRB approval, patients were retrospectively identified who underwent percutaneous Computed Tomography (CT)-guided lung biopsy with a hydrogel-based lung tract sealant between January 2016 and January 2018 at a single institution. In order to elucidate imaging findings of lung tract sealant use, patients who underwent surgical resection within 3 months of the biopsy were excluded from review. CT or PET/CT images of patients who did not undergo resection with at least 3 month imaging follow-up were reviewed noting any parenchymal changes along the needle tract on CT images and any areas of FDG avidity along the needle tract.

RESULTS

A total of 1,010 consecutive CT-guided lung biopsies were performed between 01/01/2016 and 01/01/2018. A lung tract sealant was used in 324/1,010 (32%) of patients. Of the 324 patients, 154 underwent surgical resection following the biopsy and were excluded. 85 patients had no cross-sectional imaging follow-up >3 months post-biopsy and were excluded. 20 patients with pleural-based or subpleural nodules were excluded due to inability to visualize the lung tract sealant path. A total of 65/324 (20%) patients with benign (n=33) or malignant disease (n=32) were subsequently included in this analysis. 54/65 (83%) of patients had nodular-to-linear scarring along the path of lung tract sealant deployment during lung biopsy at the 3-6 months follow-up cross-sectional CT or PET/CT. These findings were found to persist to an average of 13.8 months (SD: 7.8 months, R: 30 - 4 months), even in the setting of primary nodule resolution. Follow-up PET/CT obtained more than 3 months (Mean: 13 months, SD: 5 months) post-biopsy was available in 25/65 (38%) patients with benign (n=9) and malignant (n=16) disease. Faint FDG-uptake located in the region corresponding to the scar associated with the tract sealant was found in 15/25 (60%) patients.

CONCLUSION

Lung tract sealants are used frequently due to their proven risk reduction of pneumothorax. However, they are associated with long-term imaging findings that have not been described before.

CLINICAL RELEVANCE/APPLICATION

The radiologist should be aware of to these changes to minimize the risk of misinterpreting the findings for residual or new disease. Larger studies are needed to establish the etiology of these findings.

SSQ04-02 Radiofrequency Ablation for Resectable Colorectal Lung Metastases: A Prospective Multicenter Phase 2 Study (MLCSG-0802)

Thursday, Dec. 5 10:40AM - 10:50AM Room: E451A

Participants
Takaaki Hasegawa, Nagoya, Japan (*Presenter*) Nothing to Disclose
Haruyuki Takaki, MD, Nishinomiya, Japan (*Abstract Co-Author*) Nothing to Disclose

Hiroshi Kodama, MD, Nishinomiya , Japan (*Abstract Co-Author*) Nothing to Disclose
Takashi Yamanaka, MD, Tsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Atsuhiro Nakatsuka, MD, Tsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Motoshi Takao, Tsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Yozo Sato, MD, PhD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Ichiro Fukai, Tsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Toshiya Tokui, Ise, Japan (*Abstract Co-Author*) Nothing to Disclose
Hideo Gobara, MD, Okayama, Japan (*Abstract Co-Author*) Personal fees, Novartis AG; Personal fees, Hitachi, Ltd
Yasutaka Baba, MD, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose
Yoshitaka Inaba, MD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Koichiro Yamakado, MD, PhD, Nishinomiya, Japan (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

t-hasegawa@aichi-cc.jp

PURPOSE

To prospectively evaluate the efficacy of radiofrequency ablation (RFA) for resectable colorectal cancer (CRC) lung metastases.

METHOD AND MATERIALS

This study included CRC patients with 5 or fewer lung metastases measuring 3cm or smaller to treat by lung RFA. All tumors were judged to be technically resectable by surgeons. The primary endpoint was 3-year overall survival rate with an expectance rate of 55%. The cancer-specific survival rate, local tumor progression rate, and safety were evaluated as secondary endpoints. The survival rates were generated by using the Kaplan-Meier method. Prognostic factors of overall survival were evaluated by univariate analysis of log-rank tests and multivariate analysis of Cox proportional regression models. Adverse events (AEs) were evaluated according to the Common Terminology Criteria for Adverse Events version 3.0.

RESULTS

Seventy patients (49 men, 21 women; mean age, 66.3 ± 10.0 years; age range, 37-82 years) were enrolled from 14 institutions. Eighty-eight sessions of lung RFA were performed for 100 lung tumors with a mean maximum diameter of 1.0 ± 0.5 cm (range, 0.4 - 2.8 cm). RFA was chosen because of refusal of surgery in 62 patients (89%) or relatively high risk of general anesthesia due to high age in 5 patients (7%) and comorbid disease in 3 patients (4%). The 3-year overall survival rate was 84% (95% confidence interval [CI], 76 - 93). Rectal cancer (p=0.001), positive carcinoembryonic antigen (p=0.002), and absence of previous chemotherapy (p=0.02) were found to be significant negative prognostic factors on univariate analysis. All these 3 factors retained its significance on multivariate analysis. The 3-year cancer specific survival rate was 90% (95% CI, 82 - 97). Local tumor progression was found in 6 patients (9%, 6/70) 6 - 19 months after initial RFA. One patient died of hemothorax (Grade 5 AE rate; 1% [1/88]) on the following day after RFA. There was no grade 3 or 4 AE. Grade 2 AE of pneumothorax occurred in 18 sessions (20%, 18/88).

CONCLUSION

Although lung RFA has a potential risk to induce life-threating complication, it can provide a favorable prognosis for patients with resectable CRC lung metastases.

CLINICAL RELEVANCE/APPLICATION

This study showed that lung radiofrequency ablation could offer favorable outcomes for patients with colorectal lung metastases measuring 3 cm or less even though they were surgically resectable.

SSQ04-03 Can Thoracic MR Imaging Improve Diagnostic Accuracies of Transthoracic Needle Aspiration and Core Biopsies and Decrease Complications in Patients with Mediastinal Tumor?

Thursday, Dec. 5 10:50AM - 11:00AM Room: E451A

Participants
Yoshiharu Ohno, MD,PhD, Toyoake, Japan (*Presenter*) Research Grant, Canon Medical Systems Corporation; Research Grant, DAIICHI SANKYO Group; ;
Shinichiro Seki, Kobe, Japan (*Abstract Co-Author*) Research Grant, Canon Medical Systems Corporation
Hisanobu Koyama, MD,PhD, Osaka, Japan (*Abstract Co-Author*) Nothing to Disclose
Daisuke Takenaka, MD, Akashi, Japan (*Abstract Co-Author*) Nothing to Disclose
Takeshi Yoshikawa, MD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Canon Medical Systems Corporation

For information about this presentation, contact:

yohno@fujita-hu.ac.jp

PURPOSE

To determine the utility of thoracic MR imaging for improving diagnostic accuracies and decreasing complications on transthoracic needle aspiration and core biopsies in patients with mediastinal tumor.

METHOD AND MATERIALS

210 gender, age, size and location matched mediastinal tumor patients (112 malignant and 98 benign tumors) underwent transthoracic needle aspiration biopsy (TNAB) and core biopsy (TNCB) with and without thoracic MR imaging including diffusion-weighted imaging (DWI) and unenhanced and contract-enhanced in- and opposed-phase T1-weighted gradient echo imaging (with MR imaging: n=105, without MR imaging: n=105) and pathological examinations. Then, diagnostic accuracy and complication rates such as bleeding and pneumothorax. To determine the utility of thoracic MR imaging for TNAB and TNCB, diagnostic accuracy and complication rates as bleeding and pneumothorax rates were compared between two methods by McNemar's test. Then, multivariate logistic regression analyses were performed to determine significant factors for improving diagnostic accuracy and decreasing each complication rate among radiological methods, needle gage of each biopsy method, number of puncture, needle path length, needle/ pleural angle, needle approach and lesion size.

RESULTS

Diagnostic accuracies of TNAB and TNCB by CE-CT and thoracic MR imaging (TNAB: 96.2 [101/105] %, TNCB: 98.0 [103/105] %) were significantly higher than that without MR imaging (TNAB: 81.9 [86/105] %, p<0.0001; TNCB: 87.6 [92/105] %, p<0.0001). There were no significant differences of bleeding rate and pneumothorax rate between two methods (p>0.05). On multivariate logistic regression analysis, thoracic MR imaging was the significant factor for improving diagnostic accuracy of TNAB (Odds ratio [OR]: 5.5, p=0.003) and TNCB (OR: 7.5, p=0.01). Moreover, aspiration biopsy needle gage (OR: 0.51, p=0.04), needle/ pleural angle (OR: 1.1, p=0.04) and lesion size (OR: 0.95, p=0.04) were significant factors for decreasing pneumothorax rate. However, there were no significant factors for decreasing bleeding rate (p>0.05).

CONCLUSION

Thoracic MR imaging has a potential to improve diagnostic accuracies of TNAB and TNCB and decrease pneumothorax rate in patients with mediastinal tumor.

CLINICAL RELEVANCE/APPLICATION

Thoracic MR imaging has a potential to improve diagnostic accuracies of TNAB and TNCB and decrease pneumothorax rate in patients with mediastinal tumor.

SSQ04-04 Lung Navigation Using Micro-Electro-Mechanical (MEM) Tracked Virtual Bronchoscopy

Thursday, Dec. 5 11:00AM - 11:10AM Room: E451A

Participants
Bradford J. Wood, MD, Bethesda, MD (*Presenter*) Researcher, Koninklijke Philips NV; Researcher, Celsion Corporation; Researcher, BTG International Ltd; Researcher, Siemens AG; Researcher, XAct Robotics; Researcher, NVIDIA Corporation; Intellectual property, Koninklijke Philips NV; Intellectual property, BTG International Ltd; Royalties, Invivo Corporation; Royalties, Koninklijke Philips NV; Equipment support, AngioDynamics, Inc; Researcher, Profound Medical Inc; Researcher, Canon Medical Systems Corporation; Researcher, AstraZeneca PLC; Researcher, Exact Imaging Inc
Sheng Xu, PhD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Quirina M. de Ruiter, MD, PhD, Bethesda , MD (*Abstract Co-Author*) Former Employee, Koninklijke Philips NV
Amel Amalou, Bethesda , MD (*Abstract Co-Author*) Nothing to Disclose
Ming Li, PhD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Joe Fontana, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Zion Tsz Ho Tse, Marietta, GA (*Abstract Co-Author*) 3T Technologies
William F. Pritchard JR, MD,PhD, Chevy Chase, MD (*Abstract Co-Author*) Research collaboration, Koninklijke Philips NV; Research collaboration, Biocompatibles International plc; Research collaboration, BTG International Ltd; Research collaboration, Siemens AG; Research collaboration, XACT Robotics; Research collaboration, W. L. Gore & Associates, Inc; Research collaboration, Celsion Corporation
John W. Karanian, PhD, Bethesda , MD (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

brad.wood@nih.gov

PURPOSE

Develop a fully integrated micro-electro-mechanical (MEM) tracking system for virtual bronchoscopy (VB) navigation that assists endobronchial diagnostic and therapeutic interventions.

METHOD AND MATERIALS

Preliminary work used a 3D printed airway phantom in which all five branches selected as targets were correctly reached under the guidance of VB navigation. A swine study was conducted under a protocol approved by the Institutional Animal Care and Use Committee. Chest CT images were processed using custom software and computer to provide 2D multi-planar reconstructions and a 3D endoluminal rendering, tumor segmentation, and navigation path planning and display for real-time image guidance. Navigation routes were planned for six different target bronchi as identified virtual targets. The inexpensive wireless gyroscope MEM unit was clipped to the operator handle of the bronchoscope to track the rotation of the scope. The software rotated the VB display in real time to match the view of the bronchoscope at each branch point, displaying the correct bronchus to intubate along the course. The translation of VB was manually adjusted along the planned path to match the insertion depth of the bronchoscope. The bronchoscope's own camera captured and separately displayed real bronchoscopy images of the airways.

RESULTS

All 6 peripheral targets were quickly and accurately reached without radiation, in under a minute, with the hardware and software integration. Accuracy of targeting were verified by cone beam CT for 3 targets. The bronchoscope was successfully tracked and navigated through branch points leading to 2, 3 or 4 daughter bronchi, using combined real and virtual feedback during all navigation tasks.

CONCLUSION

The system successfully displayed consistent real and corresponding virtual bronchoscope navigation and navigation paths throughout the procedures. The wireless navigation system facilitated rapid and accurate passage through complex branching to peripheral targets. Future development will automate VB translation by tracking insertion depth.

CLINICAL RELEVANCE/APPLICATION

This innovation may result in more effective and efficient endobronchial navigation with no need for disposable tracking devices inside the patient airway. The feasibility work provides the framework for definitive validation studies of an integrated VB system.

SSQ04-05 Automated Segmentation of the Thoracic Aorta in a Large Epidemiological Study

Thursday, Dec. 5 11:10AM - 11:20AM Room: E451A

Participants
Moritz T. Winkelmann, MD, Tuebingen, Germany (*Presenter*) Nothing to Disclose

Tobias Hepp, Tubingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Marc Fischer, MSc, Stuttgart, Germany (*Abstract Co-Author*) Nothing to Disclose
Konstantin Nikolaou, MD, Tuebingen, Germany (*Abstract Co-Author*) Advisory Panel, Siemens AG; Advisory Panel, Bayer AG; Speakers Bureau, Siemens AG; Speakers Bureau, Bayer AG
Sergios Gatidis, MD, Tubingen, Germany (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

moritz.winkelmann@med.uni-tuebingen.de

PURPOSE

The purpose of this study was to develop and evaluate a fully automated algorithm for segmentation and shape analysis of the thoracic aorta in non contrast-enhanced MR-angiography (NE-MRA) images from a large, multi-centric cohort, such as the German National Cohort (GNC).

METHOD AND MATERIALS

100 Patients of the GNC, underwent a NE-MRA of the thorax based on a 3D SPACE STIR sequence in coronal orientation on a 3T scanner. First, the entire thoracic aorta was manually segmented by two experienced radiologists using the Medical Imaging Interaction Toolkit (MITK) to generate a training dataset for 100 patients. The second part of the study was to design a suitable algorithm based on a deep neural segmentation network implemented with the TensorFlow framework, trained on 75 datasets. The segmentation results of the automated algorithm applied to 25 separate datasets were analyzed in order to evaluate the performance and accuracy of the alogrithm. Qualitative analysis was performed using a Likert scale to assess segmentation accuracy: 0=correct vessel detection; 1=non-significant errors of shape; 2=significant errors affecting morphology; 3=Insufficient vessel recognition. Accuracy and dice coefficients were computed as quantitative measures of the accuracy of automated segmentation results compared to manual segmentatiaon. Based on the automatically generated masks, a shape analysis of the vessel is performed to obtain a profile of the vessel-diameter for each patient.

RESULTS

The evaluation of the algorithm revealed a voxel-wise prediction accuracy of 99.8% for the correct label and mean dice coefficient of 92%[83.4%-99.9%]. The qualitative evaluation,based on the Likert scale described above, showed predominantly accurate segmentation results: [0]:9 patients, [1]:12 patients. Only in four patients significant segmentation errors [2] were detected.

CONCLUSION

A fully automated algorithm for segmentation and shape analysis of the thoracic aorta in NE-MRA images was developed with accurate results regarding quality of segmentation. This algorithm can be applied to large epidemiological imaging studies, such as the GNC for automated analysis of thousands of data sets.

CLINICAL RELEVANCE/APPLICATION

Aneurysms of the thoracic aorta are often only detected in acute stages with a poor prognosis. Therefore, it is important to explore possibilities of early detection and prognostic assessment of pathologic changes of the thoracic aorta.

SSQ04-06 Can Presurgical Three-Dimensional (3D) Fusion Image Predict the Valve Deformation at Transcatheter Aortic Valve Implantation (TAVI) for Aortic Stenosis Patients?

Thursday, Dec. 5 11:20AM - 11:30AM Room: E451A

Participants
Yohei Sugita, Okinawa , Japan (*Presenter*) Nothing to Disclose
Akira Yogi, Nakagami, Japan (*Abstract Co-Author*) Nothing to Disclose
Kousei Ishigami, MD, Nishihara-cho, Okinawa , Japan (*Abstract Co-Author*) Nothing to Disclose
Takaaki Nagano, Okinawa, Japan (*Abstract Co-Author*) Nothing to Disclose
Nobukazu Aoyama, Nakagami-gun , Japan (*Abstract Co-Author*) Nothing to Disclose
Hiyori Mekaru, Okinawa , Japan (*Abstract Co-Author*) Nothing to Disclose
Sadayuki Murayama, MD, PhD, Nishihara-cho , Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Transcatheter aortic valve implantation (TAVI) is a treatment of choice for symptomatic aortic stenosis (AS). Three-dimensional (3D) fusion image using scanned product valve (ex vivo valve) has been occasionally utilized for the planning before TAVI (Fig. 1 and 2a). However, it should be taken into account for deformity after the valve placement. We hypothesized that the in vivo valve image obtained from post-TAVI CT in a different AS patient (Fig. 2b) may be more suitable for fusion image. The purpose of this study is to evaluate whether or not the fusion images created from in vivo valve more closely simulate the actual post-TAVI than those from ex vivo valve.

METHOD AND MATERIALS

The study group consisted of 35 patients who had undergone TAVI using SAPIEN 3 (Edwards, California) valve device with an original diameter of 23 mm. The 3D fusion CT images were created using ex vivo (method A) and in vivo (method B) valves. The height and the diameter of ex vivo and in vivo valves on the pre-TAVI fusion images were measured. Each measurement was subtracted from that of placed valve on post-TAVI CT to evaluate the difference. The differences in the height and diameter between pre- and post- TAVI CT images were compared between methods A and B, using a paired t- test.

RESULTS

In method A, the differences in the height and the diameter of ex vivo valve ranged from 0.1 mm to 2.0 mm (mean ± standard deviation [SD]: 1.2 ± 0.5 mm) and from 1.7 mm to 5.5 mm (mean ± SD: 3.1 ± 0.9 mm), respectively. In method B, the differences in the height and the diameter of in vivo valve ranged from 0.0 mm to 1.3 mm (mean ± SD: 0.4 ± 0.3 mm) and from 0.0 mm to 2.2 mm (mean ± SD:0.7 ± 0.5 mm), respectively. The differences were significantly smaller in method B (p values < 0.001) (Fig. 3).

CONCLUSION

The 3D fusion CT images created from in vivo valve more closely simulate the actual post-TAVI than those from ex vivo valve.

CLINICAL RELEVANCE/APPLICATION

The 3D fusion CT image using in vivo valve may be more appropriate for the simulation before TAVI, which may lead to better treatment outcome after TAVI.

SSQ04-07 The New Indicators of TEVAR in Patients with Complicated Type B Aortic Dissection

Thursday, Dec. 5 11:30AM - 11:40AM Room: E451A

Participants
Shuo Zhao, Jinan, China (*Presenter*) Nothing to Disclose
Ximing Wang, MD, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Hui Gu, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Zhaoping Cheng, MD, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Yanhua Duan, MD, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Baojin Chen, MD, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Xinxin Yu, Jinan, China (*Abstract Co-Author*) Nothing to Disclose
Yang Lin, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the morphological predictors for prognosing complicated type B aortic dissection (cTBAD) in dynamic CT angiography (CTA), and to investigate the influence of timing after thoracic endovascular aortic repair (TEVAR).

METHOD AND MATERIALS

Seventy-nine patients with cTBAD who underwent TEVAR between July 2013 and March 2018 were retrospectively enrolled. Patients were classified into three groups by the timing of intervention from presentation of symptoms to TEVAR (hyperacute: <2 days; acute: 2-14 days; subacute: 14-90 days). Baseline, operative characteristics and morphological parameters were reviewed. Endpoints comprised early (< 30 days) and late (> 30 days) adverse events after the intervention. Logistic regression analysis was performed to identify independent predictors for early mortality. Receiver operating characteristic (ROC) analysis was used to determine the best cut-off value of each predictor for predicting early death. Cumulative survival and freedom from adverse events were estimated using the Kaplan-Meier method and log-rank test.

RESULTS

The highest mortality (13.9%, 11 of 79) and adverse event rates (24.1%, 19 of 79) were discovered within 30 days after the procedure in the total cohort. Patients received TEVAR in hyperacute phase had significantly worse survival and lower event-free rates compared with those in acute and subacute groups (all $p < 0.05$) (Fig. 1, 2). Relative true luminal area (rTLA, defined as the ratio of true lumen area to aorta area in cross section) less than 25% (rTLA < 25%) in one cardiac cycle ($p = 0.049$) as well as the differences between the maximum and the minimum rTLA (D-TLA, $p < 0.001$) were both associated with increased early death. In addition, D-TLA ($p = 0.006$) and performing TEVAR in hyperacute phase ($p = 0.006$) were both independent predictors for early mortality. The area under the curve (AUC) of D-TLA was 0.849 with the cut-off value of 21.5% (sensitivity: 72.7%; specificity: 86.8%) (Fig. 3A). Patients with D-TLA > 21.5% had worse survivals in the long-term follow-up in comparison to those with D-TLA <= 21.5% ($p < 0.001$) (Fig. 3B).

CONCLUSION

D-TLA obtained in dynamic CTA is associated with worse survival postoperatively. Performing TEVAR in hyperacute phase may result in worse outcomes.

CLINICAL RELEVANCE/APPLICATION

Dynamic CTA is useful to identify the risk of adverse events in patients with cTBAD after TEVAR intervention.

SSQ04-08 Incidental Detection of Aortic Aneurysms in Contrast and Non-Contrast CT Using Deep Learning

Thursday, Dec. 5 11:40AM - 11:50AM Room: E451A

Participants
Yiting Xie, Cambridge, MA (*Presenter*) Employee, IBM Corporation
Benedikt Graf, PhD, Cambridge, MA (*Abstract Co-Author*) Employee, IBM Corporation
Arkadiusz Sitek, PhD, Cambridge, MA (*Abstract Co-Author*) Employee, IBM Corporation

For information about this presentation, contact:

Yiting.Xie@ibm.com

PURPOSE

A large portion of aortic aneurysms (AAs) are undetected for years and can be missed by CT especially when done without contrast. A fully-automated method is developed and tested on a large population of patients to detect AAs in CT scans containing at least partial aorta, with intention to be used as an incidental detector of AAs in clinical environment.

METHOD AND MATERIALS

To achieve our objective, we used deep learning (DL) models and trained and evaluated it using close to 3300 CT volumes from both public and private datasets. Eight hundred CT scans were manually annotated. Multi-stage DL networks were trained to segment the aorta. Once segmented it was divided into thoracic and abdominal sections (if present) and the diameters were measured by the algorithm independently for each section. AA likelihood was determined by comparing the automatically obtained diameter to established clinical guidelines. A private multi-institutional dataset (not used in training) was utilized to validate algorithm performance. It had 2513 studies with 346 volumes with positive findings including 87, 76, 206 for ascending, descending, and abdominal aneurysms, respectively. The validation dataset consisted of thoracic CT (55.2%), abdominal/pelvis CT (19.3%), and their combinations (25.5%). It consisted of contrast (44.8%) and non-contrast (55.2%) scans, with a slice thickness ranging from 0.5 to 5mm. The scanner manufacturers included GE (51.8%), Siemens (25.4%), Toshiba (11.6%), Philips (10.7%), and others (<1%). The associated radiology reports (RRs) were analyzed to establish ground truth for AAs. The automatic probabilities were

compared to the aneurysm status from the RRs and the AUCs were computed.

RESULTS

The AUCs for thoracic and abdominal aneurysm detections were 0.95 and 0.94, respectively. The 95% confidence regions were [0.93, 0.97] for thoracic and [0.92, 0.95] for abdominal aneurysm detections.

CONCLUSION

A fully automated multi-stage DL based method was developed for AAs detection on contrast and non-contrast CT containing at least partial aorta. Solid robustness and good accuracy were obtained on a multi-institutional and multi-acquisition dataset of 2513 studies indicating the method can potentially be used to detect AAs in scans for which AAs are not expected (incidental setting) reducing chances of misses.

CLINICAL RELEVANCE/APPLICATION

Automatic aortic aneurysm (AA) detection from contrast and non-contrast CTs may reduce chance of missing AAs in clinics as well as for consistent measurements of longitudinal aorta diameter interval.

SSQ04-09 Deep Learning Algorithm for Surveillance of Pneumothorax after Percutaneous Transthoracic Lung Biopsy: Validation in Multi-Center, Consecutive Cohorts

Thursday, Dec. 5 11:50AM - 12:00PM Room: E451A

Participants
Eui Jin Hwang, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Jung Hee Hong, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyunghee Lee, MD, PhD, Seongnam, Korea, Republic Of (*Abstract Co-Author*) Research Grant, Ministry of Trade, Industry, and Energy; Research Grant, SNUBH Research Fund
Jung Im Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jin Mo Goo, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Research Grant, INFINITT Healthcare Co, Ltd; Research Grant, DONGKOOK Pharmaceutical Co, Ltd;
Sunggyun Park, Seoul, Korea, Republic Of (*Abstract Co-Author*) Employee, Lunit Inc
Chang Min Park, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Research funded, Lunit Inc

For information about this presentation, contact:

cmpark.morphius@gmail.com

PURPOSE

To evaluate the performance of a deep learning algorithm (DLA) for detection of pneumothorax (PTX) after percutaneous transthoracic needle biopsy (PTNB) on chest radiograph (CR), in consecutive cohorts from multiple institutions.

METHOD AND MATERIALS

We consecutively included 1757 patients (60.0% male; median age 66 years) who underwent PTNB in 3 different institutions (Institution A:B:C=1055:388:314). We utilized a commercially-available DLA for identification of CRs with PTX. For each CR, DLA provided a probability score for the presence of PTX, along with a localization heat map. Reference standards were defined by attending thoracic radiologists of each institution. The amounts of PTX were stratified based on guidelines from the British Thoracic Society and the American College of Chest Physicians (ACCP), and percentage amount. Performance of the DLA was evaluated with area under the receiver operating characteristic curve (AUROC), sensitivities and specificities at pre-defined operating cutoff. Performance of DLA was indirectly compared with that of radiologists, by retrospective evaluation of radiology reports by radiologists in each institution.

RESULTS

PTX occurred in 17.5% (308/1757; 10.5-21.9% across institutions) of cases, among which 16.6% (51/308; 12.1-17.3% across institutions) required catheter drainage. The DLA showed AUROC of 0.937 (0.931-0.947 across institutions) for identification of PTX. Sensitivity and specificity of the DLA was 70.5% (66.8-79.1% across institutions) and 97.7% (96.3-98.5% across institutions), respectively. Radiologists showed significantly lower sensitivity (55.5%, $P<.001$) and higher specificity (99.8%, $P<.001$) than the DLA, with median turnaround time of 70.7 hours. The DLA showed 94.1% sensitivity for PTX requiring catheter drainage, and 100% sensitivities for large PTX by both guidelines and PTX with percentage amount >=20%. Radiologists showed significantly lower sensitivities for large PTX by ACCP guideline (84.6%, $P=.046$) and PTX with percentage amount >=20% (87.3%, $P<.001$) than the DLA.

CONCLUSION

The DLA appropriately identified CRs with post-PTNB PTX in multi-center, consecutive cohort, with higher sensitivity than radiologists in the actual practice.

CLINICAL RELEVANCE/APPLICATION

The nice performance of DLA in cohort simulating the actual clinical situation suggests potential for utilization in the practice, to help sensitive detection and timely management of post-PTNB PTX.

SSQ05

Science Session with Keynote: Chest (Thoracic MRI)

Thursday, Dec. 5 10:30AM - 12:00PM Room: E350

CH MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Jurgen Biederer, MD, Seeheim-Jugenheim, Germany (*Moderator*) Nothing to Disclose
Andrew J. Plodkowski, MD, Brookside, NJ (*Moderator*) Nothing to Disclose

Sub-Events

SSQ05-01 Chest Keynote Speaker: MRI of the Thorax - Concepts and Challenges

Thursday, Dec. 5 10:30AM - 10:40AM Room: E350

Participants
Jurgen Biederer, MD, Seeheim-Jugenheim, Germany (*Presenter*) Nothing to Disclose

SSQ05-02 Distinguishing Cystic Fibrosis Severity Using Dynamic 19F Lung MR Imaging

Thursday, Dec. 5 10:40AM - 10:50AM Room: E350

Participants
Tyler Glass, BEng, Chapel Hill, NC (*Presenter*) Nothing to Disclose
Sang H. Chung, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Jennifer Goralski, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Scott Donaldson, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Agathe Ceppe, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Cecil Charles, PhD, Durham, NC (*Abstract Co-Author*) Research Grant, Merck & Co, Inc
Brian J. Soher, PhD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Yueh Z. Lee, MD,PhD, Chapel Hill, NC (*Abstract Co-Author*) License agreement, XinRay Systems Inc

For information about this presentation, contact:

tyler_glass@med.unc.edu

PURPOSE

To investigate dynamic 19F lung MRI gas dynamics to distinguish disease severity in Cystic Fibrosis (CF) patients

METHOD AND MATERIALS

Coronal images of 14 healthy controls and 18 subjects with CF were acquired using a multinuclear capable 3.0 T MRI scanner (PRISMA, Siemens) with a custom 8-channel 19F-tuned chest coil (ScanMed). Subjects inhaled 19F labelled perfluoropropane (PFP) gas mixed with 21% O2 (operating under investigational new drug IND 122,215) during the wash-in phase of the scan. Fifteen second 19F GRE vibe breath hold images were obtained following three breaths of PFP for five cycles of wash in. Gas was then switched to room air for wash-out phase and images were similarly acquired every 3 breaths until wash-out was complete. Semi-automated segmentation was used to identify ventilated voxels and custom software then implemented a previously described bi-exponential model fit with parameters including wash-in and wash-out time constants, peak signal, delay from origin, and delay to steady state. Upper and lower limits for wash-in and wash-out time constants were then defined to derive fractional lung volumes (FLV) comprising a percent of fitted time constants above upper limit ("slow") or below lower limit ("fast").

RESULTS

For fitted wash-out time constant, one-way ANOVA revealed differences between normal, mild, and moderate CF groups for "fast" FLV ($p<0.001$), "slow" FLV ($p=0.0012$), and standard deviation of all fitted wash-out time constant ($p<0.001$). For fitted wash-in time constant, one-way ANOVA revealed no differences for "fast" FLV ($p=0.51$), "slow" FLV ($p=0.34$), or standard deviation of all fitted wash-in time constants ($p=0.12$). Tukey's HSD revealed differences between mild and moderate CF using wash-out time constant for "fast" FLV ($p=0.011$) and standard deviation ($p=0.015$).

CONCLUSION

Dynamic 19F ventilation MRI is able to distinguish cystic fibrosis severity using parameters based on bi-exponential fit model. Wash-out time constant showed the most differentiating power corresponding to progressive air trapping physiology seen in cystic fibrosis.

CLINICAL RELEVANCE/APPLICATION

This novel imaging technique has advantages over xenon ventilation MRI including cheaper contrast material and inert compound allowing functional imaging with multiple image sets. We anticipate applications for many other lung diseases including pediatric lung malformations, lung resection, COPD monitoring, and bronchiectasis.

SSQ05-03 Automated Quantification of T2 High-Signal-Intensity Volume for Monitoring Lung Inflammation and Response to Treatment in Cystic Fibrosis

Thursday, Dec. 5 10:50AM - 11:00AM Room: E350

Participants
Gael Dournes, MD, PhD, Pessac, France (*Presenter*) Nothing to Disclose
Ilyes Benlala, Bordeaux , France (*Abstract Co-Author*) Nothing to Disclose
Julie Macey, Bordeaux , France (*Abstract Co-Author*) Nothing to Disclose
Stephanie Bui, Bordeaux, France (*Abstract Co-Author*) Nothing to Disclose
Francois H. Laurent, MD, Pessac, France (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

gael.dournes@chu-bordeaux.fr

PURPOSE

We aim at quantifying the relative high-signal-intensity volume (T2-HSV) using a T2 radial turbo spin echo sequence (T2-RTSE) with black blood contrast, in both healthy volunteers and CF. Secondary objectives were to correlate T2-HSV to pulmonary function test (PFT) in CF, to evaluate T2-HSV changes after treatment, and to evaluate the quantification provided by a composite volume-intensity product (T2-VIP) .

METHOD AND MATERIALS

Ten healthy volunteers and twelve CF patients were prospectively enrolled between January 2017 and November 2017. All participants underwent a lung MR protocol including T2-RTSE. CF participants also underwent PFTs the same day. Six CF were under respiratory exacerbation and repeated MRI after treatment. Automated quantification of T2-HSV and T2-VIP were done by two observers. Comparison of means was performed using Mann-Whitney test, correlations were done by using Pearson test, comparison of paired means using paired t-test and reproducibility evaluated using intraclass correlation coefficient.

RESULTS

In healthy volunteers and CF, T2-HSV was equal to 0% ± 0 and 5.9% ± 5.0, respectively and T2-VIP was equal to 0ms ± 0 and 464ms ± 340, respectively ($p<0.001$). In CF, correlations were found between T2-HSV or T2-VIP with forced expiratory volume in 1 second (r -0.81 and r -0.90, respectively; $p<0.001$). A significant decrease in both T2-HSV and T2-VIP was observed after treatment ($p=0.005$ and $p<0.001$, respectively). The reproducibility of MR metrics were very good.

CONCLUSION

Automated quantification of high-signal-intensity volume is feasible in vivo in CF using MRI. The reproducible method may be a promising MR tool to monitor inflammatory modifications and response to treatment, without radiation nor contrast-product exposure.

CLINICAL RELEVANCE/APPLICATION

Automated quantification of high-signal-intensity volume is feasible in vivo in CF using MRI. The reproducible method may be a promising MR tool to monitor inflammatory modifications and response to treatment, without radiation nor contrast-product exposure.

SSQ05-04 Opportunities for Functional Lung Imaging at Low-Field MRI

Thursday, Dec. 5 11:00AM - 11:10AM Room: E350

Participants
Ipshita Bhattacharya, Bethesda, MD (*Presenter*) Nothing to Disclose
Joel Moss, MD,PhD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Kenneth Olivier, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Ashkan A. Malayeri, MD, Andover, MA (*Abstract Co-Author*) Nothing to Disclose
Elizabeth C. Jones, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Robert S. Balaban, PhD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Adrienne Campbell, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

adrienne.campbell@nih.gov

PURPOSE

Lung imaging is notoriously difficult with MRI. We show that a high-performance low field MRI system may offer two advantages for lung imaging: 1. Improved field homogeneity resulting in prolonged T2* and improved imaging of the lung parenchyma and 2. Increased oxygen relaxivity for functional assessment of ventilation.

METHOD AND MATERIALS

Lung MRI was performed on a prototype 0.55T system (ramped down MAGNETOM Aera, Siemens Healthcare, Erlangen, Germany). This system is unique because it uses modern magnet design, fast gradient design, modern RF system, custom phased array coils and advanced imaging methods. Images were compared to a commercial 1.5T (MAGNETOM Aera, Siemens Healthcare, Erlangen, Germany). Anatomical lung imaging (T2w turbo spin echo) and 3D oxygen-enhanced ultrashort TE imaging was performed on healthy volunteers and patients with disease (eg. lymphangioleiomyomatosis (LAM) and bronchiectasis) with 100% oxygen (15L/min through, non-rebreather face mask). Room-air and oxygen images were registered and subtracted to estimate regional ventilation.

RESULTS

Images at 0.55T provided superior visualization of the lung parenchyma compared to 1.5T and useful insight into lung pathology, including the assessment of cysts and bronchial wall thickening. This can be attributed to the improved B0 homogeneity, minimized susceptibility gradients at air/tissue interfaces, and the longer T2* of lung tissue. The relaxivity of molecular oxygen was 4.7e-4

mmHg-1s-1 at 0.55T (vs 3.1e-4 mmHg-1s-1 at 1.5T). In healthy volunteers, lung signal increased by 18.2 ±6.3% (n = 5) with oxygen inhalation, compared with only 8.6±2.9% at 1.5T in the same subjects. Patients with LAM (n = 8) had only 6.5 ± 5.1% signal increase with oxygen inhalation and showed increased heterogeneity in the signal enhancement.

CONCLUSION

This system pairs modern system design with low magnetic field. By comparison, most low field systems are not designed to be high performance and, thus, compromise image quality. We demonstrate the potential of a state-of-the-art low field MRI to enable lung imaging. Moreover, we demonstrate the potential of oxygen as a contrast that performs better at lower field for the assessment of regional lung function.

CLINICAL RELEVANCE/APPLICATION

Low field MRI with modern magnet design may provide a unique opportunity for functional assessment of the lung by virtue of the improved field uniformity and improved oxygen contrast performance.

SSQ05-05 Ferumoxytol-Enhanced MR Venography of the Central Veins of the Thorax to Evaluate Stenoses and Occlusions in Patients with Renal Failure

Thursday, Dec. 5 11:10AM - 11:20AM Room: E350

Participants
Christopher J. Gallo, BS, Durham, NC (*Presenter*) Nothing to Disclose
Joseph G. Mammarappallil, MD,PhD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
David Y. Johnson, MD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Charles Y. Kim, MD, Raleigh, NC (*Abstract Co-Author*) Consultant, Medtronic plc; Consultant, Humacyte; Consultant, Galvani

For information about this presentation, contact:

christopher.gallo@duke.edu

PURPOSE

Hemodialysis patients have a high prevalence of central venous stenosis and frequently need imaging for access planning; however, these individuals cannot receive gadolinium due to concern for NSF. The purpose of this study was to assess the diagnostic performance of ferumoxytol-enhanced MR venography (MRV) for detection of stenoses and occlusions of the central veins of the thorax, with conventional venography as the reference standard.

METHOD AND MATERIALS

This retrospective study was approved by the IRB; a waiver of informed consent was obtained. Analysis was performed on 35 consecutive patients (mean age 48.6 years, 17 male, 18 female) who underwent ferumoxytol-enhanced MRV of the central veins and concurrent conventional venography. The central veins were divided into 7 segments for evaluation. Two radiologists interpreted MRVs in consensus for stenoses and occlusions. Confidence levels were scored on a scale of 1-4, with 4 being completely confident. Quantitative analysis consisted of measurement and calculation of the signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and intraluminal signal heterogeneity for all venous segments.

RESULTS

Of the 126 total venous segments with corresponding conventional venography, 80 were stenotic or occluded. The sensitivity and specificity for detection of stenosis or occlusion was 0.98 and 1.0, respectively, whereas the sensitivity and specificity for detecting occlusions alone was 0.98 and 0.99. Mean reader confidence was 3.5. The calculated mean intraluminal SNR, CNR, and heterogeneity was 219.7, 169.2, and 0.07, respectively. There were no adverse events related to contrast administration.

CONCLUSION

Ferumoxytol-enhanced MR venography demonstrated excellent sensitivity and specificity for detection of central venous stenoses and occlusions of the thorax. Given that ferumoxytol is an FDA-approved parenteral iron supplement for hemodialysis patients that does not carry a risk of NSF, this contrast agent is particularly well-suited for noninvasive vascular imaging in this population.

CLINICAL RELEVANCE/APPLICATION

Since gadolinium is contraindicated for hemodialysis patients, ferumoxytol-enhanced MRV is an excellent modality for evaluation of the central veins and avoids the risk of Gd-associated NSF.

SSQ05-06 Quantitative Assessment of Diaphragm Dysfunction Using MRI in COPD

Thursday, Dec. 5 11:20AM - 11:30AM Room: E350

Participants
Yifan Wang, PhD, Rotterdam, Netherlands (*Presenter*) Nothing to Disclose
Yong Chen, Yinchuan, China (*Abstract Co-Author*) Nothing to Disclose
Harm A. Tiddens, MD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Marleen De Bruijne, PhD, Rotterdam , Netherlands (*Abstract Co-Author*) Research Grant, AstraZeneca PLC
Pierluigi Ciet, MD, Rotterdam, Netherlands (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

y.wang@erasmusmc.nl

PURPOSE

It is believed that diaphragm dysfunction is related to the airflow limitation resulting in lung hyperinflation in patients with chronic obstructive pulmonary disease (COPD). We applied dynamic MRI to quantitatively evaluate diaphragm dysfunction in COPD.

METHOD AND MATERIALS

The study comprised 80 stable COPD patients with different disease severities (GOLD stages 1-4) and 21 healthy volunteers. Chest

The study comprised 30 stable COPD patients with different disease severities (GOLD stages 1-4) and 12 healthy volunteers. Chest MRI was performed in a 3T scanner with end-inspiratory/expiratory 3D-SPGR sequence and 2D dynamic diaphragmatic sequence. Images were automatically segmented. We measured the area under the diaphragm (ds), the height of the diaphragm (dh), cranial-caudal length (cc), anterior-posterior length (ap) and lung area (ls) at the start and end of inspiration. The anterior and posterior diaphragm angles and the paradoxical diaphragmatic movement ratio were analyzed. These parameters were investigated in correlation with pulmonary function test and emphysema index.

RESULTS

In the severe COPD patients with GOLD 3-4, we observed that insp-exp-ratio of ds and dh decreased significantly, and insp-exp-ratio of the ls, cc and ap reduced, which reflected the change of diaphragmatic position. The anterior and posterior diaphragm angles reduced in patients with GOLD3-4 at the start and end of inspiration, which reflected the change of the diaphragmatic shape.

CONCLUSION

Chest dynamic MRI can provide new imaging biomarkers to assess diaphragm dysfunction in COPD without specialized equipment.

CLINICAL RELEVANCE/APPLICATION

Figure 1: Sagittal dynamic cine-MRI image of the right hemidiaphragm at the end of inspiration (left) and expiration (right), showing the shape of diaphragm in COPD patient get flat and the excursion diaphragm in COPD patient reduced.

SSQ05-07 Non-Invasive MR-Based Characterization of Pleural Effusions and Ascites in Patients with Suspected Lymphatic Leakage Using a 6-Point mDIXON Fat Quantification Method

Thursday, Dec. 5 11:30AM - 11:40AM Room: E350

Participants
Daniel Kuetting, MD, Bonn, Germany (*Presenter*) Nothing to Disclose
Anton Faron, MD, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose
Julian A. Luetkens, MD, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose
Daniel K. Thomas, MD, PhD, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose
Claus C. Pieper, MD, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess whether MR-based 6-point mDixon fat quantification (mDIXONquant) allows for non-invasive differentiation of chylous (i.e. rich in triglycerides [TG]; e.g. chylothorax) and non-chylous effusions.

METHOD AND MATERIALS

In-vitro, ex-vivo and in-vivo MR-examinations were performed using the commercially available mDIXONquant on a clinical 1.5T MR-scanner. Proton density fat fraction (PDFF) was measured by a ROI-based approach on parameter maps. For in-vitro experiments eight fatty fluid solutions with known TG content (145 to 19000 mg/dl) were examined. For ex-vivo evaluation 14 chylous and 6 non-chylous clinical fluid samples were examined. In-vivo testing was performed in 29 patients with chylous (n=16) and non-chylous (n=13) effusions. All clinical samples underwent laboratory testing for TG, total protein, leucocytes, sodium, potassium, calcium and chloride levels. Laboratory values were correlated with PDFF and receiver operating characteristic analysis was used to determine the optimal PDFF threshold to differentiate chylous and non-chylous fluids.

RESULTS

In-vitro analysis showed that PDFF-values highly correlated with TG-content (r=0.998). Ex-vivo analysis revealed significant differences between PDFF for chylous (2.5% ±1.2) and non-chylous fluids (0.8% ±0.2)(p=0.0013). Ex-vivo PDFF highly correlated with TG-content (p<0.0001; r=0.88). In-vivo PDFF also significantly differed between chylous (6.2% ±4.3) and non-chylous fluids (0.6% ±0.6)(p<0.0001). In-vivo PDFF correlated strongly with TG-content (p<0.0001; r=0.96), and moderately with protein levels (p =0.0054; r=-0.66). Using PDFF cut-off values of either > 1.2% or > 1.8% yielded a sensitivity of 86% or 79% and specificity of 91% or 100%, respectively, for in-vivo differentiation of chylous and non-chylous effusions.

CONCLUSION

Non-invasive differentiation of chylous and non-chylous effusions is feasible using a commercially available MR-based fat quantification method. This can be helpful for pre-interventional work-up of complex cases (e.g combined pleural/pericardial effusions and ascites) in which diagnostic paracentesis may lead to an increased risk of complications

CLINICAL RELEVANCE/APPLICATION

This noninvasive MR technique can be seen as an alternative and reliable diagnostic approach allowing for the differentiation between chylous and non-chylous effusions in cases where paracentesis is not possible.

SSQ05-08 Imaging and Quantitative Evaluation of Pulmonary Blood Flow Using Pseudo-Continuous Arterial Spin Labeling (PCASL) with True-FISP Imaging at 1.5 Tesla: Free-Breathing and Timed Breath-Hold Examinations

Thursday, Dec. 5 11:40AM - 11:50AM Room: E350

Participants
Ferdinand F. Seith, MD, Tubingen, Germany (*Presenter*) Nothing to Disclose
Rolf Pohmann, Tubingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Thomas Kuestner, DIPLENG, Stuttgart, Germany (*Abstract Co-Author*) Nothing to Disclose
Klaus Scheffler, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Martin Schwartz, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Marius Horger, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Konstantin Nikolaou, MD, Tuebingen, Germany (*Abstract Co-Author*) Advisory Panel, Siemens AG; Advisory Panel, Bayer AG; Speakers Bureau, Siemens AG; Speakers Bureau, Bayer AG
Fritz Schick, MD, PhD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Petros Martirosian, PhD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate PCASL imaging with True-FISP data acquisition to assess lung perfusion at 1.5 Tesla and to evaluate a free-breathing examination scheme.

METHOD AND MATERIALS

Ten volunteers (31±7 y/o, 2f) were examined in a 1.5 Tesla MRI with ECG-triggered PCASL True-FISP imaging of the lung under free-breathing (FB) and timed breath-hold (TBH) by labeling the pulmonary trunk during systole. Four coronal slices were acquired with a post labeling delay of 1000 ms and non-rigidly registered in several steps by a cubic B-spline-based multi-resolution non-rigid registration with mutual information as similarity metric and Quasi-Newton optimization algorithm. To assess the quality of image registration, the mean structural similarity index (MSSIM) and the normalized mean squared error (NMSE) were calculated using TBH data as reference. MSSIM and NMSE were compared using a paired sample t-test. A p-value <0.05 was considered significant. To quantify lung perfusion, parenchyma was segmented using Gaussian mixture model clustering and compared with Bland-Altman plots. In two patients with pulmonary embolism, FB examinations were performed.

RESULTS

High perfusion signal could be assessed in all volunteers and patients. Image registration lead to high image quality even under free breathing. Mean average over cardiac cycle pulmonary perfusion values acquired under FB (slice 1-4, ml/min/ml: 1.34±0.39, 0.98±0.36, 0.97±0.38, 0.94±0.43) were in good accordance to those from TBH (slice 1-4, ml/min/ml: 1.30±0.40, 0.97±0.35, 0.95±0.37, 0.87±.38). In patients, perfusion deficits were in accordance with embolism visible in CT.

CONCLUSION

ECG-triggered PCASL True-FISP imaging of the lung at 1.5 Tesla can provide perfusion images of high image quality by labeling the pulmonary trunk. Using non-rigid image registration, reliable quantitative perfusion maps and good image quality can be assessed, even when acquired under free breathing.

CLINICAL RELEVANCE/APPLICATION

PCASL imaging with True-FISP data acquisition enables perfusion images of the lung of high image quality even under free breathing without contrast agent which can be of clinical singificance for different types of lung diseases.

SSQ05-09 Pulmonary Thin-Section MR Imaging with Ultra-Short Echo Time (UTE) versus Low-Dose CT versus Standard-Dose CT: Capability for Nodule Detection and Lung-RADS Classification

Thursday, Dec. 5 11:50AM - 12:00PM Room: E350

Participants
Yoshiharu Ohno, MD,PhD, Toyoake, Japan (*Presenter*) Research Grant, Canon Medical Systems Corporation; Research Grant, DAIICHI SANKYO Group; ;
Masao Yui, Otawara, Japan (*Abstract Co-Author*) Employee, Canon Medical Systems Corporation
Yuji Kishida, MD,PhD, Kobe, Japan (*Abstract Co-Author*) Nothing to Disclose
Shinichiro Seki, Kobe, Japan (*Abstract Co-Author*) Research Grant, Canon Medical Systems Corporation
Daisuke Takenaka, MD, Akashi, Japan (*Abstract Co-Author*) Nothing to Disclose
Takeshi Yoshikawa, MD, Kobe, Japan (*Abstract Co-Author*) Research Grant, Canon Medical Systems Corporation

For information about this presentation, contact:

yohno@fujita-hu.ac.jp

PURPOSE

To compare the capability of pulmonary MR imaging with ultra-short echo time (UTE-MRI) for lung nodule detection and Lung-RADS classification with thin-section low- and standard-dose CTs.

METHOD AND MATERIALS

110 consecutive patients (64 males and 46 females: mean age, 65 years) with suspected pulmonary nodules at near-by hospital were examined with standard- and low-dose CTs (270 mA [SDCT] and 60 mA [LDCT]) and UTE-MRI. According to SDCT findings, all nodules were divided into solid, part-solid and ground glass nodules. In each patient, probability of presence at each pulmonary nodule was assessed on all three methods by means of 5-point visual scoring system by two board certified chest radiologists. In addition, all nodules were classified based on Lung-RADS on each method by same radiologists. To compare nodule detection capability, Jackknife alternative free-response receiver operating characteristic (JAFROC) analysis were performed among all methods. In addition, we assessed the differences among the three methods in terms of figure of merit (FOM) values, sensitivity and false-positive rate by means of one-way ANOVA. To evaluate Lung-RADS classification capability, inter-observer agreement of each method was evaluated by kappa statistics with $\chi 2$ test. In addition, inter-method agreements were also assessed by kappa statistics with $\chi 2$ test were performed.

RESULTS

FOMs of all methods (UTE-MRI: FOM=0.89, LDCT: FOM=0.86, SDCT: FOM=0.89) had no significant difference ($p>0.05$). Sensitivity (SE) and false-positive rate per case (FP) of UTE-MRI (SE: 92.5[508/549] %, FP: 0.62/case) had no significant difference with those of LDCT (SE: 93.2 [512/549] %, $p>0.05$; FP: 0.68/case, $p>0.05$) and SDCT (SE: 93.4 [513/549] %, $p>0.05$; FP: 0.55/case, $p>0.05$). Inter-observer agreement of each method for Lung-RADS classification was shown as almost perfect (UTE-MRI: $\kappa=0.92$, $p<0.0001$; LDCT: $\kappa=0.93$, $p<0.0001$; SDCT: $\kappa=0.95$, $p<0.0001$). Inter-method agreements for Lung-RADS classification were also assessed as almost perfect (UTE-MRI vs. LDCT: $\kappa=0.87$, $p<0.0001$; UTE-MRI vs. SDCT: $\kappa=0.89$, $p<0.0001$; LDCT vs. SDCT: $\kappa=0.95$, $p<0.0001$).

CONCLUSION

Pulmonary MR imaging with UTE is considered at least as valuable as low- and standard-dose CTs for lung nodule detection and Lung-RADS classification.

CLINICAL RELEVANCE/APPLICATION

MR imaging with UTE is considered at least as valuable as low- and standard-dose CTs for lung nodule detection and Lung-RADS classification.

Printed on: 10/29/20

SSQ06

Gastrointestinal (Oncology)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S103AB

GI OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Andrew D. Smith, MD, PhD, Birmingham, AL (*Moderator*) CEO, AI Metrics LLC ; Owner, AI Metrics LLC ; CEO, Radiostics LLC; Owner, Radiostics LLC; CEO, Liver Nodularity LLC ; Owner, Liver Nodularity LLC ; Research Grant, General Electric Company; Speaker, Canon Medical Systems Corporation; Speaker, AlgoMedica, Inc
Carolyn L. Wang, MD, Seattle, WA (*Moderator*) Research Grant, General Electric Company
Erik K. Paulson, MD, Durham, NC (*Moderator*) Nothing to Disclose

Sub-Events

SSQ06-01 CT Resectability According to NCCN Criteria After Neoadjuvant FOLFIRINOX Chemotherapy for Borderline and Unresectable Pancreatic Ductal Adenocarcinoma

Thursday, Dec. 5 10:30AM - 10:40AM Room: S103AB

Participants
Jae Ho Byun, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jong Keon Jang, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Jihun Kang, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jung Hee Son, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jin Hee Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Seung Soo Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyoung Jung Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Moon-Gyu Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess CT resectability according to NCCN criteria and associated CT findings for predicting R0 resection after neoadjuvant FOLFIRINOX chemotherapy in patients with pancreatic ductal adenocarcinoma (PDAC)

METHOD AND MATERIALS

Among 204 consecutive patients with PDAC who underwent neoadjuvant FOLFIRINOX therapy from 2013 to 2017, eligible patients fulfilled the following criteria were identified: 1) patients underwent both pre- and post-chemotherapy multiphase CT, 2) available pathologic result of resection margin, and 3) borderline or unresectable PDAC assessed on pre-chemotherapy CT according to NCCN criteria. We finally analyzed 64 patients (36 men; mean age, 58.8 years). For CT resectability after chemotherapy, two abdominal radiologists independently evaluated following CT findings: a) contact angle of artery or vein, b) involved depth of artery or vein, 3) degree of perivascular tumor enhancement of artery or vein in portal venous phase, and 4) tumor size and enhancement. Change in CT resectability before and after therapy was classified as regression, stable or progression. Inter-reader agreement was evaluated using intraclass correlation coefficient (ICC). Uni- and multi-variate logistic analyses were used to identify R0 resection-associated CT findings.

RESULTS

ICC for CT findings ranged from 0.64 to 0.94. R0 resection was achieved in 67% (6/9), 72% (23/32) and 68% (15/22) patients with resectable, borderline and unresectable PDAC, respectively. Sensitivity and specificity of CT resectability (resectable & borderline vs. unresectable) for R0 resection were 66% and 37%, respectively. R0 resection was made in 58% (11/19), 74% (24/31) and 69% (9/13) patients with regression, stable and progression, respectively. Sensitivity and specificity of change in CT resectability (regression & stable vs. progression) for R0 resection were 80% and 21%, respectively. On univariate analysis, low perivascular tumor enhancement of artery or vein was significant. Low perivascular enhancement of vein (<=42.5 HU; odds ratio, 6.50; P<.02) was independently associated with R0 resection on multivariate analysis.

CONCLUSION

CT resectability according to NCCN criteria after neoadjuvant chemotherapy was sensitive but not specific for assessing R0 resection. The degree of perivascular tumor enhancement may have added values to predict R0 resection.

CLINICAL RELEVANCE/APPLICATION

Efficacy of CT resectability after neoadjuvant FOLFIRINOX chemotherapy

SSQ06-02 MDCT-Based Radiomic Signature as A Predictor of Disease-Free Survival: Bringing Promotion to Preoperative Clinical Model of Gastric Cancer

Thursday, Dec. 5 10:40AM - 10:50AM Room: S103AB

Participants
Siwen Wang, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Caizhen Feng, MBChB, Beijing, China (*Presenter*) Nothing to Disclose
Di Dong, PhD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Haidong Xiang, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Xiaoxuan Jia, MA, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Yingjiang Ye, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Nan Hong, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Yi Wang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Jie Tian, PhD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

fengcaizhen2016@163.com

PURPOSE

To establish a contrast-enhanced multiple-row detector computed tomography (MDCT)-based radiomic signature for disease-free survival (DFS) prediction in gastric cancer and validate its incremental value to the preoperative clinical risk model.

METHOD AND MATERIALS

A total of 249 gastric cancer patients in this retrospective study were randomly divided into a training cohort (n=166) and a validation cohort (n=83) at a ratio of 2:1. Two-dimensional radiomic feature extraction was conducted based on tumor volumes of interest from portal venous phase MDCT images. The least absolute shrinkage and selection operator penalized Cox proportional hazards regression was used to select radiomic features and establish a radiomic signature. A radiomic nomogram in combination with the radiomic signature and significant clinical factors was developed by multivariate Cox regression. Model 1 (radiomic signature), model 2 (clinical model), and model 3 (radiomic nomogram) were evaluated in terms of discrimination, calibration, and clinical usefulness.

RESULTS

A four-feature radiomic signature showed good stratification ability in gastric cancer patients with high-risk and low-risk of DFS in both cohorts (training cohort: hazard ratio [HR] = 2.718, $P < 0.001$; validation cohort: HR = 1.825, $P < 0.05$). Univariate radiomic feature indicated good predictive performance with Harrell's concordance indices (shape feature, 0.664; first-order feature, 0.625; two texture features, 0.543 and 0.487). The radiomic nomogram (model 3) combining the radiomic signature and two significant clinical factors (AFP and EMVI defined on MDCT) demonstrated the best performance over model 1 and model 2 with a concordance index of 0.721 (95% confidence interval [CI], 0.648-0.793) as well as good fitness by calibration curves and great clinical usefulness by decision curves.

CONCLUSION

MDCT-based radiomic signature was established and validated as a preoperative predictor of DFS in gastric cancer patients, offering assistance to prognostic prediction and treatment decisions.

CLINICAL RELEVANCE/APPLICATION

For individualized treatment decision, prognosis of gastric cancer can be analyzed by radiomic approach based on high-throughput mining of quantitative image features from preoperative medical imaging.

SSQ06-03 Development of Prognostic Prediction Model of TACE for Hepatocellular Carcinoma Based on Radiomics Analysis of Preoperative DCE-MRI

Thursday, Dec. 5 10:50AM - 11:00AM Room: S103AB

Participants
Jianfei Tu, MD, Lishui, China (*Presenter*) Nothing to Disclose
Wei Weng, Lishui, China (*Abstract Co-Author*) Nothing to Disclose
Jingjing Song Jr, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Fazong Wu, Lishui, China (*Abstract Co-Author*) Nothing to Disclose
Xulu Wu, Lishui, China (*Abstract Co-Author*) Nothing to Disclose
Qiaoyou Weng, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Zhongwei Zhao, Lishui, China (*Abstract Co-Author*) Nothing to Disclose
Minjiang Chen, Lishui, China (*Abstract Co-Author*) Nothing to Disclose
Jiansong Ji, MD, Lishui , China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

tjf562878@gmail.com

PURPOSE

Transcatheter arterial chemoembolization (TACE) is the first-line treatment for hepatocellular carcinoma (HCC), but its efficacy often has individualized differences. The purpose of this study was to develop a precise prognostic model for TACE treatment of hepatocellular carcinoma based on dynamic contrast;enhanced magnetic resonance imaging (DCE-MRI).

METHOD AND MATERIALS

Retrospective collection of 107 pathologically confirmed liver cancer patients who underwent TACE in our hospital from January 2013 to June 2018 in present study. All patients underwent DCE-MRI before treatment and followed up for 3 months after TACE, who were further divided into effective group (n=70) and ineffective group (n=37) according to the reaction of the tumor based on

mRECIST criteria. The enrolled patients in the above two groups were randomly divided into a training set (n=74) and a validation set (n=33). Analysis Kit software was used to delineate the volume of interest (VOI) of lesions based on the contrast-enhanced T1-weighted images and extract a total of 396 quantitative texture parameters, which were further dimension reduction by Kruskal-Wallis (K- W) one-way ANOVA test, univariate logistic regression and LASSO algorithm, and selected the most useful features. The selected imaging features were then combined into a Rad score, which was further assessed by ROC curve analysis in the training and validation sets.

RESULTS

Six radiomic feature were finally selected to form the Rad score. The AUC for differentiating between effective group and ineffective group in the training set was 0.868 (95% CI: 0.802, 0.901), and the sensitivity and specificity were 73.5% and 88.2%, respectively. In the validation group, the AUC was 0.853 (95% CI: 0.782, 0.891), and the sensitivity and specificity were 81% and 82.6%, respectively.

CONCLUSION

A reliable TACE prognostic prediction model was developed based on the radiomics analysis of contrast-enhanced T1-weighted images, which is of great value for prognosis management of HCC patients undergoing TACE.

CLINICAL RELEVANCE/APPLICATION

A good and stable TACE short-term prognostic prediction model was constructed by using DCE-MRI based texture analysis, which is of great value for the management of HCC patients undergoing TACE.

SSQ06-04 Prognostic Value of Extracellular Volume Fraction Determined by Equilibrium Contrast-Enhanced CT in Patients with Pancreatic Adenocarcinoma Who are Scheduled for Chemoradiotherapy

Thursday, Dec. 5 11:00AM - 11:10AM Room: S103AB

Participants
Yutaka Toyomasu, MD, Tsu, Japan (*Presenter*) Nothing to Disclose
Yasutaka Ichikawa, MD, Tsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Motonori Nagata, MD, PhD, Tsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomoko Kawamura, Mie, Japan (*Abstract Co-Author*) Nothing to Disclose
Akinori Takada, MD, Koriyama, Japan (*Abstract Co-Author*) Nothing to Disclose
Naoki Nagasawa, RT, PhD, Tsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Kakuya Kitagawa, MD, PhD, Tsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Yoshihito Nomoto, Tsu, Japan (*Abstract Co-Author*) Nothing to Disclose
Hajime Sakuma, MD, Tsu, Japan (*Abstract Co-Author*) Research Grant, EIZAI; Research Grant, DAIICHI SANKYO Group; Research Grant, FUJIFILM Holdings Corporation; Research Grant, Guerbet SA; Research Grant, Nihon Medi-Physics Co, Ltd;

PURPOSE

Several recent studies indicated that extracellular volume fraction (ECV) of the malignant tumors may be useful in evaluating tumor aggressiveness and response to therapy. The purpose of this study was to determine the prognostic value of ECV quantified by equilibrium contrast-enhanced CT obtained prior to chemoradiotherapy (CRT) in patients with pancreatic adenocarcinoma.

METHOD AND MATERIALS

Thirty-five patients with histologically-proven pancreatic adenocarcinoma who had no distant metastasis and underwent dynamic CT before treatment were retrospectively studied. Absolute enhancement in Hounsfield unit was determined for the tumor (Etumor) and aorta (Eblood) by placing regions-of-interest on pre-contrast and equilibrium-phase CT images. The tumor ECV was calculated as the following equation: ECV(%) = Etumor x (100 - hematocrit(%)) / Eblood. Univariate and multivariate analyses were performed to evaluate the value of the tumor ECV as well as age, sex, primary tumor site, tumor diameter, surgical indication, and CA19-9 for the prediction of progression-free survival (PFS) and overall survival (OS).

RESULTS

The median and interquartile range of ECV in pancreatic adenocarcinoma was 35.8% and 25.0 - 43.6% in all patients. During the median observation period of 23 months, 29 (83%) of 35 patients experienced disease recurrence (n=25) or death (n=19). Kaplan-Meier curves for PFS and OS according to the ECV are shown in Figure 1. In univariate analysis, the tumor ECV of > median (35.8%) was significantly associated with better prognosis for both PFS (p=0.017) and OS (p=0.003). Multivariate analysis revealed that tumor ECV was an independent prognostic factor for PFS (Hazard ratio [95% CI], 0.383 [0.165-0.889]; p=0.025) and OS (Hazard ratio [95% CI], 0.213 [0.069-0.660]; p=0.003).

CONCLUSION

Higher tumor ECV determined by pre-contrast and equilibrium-phase CT prior to CRT is significantly associated with better outcome in patients with pancreatic adenocarcinoma. The tumor ECV can be quantified by routine dynamic CT and has excellent prognostic value in patients with pancreatic adenocarcinoma.

CLINICAL RELEVANCE/APPLICATION

Tumor ECV quantified by equilibrium contrast-enhanced CT is a novel imaging biomarker that permits prediction of the prognosis in patients who are scheduled for CRT.

SSQ06-05 Baseline Clinical and Imaging Predictors of Treatment Response and Overall Survival of Patients with Metastatic Melanoma Undergoing Immunotherapy

Thursday, Dec. 5 11:10AM - 11:20AM Room: S103AB

Participants
Ahmed Othman, MD, Tubingen, Germany (*Presenter*) Nothing to Disclose
Amadeus Schraag, Tubingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Saif Afat, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Sergios Gatidis, MD, Tubingen, Germany (*Abstract Co-Author*) Nothing to Disclose

Thomas Eigentler, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose
Bernhard Klumpp, MD, Tuebingen, Germany (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

ahmed.e.othman@googlemail.com

PURPOSE

We aimed to identify predictive clinical and CT imaging biomarkers and assess their predictive capacity regarding overall survival (OS) and treatment response in patients with metastatic melanoma undergoing immunotherapy.

METHOD AND MATERIALS

The local institutional ethics committee approved this retrospective study and waived informed patient consent. 103 patients with immunotherapy for metastatic melanoma were randomly divided into training (n= 69) or validation cohort (n=34). Baseline tumor markers (LDH, S100B), baseline CT imaging biomarkers (tumor burden, Choi density) and CT texture parameters (Entropy, Kurtosis, Skewness, uniformity, MPP, UPP) of the largest target lesion were extracted. To identify treatment response predictors, binary logistic regression analysis was performed in the training cohort and tested in the validation cohort. For OS, Cox regression and Kaplan Maier analyses were performed in the training cohort. Bivariate and multivariate models were established. Goodness of fit was assessed with Harrell's C-index. Potential predictors were tested in the validation cohort also using Cox-regression and Kaplan-Meier analyses.

RESULTS

Baseline S100B (Hazard ratio(HR)= 2.543, p0.018), tumor burden (HR=1.657, p=0.002) and Kurtosis (HR=2.484, p<0.001) were independent predictors of OS and were confirmed in the validation cohort (p<0.048). Tumor burden and Kurtosis showed incremental predictive capacity allowing a good predictive model when combined with baseline S100B levels (C-index=0.720). Only S100B was predictive of treatment response (OR<=0.630, p<=0.022). Imaging biomarkers didn't predict treatment response.

CONCLUSION

We identified easily obtainable baseline clinical (S100B) and CT predictors (tumor burden and Kurtosis) of OS in patients with metastatic melanoma undergoing immunotherapy. However, imaging predictors didn't predict treatment response.

CLINICAL RELEVANCE/APPLICATION

Baseline S100B levels, baseline tumor burden and Kurtosis of the largest target lesions are independent survival predictors in patients with metastatic melanoma undergoing immunotherapy. Baseline S100B level are also predictive of response to immunotherapy.

SSQ06-06 Evaluating for Primary Malignancy in Patients with Solitary and Multiple Brain Lesions: the Diagnostic Value of CT Chest, Abdomen, and Pelvis

Thursday, Dec. 5 11:20AM - 11:30AM Room: S103AB

Participants
Richard K. Rothman, MD, West Haven, CT (*Presenter*) Nothing to Disclose
Jeffrey C. Weinreb, MD, New Haven, CT (*Abstract Co-Author*) Consultant, Bayer AG
William B. Zucconi, DO, Madison, CT (*Abstract Co-Author*) Nothing to Disclose
Ajay Malhotra, MD, Stamford, CT (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

richard.rothman@yale.edu

PURPOSE

Patients with newly discovered brain lesions on CT or MRI often undergo CT of the chest, abdomen, and pelvis in an effort to identify a primary cancer that may have metastasized to the brain. The aim of this study was to determine the frequency of finding a primary cancer on CT of the chest, abdomen, and/or pelvis in these patients.

METHOD AND MATERIALS

We evaluated how often a primary malignancy was diagnosed in the chest versus abdomen and pelvis portions of CT scans in patients with newly identified brain lesions. Multiple brain lesion characteristics were recorded, such as size, the presence of enhancement and hemorrhage as well as whether lesions were single or multiple.

RESULTS

Out of 287 consecutive cases over five years, the final diagnoses were 136 primary brain malignancies (47%), 91 metastatic malignancies (32%), and 60 benign entities (21%). Of the 91 metastatic malignancies, 68 were of lung primary (75%). Chest CT identified a primary malignancy in 65 of 287 total cases (23%), 62 of which were lung cancers. The abdomen and pelvis portion of the CT scans identified a primary malignancy in only 3 cases (1%). In 26 cases, where the brain lesion(s) did not enhance, only 1 was a metastasis.

CONCLUSION

In patients with newly discovered brain lesions on imaging, CT of the chest to identify a primary lung cancer is warranted in patients with enhancing brain lesions. Without signs/symptoms of abdominopelvic malignancy, CT of the abdomen/pelvis will rarely reveal a primary cancer that metastasized to the brain.

CLINICAL RELEVANCE/APPLICATION

Utilizing CTC in place of CTCAP would reduce healthcare costs and patient radiation dose in patients with new brain lesions found on imaging and without sign/symptoms of an abdominopelvic malignancy.

SSQ06-07 Prediction of Outcome in Anal Squamous Cell Carcinoma Using Radiomic Feature Analysis of Pre-

Treatment FDG PET-CT

Thursday, Dec. 5 11:30AM - 11:40AM Room: S103AB

Participants
Peter Brown, MBChB, BSc, Leeds, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Russell Frood, MBBCh, Leeds, United Kingdom (*Presenter*) Nothing to Disclose
Jim Zhong, Leeds, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Stuart Currie, FRCR,MD, Leeds, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Alexandra Gilbert, MBBS, MRCP, Leeds, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Ane L. Appelt, Leeds, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
David Sebag-Montefiore, MD, PhD, Leeds, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Andrew F. Scarsbrook, FRCR, York, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Incidence of anal squamous cell carcinoma (ASCC) is increasing, with curative chemoradiotherapy (CRT) as the primary treatment of non-metastatic disease. A significant proportion of patients have loco-regional treatment failure (LRF), but rarely distant relapse. Accurate prognostication of progression free survival (PFS) would help personalisation of CRT regimens. The study aim was to evaluate novel imaging pre-treatment features, to prognosticate for PFS in ASCC.

METHOD AND MATERIALS

Consecutive patients with ASCC treated with curative intent at a large tertiary referral centre who underwent pre-treatment FDG-PET/CT were included. Radiomic feature extraction was performed using LIFEx software on baseline FDG-PET/CT. Outcome data (PFS) was collated from electronic patient records. Elastic net regularisation and feature selection was used for logistic regression model generation on a randomly selected training cohort and applied to a validation cohort using TRIPOD guidelines. ROC-AUC analysis was used to compare radiomic feature model performance with a regression model combining standard prognostic factors (age, sex, tumour and nodal stage).

RESULTS

189 patients were included in the study, with 102/145 in the training cohort and 30/44 in the validation cohort. PFS and median follow-up were 70.3% / 35.1 months and 68.2% / 37.9 months, respectively. GLCM Entropy (a measure of randomness of distribution of co-occurring pixel grey-levels), NGLDM Busyness (a measure of spatial frequency of changes in intensity between nearby voxels of different grey-level), minimum CT value (lowest HU within the lesion) and SMTV (a standardized version of MTV) were selected for inclusion in the prognostic model. AUC for elastic net model prediction in the validation cohort was 0.738, the AUC for standard prognostic factors was 0.602.

CONCLUSION

Radiomic features extracted from pre-treatment FDG-PET/CT in patients with ASCC may provide better PFS prognosis than conventional staging parameters. With external validation this might be useful to help personalise CRT regimens in the future.

CLINICAL RELEVANCE/APPLICATION

Radiomic feature analysis with FDG-PET/CT can be used in anal squamous cell carcinoma to predict outcomes, which could potentially be used to help personalise future chemoradiotherapy regimens.

SSQ06-08 Radiomics Analysis of Advanced Gastric Cancer: A More Accurate Method for Real-Time Assessment of Treatment Response to Neoadjuvant Chemotherapy

Thursday, Dec. 5 11:40AM - 11:50AM Room: S103AB

Participants
Qinmei Xu, MS,PhD, Nanjing, China (*Presenter*) Nothing to Disclose
Shangsheng Zhou, Nanjing, China (*Abstract Co-Author*) Nothing to Disclose
Danyang Ren, Nanjing, China (*Abstract Co-Author*) Nothing to Disclose
Xiuli Li, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Long Jiang Zhang, MD, PhD, Nanjing, China (*Abstract Co-Author*) Nothing to Disclose
Guang Ming Lu, MD, PhD, Nanjing, China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

xqm@smail.nju.edu.cn

PURPOSE

To develop a computed tomography (CT) based radiomics method for diagnosis of pathological downstaging after each cycle of neoadjuvant chemotherapy (NAC) in advanced gastric cancer (AGC), evaluate its performance and compare with the clinical conventional RECIST assessment at CT imaging.

METHOD AND MATERIALS

This retrospective study include 247 AGC patients who received 1-4 cycles of NAC and followed by surgery. Ninety-two of them (37.2%) achieved pathological downstaging. We extracted 1231 features from post-NAC portal venous-phase CT scans for each patient, then made up 28 cross-combination radiomic models with 7 feature selection methods and 4 classifiers within a nested cross-validation (CV) structure. The optimal model was selected. Its performance was assessed with respect to its discrimination and compared with that of RECIST at CT imaging in two external validation cohorts, which included patients who received 1-2 cycles and 3-4 cycles of NAC, respectively.

RESULTS

The optimal radiomics model consisting of the feature selection method of wilcoxon and classifier of linearSVC achieved a mean AUC of 0.919 (the highest among the 28 machine-learning models). It used 92 features, including wavelet-LHL_glszm_GrayLevelNonUniformity, wavelet-LLL_glrlm_RunLengthNonUniformity, and wavelet-LHL_firstorder_TotalEnergy, the

weight of which ranked in the top 3. This model had a good diagnostic ability in both two external validation cohorts (AUC 0.927±0.093; AUC 0.884±0.102, respectively), which outperformed the RECIST method (NRI 39.5%, p<0.05; NRI 35.4%, p<0.05, respectively).

CONCLUSION

Contrast-enhanced CT based radiomics has an excellent ability of preoperative diagnosis and early detection of pathological downstaging, more sensitive and accurate than routine method, which may have significant clinical implications on real-time assessment of downstaging for AGC patients who were experiencing NAC.

CLINICAL RELEVANCE/APPLICATION

The effective radiomics model combining 85 radiomic features might turn into a noninvasive and convenient potential imaging biomarker of chemotherapy response, providing more accurate and timely evaluation to optimize and individualize the treatment.

SSQ06-09 Agreement between Prospective Local Evaluation and Retrospective Central Evaluation of Metastatic Colorectal Cancer by RECIST

Thursday, Dec. 5 11:50AM - 12:00PM Room: S103AB

Participants
Tugce Agirlar Trabzonlu, MD, Chicago, IL (*Presenter*) Grant, Siemens AG
Roozbeh Houshyar, MD, Orange, CA (*Abstract Co-Author*) Nothing to Disclose
Mohammad Helmy, MD, Anaheim, CA (*Abstract Co-Author*) Nothing to Disclose
Yuri Velichko, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Cecil G. Wood III, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Vahid Yaghmai, MD, Orange, CA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

tugce.trabzonlu@northwestern.edu

PURPOSE

Response evaluation criteria in solid tumors (RECIST) measurements are commonly performed prospectively at the cancer centers in order to assess disease progression. However, data from clinical trial are also commonly assessed by a central review in retrospective fashion at the conclusion of trial. The purpose of our study was to assess concordance level between prospective and retrospective RECIST reporting performed by trained radiologists.

METHOD AND MATERIALS

The study was IRB approved. One hundred five CT studies in 39 patients with metastatic colorectal cancer were included. Radiologists reviewed all scans using RECIST guideline both prospectively and retrospectively. Prospective and retrospective studies were evaluated six weeks apart. The agreement in RECIST between prospective and retrospective assessment were evaluated.

RESULTS

In 34 of 39 (87.2%) patients and in 59 of 66 (89.4%) follow-up assessments, prospective and retrospective evaluation with different radiologists agreed on RECIST classification. In all patients with discordance, the radiologists selected at least 1 different target lesion in every patient. In patients with the same target lesion selected (n=7), prospective and retrospective RECIST agreement reached to 100%. When prospective and retrospective RECIST evaluation were performed by the same radiologist, agreement rate was slightly higher when compared to performance of two different radiologists (89.7% vs 87.2% of patients and 93.9% vs 89.4% of follow-up assessments (p>0.05). In the prospective and retrospective evaluation by the same radiologist, measurement variabilities resulted in RECIST discordance in 2 patients (5.1%).

CONCLUSION

If RECIST is strictly applied by blinded and trained radiologists, a strong agreement between prospective and retrospective evaluation can be observed. However, differences in target lesion selection and measurement variations may lead to differences in response assessment.

CLINICAL RELEVANCE/APPLICATION

If RECIST is strictly applied by blinded and trained radiologists, a strong agreement between prospective and retrospective evaluation can be observed. Therefore, prospective evaluation of response rate during the trial using RECIST may be a valid reflection of future evaluation by a central imaging core.

SSQ07

Gastrointestinal (Advanced MRI Techniques)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S103CD

GI MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Hersh Chandarana, MD, New York, NY (*Moderator*) Equipment support, Siemens AG; Software support, Siemens AG; ;
Kelly L. Cox, DO, Jacksonville, FL (*Moderator*) Nothing to Disclose
Michael A. Ohliger, MD,PhD, Burlingame, CA (*Moderator*) Travel support, General Electric Company; Speaker, General Electric Company

Sub-Events

SSQ07-01 Impact of Temporal Resolution and Motion Correction for Dynamic Contrast-Enhanced MR Imaging of the Liver Using an Accelerated Golden-Angle Radial Sequence

Thursday, Dec. 5 10:30AM - 10:40AM Room: S103CD

Participants
Rihab Mansour, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Alana Thibobeau-Antonacci, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Laurent Bilodeau, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Milena Cerny, MD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Guillaume Gilbert, PhD, Montreal, QC (*Abstract Co-Author*) Employee, Koninklijke Philips NV
An Tang, MD, Montreal, QC (*Abstract Co-Author*) Research Consultant, Imagia Cybernetics Inc Speaker, Siemens AG Speaker, Eli Lilly and Company
Samuel Kadoury, Montreal, QC (*Presenter*) Nothing to Disclose

PURPOSE

To evaluate the impact on image quality and quantitative dynamic contrast-enhanced (DCE)-MRI perfusion parameters when varying the number of respiratory motion states on DCE-MRI perfusion parameters using eXtraDimensional Golden-Angle Radial Sparse Parallel (XD-GRASP).

METHOD AND MATERIALS

This prospective study was approved by the institutional review board and consent was obtained from patients. Eleven patients, 6 men and 5 women (70 years ± 11 [standard deviation]), underwent DCE-MRI examinations on a 3.0 T MRI (Achieva TX, Philips Healthcare). T1 mapping was performed using the variable flip-angle method with fat-saturated cartesian 3D gradient-echo acquisitions in breath-hold. DCE acquisition was performed in free-breathing using a 3D stack-of-stars gradient-echo golden-angle radial acquisition. Contrast injection was performed 30 s after initiating the DCE acquisition. Nonparametric analysis was conducted on the time-intensity curves. Parametric analysis was performed using a dual-input single-compartment model. Comparison of signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR) and perfusion parameters was made for XD-GRASP with different number of respiratory motion states.

RESULTS

A total of 22 HCCs (size: 11 - 52 mm) were evaluated. XD-GRASP reconstructed with increased motion states improves the SNR ($P < 0.05$) but reduces temporal resolution (0.04 volume/s vs 0.17 volume/s for one motion state) ($P < 0.05$). The peak enhancement ratio and normalized maximum intensity time ratio increased with decreasing number of motion states ($P < 0.001$) while the transfer constant from the portal venous plasma to the surrounding tissue significantly decreased ($P < 0.05$).

CONCLUSION

Peak enhancement ratio, normalized maximum intensity time ratio and transfer constant from the portal venous plasma to the surrounding tissue were sensitive to the number of motion states and to the temporal resolution. While a higher number of motion states improves SNR, the resulting lower temporal resolution can influence quantitative parameters that capture rapid signal changes.

CLINICAL RELEVANCE/APPLICATION

XD-GRASP can be used to perform quantitative perfusion measures for HCC response assessment, but the number of motion states may significantly alter some quantitative parameters.

SSQ07-02 Clinical Application of Amide Proton Transfer Imaging in the Liver: The Feasibility Study

Thursday, Dec. 5 10:40AM - 10:50AM Room: S103CD

Participants
Nieun Seo, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Yong Eun Chung, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ha-Kyu Jeong, Suwon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

Jin-Young Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Mi-Suk Park, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Myeong-Jin Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Research grant, Bayer Pharma AG; Honoraium, Guerbet SA, GE healthcare, Philips, and Siemens Healthineers

For information about this presentation, contact:

neseo.radiology@gmail.com

PURPOSE

To investigate the feasibility of amide proton transfer (APT) magnetic resonance imaging (MRI) in the liver and to evaluate its ability to characterize focal liver lesions (FLL)

METHOD AND MATERIALS

A total of 85 patients with suspected FLLs who underwent APT imaging at 3T were included. APT imaging was obtained at single slice to include FLL through five breath holds with interleaved APT and B0 field map scans. APT signals in the background liver and FLL were analyzed with the asymmetric magnetization transfer ratio (MTRasym). Technical success rate of APT imaging was calculated. MTRasym values were compared between the background liver and FLL, and between different FLLs using paired sample t-test or Wilcoxon signed rank test.

RESULTS

Technical success rate of APT imaging in the liver was 69.4% (59/85), and the reason of failure was too large B0 inhomogeneity. The acquisition time of APT imaging was approximately 1 minute. Among 59 FLLs with analyzable APT images, MTRasym values of 27 patients with liver metastases and 23 patients with hepatocellular carcinomas (HCCs) were compared. MTRasym values of metastases and background liver were significantly different (0.13 ± 2.15% vs. -1.62 ± 2.12%, P = 0.001), while those values of HCCs and background liver were similar (-1.41 ± 3.68% vs. -1.18 ± 1.60%, P = 0.767). MTRasym values of metastases were significantly higher than those of liver metastases (P = 0.027).

CONCLUSION

APT imaging could have a role to differentiate metastasis from HCC, although approximately 30% of cases were failed to obtain acceptable APT images of the liver.

CLINICAL RELEVANCE/APPLICATION

APT imaging might be useful to characterize focal liver lesions, but further technical improvement is required to apply APT imaging in the human liver.

SSQ07-03 Evaluation of Liver MRE Analyzability Criteria Using a Simulation Method Based on Successively and Concentrically Decreasing the Size of Selected Regions-of-Interest: A Proof-of-Concept Study

Thursday, Dec. 5 10:50AM - 11:00AM Room: S103CD

Participants
Michael S. Middleton, MD,PhD, San Diego, CA (*Presenter*) Institutional research contract, Alexion Pharmaceuticals, Inc; Institutional research contract, AstraZeneca PLC; Institutional research contract, BioClinica, Inc; Institutional research contract, Biomedical Systems; Consultant, Bracco Group; Institutional research contract, Bristol-Myers Squibb Company; Institutional research contract, Enanta; Institutional research contract, Galmed Pharmaceuticals Ltd; Institutional consultant contract, F. Hoffmann-La Roche Ltd; Institutional research contract, General Electric Company; Institutional research contract, Gilead Sciences, Inc; Institutional research contract, Guerbet SA; Institutional research contract, ICON plc; Institutional research contract, Intercept Pharmaceuticals, Inc; Consultant, Kowa Company, Ltd; Consultant, MEDIAN Technologies; Consultant, IBM Corporation; Consultant, Novo Nordisk AS; Institutional research contract, Pfizer Inc; Stockholder, Pfizer Inc; Institutional research contract, Prosciento; Consultant, Quantitative Insights, Inc; Institutional research contract, F. Hoffmann-La Roche Ltd; Institutional research contract, Shire plc; Institutional research contract, Synageva; Institutional research contract, Siemens AG; Institutional research contract, VirtualScopics, Inc
Chetan Potu, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Walter Henderson, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Timoteo I. Delgado, BA, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Chuhan Chung, MD, Foster City, CA (*Abstract Co-Author*) Employee, Gilead Sciences, Inc
Stephen Djedjos, MD, Foster City, CA (*Abstract Co-Author*) Employee, Gilead Sciences, Inc
Robert Myers, MD, Foster City, CA (*Abstract Co-Author*) Employee, Gilead Sciences, Inc
Richard L. Ehman, MD, Rochester, MN (*Abstract Co-Author*) CEO, Resoundant, Inc; Stockholder, Resoundant, Inc;
Claude B. Sirlin, MD, San Diego, CA (*Abstract Co-Author*) Research Grant, Gilead Sciences, Inc; Research Grant, General Electric Company; Research Grant, Siemens AG; Research Grant, Bayer AG; Research Grant, Koninklijke Philips NV; Consultant, AMRA AB; Consultant, Fulcrum; Consultant, IBM Corporation; Consultant, Exact Sciences Corporation; Consultant, Boehringer Ingelheim GmbH; Consultant, Arterys Inc; Consultant, Epigenomics; Author, Medscape, LLC; Lab service agreement, Gilead Sciences, Inc; Lab service agreement, ICON plc; Lab service agreement, Intercept Pharmaceuticals, Inc; Lab service agreement, Shire plc; Lab service agreement, Enanta; Lab service agreement, Takeda Pharmaceutical Company Limited; Lab service agreement, Alexion Pharmaceuticals, Inc; Lab service agreement, NuSirt Biopharma, Inc

For information about this presentation, contact:

msm@ucsd.edu

PURPOSE

An objective method to determine the adequacy of liver magnetic resonance elastography (MRE) exams is to use a cutoff for total region-of-interest (ROI) size, usually either 500 or 700 pixels (Px) over four slices. However, little objective evidence supports either of these cutoffs. We performed a simulation study to evaluate how the mean, and the range of calculated liver stiffness values varies for these, and two higher cutoff values as we concentrically shrink total ROI size, for data from a multi-center drug development clinical trial of adults with nonalcoholic steatohepatitis (NCT02854605).

METHOD AND MATERIALS

Two-hundred and six MR exams were selected from the aforementioned clinical trial, based on availability of elastograms, and ROI size >= 4000 Px over four slices placed at clinical trial sites during the study. For each exam, stiffness values for all pixels were recorded. Stiffness values were calculated by randomly removing ten concentric Px at a time from the ROI edges, and repeating 100 times. For each simulation of 100 iterations, the stiffness ranges, at 500, 700, 2000, and 4000 Px were captured, and the medians were calculated. An absolute stiffness value difference was recorded for each of the four cutoffs, compared to the stiffness value reported using all pixels, and the means were calculated.

RESULTS

Average absolute differences in mean stiffness values across all simulations at the four cutoff values, compared to those obtained using all pixels, increased as cutoff values decreased (0.073, 0.148, 0.256, and 0.292 kPa for 4000, 2000, 700, and 500 Px, respectively). The median values of the the stiffness ranges across all simulations at the four cutoffs similarly increased as cutoff value decreased (0.014, 0.021, 0.038, 0.043 kPa at 4000, 2000, 700, and 500 Px, respectively).

CONCLUSION

At a proof-of-concept level, and subject to validation in other independent cohorts, this data supports that MRE liver stiffness analyzability cutoffs down to 500 Px over four slices are reasonable. For all four pixel cutoffs, the median values of the stiffness ranges, and the average absolute differences in mean liver stiffness compared to values obtained using all pixels, were small.

CLINICAL RELEVANCE/APPLICATION

These results suggest that MRE analyzability using a cutoff as low as 500 Px is likely to be acceptable for drug development clinical trials, and also for clinical care after further validation.

SSQ07-04 T1 Relaxation Times of the Liver and Spleen to Predict Significant Liver Fibrosis: Is There an Additional Value of Normalization to Blood Pool?

Thursday, Dec. 5 11:00AM - 11:10AM Room: S103CD

Participants
Verena Obmann, MD, Cleveland Heights, OH (*Abstract Co-Author*) Nothing to Disclose
Annalisa Berzigotti, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Lukas Ebner, MD, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Andreas Christe, Bern, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Adrian T. Huber, MD, Bern, Switzerland (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

adrian.huber@insel.ch

PURPOSE

To analyze liver and spleen native T1 relaxometry values to predict significant fibrosis and their additional value when normalized to the blood pool.

METHOD AND MATERIALS

156 patients without solid liver lesions, prior liver surgery or portal vein thrombosis on routine liver multidetector CT scans underwent liver MRI with gradient-echo based MR elastography (MRE) and Shortened Modified Look-Locker Inversion recovery (shMOLLI) based T1 relaxometry. T1 relaxation times were measured in the right liver lobe and in the spleen, as well as in the aorta and in the vena cava. MRE liver stiffness were compared with T1 relaxation times alone, as well as T1 relaxation times normalized to the blood pool in the vena cava and in the aorta. Pearson correlation, students t-test and receiver operation characteristics (ROC) analysis were used to investigate the usefulness of different T1 relaxometry values to predict significant liver fibrosis, using a cutoff value of 3.5kPa in MRE (corresponding to F2 or higher in histology).

RESULTS

Correlation between T1 relaxometry values and MRE liver stiffness was r=0.49-0.59 ($p<0.001$) for T1 of the liver and for T1 of the liver normalized to blood pool, while T1 of the spleen was less useful (r=0.11-0.17). Both normalized and not normalized T1 values of the liver allowed to significantly separate patients with significant liver fibrosis from those without significant liver fibrosis ($p<0.001$). In ROC-analysis, T1 relaxometry values normalized to the blood pool did not perform better than T1 values alone (Figure).

CONCLUSION

Native T1 relaxation times of the liver allowed to predict clinically significant liver fibrosis, while T1 relaxation times of the spleen were less useful. There was no additional value of liver and spleen native T1 relaxometry values to predict significant fibrosis when normalized to the blood pool.

CLINICAL RELEVANCE/APPLICATION

T1 relaxometry is acquired in 9 seconds per slice and may be installed on any MR scanner without the need for additional hardware. It allows to predict significant liver fibrosis without time-consuming image post-processing

SSQ07-05 New Radial Technique for the Calculation of T2 Relaxation Time in Liver MRI

Thursday, Dec. 5 11:10AM - 11:20AM Room: S103CD

Participants
Janio Szklaruk, MD, PhD, Houston, TX (*Presenter*) Nothing to Disclose
Jong Bum Son, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Jia Sun, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Bryce Starr, Durhan, NC (*Abstract Co-Author*) Nothing to Disclose
Priya R. Bhosale, MD, Bellaire, TX (*Abstract Co-Author*) Nothing to Disclose
Jingfei Ma, PhD, Houston, TX (*Abstract Co-Author*) Royalties, Siemens AG; Royalties, General Electric Company; Consultant, C4

Imaging

For information about this presentation, contact:

jszklaru@mdanderson.org

PURPOSE

The purpose is to investigate the clinical application of 2D radial TSE (2DRTSE) sequencing by evaluating the quantitative T2 relaxation time (msec) of liver lesions and the background liver parenchyma. We also evaluated image quality.

METHOD AND MATERIALS

MRI was performed at 3.0 T in this IRB-approved prospective study. The prototype 2D radial TSE sequence (2DRTSE) generated 22 echo axial images corresponding to 22 different TEs (ranging from 8.6 ms to 188.8 ms) with prospective acquisition correction for free-breathing patient scans. By placing an ROI on the automatically generated T2 map, 2 radiologists obtained relaxation times for various liver lesions and background liver. Radiologists scored image quality. Weighted linear kappa statistics and the Lin concordance correlation coefficient (CCC) were used to assess inter-reader agreement. The differences in paired T2RTs of the two readers were plotted against their mean values using Bland-Altman plots. Multiple lesions within the same patient were considered independently.The Kruskal-Wallis test was used to compare T2RTs among different lesion types.

RESULTS

19 patients were included in the study. There were 36 liver lesions: 2 cysts, 9 hemangiomas, 21 solid lesions, and 4 necrotic metastatic lesions. The solid lesions were 12 metastases, 8 HCC, and 1 FNH.The mean calculated T2RT value for solid lesions (81.5 ms) was significantly lower than that for hemangiomas (153.9 ms; P = 0.0024).The Wilcoxon rank-sum test revealed that the mean calculated T2RT for liver cysts (285.7 ms) was significantly higher than solid lesions (81.5 ms; P = 0.025). For the 2 radiologists, the CCC was 0.996 (95% confidence interval 0.9914-0.9978) for the calculated T2 of each liver lesion, indicating substantial agreement. The mean calculated T2RT for the background liver was 42.2 ms. The Bland-Altman plot of the liver T2RT data showed 95% agreement between readers, allowing for a range of +10 to -13.3 ms. . Qualitative analysis of liver margins revealed good liver margin visibility in 100% of the evaluated slices

CONCLUSION

2D radial TSE sequencing is capable of providing good T2W images and a quantitative T2RT map. The quantitative T2 map was useful for the characterization of liver lesions.

CLINICAL RELEVANCE/APPLICATION

2D radial TSE sequence may supplant current T2WI acquisition. The value of lesion detection for T2-weighted imaging will be enhanced by the addition of quantitative T2RTs.

SSQ07-06 Respiratory Motion Artifacts in Gadoterate- and Gadoxetate-Enhanced Dynamic Phase Liver MRI After Intensified and Standard Pre-Scan Preparation: A Bi-Institutional Analysis

Thursday, Dec. 5 11:20AM - 11:30AM Room: S103CD

Participants
Florian Siedek, MD, Stanford, CA (*Presenter*) Nothing to Disclose
Christian Wybranski, MD, Magdeburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Robert Damm, Magdeburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Angelos Gazis, Frankfurt am Main, Germany (*Abstract Co-Author*) Nothing to Disclose
Ortrud Kosiek, Magdeburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Stefan Haneder, MD, Cologne, Germany (*Abstract Co-Author*) Nothing to Disclose
Thorsten Persigehl, MD, Koeln, Germany (*Abstract Co-Author*) Nothing to Disclose
Susanne Steinhauser, Cologne, Germany (*Abstract Co-Author*) Nothing to Disclose
MacIej Pech, Berlin, Germany (*Abstract Co-Author*) Nothing to Disclose
Frank Fischbach, PhD, Magdeburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Katharina Fischbach, Magdeburg, Germany (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

f.siedek@gmail.com

PURPOSE

Gadoxetate disodium induced transient severe arterial phase respiratory motion (TSM) substantially degrades image quality in liver dynamic contrast-enhanced MRI (DCE-MRI). Extent of liver DCE-MRI procedural information and explanation and/or training of breath-hold commands in standard pre-scan patient preparation (SPPP) might vary between institutions due to missing standardization, contributing to the occurence of gadoxetate-related TSM. This bi-institutional study investigates the effect of intensified pre-scan patient preparation (IPPP; SPPP + custom-made educational material about liver DCE-MRI + standardized breath-hold training) on gadoxetate-related TSM.

METHOD AND MATERIALS

At site A and B, 50 (site A) and 58 (site B) patients received IPPP and 50 (site A) and 52 (site B) patients received SPPP prior to gadoxetate-enhanced liver DCE-MRI. As control, the effect of IPPP and SPPP was crosschecked in each 101 patients who received gadoterate-enhanced liver DCE-MRI (site B). Respiratory motion (RM) was scored in dynamic phase images using a Likert-scale (1 [none] - 5 [non-diagnostic]) independently by 5 (site A) and 2 (site B) blinded readers.

RESULTS

In the gadoxetate group, IPPP neither significantly mitigated TSM which was observed in 19% of patients (p=0.366) nor RM in any dynamic phase of patients without TSM (all p>0.072). In the gadoterate group, however, IPPP significantly mitigated RM in all dynamic phases (all p<0.031) compared to SPPP. The inter-reader agreement for grading of RM artifacts was excellent in pre-contrast and all dynamic phase images with all intra-class correlation coefficients (ICCs) >0.92.

CONCLUSION

IPPP failed to reduce gadoxetate-related TSM supporting the hypothesis that gadoxetate disodium acts as a chemo-toxic trigger that evokes breath-hold difficulty which cannot be willingly suppressed or attenuated by education and training. Interestingly, IPPP also did not significantly mitigate RM in any dynamic phase in the non-TSM subgroup of patients who received gadoxetate disodium whereas IPPP very effectively reduced RM in all dynamic phases in the non-TSM subgroup of patients who received gadoterate meglumine. This implies that gadoxetate-related breath-hold difficulty does not only affect the TSM subgroup of patients or exclusively the arterial phase as previously proposed but rather all dynamic phases, albeit to a much lesser extent.

CLINICAL RELEVANCE/APPLICATION

Intensified pre-scan patient preparation seems to be a very effective and cost-neutral strategy to reduce respiratory motion in liver DCE-MRI employing extracellular contrast agents.

SSQ07-07 Clinical Evaluation of Diffusion-Weighted MRI based Virtual Elastography for the Assessment of Liver Fibrosis

Thursday, Dec. 5 11:30AM - 11:40AM Room: S103CD

Participants
Marie-Luise Kromrey, MD, Greifswald, Germany (*Presenter*) Nothing to Disclose
Denis J. Le Bihan, MD, PhD, Gif-Sur-Yvette, France (*Abstract Co-Author*) Research Consultant, Olea Medical
Shintaro Ichikawa, MD, PhD, Chuo, Japan (*Abstract Co-Author*) Nothing to Disclose
Utaroh Motosugi, MD, Chuo, Japan (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

marie-luise.kromrey@uni-greifswald.de

PURPOSE

To compare diffusion-weighted MRI (dMRI) based elastography and standard MR elastography (MRE) for the assessment of liver fibrosis in a clinical setting.

METHOD AND MATERIALS

In an IRB approved retrospective study 99 patients underwent 2D MRE and dMRI on a 3T scanner. 25 patients had to be excluded due to insufficient image quality resulting in a final study population of 74 patients (45 men, mean age 68.1±8.7 years). Shear modulus measured by MRE (µMRE) was obtained in each subject by placing liver ROIs on the stiffness maps by two independent readers. Shifted apparent diffusion coefficient (sADC) was calculated from dMRI acquired without mechanical vibration with b=200 and 1500 s/mm2. dMRI-based virtual shear modulus (µDiff) was then derived from sADC as previously shown. MRI-based liver fibrosis stages were estimated from µMRE and µDiff values using optimal cutoff values according to METAVIR score (F0-F4). Statistical analysis was undertaken using Bland-Altman plots and Bayesian prediction analysis.

RESULTS

Inter-reader agreement was very high (mean difference: 0.04±0.43 kPa; -0.03±0.60 kPa for µDiff and µMRE, respectively, not significant). Correlation between sADC and µDiff was highly significant (r2=0.81, p=6 10-24) with µMRE and µDiff values showing agreement for each patient (mean difference: -0.02±0.88 kPa, not significant). Complete agreement in fibrosis staging was obtained in 55% of the patients and good agreement (ΔF=±1) in 36%. Categorizing fibrosis into "insignificant" (F0/F1) and "significant" (F2-F4) agreement between the two methods reached 85% (63/74, Kappa=0.85).

CONCLUSION

dMRI-based virtual shear modulus values and resulting fibrosis stages showed high agreement with those by MRE. dMRI holds great potential for the evaluation of liver fibrosis non-invasively without the need for any mechanical vibration setup as an alternative to MRE and biopsy.

CLINICAL RELEVANCE/APPLICATION

Diffusion MRI based virtual elastography holds great potential as an alternative to MRE to evaluate liver fibrosis non-invasively without the need for any mechanical vibration setup.

SSQ07-08 Diagnostic Accuracy of Liver Imaging Reporting and Data System (LI-RADS) for HCC in Non-Cirrhotic Patients with Chronic Hepatitis

Thursday, Dec. 5 11:40AM - 11:50AM Room: S103CD

Participants
Yu Han, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Jingbiao Chen, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Linqi Zhang, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Sichi Kuang, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Sidong Xie, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Claude B. Sirlin, MD, San Diego, CA (*Abstract Co-Author*) Research Grant, Gilead Sciences, Inc; Research Grant, General Electric Company; Research Grant, Siemens AG; Research Grant, Bayer AG; Research Grant, Koninklijke Philips NV; Consultant, AMRA AB; Consultant, Fulcrum; Consultant, IBM Corporation; Consultant, Exact Sciences Corporation; Consultant, Boehringer Ingelheim GmbH; Consultant, Arterys Inc; Consultant, Epigenomics; Author, Medscape, LLC; Lab service agreement, Gilead Sciences, Inc; Lab service agreement, ICON plc; Lab service agreement, Intercept Pharmaceuticals, Inc; Lab service agreement, Shire plc; Lab service agreement, Enanta; Lab service agreement, Takeda Pharmaceutical Company Limited; Lab service agreement, Alexion Pharmaceuticals, Inc; Lab service agreement, NuSirt Biopharma, Inc
Jin Wang, MD, Guangzhou, China (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

ysshrine@163.com

PURPOSE

The use of the Liver Imaging Reporting and Data System (LI-RADS) has not been validated in non-cirrhotic patients with chronic hepatitis. This study examines the accuracy of LI-RADS v2018 for hepatocellular carcinoma (HCC) using contrast-enhanced MR imaging in non-cirrhotic patients with chronic hepatitis.

METHOD AND MATERIALS

This retrospective single-center study was approved by our IRB with waived informed consent requirement. Between 2016 and 2018, 160 patients with chronic hepatitis and histology-proven absence of cirrhosis underwent contrast-enhanced MR imaging. In consensus, two radiologists retrospectively assigned LI-RADS v2018 categories to each of a total of 161 observations. The reference standard was histology for malignant lesions and clinical and radiological follow-up for at least one year for benign lesions. Sensitivity, specificity, accuracy, positive predictive value (PPV), negative predictive value (NPV), and false positive rate (FPR) of LR-5 for the diagnosis of HCC were estimated.

RESULTS

The final diagnoses and LI-RADS categories of each observation are summarized in Table. Overall, 71 (44.1%) lesions were HCCs, 23 (14.3%) were non-HCC malignancies, and 67 (41.6%) were benign. LI-RADS categories of LR-1, LR-2, LR-3, LR-4, LR-5, and LR-M were assigned in 6 (3.7%), 43 (26.7%), 15 (9.3%), 12 (7.5%), 70 (43.5%), and 15 (9.3%) observations, respectively. Among LR-5s, 64 (91.4%) were HCCs and 69 (98.6%) were malignant. The sensitivity, specificity, accuracy, PPV, NPV, and FPR of LR-5 for HCC were 90.1%, 93.3%, 91.2%, 91.4%, 92.3%, and 6.7%, respectively. Among LR-Ms, 4 (27%) were HCCs and 15 (100%) were malignant.

CONCLUSION

This single-center, retrospective study suggests that LIRADS v2018 using contrast-enhanced MR imaging has high accuracy for HCC in non-cirrhotic HCC patients with chronic hepatitis. Multicentric, prospective studies are needed to validate this preliminary finding.

CLINICAL RELEVANCE/APPLICATION

This single-center, retrospective study suggests that LI-RADS v2018 using contrast-enhanced MRI may be valid in non-cirrhotic patients with chronic hepatitis. Further studies are warranted.

Printed on: 10/29/20

SSQ08

Gastrointestinal (Advanced CT Technique)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S102CD

CT GI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Vahid Yaghmai, MD, Orange, CA (*Moderator*) Nothing to Disclose
Meghan G. Lubner, MD, Madison, WI (*Moderator*) Grant, Koninklijke Philips NV; Grant, Johnson & Johnson;
William C. Small, MD, PhD, Atlanta, GA (*Moderator*) Nothing to Disclose

Sub-Events

SSQ08-01 Adaptive Statistical Iterative Reconstruction Technique (ASIR-V) with Different Weights on Spectral CT Using Conventional 120kVp Scan: A Phantom Study

Thursday, Dec. 5 10:30AM - 10:40AM Room: S102CD

Participants
Yao Z. Peng, Beijing , China (*Presenter*) Nothing to Disclose

PURPOSE

To explore image quality of spectral CT using conventional 120kVp scan under the different weight of ASIR-V by using abdominal model.

METHOD AND MATERIALS

The abdominal model (Body rings)was scanned by GE Revolution CT using conventional 120kVp scan. Images were reconstructed using 20% weight to 80% weight (10%-step) of ASIR-V. The CT value, SD and CNR of different tissues(liver and erector spinae)were measured. Anova test and regression analysis were used to compare the different tissues of noise values (SD) and CNR weights of ASIR-V. The post-processing images were evaluated by two radiologists on a 4-point scale using a double-blinded method

RESULTS

With increasing of ASIR-V weight, the noise values of 7 groups generally exhibited a decreasing trend. By regression analysis, the linear regression equation of ASIR-V weight and image noise was y = -0.84x +11.321(x=ASIR-V weight y =noise),),R2 =0.977 F =832.187 P=0.000.With increasing of ASIR-V, the CNR of 7 groups generally exhibited an increasing trend. By regression analysis, the linear regression equation of ASIR-V weight and CNR was y = 0.98x + 3.425 (x = ASIR-V weight y = contrast noise ratio),R2=0.891 F =163.690, P =0.000. There was no significant difference in 30% and 40% weight of ASIR-V between the seven groups(P>0.01), but 30% and 40% weight of ASIR-V were the best in the subjective scores. There was a significant difference in the subjective scores between the other groups (P<0.01).

CONCLUSION

Image noise reduces and image quality improves as ASIR-V weight increases ina linear relationship. At 60% weight of ASIR-V,the image noise was substantially reduced and the subject score was the best. At 70% and 80% weight of ASIR-V,the image noise was substantially reduced and the subject score was poor.

CLINICAL RELEVANCE/APPLICATION

When using spectral CT using conventional 120kVp scan for liver scanning, the image quality can be improved by increasing the weight of ASIR-V to an appropriate value for better display of anatomies

SSQ08-02 Correlation between Hepatic Fatty Infiltration Degree and CT Number Measurement at Different Tube Voltages Using Animal Model

Thursday, Dec. 5 10:40AM - 10:50AM Room: S102CD

Participants
Ma Guangming, MMed, Xianyang City, China (*Presenter*) Nothing to Disclose
Furong Bai, Xianyang, China (*Abstract Co-Author*) Nothing to Disclose
Haifeng Duan, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose
Jin Chenwang, MS, Xi'an , China (*Abstract Co-Author*) Nothing to Disclose
Chenwang Jin, Xi'an, China (*Abstract Co-Author*) Nothing to Disclose
Chuangbo Yang, MMed, Xianyang City, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the correlation between the hepatic fatty infiltration degree and CT number measurement at different tube voltages (kVp).

METHOD AND MATERIALS

28 healthy SD rats weighing 200g-300g were used for the study. After 2 weeks of adaptive feeding, rats were divided into two groups: normal control group (n=5 with normal diet); experimental group (n=23 with high fat diet). After 4, 6 and 8 weeks, 8, 8 and 7 rats in the experimental group and 1, 1 and 3 rats from the control group, respectively underwent CT scans with 80kVp, 100kVp, 120kVp and 140kVp tube voltage. Rats were sacrificed after the CT scans to obtain liver specimens. CT number was measured on the conventional CT images of all tube voltages. Correlation between CT number measurement and pathologic findings was obtained.

RESULTS

There were 8, 11 and 9 normal, mild, moderate fatty liver rats based on pathology. The CT numbers for these 3 groups of rats were 69.48±1.12HU, 68.12±1.23HU and 66.57±1.08HU at 80kVp; 69.81±0.82HU, 68.56±1.72HU and 66.64±1.31HU at 100kVp; 69.24±1.42HU, 67.78±1.68HU and 65.92±1.50HU at 120kVp; and 68.58±1.63HU, 66.90±1.69HU and 64.82±1.47HU at 140kVp. The CT numbers at all tube voltages and pathology results were all negatively correlated with r values of -0.73, -0.71 -0.71 and -0.71.

CONCLUSION

CT number measurements at all 4 tube voltages (80, 100, 120 and 140kVp) all have good and similar correlation with pathologic findings for fatty infiltration degree, and changing tube voltage settings may not change the ability to differentiate normal and fatty liver tissues.

CLINICAL RELEVANCE/APPLICATION

CT number measurements at all 4 tube voltages (80, 100, 120 and 140kVp) all have good and similar correlation with pathologic findings for fatty infiltration degree, and changing tube voltage settings may not change the ability to differentiate normal and fatty liver tissues,it has a certain value in clinic fatty liver patients.

SSQ08-04 Automated Organ Segmentation Using Deep Learning with Window Setting Optimization

Thursday, Dec. 5 11:00AM - 11:10AM Room: S102CD

Participants
Myeongchan Kim, MD, Boston, MA (*Presenter*) Nothing to Disclose
Hyunkwang Lee, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Poornima Ramaraj, MS, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Kyoung Doo Song, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Synho Do, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Window display settings is a key feature of clinical CT interpretation. A Window setting optimization (WSO) module can be combined with any deep convolutional neural network to automatically find the optimal window range in CT images. In this study, we aim to find the optimal window setting values for segmentation of four different organs and to improve the performance of the segmentation models.

METHOD AND MATERIALS

We collected whole-body CT scans (both contrast & non-contrast axial series) of 21 patients. We randomly selected 33 CT series for training and 6 for testing. Manual segmentation was done for four organs (lungs, liver, spleen, and kidneys) on the CT scans by a board-certified radiologist. We only included the CT slices that had at least one pixel of each organ for experiments. For this segmentation, we developed a deep convolutional neural network model with a WSO module, comprised of a 1x1 convolutional layer and an activation function. We trained the model with a WSO module and obtained an optimal windowing level and width through learning. To explore the effect of WSO module, we trained segmentation models with two types of WSO using ReLU and sigmoid activation functions and compared against model without a WSO module.

RESULTS

For a model without a WSO module, the mean dice scores of kidneys, spleen, liver, and lungs were 0.737, 0.926, 0.947, and 0.971, respectively. For a model with a sigmoid type of WSO module, the mean dice scores of kidneys, spleen, liver, and lungs were 0.758, 0.926, 0.944, and 0.969, respectively, and for a model with a ReLu type of WSO module, the mean dice scores were 0.778, 0.953, 0.974, and 0.947, respectively. Optimized window values (level, width) of kidneys, spleen, liver, and lungs with the sigmoid activation function were (-45, 454), (-37, 371), (-35, 359), and (-188, 2177), respectively. In case of using the ReLU activation function, values were (39, 388), (39, 388), (38, 375), and (43, 429) for kidneys, spleen, liver, and lungs, respectively.

CONCLUSION

We developed deep learning models for segmentation of 4 organs (lungs, liver, spleen, and kidneys) and improved performance with a WSO module.

CLINICAL RELEVANCE/APPLICATION

WSO modules can improve AI applications, which are convolutional neural networks, and can give readers an optimized window setting for target organs.

SSQ08-05 Quantitative and Qualitative Evaluation of Imaging Quality of Hepatic Multiphase CT with Four Different Image Reconstruction Techniques including FBP, Hybrid IR, MBIR, and DLR

Thursday, Dec. 5 11:10AM - 11:20AM Room: S102CD

Participants
Haruomi Yamaguchi, MD, Hidaka, Japan (*Presenter*) Nothing to Disclose
Eriko Maeda, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Morisaka, MD, Hidaka, Japan (*Abstract Co-Author*) Nothing to Disclose
Katsuhiro Sano, MD,PhD, Hidaka, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomoaki Ichikawa, MD, PhD, Hidaka, Japan (*Abstract Co-Author*) Nothing to Disclose

Kenji Ino, PhD, Bunkyo-Ku, Japan (*Abstract Co-Author*) Nothing to Disclose
So Tsushima, Otawara, Japan (*Abstract Co-Author*) Employee, Canon Medical Systems Corporation
Jiro Sato, MD, Bunkyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Osamu Abe, MD, PhD, Itabashi-ku, Japan (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

yamaguchi.haruomi@gmail.com

PURPOSE

The purpose of this study was to evaluate the imaging quality of multiphasic hepatic CT images with four image reconstruction techniques.

METHOD AND MATERIALS

Multiphasic hepatic CT imaging in 30 patients were performed with a state-of-the-art ultra-high resolution CT scanner (Aquilion Precision; Canon Medical Systems, Otawara, Fukushima, Japan). High resolution mode (1024x1024 matrix, 0.25-mm section thickness) was employed for the CT imaging. All images were reconstructed with a combination of 512x512 matrix and 5-mm section thickness using the four image reconstruction techniques (filtered back projection (FBP), Hybrid Iterative Reconstruction (IR) (AIDR 3D), Model based IR(MBIR)(FIRST) and deep learning reconstruction(DLR)(AiCE). CT measurements were performed in the aorta (Ao) on hepatic arterial-dominant phase (HAP), in the portal vein (PV) and hepatic parenchyma (HP) on portal venous phase (PVP), and in the inferior vena cava (IVC) and HP on delayed phase (DP) images. The standard deviation (SD) of the psoas muscle as image noise was also measured on the images. All images were qualitatively assessed in terms of sharpness, granularity, and overall quality of the images in 4 -point grading scale (1-4; none, poor, good, excellent).

RESULTS

There were no significant differences in the mean CT values of the all organs on all phase images among the four different image reconstruction techniques. The mean SD on each phase images were same with each image reconstruction technique and they were 15.6 with FBP, 9.4 with Hybrid IR, 8.0 with MBIR, and 8.1 with DLR. The mean SD of all organs on the all phase images with FBP were higher than those of Hybrid IR, MBIR, and DLR. The all values with MBIR and DLR were lower than those with Hybrid IR. There were no significant differences in the all values between MBIR and DLR. The mean scores of sharpness, granularity, and overall quality of the images with DLR (3.9, 3.9, 3.9) were better than those with FBP (3.6, 3.5, 3.5), Hybrid IR (3.6, 3.6, 3.7), and MBIR (3.5, 3.5, 3.6). All these scores with MBIR were worse than those with Hybrid IR and DLR.

CONCLUSION

Based on the quantitative and the qualitative analyses, DLR was the most appropriate image reconstruction technique for multiphasic hepatic CT images obtained with the high resolution acquisition.

CLINICAL RELEVANCE/APPLICATION

It is possible to reduce further imaging noise in MBIR and DLR in comparison to FBP and Hybrid IR.

SSQ08-06 Evaluation of Malignant Liver Lesions Post Conventional Transarterial Chemoembolization: Intraprocedural Robotic Cone Beam CT (IP-CBCT) versus Multidetector CT (MDCT)

Thursday, Dec. 5 11:20AM - 11:30AM Room: S102CD

Participants
Thomas J. Vogl, MD, PhD, Frankfurt , Germany (*Abstract Co-Author*) Nothing to Disclose
Leona Alizadeh, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose
Nour-eldin A. Nour-Eldin, MD,PhD, Frankfurt am Main, Germany (*Abstract Co-Author*) Nothing to Disclose
Nagy N. Naguib, MD, MSc, Frankurt, Germany (*Abstract Co-Author*) Nothing to Disclose
Ahmed I. Ahmed, MBCHB, Assiut, Egypt (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

T.Vogl@em.uni-frankfurt.de

PURPOSE

To assess the latest technology intraprocedural robotic cone beam CT (IP-CBCT) versus postprocedural most recent multi-detector CT (MDCT) for volume imaging after conventional transarterial chemoembolization (cTACE) regarding diagnostic image quality in patients with liver lesions and tumor enhancement by ethiodized oil (Lipiodol).

METHOD AND MATERIALS

114 patients (63 females / 51 males) treated with 126 cTACE procedures underwent postinterventional Lipiodol-enhanced robotic IP-CBCT (4s, 220°, 366 images, scan length 17.5 cm) and 4 to 6 hours later native MDCT (120 kV, 76 mAs, 273 images, scan length 22.6 cm). 18 patients were treated for HCC, 96 patients for hepatic metastases of different primaries. Retrospectively, number and size of lesions and Lipiodol enhancement were evaluated and compared with the pre-interventional MRI. Image qualilty (IQ) was qualitatively evaluated in consensus with two experienced radiologists using a Likert scale (0-4).

RESULTS

For IP-CBCT significantly superior qualitative IQ scores of 3.1±0.7 were received for lesion delineation vs. 2.4±0.9 for MDCT ($p<0.05$). For general IQ IP-CBCT was evaluated with 3.0±0.6 vs. 3.1±0.4 for MDCT ($p>0.05$). Lipiodol-enhanced lesion volume correlated in 95.5% with the MRI in IP-CBCT vs. 78.33% in MDCT ($p<0.05$) due to a washout phenomenon. Complete washout was observed after a mean of 3.2h for 14% of patients (n=16). The MDCT provided no additional diagnostic information on non-target Lipiodol accumulation or other new damage.

CONCLUSION

Post-Lipiodol CBCT allows sufficient diagnostic image quality and precise information on target and non-target embolization, while enabling the radiologist to immediately adjust the therapy or react to complications. A prospective randomized trial is recommended

and planned.

CLINICAL RELEVANCE/APPLICATION

Post Lipiodol CBCT results in improved diagnostic and therapeutic information in TACE patients with malignant liver lesions.

SSQ08-07 Delayed Bolus Trigger Timing at CT Correlates with Reduced Ejection Fraction and Suboptimal Early Portovenous Contrast Phase

Thursday, Dec. 5 11:30AM - 11:40AM Room: S102CD

Participants
Corey T. Jensen, MD, Houston, TX (*Presenter*) Nothing to Disclose
Rahul G. Khetan, BS, Cypress, TX (*Abstract Co-Author*) Nothing to Disclose
Sanaz Javadi, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Saamir A. Hassan, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Ajaykumar C. Morani, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Marshall J. Adkins, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Jia Sun, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Xinming Liu, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Nicolaus A. Wagner-Bartak, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

cjensen@mdanderson.org

PURPOSE

To assess whether the delayed time to Hounsfield unit trigger during bolus-tracking for CT correlates with reduced heart function on echocardiography and suboptimal portovenous contrast timing in the abdomen.

METHOD AND MATERIALS

The health record was searched for patients who underwent portovenous CT evaluation of the abdomen using bolus-tracking and who were also evaluated by echocardiography within 2 weeks of CT. Patients were excluded if there was an abnormal contrast injection curve related to poor IV access. The time of bolus trigger at 100 Hounsfield unit in the abdominal aorta at the celiac axis, patient age, and the ejection fraction from echocardiography were recorded. Two radiologists carried out consensus scoring of the liver contrast phase in each examination with a 5 point Likert score, 5 representing an optimal portovenous phase with proper contrast in the hepatic veins. Simple linear regression (univariate) was used to test for linear associations with bolus trigger time.

RESULTS

116 patients with a mean age of 60 ± 14 years fulfilled study criteria. The mean bolus trigger time was 18 ± 6 seconds (Range: 6-36 seconds) and the mean ejection fraction was 52 ± 12% (Range: 20-69%). A longer time to bolus trigger had a significant linear association with lower ejection fraction (P=0.020), lower hepatic contrast score (P=0.007) and older age (P=0.009).

CONCLUSION

Delayed time to Hounsfield unit trigger during routine bolus-tracking for CT can indicate reduced heart function and bolus-tracking often does not adequately adjust to provide an optimal portovenous contrast phase in the abdomen in the setting of reduced heart function.

CLINICAL RELEVANCE/APPLICATION

Bolus-tracking can provide data to aid in the diagnosis of reduced heart function; tailored protocols should be made for patients with suspected cardiac dysfunction to ensure that proper contrast phases are obtained in the abdomen.

SSQ08-08 Pancreatic CT Imaging With an Ultra-High Resolution CT Scanner and a New Denoising Reconstruction Algorism Using Deep Learning Technology: Intraindividual Comparative Study with Conventional CT Imaging

Thursday, Dec. 5 11:40AM - 11:50AM Room: S102CD

Participants
Hiromitsu Onishi, MD, Suita, Japan (*Presenter*) Research Grant, Canon Medical Systems Corporation
Masatoshi Hori, MD, Muko, Japan (*Abstract Co-Author*) Nothing to Disclose
Atsushi Nakamoto, MD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Mitsuaki Tatsumi, MD, PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Hideyuki Fukui, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Noriyuki Tomiyama, MD,PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Takashi Ota, MD,PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Kazuya Ogawa, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the image quality of pancreatic CT imaging with an ultra-high resolution (UHR) CT scanner and a new denoising reconstruction algorism using deep learning technology compared with conventional CT imaging.

METHOD AND MATERIALS

Twenty consecutive patients with cystic pancreatic lesions, who underwent follow-up CT examinations with both a UHR CT scanner and a conventional CT scanner, constituted the study population. High resolution CT images with a matrix of 1024 x 1024 and a thickness of 0.25 mm were reconstructed with deep learning reconstruction algorism at the UHR CT scanner. Conventional CT images were reconstructed with a matrix of 512 x 512 and a thickness of 0.5 mm using a hybrid iterative reconstruction algorism. Image noise (standard deviation of CT values) and contrast-to-noise ratio (CNR) were measured and compared between the two CT image sets by using the paired t-test. Subjective image noise, sharpness of structural contour, delineation of the main

pancreatic ducts and cystic lesions, and overall image quality were assessed using a 5-point scale and compared by using the Wilcoxon signed rank test.

RESULTS

Image noise at UHR CT (9.4 ± 1.6) was significantly lower than that at conventional CT (13.0 ± 4.7, P < .01). CNR at UHR CT (12.7 ± 3.7) was significantly higher than that at conventional CT (8.8 ± 3.0, P < .01). Subjective image noise at UHR CT was lower than that at conventional CT images (P < .01). Sharpness, delineation of the main pancreatic duct, and overall image quality at UHR CT were significantly superior to those at conventional CT (P < .01, P < .05, P < .01, respectively). Delineation of the cystic lesions at UHR CT were also superior to those at conventional CT, although the difference did not reach statistical significance (P = .1).

CONCLUSION

Combination of a UHR CT scanner and a denoising reconstruction algorism using deep learning technology can provide high quality pancreatic CT images with less image noise and higher spatial resolution and improve the delineation of anatomical structures compared with conventional CT imaging technique.

CLINICAL RELEVANCE/APPLICATION

Ultra-high resolution CT enhanced by deep learning-based denoising reconstruction algorism may contribute to a precise evaluation of the pancreatic neoplasms due to its excellent image quality.

SSQ08-09 Determining the Use of Water Oral Contrast Based on Visceral Fat Index and Body Mass Index for CT Abdomen Pelvis Exams in the Outpatient Oncology Setting

Thursday, Dec. 5 11:50AM - 12:00PM Room: S102CD

Participants
George M. Cyriac, MD, Tampa, FL (*Presenter*) Nothing to Disclose
Kerry L. Thomas, MD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose
Trevor A. Rose, MD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose
Nainesh Parikh, MD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose
Jin Qi, MD, Tian Jin, China (*Abstract Co-Author*) Nothing to Disclose
Mahmoud Abdalah, PhD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose
Daniel Barnebee, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose
Daniel K. Jeong, MD, Tampa, FL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Assess effect of visceral fat in the CT evaluation of bowel and peritoneum with oral water versus positive density oral contrast in the outpatient oncology setting.

METHOD AND MATERIALS

100 consecutive subjects (54 males median age 64±14 years) had outpatient oncologic follow up CT abdomen pelvis exams with water used as oral contrast and available prior CT with gastrografin/barium. 500ml oral water was given 30 minutes prior to each outpatient CT scan as part of a department patient quality improvement initiative. CT exams were retrospectively evaluated and visceral fat area was segmented and thresholded (-274 to -49HU), at axial L2-3 level using a custom MATLAB (The Mathworks, Natick, MA) script, and divided by body surface area to provide visceral fat index (VFI). Bowel visualization adequacy was scored on a Likert scale (1-4) based on prior research. Confidence in ruling out peritoneal metastases and abscess were each scored on a Likert scale (1-3). Patient satisfaction surveys were obtained rating exam and wait time satisfaction on a Likert scale (1-10). Univariate receiver operating curve analysis was performed on VFI and body mass index (BMI) to predict excellent bowel visualization (Likert 1) and definitive confidence in ruling out peritoneal metastases and abscess (Likert 1). Mann Whitney U test was used to compare continuous variables, and Pearson correlation coefficient was used for correlation.

RESULTS

CT water oral contrast bowel visualization scores:1 (n=83), 2 (n=14), 3 (n=3), 4(n=0). CTs scored 1 had higher VFI 68±36 cm/m2 than CTs scored >=2; 17±16 cm/m2, p<.00001 and higher BMI 30±7 vs. 23±2 respectively p<.00001. Higher VFI was predictive of (Likert 1) excellent bowel visualization with AUC 0.91 (95%CI 0.84-0.98) p<0.001, while higher BMI had AUC 0.89 (95%CI 0.83-0.96) p<0.001. VFI threshold >= 23.76 cm/m2 sensitivity 0.92 and specificity 0.77 while BMI threshold >= 24 sensitivity 0.89 and specificity 0.82. BMI had only moderate correlation with visceral fat, R=0.62, p<.00001. Patient satisfaction was significantly higher with water compared to positive density oral contrast p<0.00001.

CONCLUSION

Our results suggest VFI >23.76 cm/m2 and BMI >24.37 are predictive of adequate CT bowel and peritoneal evaluation with oral water contrast. VFI had better diagnostic accuracy than BMI in predicting optimal CT evaluation, yet these are only moderately correlated.

CLINICAL RELEVANCE/APPLICATION

There is benefit to including VFI in addition to BMI when determining which CTs will benefit most from receiving positive density oral contrast versus water. Additionally, oral water significantly improves patients' experience compared to positive density contrast.

SSQ09

Genitourinary (Imaging of Pregnancy)

Thursday, Dec. 5 10:30AM - 12:00PM Room: E351

GU MR OB

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Jeanne M. Horowitz, MD, Chicago, IL (*Moderator*) Nothing to Disclose
Jin Yamamura, MD, Hamburg, Germany (*Moderator*) Nothing to Disclose
Priyanka Jha, MBBS, San Francisco, CA (*Moderator*) Nothing to Disclose

Sub-Events

SSQ09-01 The Placenta Accreta Spectrum (PAS) and MRI: Preliminary Findings in High-Risk Pregnancies and Associated Need for Cesarean Hysterectomy

Thursday, Dec. 5 10:30AM - 10:40AM Room: E351

Participants
Ambereen A. Khan, MD, Dallas, TX (*Presenter*) Nothing to Disclose
Haley R. Clark, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Quyen N. Do, PhD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Yin Xi, PhD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Diane M. Twickler, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

diane.twickler@utsouthwestern.edu

PURPOSE

To evaluate MR findings described in PAS and identify those significantly associated with PAS severe enough to result in cesarean hysterectomy. Interobserver agreement was also assessed.

METHOD AND MATERIALS

We performed an IRB approved retrospective review of 56 pregnancies, from our 2006-2019 MR database referred for clinically suspected PAS. After randomization, single shot fast spin echo, balanced steady state free precession and T1-weighted sequences were independently evaluated by two reviewers, one expert and one with 4 years MR experience, after review of 10 test training cases. Evaluation of 11 variables was performed, including bladder-serosal interface interruption, bridging vessels, placental texture near the scar, presence of complete or low-lying previa, radiology impression of presence or absence of invasion and degree, bulge characteristics, dark linear bands or lacunae, and cervical varices. To assess readers agreement, simple kappa and prevalence adjusted bias adjusted kappa(PABAK) were used. Univariate logistic regressions were used to assess the association with cesarean hysterectomy.

RESULTS

From the study, 6 of 11 characteristics assessed by the expert were significantly associated($p<0.05$) with the outcome of hysterectomy:interrupted bladder-serosal interface(0.007), serosal bridging vessels(0.005), radiologist prediction of invasion degree(0.002) and presence(0.02), inhomogeneous texture near scar(0.003) and low-lying or placenta previa(0.0005). Dark linear band quantification, cervical varices size, lacunae and bulge presence or size were not significant. The reader agreement was fair to moderate according to PABAK. Simple Kappa was constantly underestimated due to unbalance in the dataset.

CONCLUSION

An expert reader was significantly predictive of presence and degree of invasion with MRI in women whose placental invasion was severe enough to result in cesarean hysterectomy. Other significant findings included bridging vessels, bladder serosal interruption, low-lying or complete previa, and inhomogeneous texture near scar. However, in this small series, interobserver agreement was only fair to moderate, suggesting the need for better-defined variables assessed with more MRI cases and larger training datasets.

CLINICAL RELEVANCE/APPLICATION

Several MR findings were associated with PAS severe enough to result in cesarean hysterectomy, but interobserver agreement between radiologists remains less than optimal.

SSQ09-02 MRI Diagnosis of Placenta Accreta Spectrum Disorder

Thursday, Dec. 5 10:40AM - 10:50AM Room: E351

Participants
Sherelle L. Laifer-Narin, MD, Englewood, NJ (*Presenter*) Nothing to Disclose
Mirella Mourad, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Fady Khoury Collado, MD, New York , NY (*Abstract Co-Author*) Nothing to Disclose
Leslie Moroz, New York, NY (*Abstract Co-Author*) Nothing to Disclose

Chia-Ling Nhan-Chang, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

sll2122@cumc.columbia.edu

PURPOSE

To evaluate the accuracy of magnetic resonance imaging in diagnosing abnormal placentation.

METHOD AND MATERIALS

A retrospective review of placental MRI exams from December 2004 to January 2019 was performed. MRI reports were reviewed for suspicion of abnormal placentation. Criteria suggesting pathology included the presence of dark intraplacental bands, heterogeneous signal intensity, thick nodular contour along the urinary bladder surface, uterine bulging into the bladder, and loss of the myometrial margin with attention paid to parametrial regions. MRI was considered positive even if only one of these criteria were present. Comparison was made with findings at either delivery, operation, and pathology reports.

RESULTS

478 MRI exams were reviewed. 279 exams were negative both on MRI and delivery/pathology. 13 exams interpreted as normal on MRI underwent hysterectomy with pathology demonstrating placenta accreta. 148 exams were interpreted as positive for abnormal placentation, and were diagnosed as accreta, increta, or percreta on delivery/pathology. 38 cases interpreted as positive on MRI had normal placental delivery and pathology. MR diagnosis of abnormal placentation had a sensitivity of 92%, specificity of 88%, PPV of 80%, NPV of 96%, and an accuracy of 89%.

CONCLUSION

Placental adhesive spectrum disorder is a significant cause of maternal morbidity and mortality. Detailed imaging provides important information critical for the management of patients with this disorder. Prenatal MRI has a high degree of accuracy for the diagnosis of placenta adhesive spectrum disorder, specifically the myoinvasive forms. MRI provides detailed topographic information and is a critical component in the workup of patients at high risk for this condition.

CLINICAL RELEVANCE/APPLICATION

Advance knowledge of the diagnosis of abnormal placentation allows for predelivery operative planning and management. With this information, a multidisciplinary approach to this potentially catastrophic condition can be put into place to prevent significant morbidity and mortality.

SSQ09-03 Abnormal Fetal Placental Vasculature on MRI of Patients at High Risk for Placenta Accreta Spectrum Disorders: Analysis of 130 Cases

Thursday, Dec. 5 10:50AM - 11:00AM Room: E351

Participants
Charis Bourgioti, MD, Athens, Greece (*Presenter*) Nothing to Disclose
Anastasia Konstantinidou, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Konstantina Zafeiropoulou, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Chara Tzavara, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Stavros Fotopoulos, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
George Daskalakis, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Maria Evangelia Nikolaidou, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Marianna Theodora, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Lia A. Moulopoulos, MD, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

charisbourgioti@gmail.com

PURPOSE

To investigate the association of abnormal intraplacental (fetal) vessels on MRI of patients with placenta accreta spectrum (PAS) disorders with extent of invasiveness and poor clinical outcome

METHOD AND MATERIALS

Between 3/2016-2/2019, 130 high-risk gravid patients for abnormal placentation were referred for dedicated prenatal MRI (mean age:34.7 years, mean gestational age: 32.5 weeks); all patients underwent C-section within 6 weeks from MRI. Intraoperative/pathological findings confirmed the presence of PAS in 101/130 patients (percreta: n=58, creta/increta: n=43). 48/101 patients with PAS underwent hysterectomy, whereas in 44/101 patients, bladder repair was performed. All MRIs were reviewed by consensus by two expert radiologists after completion of the study for the presence of at least one long (>2cm), intraplacental flow void structure originating from the chorionic plate, crossing the placental parenchyma and reaching the basal plate, with paucity of branching along its course (stripped fetal vessel). Presence of stripped fetal vessels and their caliper were statistically tested for any association with degree of invasiveness and peripartum events including intraoperative blood loss, operation time, and need for hysterectomy or bladder repair.

RESULTS

There was a significant association ($p<0.001$) between presence of stripped fetal vessels with number of prior C-sections, presence of placenta percreta, hysterectomy and bladder repair treatment. Subjects with stripped fetal vessels on MRI, had significantly greater blood loss (1514.2.8vs382.8ml, $p<0.001$) and increased delivery times (145.2vs60.3min, $p<0.001$). The diameter of stripped fetal vessels was greater in patients with >=2 prior C-sections (5.2vs4.3mm,$p<0.001$), placenta percreta (5.3vs3.6mm,$p<0.001$), major bladder repair (6.4vs3.6mm,$p<0.001$) and caesarian hysterectomy (5.5vs3.5mm,$p<0.001$); additionally, stripped fetal vessel diameter was positively and significantly associated with intraoperative blood loss and duration of delivery.

CONCLUSION

The presence and extent of abnormal fetal intraplacental vasculature seems to be related with PAS invasiveness and adverse

The presence and extent of abnormal fetal intraplacental vasculature seems to be related with PAS invasiveness and adverse peripartum events.

CLINICAL RELEVANCE/APPLICATION

Accurate prenatal identification of aggressive forms of PAS may optimize treatment planning, improving patients' clinical outcome.

SSQ09-04 Apparent Diffusion Coefficient Differences in Twins of Monochorionic Diamniotic Pregnancy Complicated by Twin-To-Twin Transfusion Syndrome

Thursday, Dec. 5 11:00AM - 11:10AM Room: E351

Participants
Michael Aertsen, MD, Leuven, Belgium (*Presenter*) Nothing to Disclose
Isabel Couck, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Frederik De Keyzer, Leuven , Belgium (*Abstract Co-Author*) Nothing to Disclose
Steven Dymarkowski, MD, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Liesbeth Lewi, MD, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

michael.aertsen@uzleuven.be

PURPOSE

To evaluate the difference in apparent diffusion coefficient (ADC) of the placental parenchyma between donor and receptor of monochorionic diamniotic (MCDA) pregnancies complicated by twin-to-twin transfusion syndrome (TTTS) and compare those values with a control group of uncomplicated MCDA pairs.

METHOD AND MATERIALS

Prospective monocentric cohort study. Magnetic resonance (MR) was performed prior to surgery in TTTS and electively planned around 20 weeks (w) of gestation age (GA) for the uncomplicated MCDA cohort. Regions of interest (ROIs) for ADC calculations were placed at the cord insertion of each twin or as close as possible in velamentous insertion. Another ROI was drawn at the border of the placenta away from the presumed vascular equator. Intrapair ADC differences for the different ROIs (central (c) and peripheral (p), resp.) were compared between donor and recipient (Wilcoxon-signed rank test). GA at time of MR and intertwin ADC differences were compared between TTTS and MCDA twins (Mann-Whitney test).

RESULTS

71 pregnancies were included in the analysis. Median GA at the time of MRI was 21 w (range 18-27) in the uncomplicated (N=47) and 21 w (range 18 - 29) in the TTTS cohort (N=24) (p=.9). Intrapair ADC differences for the different placental regions and the difference in mean ADC (=(cADC + pADC)/2) of both regions in TTTS are summarized in the table. Between TTTS and MCDA cohorts, central ADC measurements in the donor (168 x10^-5 mm^2/s; 159 - 182 x10^-5 mm^2/s) and smallest twin (179 x10^-5 mm^2/s; 166-197 x10^-5 mm^2/s), respectively, differed significantly (p=.02), whereas no differences were observed between the receptor and larger twin (p=.6). cADC difference between the donor and receptor in TTTS were also larger than those in uncomplicated MCDA pregnancies (p=0.04).

CONCLUSION

In TTTS, central ADC measurements are helpful to differentiate receptor and donor insertion compared to peripheral ADC calculations. Furthermore, from an ADC point of view, the receptor seems to exhibit normal values, with the donor behaving significantly different.

CLINICAL RELEVANCE/APPLICATION

Diffusion weighted imaging has demonstrated differences in pregnancies with abnormal placental function. We want to analyze the added value of ADC measurements in TTTS twins prior to surgery.

SSQ09-05 The Value of MRI in Predicting Intraoperative Massive Hemorrhage during Hysteroscopic Treatment of Cesarean Scar Pregnancy

Thursday, Dec. 5 11:10AM - 11:20AM Room: E351

Participants
Piaoe Zeng, Beijing, China (*Presenter*) Nothing to Disclose
Yan Zhou, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Jianyu Liu, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To explore the value of MRI in predicting intraoperative massive hemorrhage during hysteroscopic treatment for cesarean scar pregnancy

METHOD AND MATERIALS

A retrospective analysis of 77 first trimester CSP patients who were diagnosed by MRI and confirmed by operation and pathology from January 20 to December 2018. According to the intraoperative blood loss, CSP patients were divided into two groups. The Inclusion criteria of intraoperative massive bleeding group: intraoperative blood loss >=200ml, by hysteroscopic treatment with or without preoperative bilateral uterine artery embolization or medication; The Inclusion criteria of non-massive bleeding group: intraoperative blood loss <200ml, by single hysteroscopic treatment without preoperative bilateral uterine artery embolization or medication. The clinical data and MRI features were compared between the two groups. The multivariate logistic regression analysis was used to analyze the risk factors of CSP intraoperative massive hemorrhage. The ROC curve was used to evaluate the efficacy and optimal threshold

RESULTS

Between the intraoperative massive hemorrhage group (11 cases) and non- massive hemorrhage group (66 cases), the gestational

Between the intraoperative massive hemorrhage group (11 cases) and non-massive hemorrhage group (30 cases), the gestational age, the maximum diameter of the gestational sac, the depth of the gestational sac, and LUST were significantly different($p < 0.05$). There were no significant differences in age, number of cesarean delivery, interval between current CSP and last cesarean, number of abortions, preoperative ß-HCG, CSP types, gestational sac or uterine hemorrhage between the two groups ($P>0.05$). Multivariate logistic regression analysis showed that only the lower uterus scar thickness was significantly different ($P=0.034$,OR=2.757, 95% CI=1.082-7.028). The ROC curve analysis showed that the AUC of the gestational age, the maximum diameter of the gestational sac, the depth of the gestational sag and LUST were 75.0%, 82.1%, 85.9%, and 91.5%, respectively. The best predictor is the LUST and the optimal cutoff value is 2.2mm, the diagnostic sensitivity, specificity, and the Youden index are 90.9%, 74.2%, and 65.2%, respectively.

CONCLUSION

Preoperative MRI can accurately predict the risk of major bleeding during cesarean section scar pregnancy and guide treatment

CLINICAL RELEVANCE/APPLICATION

To inverstigate risk factors of intraoperative excessive haemorrhage during during hysteroscopic treatment of cesarean scar pregnancy, and to guide treatment.

SSQ09-06 Role of Placental Elastography for Prediction of Preeclampsia in Early Second Trimester

Thursday, Dec. 5 11:20AM - 11:30AM Room: E351

Participants
Rajkumar Meena, MBBS, New Delhi, India (*Presenter*) Nothing to Disclose
Amita Malik, MD, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Madhuvendra S. Narwaria, MBBS, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

rajkumarvmmc@gmail.com

PURPOSE

To evaluate the role of shear wave placental elastography (SWE) in pre-clampsia (PE) and to give a cut off value of elasticity that would help in prediction of pre-eclampsia in early second trimester (14-20 weeks of period of gestation).

METHOD AND MATERIALS

A total of 230 patients who presented in obstetric OPD between 14-20 weeks of gestation and were willing to have delivery in our instituition were enrolled in the study. After taking detailed obstetric history, gray scale obstetric ultrasound with doppler scan SWE was performed. Mean value of elasticity was taken in every patient; and data were analysed to give the best cut-off value that would determine the diagnosis of PE. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy for prediction of PE were calculated based on SWE measurements. Statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0. A p value of <0.05 was considered statistically significant.

RESULTS

There was a statically significant difference in the value of elasticity in normal patients and in those who developed PE. The study concluded cut-off value of 2.9667 kPa for prediction of pre-eclampsia, with a sensitivity of 92%, specificity of 91.71%, PPV of 57.5% and NPV of 98.9% in a statistically significant manner with p-value of <0.05.

CONCLUSION

Placental stiffness is higher in patients who develop pre-eclampsia during pregnancy. It can be quantitatively measured by shear wave elastography values for prediction of pre-eclampsia in early second trimester.

CLINICAL RELEVANCE/APPLICATION

Placental elastographic values were statistically significant and higher in the patients developing preeclampsia in later pregnancy. Shear wave elastography can help us to diagnose this life threatening condition in early second trimester before the clinical appearance of preeclampsia, and act to provide early treatment and antenatal care to reduce the devastating maternal as well as fetal outcomes.

SSQ09-07 Differences in Brain Development between Fetuses with Intrauterine Growth Restriction and Normally-Grown Group Assessed by Fetal MRI

Thursday, Dec. 5 11:30AM - 11:40AM Room: E351

Participants
Behnaz Moradi, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Mahboobeh Shirazi, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Nazanin Seyed Saadat, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Zohreh Alibeigi Nezhad, MD, Tehran , Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Hasan Hashemi, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Masoumeh Gity, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Hossein Ghanaati, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Mohammad Ali Kazemi, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Maryam Rahmani, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Ghazaleh Arabkheradmand, MS, Chicago, CA (*Abstract Co-Author*) Nothing to Disclose
Farzaneh Fattahi Masrour, MD, Hartford, CT (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

b.moradi80@gmail.com

PURPOSE

To evaluate different features of brain development by Magnetic Resonance Imaging (MRI) in intrauterine growth restricted (IUGR) fetuses compared to normally-grown fetuses.

METHOD AND MATERIALS

3T MRI was performed in 42 IUGR and 28 nearly age-matched normally-grown fetuses using T2-weighted half Fourier acquisition single-shot turbo spin echo (HASTE). Cortical thickness was assessed in 4 brain regions (insula, frontal, occipital and temporal) and corrected by biparietal diameter/2. Also whole brain area (WBA) at the level of cavum septum pellucidum and area of 6 brain regions (frontal, temporal, occipital, cerebellum, midbrain and pons) were evaluated and corrected by WBA and compared between the two groups. Any cases with brain structural anomaly were excluded. All fetuses were followed until birth.

RESULTS

No significant differences were found about maternal characteristic and fetal gestational age between two groups. IUGR fetuses had significantly lower birth weight (2377 g vs 2965 g in control group). Brain signal was normal in all cases. The corrected thickness of cortex was significantly thinner in insula and temporal lobes in IUGR fetuses compared to control group (0.034 vs 0.043 and 0.036 vs 0.047 respectively, P value of < 0.05), but there was no significant different in frontal and occipital lobes. IUGR fetuses has significantly smaller WBA. The assessed corrected area of brain regions was not significantly different between groups except the corrected area of cerebellum which was smaller in normally-grown fetuses (0.147 vs 0.130, P value of < 0.05). During follow up, there was only one still birth in IUGR group.

CONCLUSION

IUGR fetuses had a significantly thinner Insular and temporal lobe cortex and smaller WBA. Among different brain regions, cerebellum was less affected by growth restriction.

CLINICAL RELEVANCE/APPLICATION

Growth restriction significantly affects brain development and the fetal MRI has a potential value to assess the various aspects of this effect.

SSQ09-08 Fetal Anterior Abdominal Wall Thickness (FAAWT): A Promising Parameter to Predict Fetal Macrosomia in Pregnancies with Gestational Diabetes

Thursday, Dec. 5 11:40AM - 11:50AM Room: E351

Participants
Ashish Bansal, MBBS, New Delhi, India (*Presenter*) Nothing to Disclose
Brijbhushan Thukral, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

ashish_bansal1820@yahoo.com

PURPOSE

To evaluate the correlation of fetal anterior abdominal wall thickness and other standard fetal biometric parameters between 36-39 weeks of gestation with neonatal birth weight in pregnancies with gestational diabetes.

METHOD AND MATERIALS

This is a prospective cohort study conducted in a tertiary care Centre with institutional ethics approval. One hundred singleton pregnancies with gestational diabetes mellitus (GDM) between 36-39 weeks of gestation were included after informed written consent. Exclusion criteria comprised of women with diseases known to affect fetal growth, uncertain gestational age, fetuses with congenital anomalies and intrauterine growth restriction. Standard fetal biometry parameters including Biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), femur length (FL) and estimated fetal weight (EFW) were measured. Fetal anterior abdominal wall thickness (FAAWT) was measured ultrasonographically in AC view. Actual neonatal birth weights were recorded. Birth weight >90th centile (INTERGROWTH-21st charts) was considered as a cut-off for macrosomia. Statistical analysis was done and 95% confidence level was considered significant for all tests.

RESULTS

16 out of 100 neonates were found to be macrosomic (16%). Third trimester mean FAAWT was significantly higher in macrosomic babies (6.36±0.5 mm) as compared to non-macrosomic babies (5.54±0.61 mm) (p-value <0.0001). A FAAWT >6 mm (ROC curve derived) provided sensitivity of 87.5% (95% CI 61.7-98.4), specificity of 75% (95% CI 64.4-83.8), PPV of 40% (95% CI 23.9-57.9) and NPV of 96.9% (95% CI 89.3-99.6) for prediction of macrosomia. While other standard fetal biometric parameters (BPD, HC, AC, FL and EFW) did not correlate well with actual birth weight in neonates with macrosomia in GDM patients, only FAAWT was found to have statistically significant correlation (correlation coefficient of 0.626, p-value 0.009).

CONCLUSION

The FAAWT was the only fetal sonographic parameter to have significant correlation with neonatal birth weight in macrosomic neonates of GDM mothers. We found a high sensitivity (87.5%), specificity (75%) and NPV (96.9%) which suggests that FAAWT <6 mm can quite confidently rule out macrosomia in pregnancies with GDM.

CLINICAL RELEVANCE/APPLICATION

FAAWT is a promising and easily measurable parameter to rule out fetal macrosomia in late third trimester in pregnancies with GDM, thus, allowing proper obstetric management .

SSQ09-09 Three-Dimensional Fetal MRI Visualization of Cerebellar White Matter Tracts

Thursday, Dec. 5 11:50AM - 12:00PM Room: E351

Participants
Gregor O. Dovjak, MD, Vienna, Austria (*Presenter*) Nothing to Disclose

Peter C. Brugger, MD, PhD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Gerlinde Gruber, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Daniela Prayer, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Gregor Kasprian, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Cerebellar white matter connectivity plays a crucial role in affective, cognitive and motor processing. Prenatal diffusion tensor imaging (DTI) can non-invasively visualize major white-matter tracts of the fetal forebrain. We retrospectively assessed the success rate of visualizing the superior, middle and inferior cerebellar peduncle (SCP, MCP and ICP) as well as transverse pontine fibers (TPF) in the third trimester.

METHOD AND MATERIALS

Cases with DTI sequences (b-value of 700 s/mm², 16 gradient encoding directions) covering the cerebellum were retrospectively assessed. Deterministic tractography was performed using the Philips IntelliSpace software based on at least two regions of interest. A visibility score was calculated as the fraction of visible tracts divided by the amount of potentially visible tracts.

RESULTS

14 Fetal MRI were assessed (9 with 1.5T and 5 with 3T MRI) with 38.51±1.00 GW (mean±standard deviation) at 1.5 T and 35.80±1.20 at 3T. There was no significant difference (p=.66) between the scores of 1.5T (0.69±0.27) and 3T (0.74±0.17). SCP could be depicted in 71% of cases, MCP in 71%, ICP in 55% and TPF in 93%.

CONCLUSION

Prenatal tractography of cerebellar white matter tracts is feasible in the third trimester and shows excellent correlation with the respective anatomy. Fetal MR based DTI thus may improve the characterization of infratentorial malformations during the third trimester, when ultrasound is limited by acoustic shadowing at the skull base.

CLINICAL RELEVANCE/APPLICATION

Fetal MR tractography with diffusion tensor imaging can demonstrate cerebellar white matter tracts in the third trimester of pregnancy. This could improve the characterization of infratentorial malformations prenatally.

Printed on: 10/29/20

SSQ10

Genitourinary (Renal Masses: Artificial Intelligence, Machine Learning, and Texture)

Thursday, Dec. 5 10:30AM - 12:00PM Room: E352

AI GU

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Atul B. Shinagare, MD, Boston, MA (*Moderator*) Consultant, Arog Pharmaceuticals, Inc; Consultant, VirtualScopics, Inc
Steven S. Raman, MD, Santa Monica, CA (*Moderator*) Consultant, Johnson & Johnson; Consultant, Bayer AG; Consultant, Merck & Co, Inc; Consultant, Amgen Inc; Consultant, Profound Medical Inc
Shabnam B. Grover, MD,DMRD, New Delhi, India (*Moderator*) Nothing to Disclose

Sub-Events

SSQ10-01 Radiomics Panels of CT-Based Shape and Texture Metrics Robustly Discriminate Benign from Malignant Renal Masses

Thursday, Dec. 5 10:30AM - 10:40AM Room: E352

Participants
Felix Y. Yap, MD, Pismo Beach, CA (*Abstract Co-Author*) Nothing to Disclose
Steven Cen, PhD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Darryl Hwang, PhD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Bino A. Varghese, PhD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Xiaomeng Lei, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Christopher Lau, BS, West Covina, CA (*Abstract Co-Author*) Nothing to Disclose
Lindsay Yang, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Austin Fullenkamp, BS, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Simin Hajian, MD, Alhambra, CA (*Abstract Co-Author*) Nothing to Disclose
Maria Elena Rivas, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Brian D. Quinn, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Megha N. Gupta, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Inderbir Gill, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Vinay A. Duddalwar, MD,FRCR, Los Angeles, CA (*Abstract Co-Author*) Research Grant, Samsung Electronics Co, Ltd Advisory Board, DeepTek Consultant, Radmetrix

For information about this presentation, contact:

Vinay.Duddalwar@med.usc.edu

PURPOSE

Differentiating benign from malignant renal masses using enhancement alone can be difficult. Additional imaging metrics (e.g. tumor shape and texture) have been shown to improve discrimination. Using a radiomics framework utilizing machine learning to quantitatively analyze shape and texture features of renal tumors in three dimensions, we tested its ability to objectively and robustly distinguish between benign and malignant renal masses on imaging. We also assessed the necessity of shape metrics in the prediction model.

METHOD AND MATERIALS

Routine standard-of-care computed tomography (CT) images of 485 patients with 291 (60%) malignant and 194 (40%) benign masses diagnosed between 2010 and 2015 were segmented. Point coordinates of tumor contours in all axial slices were input into a MATLAB (MathWorks) algorithm. 33 shape metrics and 760 texture metrics were calculated per tumor. We used Random Forest (SAS HPFOREST) for algorithm development, and 10-fold cross validation to obtain robust classification accuracy. Area under the curve (AUC) was used to assess robust discrimination power based on predicted probability from each fold of testing data. Sensitivity analysis was conducted by eliminating data with different missing patterns. SAS 9.4 was used for all data analysis.

RESULTS

In the cohort of 4-phase studies (n = 283), an AUC of 0.65 in the independent testing subset was achieved by 33 shape metrics alone, whereas an AUC of 0.69 was achieved when adding 760 texture metrics. Sensitivity analysis conducted in different phases with complete data also demonstrated similar results. Shape metrics appeared in top 3% variable of importance (VOI), featuring most prominently in the corticomedullary phase, with the sagittal convex hull perimeter ratio (CHP) consistently being a high-performing shape metric across all phases.

CONCLUSION

Robust prediction accuracy by shape alone and high ranking of VOI from shape in the combined model signify that shape analysis should not be ignored or underestimated in distinguishing benign from malignant tumors. A future radiomics platform powered by machine learning should therefore combine both shape and texture metrics rather than utilize them in isolation from each other.

CLINICAL RELEVANCE/APPLICATION

Combining both shape and texture metrics on a radiomics platform utilizing machine learning facilitates the differentiation of benign from malignant renal tumors on routine standard-of-care imaging.

SSQ10-02 Machine Learning of Multi-Phase CT Texture Features to Differentiate Clear Cell Renal Cell Carcinoma from Oncocytic Renal Neoplasms

Thursday, Dec. 5 10:40AM - 10:50AM Room: E352

Participants
Kathleen Nguyen, MD, Ottawa, ON (*Presenter*) Nothing to Disclose
Rebecca Thornhill, PhD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Nick D. James, PhD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Matthew D. McInnes, MD, PhD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Nicola Schieda, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

nschieda@toh.ca

PURPOSE

Among common subtypes of renal masses, differentiation of clear cell renal cell carcinoma (cc-RCC) from oncocytic neoplasms is limited at CT and MRI. This study evaluates the diagnostic accuracy of machine learning (ML) of multi-phase CT texture analysis (TA) features to differentiate cc-RCC from oncocytic tumors.

METHOD AND MATERIALS

With IRB approval, we compared 81 consecutive cc-RCC and 66 consecutive oncocytic tumors (25 chromophobe RCC and 41 oncocytomas) with multi-phase CT performed from 2012-2018. A radiologist manually segmented tumors and second order TA features were extracted from non-contrast enhanced CT(NECT), corticomedullary (CM) and nephrographic (NG) contrast-enhanced CT(CECT). TA features were inputted into a ML Bayesian optimization algorithm and tested using 10-fold randomly stratified cross-validation. The ML system uses Gaussian processes with a heuristic technique to propose models evaluated by a fitness score to achieve the highest accuracy.

RESULTS

There was no difference in age, gender or size of tumors ($p>0.05$). Comparing the three CT phases, NG phase CECT TA achieved the highest discriminatory ability. The optimized ML algorithm which achieved the highest accuracy of classification at NG phase CECT incorporated various texture features most importantly: skewness, mean and RNLU. The area under the ROC curve (standard error) with optimal sensitivity/specificity for diangosis of cc-RCC was: 0.822 (0.087) and 71.3/81.4%. Statistically significant texture features compared between groups differed from NECT to CM and NG phase CECT; however, combining the most important features between phases did not improve accuracy of classification compared to NG phase analysis alone.

CONCLUSION

Machine learning of nephrographic phase CECT second order texture features achieved moderate accuracy to differentiate between clear cell RCC and oncocytic (chromophobe RCC + renal oncocytoma) neoplasms and outperformed assessment at unenhanced CT, corticomedullary phase CECT and combined three phase assessment.

CLINICAL RELEVANCE/APPLICATION

Machine learning of nephrographic phase enhanced CT texture features may improve classification of solid renal masses, in particular, moderate accuracy was achieved for the difficult comparison of clear cell RCC to oncocytic tumors where conventional CT/MRI evaluation is limited.

SSQ10-03 Machine Learning Derived Decision Tree to Identify Renal Mass Histological Type Based on CT Texture Analysis

Thursday, Dec. 5 10:50AM - 11:00AM Room: E352

Participants
Raghunandan Vikram, MBBS, FRCR, Bellaire, TX (*Abstract Co-Author*) Nothing to Disclose
Diana Kaya, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Marwa M. Zaid, FFR(RCSI), Sugar Land, TX (*Presenter*) Nothing to Disclose
Behrang Amini, MD, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

rvikram@mdanderson.org

PURPOSE

Many renal masses share overlapping imaging features on contrast enhanced CT. In addition, subjective assessment of imaging features suffer from not insignificant interoberver variability. We created a machine learning derived decision tree matrix to differentiate subtypes of renal masses based on extracted quantitative texture features from CT images.

METHOD AND MATERIALS

Multi-phase contrast enhanced CT (CECT) including Non contrast (NC), Corticomedullary (CM), nephrographic (N) and excretory (E) of 268 patients. 93 had papillary RCC (prcc), 105 clear cell RCC (crcc), 43 Oncocytoma (oc) and 27 lipid poor AML(AML) . The CT images were subject to filtration-histogram based CT Texture analysis (CTTA) using a commercially available research software (TexRAD Ltd, www.texrad.com, part of Feedback Plc, Cambridge, UK). Using the DICOM images, filtration step extracted texture features using different spatial scale filters corresponding to fine, medium and coarse texture scales followed by histogram quantification: Mean gray-level pixel intensity, Entropy, Standard-Deviation (SD), Mean of positive pixels (MPP), Kurtosis and Skewness were derived. CTTA data obtained from excretory phase images (n=208) were used to build a decision tree for

classification of subtypes using a recursive partitioning and regression tree algorithm in R, employing a 10-fold cross validation technique and a cost matrix favoring detection of crcc due to its relative poor prognosis.

RESULTS

The decision tree is shown in the attached figure various texture features assessed using various filters. The sensitivity for detecting AML, crcc, oc and prcc was 0.3, 0.76, 0.68 and 0.71; specificity 0.94, 0.81, 0.93 and 0.87 and Accuracy was 0.75, 0.70, 0.58 and 0.76

CONCLUSION

A machine learning derived decision tree classification algorithm can be applied on CT derived texture features to identify different histological subtypes of renal masses

CLINICAL RELEVANCE/APPLICATION

A machine learning derived decision tree classification of renal masses based on quantitatively derived textural features may be clinically relevant in triaging patients for conservative versus aggressive management.

SSQ10-04 CT Texture Predicts Metastatic RCC Response to Anti-Angiogenic Therapy

Thursday, Dec. 5 11:00AM - 11:10AM Room: E352

Participants
Andrew D. Smith, MD, PhD, Birmingham, AL (*Abstract Co-Author*) CEO, AI Metrics LLC ; Owner, AI Metrics LLC ; CEO, Radiostics LLC; Owner, Radiostics LLC; CEO, Liver Nodularity LLC ; Owner, Liver Nodularity LLC ; Research Grant, General Electric Company; Speaker, Canon Medical Systems Corporation; Speaker, AlgoMedica, Inc
Edward Florez, PhD, Jackson, MS (*Abstract Co-Author*) Nothing to Disclose
Judd M. Storrs, PhD, Jackson, MS (*Abstract Co-Author*) Consultant, ABSIST LLC
Asser Abou Elkassem, Birmingham, AL (*Presenter*) Nothing to Disclose
Antoine Saillant, Somerset, United Kingdom (*Abstract Co-Author*) Employee, Feedback PLC
Balaji Ganeshan, PhD, London, United Kingdom (*Abstract Co-Author*) Research partner & Director, Feedback Medical Ltd; Research partner & CEO, TexRAD Ltd; Director, Stone Checker Software Ltd;

For information about this presentation, contact:

andrewdennissmith@uabmc.edu

PURPOSE

The objective of this study was to quantify initial changes in CT texture to predict progression-free survival (PFS) in patients with metastatic renal cell carcinoma (RCC) treated with anti-angiogenic therapy.

METHOD AND MATERIALS

For this retrospective post-hoc secondary analysis of a prospective phase III trial, adult patients with metastatic RCC treated with sunitinib were included (N=275). Up to 5 target lesions were segmented using freeform regions-of-interest on 2D axial images on the baseline and initial post-therapy CT studies using eMASS software (eMASS LLC, Hoover, AL), to derive change in tumor length and vascular tumor burden (VTB). The segmentations were then processed using TexRAD software (Feedback Medical Ltd., Cambridge, UK) which used a CT texture filtration-histogram technique. A total of 6 texture parameters were measured at 6 filtration levels for a total of 36 texture/filtration parameters. Initial changes in CT texture were associated with PFS using univariate Kaplan Meier survival analysis (log-rank test). Multivariate Cox-proportional analysis was used to assess the independence of CT texture from other imaging biomarkers.

RESULTS

Median PFS of the cohort was 1.1 years. An increase in CT texture at the fine to medium texture scales were associated with shorter PFS (fine: SD, p=0.001; Entropy, p<0.001; medium: Entropy, p=0.001). A multivariate Cox model indicated that a change in fine texture (SD: HR=1.4, 95%CI: 1.0-1.9, p=0.033), tumor length (HR=1.8, 95%CI: 1.1-2.7, p=0.010) and VTB (HR=3.1, 95%CI: 2.0-4.7, p<0.001) were independent predictors of PFS.

CONCLUSION

Quantitative changes in CT texture on initial post-therapy CT images are predictive of PFS and independent of changes in tumor length and vascular tumor burden in patients with metastatic RCC treated with anti-angiogenic therapy.

CLINICAL RELEVANCE/APPLICATION

Change in tumor texture on CT can be quantified with no additional radiation or patient cost and has the potential to serve as a predictive biomarker of response to targeted therapy in patients with metastatic RCC.

SSQ10-05 Automated Detection of Renal Ultrasound Abnormalities Using Deep Learning

Thursday, Dec. 5 11:10AM - 11:20AM Room: E352

Participants
William Marshall, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Hersh Sagreiya, MD, Palo Alto, CA (*Abstract Co-Author*) Nothing to Disclose
Jared Dunnmon, PhD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Daniel L. Rubin, MD, Stanford, CA (*Abstract Co-Author*) Consultant, F. Hoffmann-La Roche Ltd
Matthew P. Lungren, MD, Palo Alto, CA (*Abstract Co-Author*) Advisor, Nines AI; Shareholder, Nines AI; Advisor, SegMed; Shareholder, SegMed; Advisor, Bunker Hill ; Shareholder, Bunker Hill
Bhavik N. Patel, MD, Fremont, CA (*Presenter*) Speakers Bureau, General Electric Company; Research Grant, General Electric Company

For information about this presentation, contact:

sagreiya@stanford.edu

sagreiya@stanford.edu

PURPOSE

To develop a deep learning model that detects abnormalities on renal ultrasound examinations, as well as the presence of cystic lesions.

METHOD AND MATERIALS

This IRB-approved, HIPAA-compliant single center retrospective study involved 2,240 renal ultrasound examinations comprising 108,257 images. Scans were performed on Siemens Acuson Sequoia, GE Logiq E9, Siemens Acuson S2000, and ATL HDI 5000. Each examination was labeled by a board-certified radiologist for normal vs. abnormal and for the presence of cystic lesions. 10% of examinations were held out as a separate test set, whose ground truth labels were by consensus of two out of three board-certified radiologists. Scanner types were equally distributed across training and test sets, as well as normal and abnormal classes. The number of images per exam was balanced between abnormal and normal classes. After image pre-processing and data augmentation, a basic DenseNet-121 was investigated as well as four models with refinements over the DenseNet base, including an instance-aggregation model, an embedding-aggregation model, an attention model, and an ensemble of the best three attention models. Next, the well-performing attention models were applied to the detection of renal cystic lesions. All models were optimized using Adam with default parameters, with tuning of learning rate and regularization performed on the validation set.

RESULTS

For binary classification of normal vs. abnormal, the basic Densenet-121 had an AUC of 0.61. Instance- and embedded-aggregation improved performance to AUC=0.69 and 0.81, respectively. The attention model (AUC=0.82) and the ensemble of attention models (AUC=0.84) performed best. For cystic lesion detection, high diagnostic accuracy was achieved using the attention model (AUC=0.91) and the ensemble of attention models (AUC=0.95).

CONCLUSION

Diagnostic performance of baseline models for classification tasks can be increased using aggregation and attention techniques. Attention models had the highest diagnostic performance for normal vs. abnormal renal ultrasound characterization and the detection of renal cystic lesions.

CLINICAL RELEVANCE/APPLICATION

Our model could potentially serve as a triage tool for patients undergoing renal ultrasound examinations. It could improve operational efficiency for radiologists by optimizing workflow, improving patient throughput, and providing a quicker time to diagnosis and treatment for the referring physician.

SSQ10-06 Deep Learning to Distinguish Benign from Malignant Renal Lesions Based on Routine MR Imaging

Thursday, Dec. 5 11:20AM - 11:30AM Room: E352

Awards
Trainee Research Prize - Fellow

Participants
Yijun Zhao, Changsha, China (*Presenter*) Nothing to Disclose
Ianto L. Xi, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Harrison X. Bai, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Hui Liu, Changsha, China (*Abstract Co-Author*) Nothing to Disclose
Ken Chang, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Ting Huang, Changsha, China (*Abstract Co-Author*) Nothing to Disclose
Raymond Y. Huang, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
An Xie, Changsha, China (*Abstract Co-Author*) Nothing to Disclose
Alvin C. Silva, MD, Scottsdale, AZ (*Abstract Co-Author*) Nothing to Disclose
Quanliang Shang, Changsha, China (*Abstract Co-Author*) Nothing to Disclose
Dehong Peng, Changsha, China (*Abstract Co-Author*) Nothing to Disclose
Martin Vallieres, PHD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Peiman Habibollahi, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Jianbin Liu, Changsha, China (*Abstract Co-Author*) Nothing to Disclose
Yong Fan, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Terence P. Gade, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Research Grant, Guerbet SA
Paul Zhang, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Michael C. Soulen, MD, Lafayette Hill, PA (*Abstract Co-Author*) Consultant, F. Hoffmann-La Roche Ltd; Consultant, Guerbet SA; Research support, Guerbet SA; Research support, BTG International Ltd; Proctor, Sirtex Medical Ltd;
Zishu Zhang, MD, PhD, Changsha, China (*Abstract Co-Author*) Nothing to Disclose
William.s Stavropoulos, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

zhaoyj25@126.com

PURPOSE

With increasing incidence of renal mass, it is important to make a pre-treatment differentiation between benign renal mass and malignant tumor. We aimed to propose a deep learning model to distinguish benign renal tumors from renal cell carcinoma (RCC) using routine MR imaging by applying a residual convolutional neural network (ResNet).

METHOD AND MATERIALS

Preoperative MR images (T2-weighted and T1-post contrast sequences) of 467 renal lesions in a multicenter cohort with definitive pathology were divided into training, validation, and test sets (70:20:10 split). An ensemble model based on ResNet was created combining clinical variable, T1C and T2WI MR images using a bagging classifier to predict renal tumor pathology. Final model performance was compared with expert interpretation.

RESULTS

Among the 467 renal lesions, 367 were malignant and 100 were benign. The final ensemble model achieved a test accuracy of 87.2%, F1 score of 0.925, and precision recall AUC of 0.939. In comparison, expert 1 achieved an accuracy of 85.1% and F1 score of 0.914, and expert 2 achieved an accuracy of 87.5% and F1 score of 0.875.

CONCLUSION

Deep learning can non-invasively distinguish benign renal tumors from RCC using conventional MR imaging in a multi-institutional dataset with high accuracy compared to experts.

CLINICAL RELEVANCE/APPLICATION

With the wide use of imaging modalities, the detection of incidental renal tumors increases rapidly. There is a substantial number of patients with benign renal tumors who undergo unnecessary surgery with its concurrent risk and morbidity. Our deep learning model has the potential to noninvasively and accurately distinguish benign from malignant renal lesions and help guide clinical management.

SSQ10-07 T2WI Texture Analysis of Fat-Poor Angiomyolipoma and Other Renal Tumors: Histologic Subtype Classification

Thursday, Dec. 5 11:30AM - 11:40AM Room: E352

Participants
Zhenhao Liu, Changzhi, China (*Presenter*) Nothing to Disclose
Haiyi Wang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Bai Xu, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Huiling Yi, Qinhuangdao, China (*Abstract Co-Author*) Nothing to Disclose
Qiong Li, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose
Huiyi Ye, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

liuzhenhaook@sina.com

PURPOSE

The purpose of this study was to explore the value of T2WI texture analysis in differentiation between fat-poor angiomyolipoma and renal cell carcinoma.

METHOD AND MATERIALS

T2WI Texture analysis was applied to analyze renal tumors, including 32 clear cell renal cell carcinomas (ccRCCs), 25 papillary RCCs(pRCCs), 27 chromophobe RCCs(cRCCs) and 20 fat-poor angiomyolipomas(fat-poor AMLs). All the tumors were removed by surgery and pathologically confirmed. These renal masses were divided into four groups: group A (fat-poor AMLs and RCCs), group B (fat-poor AMLs and ccRCCs), group C (fat-poor AMLs and pRCCs) and group D (fat-poor AMLs and cRCCs). Lesions were delineated on software named Radiomics Cloud Platform by two radiologists to extract the corresponding volume of interest (VOI) and then 93 features based on feature classes were generated. The average values of two radiologists were obtained and used as the final data. The difference features between fat-poor AMLs and RCCs were screened by Mann-Whitney U test in each group. Receiver operating characteristic (ROC) analysis was performed and area under the ROC curve (AUC) was calculated for features that were significantly different ($P < 0.01$). The corresponding optimal thresholds were determined and diagnostic effect was assessed.

RESULTS

Among the significantly different ($P < 0.01$) features(n=19, 22, 6 and 13 in group A, B, C and D respectively), minimum generated the largest AUC of 0.889±0.044(95% CI 0.812 - 0.942),0.881±0.049(95% CI 0.761 - 0.954),0.893±0.049(95% CI 0.765 - 0.965)and 0.894±0.048(95% CI 0.770 to 0.965) in group A, B, C and D respectively. The corresponding cut-off value of minimum was 189, 189, 176 and 138, which permitted the diagnosis of RCC, ccRCC, pRCC and cRCC with sensitivity of 90.48%, 90.62%, 92.00% and 88.89%, specificity of 80%, 80%, 80% and 80%, positive predictive value of 95.00%, 87.88%, 85.19% and 85.71%, negative predictive value of 66.67%, 84.21%, 88.89% and 84.21% and accuracy of 88.46%, 86.54%, 86,67% and 85.11% respectively.

CONCLUSION

T2WI texture analysis can effectively distinguish between fat-poor angiomyolipoma and common renal cell carcinoma. Minimum had the optimal diagnostic performance.

CLINICAL RELEVANCE/APPLICATION

Fat-poor AML, not showing visible fat, can mimic RCC, leading to unnecessary surgical resection. T2WI texture analysis can effectively differentiate between these two tumors, so patients may benefit.

SSQ10-08 Renal Cysts: Role of MRI-Based 3D Texture Features to Classify Renal Cystic Lesions According to the Bosniak Classification

Thursday, Dec. 5 11:40AM - 11:50AM Room: E352

Participants
Ahmed Al Kindi, MD, Montreal, QC (*Presenter*) Nothing to Disclose
Amit Shrivstava, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Peter Savadjiev, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Sahir Bhatnagar, PhD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Reza Forghani, MD,PhD, Cote Saint-Luc, QC (*Abstract Co-Author*) Researcher, General Electric Company; Institutional research collaboration, General Electric Company; Consultant, General Electric Company; Speaker, General Electric Company ; Founder, 4intelligent Inc; Stockholder, 4intelligent Inc; Stockholder, Real-Time Medical, Inc
Caroline Reinhold, MD, MSc, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

ahmedalkindi87@gmail.com

PURPOSE

Purpose: To determine the role of MRI texture features to differentiate Bosniak 2F from Bosniak 3-4 renal cysts given the known interobserver variation for Bosniak cyst classification in the clinic.

METHOD AND MATERIALS

This retrospective study was performed from January 2005 to September 2016. Patients with a complex renal cyst (Bosniak category 2F, 3 and 4) on MRI were selected. 176 patients were identified; only the highest category cyst was included per patient. Cysts were divided into two groups: 107 patients had Bosniak 2F cysts, and 69 had Bosniak 3 or 4 cysts. The standard of reference for group assignment was agreement on Bosniak classification between at least 2 of 3 independent expert reviewers; findings at histology or 4-year follow up. Each cyst was delineated 2x on the venous phase of the post contrast MRI in 3D using the inner core (Inner), and outer region that included both the lesion's inner core and its periphery (Total). The difference between these two regions defined the cyst's periphery (Border). Six histogram-derived texture features were computed for each of the three ROIs on the native and transformed images, resulting in 18 features per cyst. Univariate t-tests were computed on the two groups Accounting for Bonferroni correction for multiple comparisons, features with $p<(0.05/18)=0.0028$ were selected and univariate diagnostic models were built separately for each selected feature. 95% confidence intervals were estimated using 1000 bootstrap iterations.

RESULTS

11 features with $p<0.0028$ were found. Among them, the top three univariate diagnostic performances were variance, entropy, and uniformity. (95% confidence interval indicated in brackets) (please refer to the table included in the figure)

CONCLUSION

Texture analysis can differentiate Bosniak 2F from Bosniak 3-4 renal cysts with good accuracy, sensitivity, and specificity.

CLINICAL RELEVANCE/APPLICATION

The radiomics techniques are helpful to differentiate Bosniak 2F and Bosniak 3-4 status of the cyst given the known interobserver variation for Bosniak cyst classification.

SSQ10-09 Development and External Validation of Prediction Models for the Fuhrman Nuclear Grade of Clear Cell Renal Cell Carcinoma: A Comparison between CT- and MR-Based High-Dimensional Machine Learning Models

Thursday, Dec. 5 11:50AM - 12:00PM Room: E352

Participants
Enming Cui, MD, Jiangmen, China (*Presenter*) Nothing to Disclose
Fan Lin, MD, Shenzhen, China (*Abstract Co-Author*) Nothing to Disclose
Wansheng Long, MD, Guangdong, China (*Abstract Co-Author*) Nothing to Disclose
Zhuoyong Li, Jiangmen, China (*Abstract Co-Author*) Nothing to Disclose
Yong Lan, Jiangmen, China (*Abstract Co-Author*) Nothing to Disclose
Changyi Ma, MMed,MMed, Jiangmen , China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

cem2008@163.com

PURPOSE

To compare the diagnostic performance between CT- and MR-based machine learning models in predicting the Fuhrman nuclear grade of clear cell renal cell carcinoma (ccRCC).

METHOD AND MATERIALS

Patients with pathologically proven ccRCC from 1 February 2009 to 31 December 2018 were included by this retrospective study for development dataset. Additional dataset from another institution and the Cancer Imaging Archive (TCIA) dataset, including both CT and MR imaging prior to surgery, were collected for external validation dataset. The features were extracted from precontrast phase (PCP), corticomedullary phase (CMP), nephrographic phase (NP) on CT, as well as fat-suppressed T2WI, T1WI, CMP and NP on MRI. The CatBoost was utilized to investigate machine learning models for the differentiation of low- from high-grade ccRCC. The performance of machine learning classifiers based on CT and MRI were compared.

RESULTS

A total of 416 patients with 419 pathologically proven ccRCCs were included for development dataset and ten pairs of dataset with both CT and MRI from another hospital and TCIA database were used for external validation. Thirty-nine, 41, 35 and 17 features were extracted from ctPCP, ctCMP, ctNP and ctALL images, and 34, 38, 37, 38 and 12 features derived from fat-suppressed T2WI, T1WI, mrCMP, mrNP and mrALL images, respectively. The classifier based on all-phase CT and all-sequence MR images achieved the best performance in differentiating low- from high-grade ccRCC with area under the ROC curve (AUC) of 0.82 and 0.73, respectively. In the external validation set, the classifier based on all-phase CT and all-sequence MR images also obtained the best performance in differentiating low- from high-grade ccRCC with AUC of 0.76 and 0.77, respectively. The comparison of the AUC for all-phase T-based vs all-sequence MR-based machine learning classifier showed no significantly different performance.

CONCLUSION

Both CT- and MR-based machine learning model are valuable noninvasive techniques in differentiating low- and high-Fuhrman nuclear grade ccRCC. MR-based machine learning model had comparable but no better performance than CT-based model.

CLINICAL RELEVANCE/APPLICATION

(dealing with preoperative ccRCC grading)'Both CT- and MR-based machine learning model can be used to preoperatively predict

(dealing with preoperative ccRCC grading) Both CT- and MR-based machine learning model can be used to preoperatively predict the Fuhrman nuclear grade of ccRCC and MR-based model had comparable but no better performance than CT-base model.'

Printed on: 10/29/20

SSQ11

Informatics (Education, Analytics, Quantitative)

Thursday, Dec. 5 10:30AM - 12:00PM Room: N229

AI BQ ED IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Gary J. Wendt, MD, Middleton, WI (*Moderator*) Medical Advisory Board, McKesson Corporation; Medical Advisory Board, HealthMyne, Inc; Stockholder, HealthMyne, Inc; Co-founder, ImageMoverMD;
Hari Trivedi, MD, Atlanta, GA (*Moderator*) Consultant, Arterys Inc; Founder, Lightbox AI; Founder, BioData Consortium

Sub-Events

SSQ11-01 Redesigning Radiology Training for The Innovation Age: Two-Year Results of the First Core Residency Curriculum in Invention, Design Thinking, and Artificial Intelligence - The MESH Incubator

Thursday, Dec. 5 10:30AM - 10:40AM Room: N229

Participants
Marc D. Succi, MD, Boston, MA (*Presenter*) Patent agreement, Frequency Therapeutics, LLC; Patent agreement, AugMI Labs, Inc; Stockholder, 2 Minute Medicine
Raul N. Uppot, MD, Boston, MA (*Abstract Co-Author*) Grant, Controlled Risk Insurance Corporation
Michael S. Gee, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Theresa C. McLoud, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
James A. Brink, MD, Boston, MA (*Abstract Co-Author*) Board of Directors, Accumen, Inc

For information about this presentation, contact:

msucci@mgh.harvard.edu

CONCLUSION

The MESH CRDC is the first core curriculum in technological innovation integrated into a residency program, and results in significant increases in the technological innovation skill- and knowledge-set of residents.

Background

Radiology training lacks structured processes to help staff develop patient-centered technologies as well as curricula to train healthcare professionals in the fundamentals of informatics, artificial intelligence, idea generation, intellectual property, device and software prototyping, and entrepreneurship. To expand our previously created first-in-kind innovation incubator in a radiology department, the Medically Engineered Solutions in Healthcare (MESH) Incubator™, we created and tested a novel residency innovation curriculum, the MESH Core Residency Design Curriculum (CRDC™).

Evaluation

We conducted a Likert-type survey of current radiology residents regarding aspects of medical innovation to inform the design of the MESH CRDC, a one-week innovation rotation. The MESH CRDC took place in the MESH Incubator, a physical invention workspace in an academic hospital. Residents were enrolled from an ACGME-accredited radiology residency program. Residents who completed the MESH CRDC were assessed using a 21 question pre- and post-course exam, created by experts in various aspects of innovation. A pre- and post-course Likert-type method was employed to assess resident comfortability with 5 fundamental aspects of medical technologies. Anonymous sessions ratings and comments were also collected. Wilcoxon matched-pairs signed-rank test was used to analyze differences in pre- and post-course data.

Discussion

11 residents completed the MESH CRDC. There was a significant increase in exam scores after completion of the CRDC rotation, with a median pre- and post-course score of 52.38% and 90.48%, respectively ($p = .001$, 95% confidence interval = 38.10% to 57.14% and 76.19% to 100.00%, respectively). Pre- and post-course Likert methods (1-5, 1 = very uncomfortable, 5 = very comfortable) were employed to assess resident comfortability in 5 key tenants of innovation in medicine, demonstrating significant post-course increases in multifaceted aspects of a technological innovation skillset.

SSQ11-02 A Web-Based MRI Simulator for Radiographer Education: Quantitative Evaluation of an Actual Classroom Experience

Thursday, Dec. 5 10:40AM - 10:50AM Room: N229

Participants
Daniel Treceno-Fernandez, Valladolid, Spain (*Abstract Co-Author*) Research funded, SME Giveme5D
Juan Calabia-del-Campo, Valladolid , Spain (*Abstract Co-Author*) Research funded, SME Giveme5D
Antonio Luna, MD,PhD, Jaen, Spain (*Abstract Co-Author*) Speaker, Canon Medical Systems Corporation; Speaker, Koninklijke Philips NV; Speaker, Siemens AG
Miguel Bote-Lorenzo, Valladolid, Spain (*Abstract Co-Author*) Nothing to Disclose
Eduardo Gomez-Sanchez, Valladolid, Spain (*Abstract Co-Author*) Nothing to Disclose

Rodrigo de-Luis-Garcia, PhD, Valladolid , Spain (*Abstract Co-Author*) Research funded, SME Giveme5D
Carlos Alberola-Lopez, PhD,MENG, Valladolid, Spain (*Presenter*) Research funded, SME Giveme 5D

For information about this presentation, contact:

caralb@tel.uva.es

PURPOSE

The present study gives a quantitative answer to the following question: Does an MRI simulator built on specific functional and non-functional requirements help radiographers learn MRI theoretical and practical concepts better than a traditional educational method based on lectures?

METHOD AND MATERIALS

We designed and implemented a web-based MRI simulator for educational purposes. The simulator mimics an actual MRI console, and allows trainees to select and execute MRI sequences, with the capacity to perform geometrical planning, to modify acquisition parameters and to obtain simulated images accordingly. Using this MRI simulator, the study was carried out during a one-day classroom experience by a total of 60 students from the School of Radiographers at the Hospital XXXXX. The experiment followed a randomized pre-test post-test design with a control group and an experimental group. Both groups attended the same introductory lecture on MRI; then the control group attended a practical lecture while students in the experimental group carried out guided exercises with the simulator, covering the same contents. We designed a 10-item instrument to assess knowledge level before (pre-test) and after (post-test) our intervention. The instrument was split into two halves, corresponding to each of the two sessions attended. We hypothesized that the use of the simulator would reflect on increased learning outcomes in the practical part of the instrument. The instrument had an acceptable reliability value.

RESULTS

No differences were found in the pre-test; statistical differences (p-value < 0.05) were found in favor of the experimental group in the second half of the post-test, both in terms of the test score ($p=0.018$) as well as the gain (defined as the difference between post-test and pre-test scores, $p=0.036$); its associated effect size turned out to be significant as well (Cohen's $d > 0.6$).

CONCLUSION

We have designed an experiment aimed at comparing differences in learning outcomes between a method that makes use of an MRI simulator and a traditional educational approach. We have shown that a simulator built on specific design requirements is a valuable complement to traditional education procedures; our departing hypothesis is now backed up with statistical differences in learning results

CLINICAL RELEVANCE/APPLICATION

Despite the large number of MRI simulators that have been proposed, we have no evidence that any of them has been evaluated in terms of educational power. Our design requirements (capability of spatial planning, sequence parameter tuning and artifact reduction) have given rise to measurable differences in an actual classroom experience. This encourages using our technology for radiographer education.

SSQ11-03 Stop Repeating the Same Old Mistakes: Improving Residents' Reporting through a Report Comparison Tool

Thursday, Dec. 5 10:50AM - 11:00AM Room: N229

Participants
Jan Vosshenrich, MD, Basel, Switzerland (*Presenter*) Nothing to Disclose
Joshy Cyriac, Basel, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Bram Stieltjes, MD,PhD, Basel, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Tobias Heye, MD, Basel , Switzerland (*Abstract Co-Author*) Nothing to Disclose
Philipp Brantner, MD, Basel, Switzerland (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

jan.vosshenrich@usb.ch

PURPOSE

To create a web-based report comparison tool for fast and objective feedback helping residents to improve the quality of their radiologic reports and to let them conveniently track their progress over time.

METHOD AND MATERIALS

Different states of each radiologic report are queried from the RIS-database automatically every 15 minutes. States are tracked according to the RIS-data and include the resident's first draft, the revised report after review with an attending and the finalized report. Changes in content between the different states of a report are visualized as a color-coded side-by-side comparison. A search engine lets the user select a time period or a number of reports (e.g. last 10 reports), subspecialties (e.g. neuroimaging) and modalities (e.g. MRI). Furthermore, only cases reviewed and finalized by a specific attending may be selected. A dashboard view visualizes calculated metrics for the queried reports, including similarity index (intersection of initial and final version divided by union of initial and final version), add index (ratio of added words) and delete index (ratio of deleted words). Indices are displayed for each report as well as a personal median for all reports queried which is displayed side-by-side to the overall median of all residents.

RESULTS

Since its introduction in late 2017, our report comparison tool assisted residents in tracking changes in more than 150,000 reports. Visualized data in side-by-side comparison offers residents an easy and fast way to comprehend changes in each report as well as to identify recurring errors. The dashboard provides residents with a macroscopic view on progress over time and may assist in identifying sections where reports needs more emphasis.

CONCLUSION

One of the key skills to acquire during residency is a clear style of reporting and to be able to explicitly communicate findings and recommendations. Our tool offers residents additional objective feedback concerning the quality of their reports. It is independent of subjective evaluation by an attending and illustrates development over time.

CLINICAL RELEVANCE/APPLICATION

Report state comparison is a useful tool to provide personalized feedback and to better understand learning patterns of residents. Data may be extracted and analyzed to maintain effective teaching.

SSQ11-04 Algorithmic Prediction of Delays in On-Call Radiology Scans and Interpretations: A Quality Improvement Study

Thursday, Dec. 5 11:00AM - 11:10AM Room: N229

Participants
Vaibhavi Shah, Cambridge, MA (*Abstract Co-Author*) Nothing to Disclose
Yeshwant R. Chillakuru, BA,MSc, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Alexander Rybkin, MD, San Francisco, CA (*Abstract Co-Author*) Founder, Caredination Inc
Thienkhai H. Vu, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Youngho Seo, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Jae Ho Sohn, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

sohn87@gmail.com

sohn87@gmail.com

CONCLUSION

A machine learning algorithm was trained to predict delays in scanning and interpreting cross-sectional radiology studies while on call, which may serve as a step towards quality improvement.

Background

The time taken for radiology scans to be performed, interpreted, and communicated back to the clinicians during on-call settings is an important quality measure that carries patient safety and hospital finance implications. Reasons for delays in radiology are multifactorial; thus identifying the cohort of cases expected to be delayed would represent a step towards quality improvement. The aim of this study is to leverage the big data approach in radiology to predict cases that are likely to result in delay.

Evaluation

We collected 12,525 cross-sectional studies from May 2018 to March 2019 at a single academic hospital that were performed during off-hours (evenings, nights, weekends, and holidays) and interpreted by on-call residents. More than 30 metadata for each study were extracted, including order time, scan time, phone call time to clinician, time of preliminary interpretation, clinical history, scanner, body part, ED vs inpatient, contrast, resident, technologist, and ordering physician. After splitting data into training and test sets (75:25 ratio), a random forest algorithm was trained to predict above median delay in exam order to preliminary reporting (or phone communication). Randomized parameter search was conducted in Scikit-Learn to dynamically derive the optimal tree numbers (n=100), depths, and useful features (ED vs inpatient, body part, order time, scan time). Confusion matrix and ROC curve were generated.

Discussion

The average time from order to preliminary reporting (or phone call) was 320.4 +/- 463.7 (median 194.5) minutes, with scan completion to reporting time averaging 89.01 +/- 198.2 minutes (median 69.0). The random forest model achieved AUC of ROC curve on the test set (n=3,132) at 0.76. 1,168 cases were correctly classified as below median and 1126 cases were correctly classified as above median. 414 cases were incorrectly classified as below median and 424 cases were incorrectly classified as above median. Error analysis confirmed no systematic error.

SSQ11-05 Staying on Time: Data-Driven Algorithm for Optimizing Patient Scheduling

Thursday, Dec. 5 11:10AM - 11:20AM Room: N229

Participants
Oleg S. Pianykh, Newton Highlands, MA (*Presenter*) Nothing to Disclose
Steven P. Guitron, MS,BS, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

opianykh@mgh.harvard.edu

CONCLUSION

Optimal scheduling uses real exam duration distributions to rearrange the order of exams to produce the most stable (least delayed) schedule. The algorithm is not MRI-specific and can be applied to any other modality or workflow.

Background

Modern healthcare workflow presents a complex combination of different resources and priorities, yet exam scheduling still relies on very outdated, static, manual techniques.. Despite the variability of exam length even within the same exam types, exams are typically scheduled into same-size blocks., The order of exams is also rarely taken into account to design a stable schedule. Our goal was to devise an algorithm to take into account the probabilistic nature of exam lengths in the formulation of an optimal schedule.

Evaluation

We used a full year of MRI scheduling data available from our Radiology Information System (3700 exams per MRI scanner). Two

data-driven algorithms were developed: one to learn the real distribution of exam durations from the RIS data, and one to discover the most optimal sequencing of exams during a day. The optimal sequencing was formulated as the order of real exams most likely to stay on time. Exam batching to speed up processing was considered as well. With many millions of possible sequences, a highly-efficient branch-and-bound algorithm was designed to find the best solution in a few minutes of computational time.

Discussion

The analysis of the current, manually-designed schedules has revealed that they are far from optimal, with significant amounts of delay accumulating as the day progresses. It has also demonstrated that scheduling sequences change frequently, randomly deviating from the initial design. These problems can be solved or significantly reduced by replacing random and suboptimal schedules by optimal schedules, resulting in 30-45-minute reduction of delay time depending on the probabilistic exam composition.

SSQ11-06 How Not To Do Radiomics - Observations from a Double Baseline Study in Glioblastoma

Thursday, Dec. 5 11:20AM - 11:30AM Room: N229

Participants
Katharina V. Hoebel, BSC,MD, Charlestown, MA (*Presenter*) Nothing to Disclose
Andrew Beers, Charlestown, MA (*Abstract Co-Author*) Nothing to Disclose
Ken Chang, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jay B. Patel, Charlestown, MA (*Abstract Co-Author*) Nothing to Disclose
James M. Brown, PhD, Charlestown, MA (*Abstract Co-Author*) Nothing to Disclose
Marco C. Pinho, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Bruce R. Rosen, MD, PhD, Charlestown, MA (*Abstract Co-Author*) Nothing to Disclose
Tracy T. Batchelor, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Elizabeth Gerstner, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jayashree Kalpathy-Cramer, MS, PhD, Portland, OR (*Abstract Co-Author*) Research support, General Electric Company; Research support, F. Hoffmann-La Roche Ltd;

For information about this presentation, contact:

khoebel@mit.edu

PURPOSE

Radiomics, the extraction of predefined quantitative features from a region of interest in medical imaging, is a popular tool for disease classification and predicting outcomes. Intensity and texture features are highly sensitive to variations in acquisition parameters. Here, we focus on the effect of normalization on the repeatability of intensity and texture features in a unique double-baseline magnetic resonance imaging (MRI) dataset of patients with glioblastoma. We find that preprocessing is a key, yet under reported driver of repeatability and reproducibility.

METHOD AND MATERIALS

We evaluated imaging from 48 patients from two IRB approved clinical trials. Patients underwent two baseline scans 2-5 days apart using identical imaging protocols on a 3.0T MRI system. Radiomics features were extracted from skull-stripped T2w-FLAIR using the pyradiomics package based on manual segmentations by expert raters. We extracted features under four different conditions: fixed bin width (of 10) or fixed bin count when quantizing voxel intensities, and with or without normalization. We determined intraclass correlation coefficient (ICC) between feature values on the first and second visit as a measure of repeatability and Spearman's correlation coefficient to look for associations between features.

RESULTS

Under each condition, we extracted 16 intensity and 22 texture features. ICC values ranged between 0.5 to 0.9 for different preprocessing schemes. Normalization leads to higher ICCs values for intensity features, but has a mixed effect on the repeatability of texture features depending on the binning technique. Correlation between different texture features is substantially higher using fixed bin width compared to fixed bin count.

CONCLUSION

Normalization has a positive effect on intensity and texture feature repeatability on MRI. Users need to be careful in the choice of histogram bins to ensure the extraction of meaningful features and preprocessing and parameters need to be reported to enable reproduction of radiomics research. More research on the influence of image acquisition and feature extraction on the repeatability of radiomic features has to be undertaken to make radiomics a robust image-analysis tool.

CLINICAL RELEVANCE/APPLICATION

We examine the effect of normalization and histogram binning on the repeatability of radiomic features to make radiomics a widely adoptable tools for clinical application.

SSQ11-07 Differentiation between Pancreatic Cancer and Nontumorous Pancreas on Computed Tomography by Radiomics and Machine Learning

Thursday, Dec. 5 11:30AM - 11:40AM Room: N229

Participants
Po-Ting Chen, MD, Taipei City, Taiwan (*Presenter*) Nothing to Disclose
Huihsuan Yen, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Dawei Chang, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Wei-Chih Liao, MD,PhD, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Kao-Lang Liu, MD, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Holger R. Roth, PhD, Bethesda, MD (*Abstract Co-Author*) Employee, NVIDIA Corporation; Researcher, NVIDIA Corporation
Weichung Wang, PhD, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Tinghui Wu, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Pancreatic cancer (PC) is the most lethal cancer and the fourth leading cause of cancer death in the United States. Radiomics is a methodology that extracts quantitative statistics and features from medical images. The purpose of this study is to develop a machine learning model to differentiate PC from nontumorous pancreas (NP) on contrast-enhanced computed tomography (CT) using radiomic features.

METHOD AND MATERIALS

Contrast-enhanced venous phase CT images of 100 cases with PC and 100 controls were reviewed by an expert radiologist, and tumors and pancreases were manually labeled for PC. Most of NP labels were segmented by a pre-trained deep learning model. Data were split into training set (60 NP cases, 60 PC cases), validation set (20 NP cases, 19 PC cases), and test set (20 NP cases, 19 PC cases). Pancreas and tumor were cut into patches of 20 pixels by 20 pixels for subsequent extraction of radomic features. A total of 91 radiomic features were extracted and subject to eXtreme Gradient Boosting (XGBoost) model to perform classification.

RESULTS

A total of 3596 patches of PC and 19446 patches of NP were generated and used for training, and the testing set included 691 patches of PC and 3889 patches of NP. For differentiation between PC and NP, the accuracy of the XGBoost by patch-based analysis was 93.43%, with an area under the receiver operating characteristic (ROC) curve (AUC) of 0.94712. In patient-based analysis, the accuracy, sensitivity, specificity and AUC were 95.12%, 0.90476, 1, and 0.95238, respectively. Top 10 features with highest feature importance score were median, 10 percentile, energy, skewness, 90 percentile, maximum, minimum, and kurtosis in first order statistics, dependence nonuniformity in gray level dependence matrix (GLDM), and cluster shade in gray level cooccurrence matrix (GLCM).

CONCLUSION

We developed a machine learning model that could differentiate between CTs of pancreas with PC and without PC with a 95.12% accuracy in patient-based analysis and 93.43% accuracy in patch-based analysis. Among the important features which our model selects, features in first order statistics have the highest importance score followed by features in higher order statistics related to nonuniformity.

CLINICAL RELEVANCE/APPLICATION

This model can accurately differentiate between cancerous and nontumorous pancreas and is a potential computer-aided diagnosis tool.

SSQ11-08 Use of DICOM Header Analysis for Practice Quality Improvement and Equipment Utilization in Digital Radiography

Thursday, Dec. 5 11:40AM - 11:50AM Room: N229

Participants
Zaiyang Long, PhD, Rochester, MN (*Presenter*) Nothing to Disclose
Alisa Walz-Flannigan, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Brandon D. Stuve, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Laurel A. Littrell, MD, Winona, MN (*Abstract Co-Author*) Nothing to Disclose
Beth A. Schueler, PhD, Zumbrota, MN (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

long.zaiyang@mayo.edu

long.zaiyang@mayo.edu

CONCLUSION

Clinical DICOM header analysis is a feasible and valuable tool to provide insight into unintended practice variation and provides metrics that can be used to optimize and better standardize clinical image quality.

Background

DICOM headers contain a wealth of information about image acquisition and processing parameters that could be used for practice quality improvement and equipment utilization in digital radiography (DR).

Evaluation

Infrastructure was architected and tools were developed to receive and extract DICOM header information from clinical DR images. Image information from public and private header elements from 18 systems were mined, aggregated and analyzed. Data extracted included study and image times, study description, station name, software version, kV, SID, exposure mode, AEC chamber selection, mAs, exposure time, grid use, detector serial number, exposure index (EI), EI target and deviation index, as well as processing-related tags such as processing name, window width/level, parameters such as contrast and edge enhancement when available. This data was used for efforts towards practice standardization, image optimization and equipment utilization. In one case, we found grids were not used as anticipated for several exams with a gridded technique. In another example, many exam views showed variation in image processing selection; this identified where system defaults were not set up as expected, or where technologists were struggling to consistently achieve good image quality with default processing. Data extracted from headers also made it more efficient to ascertain median EI values and ranges of EI. EI data combined with image quality analysis, helped to identify where we needed to improve our EI targets, techniques, etc. Data was also used to help determine the frequency of use and estimated need for purchase of 10"×12" detectors.

Discussion

Data analyzed from clinical DICOM headers provided us with valuable information on equipment usage, image acquisition and processing. These data have been successfully used for quality improvement, technologist education, and equipment purchase decisions.

SSQ11-09 Liver Surface Nodularity as a Quantitative CT Imaging Biomarker for Staging Liver Fibrosis

Thursday, Dec. 5 11:50AM - 12:00PM Room: N229

Participants
Andrew D. Smith, MD, PhD, Birmingham, AL (*Presenter*) CEO, AI Metrics LLC ; Owner, AI Metrics LLC ; CEO, Radiostics LLC; Owner, Radiostics LLC; CEO, Liver Nodularity LLC ; Owner, Liver Nodularity LLC ; Research Grant, General Electric Company; Speaker, Canon Medical Systems Corporation; Speaker, AlgoMedica, Inc

For information about this presentation, contact:

andrewdennissmith@uabmc.edu

CONCLUSION

The LSN score, a quantitative CT imaging biomarker, has developed into a clinically applicable method for accurately staging of liver fibrosis.

Background

Chronic liver disease (CLD) is a major cause of morbidity and mortality in the United States (U.S.) and worldwide. The progression of liver fibrosis is common with HCV, HBV, AH, and NASH forms of CLD and is initially a slow and gradual development of fibrotic bands and numerous regenerative nodules that progressively increase in number and size. We developed software to quantify liver surface nodularity on CT images and generate a Liver Surface Nodularity (LSN) score that can be used to noninvasively and stage liver fibrosis and cirrohosis.

Evaluation

In retrospective studies comparing the LSN score to the stage of HCV hepatic fibrosis on biopsy, the range of accuracy (AUC) for differentiating early fibrosis (>F2), advanced fibrosis (>F3) and cirrhosis (F4) were: 0.88-0.90, 0.89-0.93, and 0.90-0.96, respectively. The accuracy for staging hepatic fibrosis was further improved when mathematically combined with the FIB-4 index, which includes patient age, basic serum liver function tests, and platelet count. The LSN score has also been used to substage cirrhosis and was highly predictive of hepatic decompensation and death in a large cohort (N=830) with a variety of forms of cirrhosis. Furthermore, the LSN score demonstrated high diagnostic accuracy (AUC: 0.87) for detecting clinically significant portal hypertension and outperformed liver and splenic volumes and multiple serum indices.

Discussion

The advantages of the CT LSN score for staging hepatic fibrosis are high accuracy and precision with HCV CLD, high accuracy for staging cirrhosis and predicting clinically significant portal hypertension and future liver-related events, vendor neutral method, rapid image acquisition and processing, no need for patient fasting, no need for additional hardware, very low technical failure rate, and applicability to routine noncontrast CT images.

Printed on: 10/29/20

SSQ12

Science Session with Keynote: Molecular Imaging (Image Analysis and Quantification)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S501ABC

BQ MI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Ciprian Catana, MD, PhD, Charlestown, MA (*Moderator*) Nothing to Disclose
Dima A. Hammoud, MD, Bethesda, MD (*Moderator*) Nothing to Disclose

Sub-Events

SSQ12-01 Molecular Imaging Keynote Speaker: Recent Efforts for the Use of Machine Learning for PET/MRI

Thursday, Dec. 5 10:30AM - 10:50AM Room: S501ABC

Participants
Ciprian Catana, MD, PhD, Charlestown, MA (*Presenter*) Nothing to Disclose

SSQ12-03 Addressing Long-Term Fate of Iron Oxide Nanoparticles(ION) and Specific MRI Cell Tracking by Combining MRI and Mass Spectrometry with 57Fe-ION

Thursday, Dec. 5 10:50AM - 11:00AM Room: S501ABC

Participants
Max Masthoff, MD, Muenster, Germany (*Presenter*) Nothing to Disclose
Andre Beuker, Muenster, Germany (*Abstract Co-Author*) Nothing to Disclose
Rebecca Buchholz, Muenster, Germany (*Abstract Co-Author*) Nothing to Disclose
Uwe Karst, PhD, Muenster, Germany (*Abstract Co-Author*) Nothing to Disclose
Walter L. Heindel, MD, Muenster, Germany (*Abstract Co-Author*) Nothing to Disclose
Cornelius Faber, Muenster, Germany (*Abstract Co-Author*) Nothing to Disclose
Moritz Wildgruber, MD, PhD, Iffeldorf, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Iron oxide nanoparticles (ION) are common contrast agents for (pre-)clinical MRI, but signal is always influenced by endogenous iron hampering quantification of administered ION. We combine non-radioactive 57Fe-ION MRI with laser-ablation-mass-spectrometry (LA-ICP-MS) for differentiation between endogenous iron (56Fe) and applied ION. We aim to assess distribution and long-term fate of ION, to correlate ION concentration to T2-relaxivity and to apply 57Fe-ION for cell tracking.

METHOD AND MATERIALS

Healthy C57BL/6 mice were injected with custom engineered 57Fe-ION (NanoPET, Berlin). For ION distribution T2-mapping of liver, spleen, kidney and brain was performed on a 9.4T small-animal MRI after 2h, 1d, 3d, 7d, 30d and 90d (n=5 each). For iron amount/T2 correlation mice were injected with increasing ION dosage. Mice were sacrificed and organs extracted for LA-ICP-MS to quantify 57Fe and the 56Fe/57Fe isotope ratio. To evaluate 57Fe-ION for cell tracking mice were injected s.c. with a polyacrylamide-gel (pellet) to induce local inflammation. After 24h first baseline MRI with T2-mapping of the pellet was performed, followed by i.v. injection of either 57Fe-ION or PBS as control (n=3 each). 24h later MRI was repeated followed by histology and LA-ICP-MS.

RESULTS

57Fe-ION MRI with LA-ICP-MS enabled to specifically assess and resolve local distribution and long-term fate of ION. 57Fe of ION was first found in cells of the reticulo-endothelial-system (RES), but relocated to endogenous iron stores especially in spleen, blood and brain parenchyma after 90d. A non-linear dependence of T2-relaxivity on increasing ION dosage was observed in the liver, likely resulting from ION packing and state during metabolic processing. T2-relaxivity in the cell tracking model was mainly influenced by applied 57Fe-ION, which were located in adjacent inflammatory tissue representing invaded labelled cells, and not by endogenous iron sources.

CONCLUSION

Combining 57Fe-ION MRI and LA-ICP-MS enables to study ION distribution and long-term fate, MRI iron quantification and validation of ION-based cell tracking in a specific, non-radioactive and quantitative manner.

CLINICAL RELEVANCE/APPLICATION

57Fe-ION MRI supports research to study ION contrast agent biodistribution and long-term fate, to facilitate iron quantification and to validate MRI cell tracking studies.

SSQ12-04 Evaluation of Low Dose PET Simulation Using Time-, Space-, and Order-Based Approaches on a SiPM Digital Photon Counting Time-of-Flight PET/CT

Thursday, Dec. 5 11:00AM - 11:10AM Room: S501ABC

Participants
Jun Zhang, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Bin Zhang, PhD, Cleveland, OH (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Katherine Binzel, PhD, Columbus, OH (*Presenter*) Nothing to Disclose
Yu-lung Hsieh, PhD, Columbus , OH (*Abstract Co-Author*) Nothing to Disclose
Richard Moore, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Michael T. Friel, BS, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Taylor Porter, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Michael V. Knopp, MD, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

knopp.16@osu.edu

PURPOSE

To introduce and evaluate low dose PET simulation using different approaches on the new generation solid state (SiPM) digital photon counting (DPC) Time-Of-Flight (TOF) PET/CT.

METHOD AND MATERIALS

FDG PET/CT of uniformity phantom (~37MBq), NEMA Body phantom with 6 hot spheres (46MBq) and 82 tumors of oncology patients (460±47 MBq, 53±4 min p.i, 10-30 BMI) were imaged 90s/bed on a DPC TOF system (Vereos). Low dose PET (50% counts reduction) was generated based on listmode data using 3 simulation approaches: 1) Time-based (T): 45s/bed, 2) Space-based: Sparse-ring configurations with every other detector disabled in tangential (ST) and axial (SA), and 3) Order-based (O): every other prompt event in order was extracted. Images were reconstructed in 3D-OSEM (low dose: 3i7s, full dose: 3i15s). Image quality was evaluated via blinded image review and quantitative assessment (lesion SUVmax, liver SUVmean, p value, Bland Altman Plots).

RESULTS

Visually, all lesions remained visible and clearly identifiable on all simulated half dose PET without compromised image quality. Image noise appeared visible at BMI >24, more on the half dose PET simulated by O approach than those by T and ST/SA approaches. Quantitatively, no significant SUVmax differences (-1±3%, -6±7%, -6±6% and -3±8%) were found (p=0.46, 0.33, 0.30 and 0.33) between any simulated half dose PET (T, ST, SA and O) and the full dose PET. Liver SUV was robust (-1±1% variances). BAP analysis indicated good SUV correlation between half dose PET and full dose PET ([-0.07, -0.72, 0.58], [-0.36, -1.46, 0.73], [-0.43, -1.32, 0.46] and [-0.35, -1.81, 1.10] in [Bias, Lower LOA, Upper LOA] for T, ST, SA and O PET. Phantom PET showed more consistent results with less SUV variances compared to the clinical PET. More details on sensitivity, advantages and disadvantages of the approaches will be presented.

CONCLUSION

The study demonstrated 3 approaches based on Time, Space and Order for low dose PET simulation. It indicated that these approaches are practicable to provide equivalent low dose PET simulation, and it is feasible to reduce PET dose by at least a factor of two from current standard of care (SOC) using the solid-state DPC PET.

CLINICAL RELEVANCE/APPLICATION

It is challenging and also unethical to test low dose PET imaging in patients especially pediatric via sequential imaging protocols for comparison, which necessitates simulation approaches to enable such.

SSQ12-05 CT Radiomic Features Predicting Epidermal Growth Factor Receptor Mutation Status In Lung Adenocarcinoma

Thursday, Dec. 5 11:10AM - 11:20AM Room: S501ABC

Participants
Gui-xue Liu, Shanghai , China (*Presenter*) Nothing to Disclose
Xueqian Xie, MD, PhD, Groningen , Netherlands (*Abstract Co-Author*) Nothing to Disclose
Zhihan Xu, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Ying-Qian Ge, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Yaping Zhang, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Bei-Bei Jiang, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

liugx15@fudan.edu.cn

PURPOSE

To evaluate the ability of CT radiomic features for predicting the epidermal growth factor receptor (EGFR) mutation status in Asian lung adenocarcinoma patients so as to choose the best targeted therapies.

METHOD AND MATERIALS

The study was approved by the Institutional Review Committee and gave up informed consent. A total of 237 adenocarcinoma patients (115 males and 122 females; mean age of 62.30 ±9.57 years) who confirmed by pathological examination from July 2017 to December 2018 were involved in this study and undergone a chest CT (contrast-enhanced CT, Thickness 0.63mm) examination before the operation. The data of EGFR gene expression, mutation sites, clinical features and CT imaging were collected and analyzed retrospectively. Radiomics features were post-processed and extracted by Radiomics software, implemented in a client server application of the manufacturer (syngoVia, Research Frontier, Siemens Healthcare, Germany). A total of 849 CT features were extracted from the volume of each tumor. After the feature selection by univariate analysis, multivariate logistic regression analysis was used to build the classifiers to predict the mutation status of EGFR.

RESULTS

Univariate analysis showed a statistically significant correlation between patient gender and EGFR mutation with p = 0.003. 72 of 849 imaging radiomic features were proved that had statistically associated with EGFR mutation (p<0.05). The top 10 most relevant features were involved to establish the logistic regression models. In model selection, two and eight features were applied to build classifier by the min-BIC and min-AIC criteria respectively. The performances of logistic regression classifiers with radiomic features obtained the AUC of 0.81 and 0.75 with min-AIC and min-BIC selected respectively. Their AUCs were improved to 0.83 and 0.75 by adding patient gender into the model establishment. The sensitivity and specificity were 77% and 81% at the best diagnostic decision point.

CONCLUSION

CT imaging radiomic features of lung adenocarcinoma combined with clinical variables showed better performance on predicting the mutation status of EGRF. CT imaging radiomic features might have the potential to be the biomarker for identifying EGRF mutations.

CLINICAL RELEVANCE/APPLICATION

Radiomics could not only investigate the genetic mutations among tumors but also show the diagnostic value and have the potential to be a diagnostic tool in the future.

SSQ12-06 Non-Invasive, Macrophage-Specific Spectral Photon Counting CT K-Edge Imaging in Atherosclerosis Using PEGylated Gold Nanoparticles

Thursday, Dec. 5 11:20AM - 11:30AM Room: S501ABC

Participants
Salim Si-Mohamed, Bron, France (*Abstract Co-Author*) Nothing to Disclose
David P. Cormode, DPhil, MS, Philadelphia, PA (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV; Stockholder, PolyAurum; Stockholder, Daimroc Imaging
Monica Sigovan, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Marine Breuilly, Lyon, France (*Abstract Co-Author*) Nothing to Disclose
Pratap Naha, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Lara Chalabreysse, Lyon, France (*Abstract Co-Author*) Nothing to Disclose
Philippe Coulon, PhD, Dourdan, France (*Abstract Co-Author*) Nothing to Disclose
Heiner Daerr, Hambrg, Germany (*Abstract Co-Author*) Nothing to Disclose
Yoad Yagil, PhD, Haifa, Israel (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Loic Boussel, MD, Lyon, France (*Abstract Co-Author*) Nothing to Disclose
Philippe C. Douek, MD, PhD, Lyon, France (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

salim.si-mohamed@chu-lyon.fr

PURPOSE

To detect and quantify the macrophages component within the atherosclerotic plaques using a pegylated gold nanoparticles and a spectral photon-counting computed tomography (SPCCT) via K-edge imaging, in comparison to histological, transmission electron microscopy analysis and quantitative ICP mass spectrometry.

METHOD AND MATERIALS

In vivo imaging was performed on 7 atherosclerotic and 4 non-atherosclerotic NZW rabbits (control) using thiol-pegylated gold nanoparticles. Imaging was performed with a prototype SPCCT system over two days. Quantitative analysis was based on the attenuation (HU) and concentrations of gold measured on gold K-edge images within the aortic parietal wall. Transmission electron microscopy (TEM) on 8 following slices to the ones used for histology on atherosclerotic rabbits was performed to confirm the macrophage uptake of gold nanoparticles.

RESULTS

SPCCT images depicted a thickened aorta with few calcifications before injection. Conventional and K-edge images depicted enhancement within the arterial lumen after injection corresponding to arterial peak and blood pool imaging effect. Atherosclerotic plaque enhancement was observable at day 1 and 2, appearing as a well delimited enhanced plaque, supported by a thickened parietal wall and some calcifications.Only the K-edge images allow of the distinction of plaque enhancement within calcifications. TEM images of rabbit aorta sections confirmed the localization in high number of gold nanoparticles in macrophages.

CONCLUSION

We show the feasibility of noninvasive specific detection and quantification of macrophages in atherosclerotic plaques of rabbits using the K-edge capability of SPCCT and intravenous injection of pegylated gold nanoparticles.

CLINICAL RELEVANCE/APPLICATION

Noninvasive specific detection and quantification of macrophages in atherosclerotic plaques using spectral photon-counting CT and intravenous injection of pegylated gold nanoparticles may be helpful for diagnosis and prognosis in atherosclerosis, in particular for coronary imaging.

SSQ12-07 Prognostic Value of Radiomic Features from 18F-FDG PET/CT in Patients with Oral Cavity Squamous Cell Carcinoma

Thursday, Dec. 5 11:30AM - 11:40AM Room: S501ABC

Participants
Yasser Abdelhafez, MD, Sacramento, CA (*Presenter*) Nothing to Disclose
Yimeng Dou, BS, Davis, CA (*Abstract Co-Author*) Nothing to Disclose
Tzu-Chen Yen, MD, PHD, Taoyuan, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Chun-Ta Liao, Tayouan, Taiwan (*Abstract Co-Author*) Nothing to Disclose

Abhijit J. Chaudhari, PhD, Sacramento, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the prognostic value of radiomic features extracted from pre-operative 18F-FDG PET/CT in patients with advanced stage oral cavity squamous cell carcinoma (OCSCC)

METHOD AND MATERIALS

The study retrospectively included 113 patients with advanced stage OCSCC (pathologic TNM stage III=28, IV=85; 107 males, 6 females; median age 49 years, range: 29-89). All patients had biopsy-proven SCC of oral cavity, locally- or loco-regionally advanced disease with no distant metastasis (M0), and staging 18F-FDG PET/CT scan. Patients were treated with surgical resection of the primary tumor followed by adjuvant chemo(radio)therapy. The maximum pathologic axial tumor size was 33.5±16.8 mm. Primary tumor from PET images was segmented using absolute isocontour threshold of 40% of the maximum standard uptake value (SUV). Using TextIriX, a texture analysis plugin developed for OsiriX by our group, a total of 78 radiomic features (including shape, first order and texture features) were extracted. SUVs within the segmented volume were normalized between the minimum and maximum values, then discretized into 64-bins to construct the grey-level matrices. No spatial resampling was used. ROC curves of the extracted features were plotted against disease-specific survival (DSS) status. All patients had a follow-up of 5-years or till death.

RESULTS

Fifty-two patients died of cancer (5-year DSS=51.6%). The following radiomic features were associated with DSS (run entropy, zone entropy, entropy, dependence entropy, dependence non-uniformity, size zone non-uniformity, run-length non-uniformity), with AUC ranging from 0.637-0.661 ($p < 0.01$). Using backward Cox hazard model with 1000-samples bootstrapping, only run entropy (randomness in the distribution of run lengths and gray levels) was independently associated with DSS (hazards ratio=2.71, 95% confidence interval=1.5-5, p=0.001). When dichotomizing all patients by median value of run entropy (value=5.2), patients with entropy <= median had 5-year-DSS of 64.5% with mean survival time of 72.6 months compared to 5-year DSS of 38.5% and mean survival time of 42.4 months for patients with high entropy (p=0.003).

CONCLUSION

Tumor run entropy from 18F-FDG PET/CT was significantly and independently associated with disease-specific survival in patients with OCSCC.

CLINICAL RELEVANCE/APPLICATION

Radiomic features extracted from 18F-FDG-PET/CT are associated with prognosis in patients with oral cavity cancer.

SSQ12-08 High Definition Image Reconstruction: Enhancing PET Quantification as Enabled by Digital Photon Counting PET/CT

Thursday, Dec. 5 11:40AM - 11:50AM Room: S501ABC

Participants
Katherine Binzel, PhD, Columbus, OH (*Presenter*) Nothing to Disclose
Taylor Porter, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Richard Moore, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Michael T. Friel, BS, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Yu-lung Hsieh, PhD, Columbus , OH (*Abstract Co-Author*) Nothing to Disclose
Jun Zhang, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose
Michael V. Knopp, MD, PhD, Columbus, OH (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

knopp.16@osu.edu

PURPOSE

Digital photon counting PET/CT enables more sensitive event detection and localization, leading to an increase in count density in the image data allowing image reconstruction with a larger matrix size resulting in smaller voxel volumes. We evaluated the quantitative impact of higher definition reconstruction on clinical data acquired on a next-generation digital photon counting PET/CT system.

METHOD AND MATERIALS

80 clinical patients were imaged for 90 seconds per bed position on a solid state digital photon counting PET/CT system (Philips Vereos, dPET) following injection of 13 mCi 18F-FDG. Standard definition (SD) reconstruction used a 4x4x4 mm3 isometric voxel volume, 144x144 matrix. Secondary reconstructions were completed using a 2x2x2 mm3 voxel volume, 288x288 matrix (high definition, HD) protocol, and a 1x1x1 mm3 voxel volume, 576x576 matrix (ultra-high definition, UHD) protocol. Using the SD images as reference, target tumor lesions and physiologic uptake were assessed by SUVmax and SUVmean, respectively. The percent difference from SD reconstruction measurements was calculated.

RESULTS

Quantification was significantly ($p<0.05$) improved by the use of larger reconstruction matrices. In background tissues, the average SUVmean increased 2.7% from SD values for the HD images and 4.3% for the UHD images. In target lesions the SUVmax increased an average of 24.9% and 57.9% for HD and UHD reconstructions. These improvements are consistent with the improved recovery coefficients seen in phantom data. The change in SUVmax of target tumor lesions was related to the tumor volume, with lesions less than 5cm3 having greater increases in SUVmax than lesions which were larger or more homogeneous.

CONCLUSION

High definition image reconstruction improves quantification of PET radiotracer activity. The reduction in partial volume effects created by utilizing smaller voxel sizes is enabled by the improved count senstivity and substantially faster time of flight timing resolution of the digital photon counting PET/CT platform.

CLINICAL RELEVANCE/APPLICATION

Next-generation digital photon counting PET/CT technology enables the use of larger reconstruction matrices due to improvements in spatial resolution and annihilation event localization.

SSQ12-09 Improving 18F-FMISO Hypoxia Target Map with EPRI and DCE-MRI

Thursday, Dec. 5 11:50AM - 12:00PM Room: S501ABC

Participants
Inna Gertsenshteyn, BA, Chicago, IL (*Presenter*) Nothing to Disclose
Boris Epel, PhD, Chicago, IL (*Abstract Co-Author*) Patent holder, 9,392, 957 ; Member, O2M
Lara Leoni, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Eugene Barth, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Xiaobing Fan, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Marta A. Zamora, BS, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Erica Markiewicz, BA, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Richard Freifelder, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Mohammed Bhuiyan, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Anna Kucharski, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Darwin Bodero, BA, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Hsiu-Ming Tsai, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Gregory S. Karczmar, PhD, Crete, IL (*Abstract Co-Author*) Nothing to Disclose
Chien-Min Kao, PhD, Chicago, IL (*Abstract Co-Author*) Stockholder, Walgreens Boots Alliance, Inc
Chin-Tu Chen, PhD, Chicago, IL (*Abstract Co-Author*) Board Member, BioMed Global Board Member, EVO Worldwide, Inc Board Member, AEPX Board Member, EnDepth Vision Systems, LLC Research Grant, DxRay, Inc Advisor, RefleXion Medical Inc Shareholder, EDDA Technology, Inc
Howard J. Halpern, MD, PhD, Chicago, IL (*Abstract Co-Author*) Patent holder, 8,664,955 ; Patent holder, 9,392,957 ; Member, O2M Technologies

PURPOSE

Electron Paramagnetic Resonance (EPR) pO2 images provide a radiobiologically validated standard to accurately identify hypoxia within tumors. Using EPR pO2 images as ground truth, we show the modification of PET-18F-MISO images using dynamic contrast enhanced (DCE)-MRI to better predict true hypoxia as defined by EPR in preclinical models for the eventual translation of this application to clinical human imaging.

METHOD AND MATERIALS

We used 6 MCa4 and SCC7 tumor mouse models grown in the leg in the range of 250-400 mm^3. Under minimal anesthesia, each mouse leg was set in a soft vinylpolysiloxane cast and imaged in EPR using trityl as the oxygen spin probe, followed by a T2 and DCE-MRI using gadolinium as the contrast agent, then a PET/CT scan using FMISO as the radiotracer to target hypoxia. Based on the Tofts model, ktrans and kep maps were obtained from DCE-MRI, as well as the Relative Signal Increase (RSI) of contrast. Data from all modalities were registered. We modeled radiotracer retention as the logistic function of pO2 to map the quantitative EPR pO2 image to PET-FMISO Tumor:Muscle ratio (TMR) images, so that its sigmoidal point of inflection was at the threshold of retention. Then a linear combination of the PET and DCE-MRI data was mapped to the logistic[pO2] data using the least squares method, and that combination of PET-DCE-MRI data was finally mapped back to EPR pO2 torr units by applying an inverted logistic function as a check. The Dice coefficient between EPR pO2 < 15 torr and PET or modified PET > 1.4 TMR was used as a metric of the effectiveness of mapping.

RESULTS

On average, the Dice coefficient before and after implementing our mapping method increased by 32% to define hypoxic regions within the tumor. We anticipate that a more sophisticated combination including a nonlinear combination of PET and MRI will improve Dice coefficient overlap of PET-FMISO and EPR pO2 image-defined hypoxia.

CONCLUSION

The improvement of overlap between our reference standard of hypoxia definition by EPR with mapped PET-DCE-MRI when compared to PET-FMISO alone shows that using solely PET-FMISO to define hypoxia is insufficient.

CLINICAL RELEVANCE/APPLICATION

Our mapping method to improve the accuracy of hypoxia definition using clinically accepted imaging methods can improve radiotherapy outcomes for tumor cure, and show another clinical advantage of PET-MRI imaging.

SSQ13

Musculoskeletal (Hardware and Orthopedic Implants)

Thursday, Dec. 5 10:30AM - 12:00PM Room: N226

MK

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Reto Sutter, MD, Zurich, Switzerland (*Moderator*) Nothing to Disclose
Thomas M. Link, MD, PhD, San Francisco, CA (*Moderator*) Research Grant, General Electric Company; Research Consultant, General Electric Company; Research Consultant, InSightec Ltd; Research Grant, InSightec Ltd; Consultant, Springer Nature; Research Consultant, Pfizer Inc;

Sub-Events

SSQ13-01 Diagnosis of Hip Arthroplasty Infection is Highly Accurate with State-of-the-Art MR Imaging

Thursday, Dec. 5 10:30AM - 10:40AM Room: N226

Participants
Julien Galley, MD, Zurich, Switzerland (*Presenter*) Nothing to Disclose
Reto Sutter, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Christoph Stern, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Lukas Filli, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Christian W. Pfirrmann, MD, MBA, Forch, Switzerland (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

julien.galley@balgrist.ch

PURPOSE

To evaluate MRI findings of hip arthroplasty infection and determine their diagnostic accuracy

METHOD AND MATERIALS

This retrospective case control study was approved by the local ethical committee. Dedicated Compressed-Sensing Slice Encoding for Metal Artifact Correction (CS SEMAC) MR exams from 40 patients with proven hip arthroplasty infection and 100 patients with non-infected arthroplasty were evaluated by two musculoskeletal radiologists for bone (peri-implant osteolysis, edema, periosteal reaction), articular (effusion, capsule appearance and thickness) and periprosthetic soft tissue findings (collection, intramuscular edema, bursitis, adenopathy). Chi square test was used to compare the groups. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were evaluated for each finding. Interobserver reliability was assessed with κ statistics.

RESULTS

Differences between infection and control group was highly significant ($P<0.001$) for the three following findings. Periosteal reaction was found in 31 of 40 patients with infection and in 10 of 100 in the control group, with a sensitivity of 77.5%, a specificity of 90.0%, a PPV of 75.6% and a NPV of 90.9%. Capsule edema was found in 33/40 (infection group) and in 5/100 (control group), with a sensitivity of 82.5%, specificity of 95.0%, PPV of 86.8% and NPV of 93.1%. Intramuscular edema was found in 38/40 (infection group) and in 14/100 (control group) with a sensitivity of 95.0%, a specificity of 86%, a 73.1% PPV and a NPV of 97.7%. The interobserver agreement was almost perfect with κ values between 0.88 and 0.92.

CONCLUSION

The presence of periosteal reaction, capsule edema and intramuscular edema at MRI of hip arthroplasty has a high sensitivity, specificity and negative predictive value for diagnosing infection.

CLINICAL RELEVANCE/APPLICATION

State-of-the-art MRI allows excluding hip arthroplasty infection and could avoid unnecessary joint aspiration.

SSQ13-02 Radiographic Evidence of Soft Tissue Gas Fifteen Days after Total Knee Arthroplasty is Predictive of Early Prosthetic Joint Infection

Thursday, Dec. 5 10:40AM - 10:50AM Room: N226

Participants
Ningcheng Li, MD, Portland, OR (*Presenter*) Nothing to Disclose
Ryland Kagan, MD, Portland, OR (*Abstract Co-Author*) Nothing to Disclose
Christopher J. Hanrahan, MD, PhD, Salt Lake City, UT (*Abstract Co-Author*) Nothing to Disclose
Barry G. Hansford, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The diagnosis of early prosthetic joint infection (PJI), defined as within six weeks after total knee arthroplasties (TKA), can be difficult due to expected post-surgical changes and elevated inflammatory markers. The role of radiographic evaluation in this situation carries unclear clinical significance. This study had two primary aims: 1) To determine when soft tissue gas is no longer an expected post-operative radiographic finding; and 2) To determine whether soft tissue gas is predictive of early PJI. The secondary aim was to determine if soft tissue gas correlated with microbiological culture results. To the best of our knowledge, this is the first study to address these questions in the literature.

METHOD AND MATERIALS

IRB approved retrospective study of patients who underwent TKA from 2008-2018, with available imaging between 5 days and 6 weeks post-operatively, and no interval intervention prior to imaging. All confirmed early PJI cases were included (n=25; 15 patients). For comparison, TKA patients without PJI (n=180; 150 patients) were selected randomly. Radiographs were reviewed by two musculoskeletal radiologists for presence of soft tissue gas. Comparative analysis was performed using Fisher's exact, binomial and nonparametric t-tests. A two-tailed $p<0.05$ was considered significant.

RESULTS

Soft tissue gas was identified in 13/25 (52.0%, 28.3±2.3 days post-op) cases with early post-operative PJI and 4/180 (2.2%, 15.3±7.3 days post-op) cases without PJI ($p<0.0001$, odds ratio 47.67 (95% Confidence Interval (CI): 13.79-143)). Presence of soft tissue gas had a sensitivity of 0.52 (95% CI: 0.36-0.70) and specificity of 0.98 (95% CI: 0.94-0.99). Staphylococcus species were the dominant organisms in cases with gas (45.0%) and in the absence of gas (50.0%), $p = 0.66$; but cases with gas demonstrated a wider variety of microbiology species ($p = 0.01$). 100% of cases with soft tissue gas prior to a suggested cut-off of 15 days post-op had no evidence of early knee PJI while 92.9% of cases with soft tissue gas after this cut-off had confirmed early knee PJI.

CONCLUSION

Post-operative soft tissue gas present on imaging performed fifteen days or more after TKA is predictive of early PJI and associated with a wider spectrum of cultured organisms.

CLINICAL RELEVANCE/APPLICATION

Soft tissue gas on post-operative radiographs fifteen days or more after TKA is predictive of early knee PJI as opposed to an expected post-operative finding.

SSQ13-03 Evaluation of a New Adaptive Iterative Metal Artifact Reduction Method in Clinical Whole-Body Low-Dose CT Skeletal Survey Examinations

Thursday, Dec. 5 10:50AM - 11:00AM Room: N226

Participants
Zaiyang Long, PhD, Rochester, MN (*Presenter*) Nothing to Disclose
Christin A. Tiegs-Heiden, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Tara L. Anderson, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Mark C. Adkins, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Julian A. Hagen, BSC, Malvern , PA (*Abstract Co-Author*) Employee, Siemens AG
Katrina N. Glazebrook, MBChB, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Ahmed Halaweish, PhD, Rochester, MN (*Abstract Co-Author*) Employee, Siemens AG
Cynthia H. McCollough, PhD, Rochester, MN (*Abstract Co-Author*) Research Grant, Siemens AG
Joel G. Fletcher, MD, Rochester, MN (*Abstract Co-Author*) Grant, Siemens AG; Consultant, Medtronic plc; Consultant, Takeda Pharmaceutical Company Limited; Grant, Takeda Pharmaceutical Company Limited; ;

For information about this presentation, contact:

long.zaiyang@mayo.edu

PURPOSE

Whole-body low-dose CT (WBLDCT) skeletal surveys contain many images and are being increasingly performed. Current iterative metal artifact reduction (iMAR) methods require parameters that are tailored to metal type and body region, requiring creation of many image sets in patients with multiple metallic implants. This study aims to evaluate an adaptive iMAR (AiMAR) algorithm, which automatically selects best parameters to allow a single image set to be used across all body regions, for use in WBLDCT.

METHOD AND MATERIALS

Projection data were collected from 25 patients, each with two types of metal implants, who underwent clinical WBLDCT on Siemens SOMATOM Definition Edge or Force scanners (120kV; CAREDose4D on with quality reference mAs of 110 or 70, respectively). Implants included dental, shoulder, spine, hip and knee prostheses, as well as pacemakers. Three AiMAR strength settings (2, 4, and 5) were considered, in addition to the original images without metal artifact reduction. For each setting, soft tissue and bone kernel images were reconstructed with a 3 mm image thickness and increment, resulting in eight image series. All series were anonymized and randomized for a reader study. Two musculoskeletal radiologists scored the images for artifact degree, anatomy visualization, and diagnostic quality, as well as ranked overall performance.

RESULTS

K-related sample Friedman test revealed statistically significant differences among the four settings in artifact degree, anatomy visualization, and diagnostic quality (all $p<0.01$). AiMAR strength 5 showed best artifact reduction but was noted to cause tissue/bone cortex blurring or loss in 10/25 patients. AiMAR strength 4 was ranked highest in overall performance.

CONCLUSION

AiMAR was evaluated in patients with multiple implants for WBLDCT skeletal surveys. Strength 4 provided excellent metal artifact reduction in a single reconstruction to address multiple implants in the same patient, overcoming current workflow limitations from body-part-specific iMAR techniques.

CLINICAL RELEVANCE/APPLICATION

WBLDCT skeletal survey exams often suffer from metal artifacts. The evaluated adaptive iterative metal artifact reduction algorithm with strength 4 provided significant metal artifact reduction for multiple implants while improving clinical workflow.

SSQ13-04 Effect of Radiofrequency Pulse Transmission Polarization on Metal Related Artifacts at 3T Magnetic Resonance Imaging: Circular versus Elliptical Polarization

Thursday, Dec. 5 11:00AM - 11:10AM Room: N226

Participants
Iman Khodarahmi, MD, PhD, New York, NY (*Presenter*) Nothing to Disclose
William Walter, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
John Kirsch, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Gregory Chang, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Jan Fritz, MD, Baltimore, MD (*Abstract Co-Author*) Institutional research support, Siemens AG; Institutional research support, Johnson & Johnson; Institutional research support, Zimmer Biomet Holdings, Inc; Institutional research support, Microsoft Corporation; Institutional research support, BTG International Ltd; Scientific Advisor, Siemens AG; Scientific Advisor, General Electric Company; Scientific Advisor, BTG International Ltd; Speaker, Siemens AG; Patent agreement, Siemens AG

For information about this presentation, contact:

iman.khodarahmi@nyumc.org

PURPOSE

To investigate the effect of circular and elliptical polarization of the radiofrequency (RF) pulse on the metal related artifacts of total hip arthroplasty implants during Metal Artifact Reduction Sequence (MARS) MRI at 3T.

METHOD AND MATERIALS

For this in-vitro study, we used a clinical cobalt-chromium total hip arthroplasty system with polyethylene liner immersed in a standard ASTM gel phantom. Clinical MARS MR sequences including high-bandwidth turbo spin echo (HBW-TSE), Slice Encoding for Metal Artifact Correction (SEMAC), and compressed sensing (CS) SEMAC were acquired in axial, coronal, and sagittal planes using proton density weighting. Each scan was acquired twice with circular (CP) and elliptical (EP) RF polarization, while keeping other sequence parameters identical. After anonymization and randomization, metal artifacts were volumetrically quantified for CP and EP images using manual segmentation. Additionally, observers compared the two modes for overall image quality through side-by-side display of each image pair and selcetion of the prefered polarization mode (tied selections allowed). A p-value of less than 0.05 was considered significant for all statistical analyses.

RESULTS

On quantitative analysis, metal artifact degraded regions were significantly smaller on EP images compared to the corresponding CP images of the same location and pulse sequence (paired t-test: $p < 0.02$ for all pulse sequences). The overall artifact volume (including implant itself) calculated using axial HBW-TSE images was 19% lower for EP (510 cm3) compared to CP (608 cm3). Readers chose image quality of EP in 56% (95% CI: 51%-61%) and CP in 7% (95% CI: 4%-9%) of the cases with significantly superior image quality of EP (signed test: p-value < 0.001 for all pulse sequences).

CONCLUSION

MRI at 3T with elliptical RF pulse polarization results in stronger metal artifact reduction and overall superior image quality than circular polarization. Switching to elliptical polarization for 3T MARS imaging of metal containing body parts may eventually hold promise for in vivo clinical imaging.

CLINICAL RELEVANCE/APPLICATION

MARS MRI performed with elliptical polarization of the RF pulse has the potential to provide images with lower artifact and higher image quality instead of circular polarization.

SSQ13-05 Impact of Stem Design and Cementation on Postoperative Femoral Antetorsion in 227 Patients with Total Hip Arthroplasty (THA)

Thursday, Dec. 5 11:10AM - 11:20AM Room: N226

Participants
Tim Fischer, Zurich, Switzerland (*Presenter*) Nothing to Disclose
Christoph Stern, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Benjamin Fritz, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Patrick Zingg, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Christian W. Pfirrmann, MD, MBA, Forch, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Reto Sutter, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

tim.fischer@balgrist.ch

PURPOSE

In total hip arthroplasty (THA), surgeons try to achieve a physiological antetorsion with a combined cup and stem approach. Still, postoperative antetorsion of the femoral stem is known to show large variabilities. The purpose of this study was to assess if postoperative femoral antetorsion is influenced by stem design or cementation.

METHOD AND MATERIALS

Following ethics approval, we analyzed the postoperative femoral antetorsion in metal suppressed MR examinations of 227 patients with THA and five stem (S) designs (S1-5). S1 was cementless and short curved (n=32), S2 and S3 were cementless and standard straight (n=53 and n=51, respectively), S4 was collared cementless standard straight (n=48) and S5 cemented straight (n=43). Prostheses with suspected stem loosening were excluded. Two fellowship-trained musculoskeletal radiologists independently

evaluated femoral antetorsion by measuring the angle between the axis along the proximal neck of the femoral component and a tangent aligned to the posterior femoral condyles. Statistical analysis included general descriptive statistics, univariate analysis and inter-reader reliability.

RESULTS

Inter-reader reliability was very good with an ICC of 0.98. The cementless collared S4 showed the highest antetorsion with 18.1° (SD ±10.5°; range -10° to 45°), which was significantly higher than the antetorsion of the collarless S3 with 13.3° (±8.4°; -4° to 29°) and the cemented S5 with 12.7° (±7.7°; -3° to 27°) with p=0.012 and p=0.007, respectively. S1 and S2 showed an antetorsion of 14.8° (±10.0°; 1° to 37°) and 14.1° (±12.2°; -20° to 41°), which did not differ significantly from S3-5 (all p>0.165). The combined standard deviation of the cementless stems (S1-4) was significantly higher compared to the cemented S5 with 10.5° and 7.7°, respectively (p=0.019).

CONCLUSION

Different patterns of femoral antetorsion exist for different stem types of THA, with some statistical differences between cemented and cementless stems as well as between cementless types with and without collar. The cemented stems demonstrated the lowest variability, suggesting the lowest rate of inadvertent malrotation during implant placement.

CLINICAL RELEVANCE/APPLICATION

This is the first study reporting the postoperative range of femoral antetorsion in patients with THA for different stem designs, and can be used as a reference dataset for clinical evaluation.

SSQ13-06 Loss of Reduction is Common After Coracoclavicular Ligament Reconstruction

Thursday, Dec. 5 11:20AM - 11:30AM Room: N226

Participants
Brian P. Kennedy, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Zehava S. Rosenberg, MD, Hoboken, NJ (*Abstract Co-Author*) Nothing to Disclose
Michael Alaia, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Mohammad M. Samim, MD, MRCS, Yonkers, NY (*Abstract Co-Author*) Nothing to Disclose
Erin F. Alaia, MD, New York, NY (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

erin.fitzgerald@nyulangone.org

PURPOSE

Coracoclavicular ligament reconstruction is an increasingly common treatment for significant acromioclavicular joint injury. We have anecdotally noted loss of acromioclavicular joint reduction, coracoclavicular interval widening, distal clavicular osteolysis, and osseous tunnel widening on follow-up imaging. Our purpose is to report radiographic features and complications following coracoclavicular ligament reconstruction.

METHOD AND MATERIALS

Retrospective query of our imaging database identified 55 cases of coracoclavicular ligament reconstruction. Cases with at least one month of follow-up and available operative report were reviewed with attention to acromioclavicualar joint alignment, coracoclavicular interval widening, distal clavicular osteolysis, widening of the osseous tunnel, and hardware complication. Two additional blinded radiologists reviewed the cases to assess for inter-reader agreement.

RESULTS

32 patients with post-operative imaging following coracoclavicular ligament reconstruction (23 male, 9 female; age range 24-64, imaged 1-34 months following surgery) were included. Loss of acromioclavicular joint reduction was the most common imaging finding at follow-up (n = 25), with 88% of cases seen within 6 months of surgery. 19 patients with loss of acromioclavicular reduction progressed to coracoclavicular interval widening. Distal clavicular osteolysis was seen in 21 patients, with 90% of cases seen within 6 months of surgery. Reconstruction tunnels widened on average 2 mm (range 0 - 4 mm). Hardware complication, including perihardware fractures, was seen in 6 patients. Loss of acromioclavicular joint reduction was found to have a statistically significant association with distal clavicular osteolysis (p = 0.032). Inter-reader agreement was substantial for coracoclavicular interval widening (k = 0.63), moderate for tunnel widening (k = 0.48) and hardware complication (k = 0.56), and fair for distal clavicular osteolysis (k = 0.40) and loss of acromioclavicular reduction (k = 0.39).

CONCLUSION

Loss of acromioclavicular joint reduction, distal clavicular osteolysis, and tunnel widening are frequently demonstrated after coracoclavicular ligament reconstruction.

CLINICAL RELEVANCE/APPLICATION

Radiologists should be aware of the common imaging findings following coracoclavicular reconstruction. Attention to early loss of reduction or distal clavicular osteolysis may guide treatment approach and impact patient outcomes.

SSQ13-07 Fast Magnetic Imaging with Metallic Artifact Reduction Using Spectral Bin Modulation of Multiacquisition Variable Resonance Image Combination Selective Imaging

Thursday, Dec. 5 11:30AM - 11:40AM Room: N226

Participants
Hong Seon Lee, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Joohee Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Salman Albakheet, MBBS, Alkhober, Saudi Arabia (*Abstract Co-Author*) Nothing to Disclose
Young Han Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sungjun Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

Ho-Taek Song, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jin-Suck Suh, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Suryanarayanan S. Kaushik, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company

PURPOSE

To assess the clinical utility of a prototype metal artifact reduction sequence (MAVRIC-SL) at 3T. This sequence allows a surgical prosthesis-dependent spectral bin reduction. We compared the prototype MAVRIC-SL with conventional 2D FSE sequences and further compared MAVRIC-SL images acquired with all the spectral bins, and those with the optimized spectral bins.

METHOD AND MATERIALS

MAVRIC SL images were acquired in a total 25 subjects. For each subject, the optimized number of spectral bins were determined using a short spectral calibration scan. The MR image sets used for analysis consisted of MAVRIC-SL PD-weighted or MAVRIC-SL STIR or MAVRIC-SL PD-weighted acquired with all 24 spectral bins, the corresponding images with the optimized spectral bins, conventional image of PD-weighted FSE or STIR images. The images were reviewed by a musculoskeletal radiologist and were scored using a five-point scale for artifact reduction around the prosthesis, visualization of the prosthesis, and visualization of peri-prosthetic tissues. Quantitative evaluation of peri-prosthetic tissues was also done. For statistical analyses, Paired Sample t-test was used to test for significance.

RESULTS

The MAVRIC SL images enabled significantly improved metallic artifact reduction as compared with conventional 2D FSE sequences. The optimized spectral bin numbers calculated by the spectral calibration scan ranged from 6 to 20, and this depended on the prosthesis susceptibility, size, and the orientation to the B0 field. The scan times were significantly different ($p<0.05$, 20% reduced scan time). Compared to the MAVRIC SL images acquired with all 24 bins, artifact reduction, visualization of prosthesis and visualization of peri-prosthetic tissues was not significantly different.

CONCLUSION

Compared to the MAVRIC SL images acquired with all 24 spectral bins, MAVRIC SL acquired with an optimized number of spectral bins can reduce metallic implant induced susceptibility artifacts with no significant image quality degradation, while still providing a decrease in scan time. With fewer spectral bins, the patient convenience can be increased by reducing the scan time, or the reduced time can be used to increase the spatial resolution to obtain a higher resolution image.

CLINICAL RELEVANCE/APPLICATION

MAVRIC-SL with spectral bin modulation improved image quality and decreased metallic artifacts with similar scan times to conventional images.

SSQ13-08 Comparison of Metal Artifact Reduction (MAR) Algorithms: Which is Better MAR for Hip Prostheses Evaluation

Thursday, Dec. 5 11:40AM - 11:50AM Room: N226

Participants
Hye Jin Yoo, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Sung Hwan Hong, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ja-Young Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hee-Dong Chae, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ji Hee Kang, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ji-Eun Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyunjung Yeoh, BMedSc, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the effect of various metal artifact reduction (MAR) algorithms in CT imaging of patients with hip prostheses

METHOD AND MATERIALS

Total 47 patients with hip prostheses were enrolled who underwent dual-layer detector spectral CT (28 men and 19 women, mean age of 63.2±10.7 years). Conventional images (CI) with iterative reconstruction algorithm (iDose 2), CI with orthopedic metal artifact reduction algorithm (O-MAR), and a variable energy range of virtual monoenergetic image (VMI, 50~200 keV) were obtained from the dual energy CT data. The image quality was quantitatively assessed by comparing CT numbers, standard deviations (SDs), corrected image noise (CIN), contrast-to-noise ratios (CNRs) and artifact index (AIs) in the seven region-of-interests (ROIs) placed around the hip prostheses among three datasets. The structural similarity (SSIM) was used to quantitatively evaluate the performance of metal artifact correction in O-MAR and VMI using CI as a reference images. Qualitative evaluation included degree of metal artifact, conspicuity of bone trabeculation, and presence of pseudolesions.

RESULTS

The lowest image noise, AI, CNR were found in O-MAR, followed by high-keV VMI in most of the regions. VMI and O-MAR showed the similar SSIM values in periprosthetic region, but VMI showed significantly higher SSIM values than O-MAR in other soft tissue region, indicating lesser metal artifact reduction of VMI. On qualitative evaluation, O-MAR provided lesser metal artifact but induced new artifacts including lesser conspicuity of bone trabeculation, artefactual cortical thinning and pseudocemented appearance in the adjacent bone.

CONCLUSION

For evaluation of hip prostheses, O-MAR presented quantitatively and qualitatively favorable image quality than VMI and iDose 2, but it can generate new artifacts.

CLINICAL RELEVANCE/APPLICATION

As MAR algorithms are popularized in many institutions by technical advance, we need to know what the most favorable MAR algorithm is and to be aware of the new artifacts generated by MAR algorithm.

SSQ13-09 Metal-Artifacts in Orthopaedic Implants: How Can We Improve our CT-Scans and What About Tin-Filter Technology?

Thursday, Dec. 5 11:50AM - 12:00PM Room: N226

Participants
Carsten Hackenbroch, Ulm, Germany (*Presenter*) Nothing to Disclose
Simone Schule, Ulm, Germany (*Abstract Co-Author*) Nothing to Disclose
Meinrad J. Beer, MD, Ulm, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of the study was to assess, how to improve CT image quality in the presence of different orthopaedic implants while using various CT modalities, especially DECT and tin- filter technology vs conventional CT. Furthermore, we wanted to explore, if scanning at reduced dose can still provide good image quality in the presence of metal implants.

METHOD AND MATERIALS

4 cadavers (pelvis und lower L- spine) with different orthopaedic implants were tested, using 9 various scan-protocols, consisting of Full-dose (FD, CDTI 10 mGy) and low dose (LD, CDTI 3,3 mGy) scans. That included scans with tin-filter technique, DECT and conventional CT on a 3rd generation DECT scanner. Additionally, besides standard 3rd generation iterative reconstruction software (ADMIRE), a novel metal artefact reduction software (iMAR) was used. Evaluation was done by using a 6-part Likert scale for objective and subjective parameters.

RESULTS

In all 4 cadavers FD tin filter scans with 150 kV Sn showed the best overall results, which was improved by using MARS-software. Looking only at metal artefact reduction, the best results were obtained, using DECT technique (FD as well as LD), but these images suffered from high imaging noise, leading to a blurring of fine osseous structures as trabecular bone, which reduced their overall rating. Even low dose scans at 150 kV Sn, showed a good overall rating.

CONCLUSION

Tin filter technology did effectively reduce metal artefacts while providing good image quality of the adjacent bony structures near orthopaedic implants. While DECT showed the best metal artefact reduction it suffered from image noise, that obscured fine bony structures. Using a LD 150 kV tin filter program can significantly reduce dose (1/3 of normal dose) and still provide good image quality and good metal artefact reduction at the same time.

CLINICAL RELEVANCE/APPLICATION

Metal- artefact reduction is an important task in CT scanning. To explore the best possible way how to obtain this (by means of hardware-tools, software-tools or a combination of both) is important.

Printed on: 10/29/20

SSQ14

Nuclear Medicine (Breast/General Oncology Nuclear Medicine and PET)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S402AB

BR MR NM OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Amy M. Fowler, MD,PhD, Madison, WI (*Moderator*) Institutional research support, General Electric Company; Author with royalties, Reed Elsevier
Bital Savir-Baruch, MD, Atlanta, GA (*Moderator*) Research Grant, Blue Earth Diagnostics Ltd; Consultant, Blue Earth Diagnostics Ltd

Sub-Events

SSQ14-01 Can We Replace Sentinel Lymph Node Resection in Breast Cancer Patients by Breast MRI, Axillary MRI, Axillary 18F-FDG PET/MRI or Axillary Sonography?

Thursday, Dec. 5 10:30AM - 10:40AM Room: S402AB

Participants
Ole Martin, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Julian Kirchner, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Nils M. Bruckmann, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Benedikt M. Schaarschmidt, MD, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Johannes Grueneisen, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Lale Umutlu, MD, Essen, Germany (*Abstract Co-Author*) Consultant, Bayer AG
Gerald Antoch, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Lino Sawicki, MD, Dusseldorf, Germany (*Presenter*) Nothing to Disclose

PURPOSE

To compare the diagnostic performance of Mamma-MRI, axillary MRI, axillary 18F-FDG PET/MRI and axillary sonography in the detection of lymph node metastases in patients suffering from breast cancer.

METHOD AND MATERIALS

56 female patients with breast cancer (mean age 53.5±12.2 years) with newly diagnosed, histopathologically proven breast cancer were prospectively enrolled in this two-center trial. All patients underwent dedicated prone 18F-FDG breast PET/MRI and supine whole-body 18F-FDG PET/MRI as well as axillary sonography. Sentinel lymph node biopsy (SLNB) and/or axillary lymph node dissection were performed in all patients and histopathology served as reference standard. Sensitivity, specificity, PPV, NPV and accuracy regarding axillary lymph node assessment were calculated for dedicated breast MRI, axillary MRI, axillary 18F-FDG PET/MRI and axillary sonography.

RESULTS

According to the reference standard, lymph node metastases were present in 25 patients with a total of 78 metastases. On a patient based analysis, dedicated breast MRI identified 14/25 (56%), axillary MRI 15/25 (60%), axillary PET/MRI 19/25 (76%) and axillary sonography 18/25 (72%) of the patients with a positive nodal status. On a lesion-based analysis, sensitivity, specificity, PPV, NPV and accuracy were 54.5%, 88.9%, 88.9%, 54.5% and 67.6% for breast MRI; 55.1%, 90%, 89.3%, 53.2% and 57,5% for axillary MRI; 71.4%, 92.1%, 65.0%, 89.7% and 78.2% for axillary PET/MRI and 60.0%, 86.2%, 84.0%, 61.1% and 71.9% for axillary sonography.

CONCLUSION

18F-FDG PET/MRI and sonography serve equally acceptable diagnostic accuracy for nodal staging in breast cancer patients and are both superior to dedicated breast MRI or supine whole-body MRI. Although PET/MRI provides important information for staging workup breast cancer patients, neither PET/MRI nor axillary sonography do reliably differentiate N-positive from N-negative breast cancer patients.

CLINICAL RELEVANCE/APPLICATION

Sentinel lymph node biopsy cannot be replaced by imaging procedures alone and is still mandatory for staging breast cancer patients.

SSQ14-02 Simultaneous PET/MRI in the Early Prediction of Response to Neoadjuvant Chemotherapy in Patients with Locally-Advanced Breast Cancer

Thursday, Dec. 5 10:40AM - 10:50AM Room: S402AB

Participants
Valeria Romeo, Naples, Italy (*Presenter*) Nothing to Disclose
Carlo Cavaliere, Naples, Italy (*Abstract Co-Author*) Nothing to Disclose
Luca Basso, Naples, Italy (*Abstract Co-Author*) Nothing to Disclose
Nunzia Garbino, Naples, Italy (*Abstract Co-Author*) Nothing to Disclose

Mario Petretta, 80125, Italy (*Abstract Co-Author*) Nothing to Disclose
Emanuele Nicolai, Napoli, Italy (*Abstract Co-Author*) Nothing to Disclose
Massimo Imbriaco, MD, Napoli, Italy (*Abstract Co-Author*) Nothing to Disclose
Marco Salvatore, MD, Napoli, Italy (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

valeria.romeo@unina.it

PURPOSE

Aim of the study was to assess whether simultaneous PET/MRI could be helpful in the early prediction of the response to neoadjuvant chemotherapy (NAC) in patients with locally advanced breast cancer (LABC).

METHOD AND MATERIALS

Between January 2017 and July 2018, 20 consecutive patients (mean age 45 yrs) with LABC who underwent anthracycline- and taxane-based neoadjuvant chemotherapy (NAC) followed by surgical resection were prospectively enrolled. Simultaneous breast PET/MRI examination was performed twice in each patient, one week before NAC and early after the second anthracycline cycle. PET/MRI images were analyzed to extract quantitative diffusion (ADCmin, ADCmean), perfusion (Ktrans, Kep, Ve, IAUC) and metabolic (SUV2d, SUV3d, MTV) parameters. The variation of each parameter (delta, D) after the second anthracycline cycle was then calculated. The normality of the data was tested using the Shapiro-Wilk test. Differences in terms of pre-treatment and D parameters between patients histologically classified as complete response (CR) and partial response (PR) were compared using of the nonparametric Mann-Whitney U test. Logistic regression analysis was performed to identify imaging parameters predictive of the response.

RESULTS

D-Size, D-Ktrans, Kep, D-Kep, MTV and D-MTV resulted significantly different ($p<0.03$) between patients who showed CR and PR. In detail, pre-treatment Kep and MTV were significantly lower in patients with CR while the variation of each parameter was significantly higher in patients with CR as compared to patients with PR. A cut-off value of 5.09 D-MTV perfectly predicted the response to treatment (Figure 1). MRI parameters significantly associated to the response to treatment were D-Ktrans ($p=0.05$), Kep (0.04), and D-Kep (0.05).

CONCLUSION

Simultaneous breast PET/MRI could be useful to early predict the response to NAC in patients with LABC. Our preliminary observations show that functional (i.e. perfusion and metabolic) rather than morphological parameters may identify patients who will respond completely, particularly using both pre-treatment and the variation of quantitative parameters early after the second cycle of NAC.

CLINICAL RELEVANCE/APPLICATION

Simultaneous breast PET/MRI may be useful for early identification of LABC patients who would benefit from continuing NAC or for whom surgical excision could be optionally considered.

SSQ14-03 Quantitative 18F-FDG Uptake of Invasive Breast Cancer Using Harmonized Prone PET/CT and Simultaneous Breast PET/MRI with 10 Minute PET Acquisition Time

Thursday, Dec. 5 10:50AM - 11:00AM Room: S402AB

Participants
Amy M. Fowler, MD,PhD, Madison, WI (*Presenter*) Institutional research support, General Electric Company; Author with royalties, Reed Elsevier
Manoj Kumar, MS, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Leah Henze Bancroft, PhD, Madison, WI (*Abstract Co-Author*) Institutional research support, General Electric Company
Jacob Johnson, Madison, WI (*Abstract Co-Author*) Institutional research support, General Electric Company
Jillian A. Karow, MD, Minneapolis, MN (*Abstract Co-Author*) Nothing to Disclose
Kelley Salem, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Tyler Bradshaw, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Alan B. McMillan, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Roberta M. Strigel, MD, Madison, WI (*Abstract Co-Author*) Research support, General Electric Company

For information about this presentation, contact:

afowler@uwhealth.org

PURPOSE

To compare tumor 18F-FDG uptake measured with 10 min PET acquisition using breast PET/MRI harmonized with prone PET/CT in patients with newly diagnosed invasive breast cancer.

METHOD AND MATERIALS

This HIPAA-compliant, IRB-approved single-institution, prospective study was performed from 2016 to 2018. Patients with biopsy-proven invasive breast cancer undergoing preoperative breast MRI were included. Patients who were pregnant, lactating, had implants, or underwent neoadjuvant therapy were not eligible. Fasting subjects underwent PET/CT (Discovery 710) of the breasts 60 min after injection of 10 mCi 18F-FDG. Patients were scanned at one bed position for 10 min in the prone position using the breast MRI coil housing with metal components removed. A low dose CT scan was obtained for attenuation correction. Subjects then underwent simultaneous breast PET/MRI (Signa 3.0T PET/MR) using an 8-channel breast coil 85 min after 18F-FDG injection. Standard clinical breast MRI sequences and Dixon-based sequences for attenuation correction were obtained simultaneously with the PET acquisition for 30 min. PET reconstruction was harmonized between scanners based on phantom scans. For analysis, the first 10 min of PET/MRI acquisition was compared to PET/CT. Standardized uptake value (SUV) measurements were performed for the tumor and contralateral normal (nl) fibroglandular tissue. Bland-Altman analysis was performed to determine measurement bias and 95% limits of agreement.

RESULTS

23 women (mean 49.6 yrs; 33-70) with 24 biopsy-proven sites of invasive breast carcinoma participated. Mean lesion size was 3.8 cm (1.1-8.8 cm) on MRI. Mean±SEM for tumor SUVmax, tumor SUVmean, and nl breast SUVmean for PET/MRI vs PET/CT, respectively, were 8.6±1.3 vs 7.3±1.1, 4.9±0.76 vs 3.7±0.57, and 1.4±0.083 vs 1.3±0.090. Measurement bias for PET/MRI vs PET/CT was 15.6% [-15.1,46.2] for tumor SUVmax, 28.7% [-7.21,64.6] for tumor SUVmean, 3.74% [-29.3,36.7] for tumor SUVmax/nl breast SUVmean, and 17.1% [-18.2,52.5] for tumor SUVmean/nl breast SUVmean.

CONCLUSION

Quantitative assessment of 18F-FDG uptake of invasive breast cancer is feasible using simultaneous breast PET/MRI with acceptable agreement between PET/MRI and PET/CT.

CLINICAL RELEVANCE/APPLICATION

Establishing the agreement between PET/CT and simultaneous breast PET/MRI for tumor 18F-FDG uptake is important for potential clinical applications such as neoadjuvant therapy response assessment.

SSQ14-04 Comparison of Whole-Body 18F-FDG-PET/MRI and PET/CT in Terms of Lesion Detection in Asymptomatic Subjects: A Retrospective Study

Thursday, Dec. 5 11:00AM - 11:10AM Room: S402AB

Participants
Mingxiang Sun, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Mu Lin, Shanghai, China (*Abstract Co-Author*) Employee, Siemens AG
Liling Peng, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Xin Gao, MD, Shanghai , China (*Presenter*) Nothing to Disclose
Holger Schmidt, Erlangen, Germany (*Abstract Co-Author*) Employee, Siemens AG

PURPOSE

To compare fluorine fluorodeoxyglucose (18F-FDG) combined positron emission tomography and magnetic resonance imaging (PET/MRI) with 18F-FDG combined positron emission tomography and computed tomography (PET/CT) in terms of organ-specific lesion detection in asymptomatic subjects for cancer screening.

METHOD AND MATERIALS

2794 individuals undergoing PET/MRI (Biograph mMR, Siemens Healthcare, Erlangen, Germany) and 4283 individuals undergoing PET/CT examinations (Biograph mCT, Siemens Healthcare, Knoxville, USA), from January 2016 to December 2017 in our center, were enrolled for this retrospective study. The local ethics committee approved this study. Written, informed consent was obtained from all subjects. Besides PET/MRI and PET/CT examinations, the screening methods included ultrasound, CT (for PET/MRI), MRI (for PET/CT) and tumor marker tests of CEA, CA19-9, PSA (for male) and CA125 (for female), dependent on the cancer type. Subjects who had no positive findings in the following 12 months were considered as 'cancer negative'.

RESULTS

In the 2794 subjects, PET/MRI detected 66 suspicious lesions, 54 of them were diagnosed as malignant tumors (true positive) and 12 of them were benign (false positive). 12 malignant tumors were missed but detected by other modalities (false negative). The detection rate, sensitivity, specificity, PPV and NPV of PET/MRI screening were 1.93% (54/2794), 81.8% (54/66), 99.5% (2715/2728), 81.8% (54/66) and 99.5% (2715/2728) respectively. In the 4283 subjects, PET/CT detected 55 suspicious lesions and 48 of them were malignant tumors (true positive) and 7 of them were benign (false positive). 7 malignant tumors were missed but detected by other modalities (false negative). The detection rate, sensitivity, specificity, PPV and NPV of PET/CT screening were 1.12% (48/4283), 87.3% (48/55), 99.8% (4228/4283), 87.3% (48/55) and 99.8% (4228/4283) respectively. The detailed distribution of cancer types is shown in Figure.

CONCLUSION

To our best knowledge, this is the first work to compare the diagnostic values of PET/MRI and PET/CT for cancer screening in asymptomatic subjects. Both methods can detect a wide variety of cancer at early stage.

CLINICAL RELEVANCE/APPLICATION

Compared to PET/CT, PET/MRI has a higher detection rate and a higher sensitivity in solid organs except lung. Considering also the reduced radiation dose, PET/MRI is recommended as part of a cancer screening program for asymptomatic subjects.

SSQ14-05 Whole-Body MRI and 18F-FDG PET/MRI for N and M Staging in Primary Breast Cancer: A Multicenter Trial

Thursday, Dec. 5 11:10AM - 11:20AM Room: S402AB

Participants
Nils M. Bruckmann, MD, Duesseldorf, Germany (*Presenter*) Nothing to Disclose
Julian Kirchner, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Ole Martin, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Benedikt M. Schaarschmidt, MD, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Lale Umutlu, MD, Essen, Germany (*Abstract Co-Author*) Consultant, Bayer AG
Gerald Antoch, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Lino Sawicki, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate and compare the diagnostic potential of whole-body MRI and 18F-FDG PET/MRI for N and M staging in newly diagnosed, histopathological proven breast cancer.

METHOD AND MATERIALS

A total of 77 patients with newly diagnosed, histopathological proven breast cancer were enrolled in this study prospectively. All patient underwent a whole-body 18F-FDG PET/MRI in supine position. The MRI protocol included a transverse T2-weighted, a T1-weighted and a DWI sequence of the whole body from head to the thigh. The N and M staging was assessed according to the eighth edition of the American Joint Committee on Cancer staging manual in MRI datasets alone and in 18F-FDG PET/MRI datasets, respectively. Histopathology or follow up examination as reference standard were available in all 77 patients for N and M staging. A McNemar chi2 test was performed to investigate whether differences in the evaluation of the correct N and M stage between 18F-FDG PET/MRI and MRI were statistically significant.

RESULTS

MRI and PET/MRI were concordant for N and M staging in 74 of 77 (96.1%) patients. Compared to the reference standard, PET/MRI as well as MRI determined a correct N and M stage in 57/77 (74%) of the patients, respectively. A positive nodal status was present in 33/77 patients (43%). PET/MRI determined the N stage correctly in 62 of 77 (80.5%) patients with a sensitivity of 78.8% and a specificity of 93.2%. MRI determined the N stage correctly in 61 of 77 (79%) with a sensitivity of 75.8% and a specificity of 93.2%. Distant metastases were present in 4/77 patients (5%). PET/MRI detected all of the histopathological proven metastases (100% identification), while one metastasis was missed in MRI (75% identification). Additionally, PET/MRI leads to false-positive findings in 6 patients (8%) and MRI in 5 patients (7%). No statistically significant differences between the modalities were seen.

CONCLUSION

18F-FDG PET/MRI was shown to be slightly superior to MRI in the N and M staging in primary breast cancer patients. However, both modalities bear the risk to overestimate the M-stage.

CLINICAL RELEVANCE/APPLICATION

A whole-body 18F-FDG PET/MRI and MRI are highly accurate for evaluating the M stage in breast cancer patients and therefore could be considered in combination with a dedicated breast 18F-FDG PET/MRI as staging method of choice at time of diagnosis.

SSQ14-06 Correlation of 18F-FDG PET/MRI Imaging Information with Relevant Immunohistochemical Markers in Breast Cancer Patients: Could PET/MRI Identify High-Risk Patients?

Thursday, Dec. 5 11:20AM - 11:30AM Room: S402AB

Participants
Ole Martin, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Julian Kirchner, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Nils M. Bruckmann, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Benedikt M. Schaarschmidt, MD, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Johannes Grueneisen, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Yan Li, Essen, Germany (*Abstract Co-Author*) Nothing to Disclose
Lale Umutlu, MD, Essen, Germany (*Abstract Co-Author*) Consultant, Bayer AG
Gerald Antoch, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Lino Sawicki, MD, Dusseldorf, Germany (*Presenter*) Nothing to Disclose

PURPOSE

To correlate prognostically relevant immunohistochemical parameters of breast cancer with simultaneously acquired standardized uptake values (SUV) and apparent diffusion coefficient (ADC) derived from hybrid PET/MRI.

METHOD AND MATERIALS

56 female patients with therapy naive, histologically proven breast cancer (mean age 54.1±12.0 years) underwent dedicated prone 18F-FDG breast PET/MRI and supine whole-body 18F-FDG PET/MRI. As part of the diagnostic imaging protocol, diffusion-weighted imaging (DWI, b values: 0, 500, 1000 s/mm²) was performed simultaneously with PET acquisition. A region of interest (ROI) encompassing the entire primary tumor was drawn into each patient's breast and prone PET/MR images to determine the glucose metabolism represented by maximum and mean SUV and into ADC maps to assess tumor cellularity represented by mean and minimum ADC values. Histopathological tumor grading as well as additional prognostically relevant immunohistochemical markers, i.e. Ki-67, progesterone, estrogen receptor, and human epidermal growth factor receptor 2 (HER2/neu) were determined.

RESULTS

We found a significant inverse correlation between both SUV- and ADC-values derived from breast PET/MRI ($r=-0.49$ for SUVmean vs. ADCmean and $r=-0.43$ for SUVmax vs. ADCmin, both $p<0.001$). Tumor grading as well as Ki67 showed a significant positive correlation with SUVmean from both whole-body PET/MRI ($r=0.42$ and $r=0.37$, $p<0.001$) and breast PET/MRI ($r=0.37$ and $r=0.32$, $p<0.01$). For immunohistochemical markers, HER2/neu significantly correlates inverse with ADC-values from breast PET/MRI ($r=-0.35$, $p<0.01$). In addition, estrogen receptor expression showed significant inverse correlation with SUV-values from whole-body PET/MRI ($r=-0.47$, $p<0.001$) and breast PET/MRI ($r=-0.45$, $p<0.001$).

CONCLUSION

The present data show a correlation between increased glucose-metabolism, cellularity, degree of differentiation as well as Ki67 and HER2/neu expression of breast cancer primaries. 18F-FDG-PET and DWI from hybrid PET/MRI may offer complementary information for evaluation of breast cancer aggressiveness in initial staging and treatment response.

CLINICAL RELEVANCE/APPLICATION

Easily applicable information from PET/MRI leads to complementary knowledge in breast cancer staging workup. This could help to identify high-risk patients efficiently.

SSQ14-07 Impact of 18FDG PET/MRI on Therapeutic Management in Breast Cancer Patients - A Prospective Multicenter Comparison Trial to the Guideline Staging Algorithm

Thursday, Dec. 5 11:30AM - 11:40AM Room: S402AB

Participants
Julian Kirchner, Dusseldorf, Germany (*Presenter*) Nothing to Disclose
Ole Martin, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Lale Umutlu, MD, Essen, Germany (*Abstract Co-Author*) Consultant, Bayer AG
Ken Herrmann, Essen, Germany (*Abstract Co-Author*) 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
Gerald Antoch, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Christian Buchbender, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

Julian.Kirchner@med.uni-duesseldorf.de

PURPOSE

To investigate whether the differences between the traditional staging imaging algorithm and 18F-FDG PET/MR lead to different therapeutic decisions in patients with breast carcinoma

METHOD AND MATERIALS

A total of 57 female patients with newly diagnosed breast cancer and elevated pre-test probability for distant metastases (initial tumor stage, immunohistochemical receptor expression) from two centers were prospectively included in this study. The traditional staging imaging algorithm was performed in clinical routine at the home institution of the patient. Additionally, each patient underwent a PET/MRI including dedicated diagnostic breast imaging and a whole-body MRI. Tumor stage was determined according to AJCC Staging Manual separately for both, 18F-FDG PET/MR and traditional staging algorithm. To determine the different treatment strategies each patient was discussed two times in separate DMT sessions. In one, the determination of the treatment strategy was based exclusively on the results of the traditional algorithm and in the other on the PET/MR. The primary endpoint was the incidence of differences between the therapy recommendations. The secondary endpoint was the comparison of diagnostic accuracy between the traditional staging algorithm and PET/MR for the TNM classification.

RESULTS

PET/MR and the traditional staging algorithm agreed on TNM-stages in 45 of 57 (78.9%) patients. All deviations between were due to a higher stage in PET/MR. Compared with the reference standard, PET/MR determined correct stage in 53/57 (93.0%) and the traditional staging algorithm in 43/57 (75.4%), respectively and resulting in a significant higher diagnostic accuracy in PET/MR. Different therapeutic decisions between PET/MR and the traditional staging algorithm occurred in 7/57 (12.3%) of the patients.

CONCLUSION

For breast cancer patients with elevated pre-test probability for distant metastases a change of the therapy regime occurs in 12.3% compared to the traditional staging algorithm when staged by 18F-FDG PET/MR. Furthermore the study revealed the diagnostic superiority for determining the exact TNM stage of 18F-FDG PET/MR over the traditional staging algorithm

CLINICAL RELEVANCE/APPLICATION

Current guidelines should consider systemic staging with 18F-FDG-PET/MRI in breast cancer patients with elevated pre-test probability for distant metastases at the time of initial diagnosis.

SSQ14-08 CT-Less Direct Correction of Attenuation and Scatter in Image Space Using Deep Learning for Total-Body PET: A Feasibility Study

Thursday, Dec. 5 11:40AM - 11:50AM Room: S402AB

Participants
Jaewon Yang, San Francisco, CA (*Presenter*) Nothing to Disclose
Dookun Park, PhD,DPhil, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Grant Gullberg, PhD, Berkeley, CA (*Abstract Co-Author*) Nothing to Disclose
Youngho Seo, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

A total-body PET scanner like EXPLORER provides a substantial sensitivity gain of a factor of approximately 40 over current clinical PET scanners. The 40-fold increase in the effective sensitivity can reduce total radiation dose by 1/40th; however, the extra radiation dose of CT for PET attenuation and scatter correction (ASC) will mitigate the merit of the ultralow-dose PET. Therefore, we propose CT-less direct ASC without any intermediate step using deep learning (DL) potentially for total-body PET.

METHOD AND MATERIALS

In an IRB-approved study, we obtained images from 59 whole-body 18F-FDG PET/CT studies that were acquired from March 2016 through August 2017. A deep convolutional neural network (DCNN) was implemented with the 59 pairs of uncorrected PET (without ASC; PETUC) and corrected PET (with ASC; PETASC) as inputs to predict attenuation-scatter corrected PET (PETDCNN) directly from uncorrected PET (50/9 split for training and test data). Quality of the predicted images (PETDCNN) was evaluated using standardized uptake values (SUV) by the normalized root mean square error (NRMSE), peak signal to noise ratio (PSNR), and structural similarity index (SSIM). Statistical analyses were performed using joint and error histograms.

RESULTS

The overall performance of PETDCNN is quantitatively comparable to CT-based ASC (PETASC). Across the test set of 9 subjects, the NRMSE was 0.26 ± 0.05; the average PSNR was 14.75 ± 3.22; the average SSIM was 0.94 ± 0.03, demonstrating high image similarity between PETDCNN and reference PETASC. The joint histogram shows the voxel-wise similarity between PETDCNN and

reference PETASC with the slope of 1.05 and R2 of 0.90 which was consistent with the result of the error histogram where most of errors (~ 90%) stay within ±0.5 SUV differences.

CONCLUSION

We demonstrated the feasibility of CT-less direct ASC using deep learning potentially for total-body PET. The clinical translation of our approach will remove the need of CT scans for PET ASC, which results in significant reduction of radiation dose particularly for pediatric patients or treatment follow-ups.

CLINICAL RELEVANCE/APPLICATION

Our proposed DL method can remove the need of CT for PET ASC, which reduces the radiation dose from a whole-body CT scan, preserving the merit of ultra-low dose imaging in total-body PET.

SSQ14-09 Quantitative Standardized Uptake Value Evaluation of 4x Faster PET Scans Enhanced Using Deep Learning

Thursday, Dec. 5 11:50AM - 12:00PM Room: S402AB

Participants
Akshay Chaudhari, PhD, Menlo Park, CA (*Abstract Co-Author*) Research Consultant and Stockholder, Subtle Medical; Research Consultant, Skope MR; Scientific Advisory Board and Stockholder, Brain Key; Scientific Advisory Board, Chondrometrics GmbH; Stockholder, LVIS Corporation; ;
Praveen Gulaka, PhD, Menlo Park, CA (*Presenter*) Employee, Subtle Medical
Tao Zhang, Menlo Park, CA (*Abstract Co-Author*) Employee, Subtle Medical
Shyam Srinivas, MD, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Greg Zaharchuk, MD, PhD, Stanford, CA (*Abstract Co-Author*) Research Grant, General Electric Company; Research Grant, Bayer AG; Stockholder, Subtle Medical
Enhao Gong, PhD, Menlo Park, CA (*Abstract Co-Author*) Stockholder, Subtle Medical

For information about this presentation, contact:

enhao@subtlemedical.com

PURPOSE

The goal of this study was to evaluate the accuracy of quantitative standardized uptake values (SUV) for noisy PET scans acquired 4x faster and subsequently enhanced using deep learning.

METHOD AND MATERIALS

15 subjects (7 male, 8 female; mean age: 67 years, range: 45;85 yrs, average BMI: 30, range: 19-48) referred for clinical whole-body PET/CT exams underwent two separate PET scans - one with the standard acquisition duration followed by one acquired 4 times faster, following IRB approval and informed consent. The 4x faster PET images were enhanced using a deep learning (DL) software (SubtlePET, Subtle Medical, Menlo Park, CA). One nuclear medicine physician reviewed the standard acquisition PET images, identified possible lesions and some normal regions, and drew regions of interest (ROIs) in OsiriX. The same lesions were reviewed on the DL-enhanced 4x faster scan images and the ROIs from the standard acquisition were propagated to the DL-enhanced 4x faster scan. Quantitative mean and maximum SUV values per ROI between the standard and DL-enhanced 4x faster acquisitions were visualized using Bland-Altman tests and compared using concordance correlation coefficients (CCC), linear regressions, and Mann-Whitney U-Tests.

RESULTS

A total of 63 ROIs were identified in the standard acquisition PET images. The Bland-Altman plot in Fig.1a-b (dotted line indicating mean, and dashed line indicating 95% limits of agreement) showed minimal differences between SUVs obtained from the two sets of scans, with almost all values contained within the 95% limits of agreement interval. CCC and linear Pearson coefficient values of 0.99 for both SUV-max and SUV-mean indicated very strong agreement between the SUV values from standard acquisition and DL-enhanced scan (Fig.1c-d, where the dotted line indicates the unity line). This was further indicated by the lack of statistical significance of p=0.68 for SUV-max and p=0.77 for SUV-mean values using the Mann-Whitney U-Test. Sample images can also be seen in Fig.1.

CONCLUSION

Deep learning can enhance 4x faster PET acquisitions without compromising quantitative SUV values compared a standard duration acquisition.

CLINICAL RELEVANCE/APPLICATION

Deep learning can enhance image quality of noisy 4x faster PET acquisitions thereby enabling higher comfort for patients, higher throughput of PET scans for hospitals, or reduced radiotracer dosages.

SSQ15

Neuroradiology/Head and Neck (Artificial Intelligence)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S404AB

AI HN NR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Reza Forghani, MD,PhD, Cote Saint-Luc, QC (*Moderator*) Researcher, General Electric Company; Institutional research collaboration, General Electric Company; Consultant, General Electric Company; Speaker, General Electric Company ; Founder, 4intelligent Inc; Stockholder, 4intelligent Inc; Stockholder, Real-Time Medical, Inc
Christopher G. Filippi, MD, New York, NY (*Moderator*) Research Consultant, Syntactx, LLC; Consultant, Biogen Idec Inc; ; ;

Sub-Events

SSQ15-01 Deep Learning for Brain Tissue Segmentation

Thursday, Dec. 5 10:30AM - 10:40AM Room: S404AB

Participants
Mikayla N. Howie, Orange, CA (*Abstract Co-Author*) Nothing to Disclose
Michelle Bardis, MS, Orange, CA (*Presenter*) Nothing to Disclose
Michael Yan, Orange, CA (*Abstract Co-Author*) Nothing to Disclose
Anna Alber, MSc, Orange, CA (*Abstract Co-Author*) Nothing to Disclose
Madeleine Shaver, BA, Orange, CA (*Abstract Co-Author*) Nothing to Disclose
Brent D. Weinberg, MD, PhD, Atlanta, GA (*Abstract Co-Author*) Nothing to Disclose
Leo P. Sugrue, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Jack Grinband, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Theodorus van Erp, PhD, Irvine , CA (*Abstract Co-Author*) Nothing to Disclose
Daniel S. Chow, MD, Orange, CA (*Abstract Co-Author*) Nothing to Disclose
Peter Chang, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

caidminfo@hs.uci.edu

PURPOSE

Brain segmentation, the identification of white matter, grey matter, deep grey matter, and the ventricles is typically one of the first imaging preprocessing steps of neuroimaging analysis. Currently, the reference standards for this involve either laborious manual segmentation or computationally taxing applications such as FreeSurfer that typically require hours. Deep learning has recently emerged as a promising tool for image analysis, and we hypothesize that a trained neural network that has established its weights can be optimized for inference to automatically recognize prior features. This would enable segmentation of brain structures to be completed in a matter of seconds as opposed to hours, freeing computational resources for other tasks.

METHOD AND MATERIALS

MRIs of the brain were collected from the University of California, Irvine Imaging Archive. All MRIs were passed through FreeSurfer for brain extraction and segmentation, which served as the gold standard. A customized version of U-net was developed for this study. Specifically, we designed a 3D/2D architecture capable of utilizing contextual information from adjacent MRI slices while also providing a memory-efficient method for brain segmentation. To assess algorithm generalization, we used a 5-fold cross-validation approach. Performance of masks was assessed by comparing the Dice score coefficient.

RESULTS

A total of 873 brain MRIs were included for this study. Brain extraction using the 3D/2D neural network approach resulted in a Dice scores of .862 for ventricle segmentation, 0.938 for white matter segmentation, 0.896 for grey matter, and 0.908 for deep grey matter segmentation. The processing time for our brain extraction program averaged under 5 seconds per patient, which was significantly lower compared to FreeSurfer (average time in 73 minutes, $p < 0.001$) on single CPU.

CONCLUSION

The modified U-Net produced competitive white matter, grey matter, deep grey matter, and ventricle segmentation results compared to FreeSurfer while reducing CPU load.

CLINICAL RELEVANCE/APPLICATION

Deep learning enabled brain segmentation can be accurately completed in seconds as opposed to hours, which can free computational resources for other tasks. This has important implications for neuroimaging research reliant on segmentation.

SSQ15-02 Clinical Context Improves the Performance of AI Models for Cranial Fracture Detection

Thursday, Dec. 5 10:40AM - 10:50AM Room: S404AB

Participants
Swetha Tanamala, BEng,MENG, Mumbai, India (*Abstract Co-Author*) Employee, Qure.ai
Sasank Chilamkurthy, BEng, Mumbai, India (*Presenter*) Employee, Qure.ai
Mayug Maniparambil, BEng,MENG, Mumbai, India (*Abstract Co-Author*) Employee, Qure.ai
Pooja Rao, MBBS,PhD, Mumbai, India (*Abstract Co-Author*) Employee, Qure.ai
Mustafa Biviji, MBBS,DMRD, Nagpur, India (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

swetha.tanamala@qure.ai

PURPOSE

Clinical history plays a vital role in a physician's or radiologist's diagnosis. However, when training AI models, clinical history or presence of an abnormality which correlates to the target abnormality were not generally considered. In this study, we use scalp hematoma as an additional clinical context in training the models and study the accuracy (AUC and average precision) of a fracture detection AI model before and after adding this clinical context.

METHOD AND MATERIALS

Using 141,105 studies, we trained a convolutional neural network (CNN) to detect cranial fractures on non-contrast head CT scans. Scalp hematoma is considered a good indicator by physicians for diagnosing fractures. We confirmed this by automated natural language processing (NLP) analysis of large number of reports. Therefore, scalp hematoma is a good candidate for improving AI algorithms for detecting fractures. A logistic regression model was trained to detect a cranial fracture, using the presence of a scalp hematoma and the output probability of the CNN as inputs. The original CNN by itself (Model 1) and the combined CNN-logistic regression algorithm (Model 2) were tested using an independent set containing 18200 scans. We used area under the ROC curve (AUC) and average precision (AP), a probability based metric that is inversely proportional to false positive rate, as evaluation metrics.

RESULTS

Analysis of 141,105 reports confirmed that scalp hematoma was present in 49.8% of scans with fractures and conversely fractures were present in 29.8% of scans with scalp hematoma. The CNN with images as sole inputs reached an AUC and AP of 0.9599 and 0.7952 respectively. Adding scalp hematoma as a feature increased AUC to 0.9666. AP however, increased significantly to 0.8190.

CONCLUSION

Using a simple probabilistic algorithm to add clinical context to a CNN resulted in a significant improvement in AP. As AUC is saturated, there is no significant difference in AUC. Results show significant decrease in false positive rate without impacting sensitivity.

CLINICAL RELEVANCE/APPLICATION

Like radiologists, deep learning models can be more accurate when they incorporate clinical context in addition to image analysis.

SSQ15-03 Pathology Localization of MCI Progression via Attention Neural Networks

Thursday, Dec. 5 10:50AM - 11:00AM Room: S404AB

Participants
Qingfeng Li, Guangzhou, China (*Abstract Co-Author*) Intern, Shanghai United Imaging Healthcare Co, Ltd
Shaozhen Yan, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Xiaodan Xing, Shanghai, China (*Abstract Co-Author*) Intern, Shanghai United Imaging Healthcare Co, Ltd
Ying Sun, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Bin Xiao, PhD, Shanghai , China (*Abstract Co-Author*) Nothing to Disclose
Hao Wei, Changsha, China (*Abstract Co-Author*) Intern, Shanghai United Imaging Healthcare Co, Ltd
Minqing Zhang, Suzhou, China (*Abstract Co-Author*) Intern, Shanghai United Imaging Healthcare Co, Ltd
Quan Huo, Shanghai, China (*Abstract Co-Author*) Employee, Shanghai United Imaging Healthcare Co, Ltd
Xiang S. Zhou, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Yiqiang Zhan, PhD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Zhong Xue, PhD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Jie Lu, MD, PhD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Feng Shi, Shanghai, China (*Presenter*) Employee, Shanghai United Imaging Healthcare Co, Ltd

For information about this presentation, contact:

qingfengli19950821@163.com

PURPOSE

In recent studies, the intrinsic relationship between pathological region localization and respective feature extraction was usually neglected. To address this issue, we proposed a novel strategy for joint pathological region localization and identification of progressive MCI (pMCI) from stable MCI (sMCI).

METHOD AND MATERIALS

We propose iterative attention focusing (IAF) attention neural networks for yielding disease-relevant attention map and predicting diagnosis result. There are two major components in IAF: 1) the full-size diagnosis network (FDN), and 2) the attention map generator (AMG). The reason of such design is that the attention maps generated previously can provide guidance for separation task, and the improvement of FDN separation performance can be helpful for precise localization of disease-related regions. We used the 1.5T T1 MR images from ADNI-1 dataset for training and 3.0T T1 images from ADNI-2 dataset for testing. In particular, the training set includes 226 sMCI and 167 pMCI subjects, and the testing set contains 239 sMCI and 38 pMCI subjects. It is worth noting that we followed previous studies to use the exact same sMCI and pMCI data for easier comparison of results.

RESULTS

For pMCI vs. sMCI separation task, results show our method achieved accuracy of 81.6%, which outperform other state-of-the-art methods such as VBM-based method of 64.3% and patch-based deep learning method (LDMIL) of 76.9%. Note that we also achieved higher sensitivity, as 60.5% against VBM of 36.8% and LDMIL of 42.1%, which indicates our method is more capable to identify possible MCI converters. Besides, our method can provide a focused attention map on specific pathological locations related to MCI progression, with detailed anatomical patterns. Results show the regions most relevant to MCI progression are mainly located at the left brain, including temporal lobe, entorhinal cortex, and hippocampus. Note that these discriminative regions differ among individuals.

CONCLUSION

We proposed novel attention neural networks for joint pathological region localization and identification of pMCI from sMCI. Besides diagnosis results, the focused attention maps provide specific pathological locations related to MCI progression.

CLINICAL RELEVANCE/APPLICATION

Our purposed attention neural networks can serve as a novel computer-aided dementia diagnosis method and allow for more insights and better understanding of the progression of MCI to AD.

SSQ15-04 Deep Learning-Based Automated Detection and Localization of Cerebral Aneurysms on MR Angiography

Thursday, Dec. 5 11:00AM - 11:10AM Room: S404AB

Participants
Bio Joo, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Sung Soo Ahn, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yongeun Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jun Ho Bae, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Moo Sung Park, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

yonnebio2@gmail.com

PURPOSE

To develop a deep learning algorithm for automated detection of cerebral aneurysms on time-of-flight MR angiography and evaluate its diagnostic performance.

METHOD AND MATERIALS

MR images with aneurysms based on the radiological reports were extracted from January 2014 through December 2016 in our hospital. The examinations were randomly divided into two: training data set, which provided training and validation data, and test data sets (468 and 120 examinations, respectively). Additionally, 50 examinations without aneurysm were randomly selected in the same study period and added in the test set. Manual ground truth annotation of aneurysms by two radiologists and pre-processing including resampling and 3D patching around vessels and the aneurysms using vessel segmentation were performed. Next, the deep learning algorithm based on 3D ResNet architecture was established with the training data set for patch-wise classification followed by pixel voting algorithm. Its sensitivity, positive predictive value, and specificity were evaluated in the independent test data sets.

RESULTS

The training data set included 551 aneurysms (mean size, 4.13 ± 2.41 mm). Test data set included 147 aneurysms (mean size, 3.98 ± 2.11 mm). The sensitivity, the positive predictive value, and the specificity for the test data set was 87.1% (128/ 147), 95.5% (128/ 134), and 92.0% (46/ 50), respectively. One aneurysm was newly diagnosed by the algorithm in the test data set. The detection sensitivity was greatest for aneurysms larger than 5mm (23/25, 92.0%) and lowest for aneurysms 3mm or smaller (59/70, 84.3%). Fourteen out of the 19 missed aneurysms and 9 out of the 10 false positive detections in the test data set were located in the internal carotid artery.

CONCLUSION

A deep learning algorithm detected cerebral aneurysms with high sensitivity, positive predictive value, and specificity.

CLINICAL RELEVANCE/APPLICATION

A deep learning-based algorithm detects cerebral aneurysms with high diagnostic performance on MR angiography and might be useful for a more accurate and efficient evaluation of cerebral aneurysm.

SSQ15-05 Deep Learning based Detection and Localization of intracranial Aneurysms in Digital Subtraction Angiography

Thursday, Dec. 5 11:10AM - 11:20AM Room: S404AB

Participants
Nicolin Hainc, MD, Zurich, Switzerland (*Presenter*) Nothing to Disclose
Manoj Mannil, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Vaia Anagnostakou, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Hatem Alkadhi, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Andrea Bink, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Shakir Husain, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Zsolt Kulcsar, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Christoph Stippich, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Sebastian Winklhofer, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To detect and localize intracranial aneurysms on digital subtraction angiography images using deep learning.

METHOD AND MATERIALS

In this IRB-approved analysis, 706 digital subtraction angiography (DSA) images were derived after image augmentation of a cohort of 234 patients (150 female, mean age 59 years, range 20-92; 84 male patients, mean age 55, range 19-83) from a tertiary neurointerventional center. 389 (55% of total) single frame anterior-posterior and lateral images of a DSA series of 184 aneurysms (41 ruptured and 143 unruptured; average size 7mm, standard deviation ± 5.3mm, range 1mm to 25mm) and 317 (45% of total) aneurysm negative study images were retrospectively analyzed regarding the presence and localization of intracranial aneurysms. The presence and location of aneurysms was determined on 3D rotational DSA images by two experienced interventional neuroradiologists. The data was split into testing and training sets in a ratio of 4:1 to avoid overfitting. Deep learning was performed by use of commercial-grade machine learning software (Cognex, ViDi Suite 2.0) based on the open source Tensorflow framework in supervised mode. Computation was performed on a desktop personal computer with a dedicated graphical processing unit (Nvidia GeForce GTX 1080). Classification results were based solely on unseen test data. Sensitivity, specificity, precision, F1 score, and the area-under-the-curve (AUC) from receiver operating characteristics (ROC) analysis thereof were calculated.

RESULTS

Of the 184 aneurysms, 139 (76 %) were correctly detected and localized on both views. No size difference was found between detected and undetected aneurysms (5.7 ± 3.3mm vs. 7.1 ± 5.5mm; p= 0.19). Intracranial aneurysms were detected and correctly localized with a sensitivity of 79 %, a specificity of 79 %, a precision of 0.75, a F1 score of 0.77, and an AUC of 0.85.

CONCLUSION

Deep learning allows for detection and localization of intracranial aneurysms on DSA images.

CLINICAL RELEVANCE/APPLICATION

This proof-of-principle study demonstrates the feasibility of applying deep learning to DSA images. This algorithm has the potential to assist in the detection and localization of intracranial aneurysms on DSA images.

SSQ15-06 Deep Learning-Based Synthetic Post-Contrast T1-Weighted MR Imaging of Glioblastomas

Thursday, Dec. 5 11:20AM - 11:30AM Room: S404AB

Awards
Trainee Research Prize - Resident

Participants
Evan D. Calabrese, MD, PhD, San Francisco , CA (*Presenter*) Private interest, Qspin LLC
Javier Villanueva-Meyer, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Soonmee Cha, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Post-contrast MRI is essential for characterizing brain tumors, especially glioblastomas. Despite its widespread use, there are costs and drawbacks associated with gadolinium contrast including additional scan time, side effects, and the theoretical risks associated with deposition. The purpose of our study was to evaluate the feasibility and accuracy of a deep learning algorithm designed to generate synthetic post-contrast images from pre-contrast MR images of glioblastomas.

METHOD AND MATERIALS

We analyzed preoperative MR images from 131 patients with glioblastoma. The imaging protocol included pre and post-contrast T1, T2, T2 FLAIR, arterial spin labeling, susceptibility (SWI), and diffusion (DWI) weighted sequences. 105 (80%) of the preprocessed datasets were used to train a deep convolutional neural network based on a modified U-net architecture with decomposed 3D convolutions and residual learning. The network was trained with all available pre-contrast image data, and separately with each iteration of a "leave-one-out" approach to determine the contribution of each series. Synthetic post-contrast T1-weighted images were generated from the remaining 26 (20%) of the datasets and compared directly to real post-contrast images using mean absolute percentage error.

RESULTS

Our deep-learning network was able to generate synthetic post-contrast T1-weighted images that were qualitatively and quantitatively similar to real post-contrast images. The average percent absolute error for synthetic post-contrast images was 8.3% for the whole brain and 13.0% for the tumor region only. The largest contribution to the synthetic post-contrast images across the whole brain was from T1 pre-contrast images followed by SWI. The largest contribution to the tumor region only was from DWI followed by SWI.

CONCLUSION

We used a deep learning algorithm to generate synthetic post-contrast T1-weighted images of brain glioblastomas. Synthetic post-contrast images were qualitatively and quantitatively similar to real post-contrast images. This relatively small retrospective study suggests that there may be a role for deep learning to help reduce the need for administration of gadolinium-based contrast agents in some cases.

CLINICAL RELEVANCE/APPLICATION

This study demonstrates a deep learning algorithm that can generate accurate synthetic post-contrast T1-weighted images from pre-contrast images in patients with glioblastoma.

SSQ15-07 Classification of IDH Mutation Status in Brain Tumors Using Deep Learning

Thursday, Dec. 5 11:30AM - 11:40AM Room: S404AB

Participants
Chandan Ganesh Bangalore Yogananda, MS, Dallas, TX (*Presenter*) Nothing to Disclose
Ben Wagner, BS, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Maryam Vejdani-Jahromi, MD, Cambridge, MA (*Abstract Co-Author*) Nothing to Disclose

Gowtham Krishnan Murugesan, MS, Arlington, TX (*Abstract Co-Author*) Nothing to Disclose
Sahil S. Nalawade, Arlington, TX (*Abstract Co-Author*) Nothing to Disclose
Fang Yu, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Ananth J. Madhuranthakam, PhD, Dallas, TX (*Abstract Co-Author*) Institutional research support, Koninklijke Philips NV
Joseph A. Maldjian, MD, Dallas, TX (*Abstract Co-Author*) Consultant, BioClinica, Inc; Consultant, Koninklijke Philips NV

For information about this presentation, contact:

ChandanGanesh.BangaloreYogananda@utsouthwestern.edu

PURPOSE

Isocitrate dehydrogenase (IDH) mutation status is a widely recognized biomarker in diagnosing and treating primary brain tumors. Currently, it is determined using immunohistochemistry or gene sequencing on tissue specimens, acquired through biopsy or surgery. In this work, we developed a fully automated deep-learning network for non-invasive prediction of IDH mutation status using MRI.

METHOD AND MATERIALS

87 preoperative multi-parametric brain MRI using the Penn curated dataset from the cancer imaging archive (TCIA)[1] database and genomic information from the cancer genome atlas(TCGA) database were used[2,3,4]. An additional 127 cases from the TCIA database were also identified. The final dataset consisted of 214 cases with 89 IDH mutated and 125 IDH wild type cases. Whole tumor masks for 87 cases were acquired from Penn segmentation resource for TCIA cases and were used as the ground truth for segmentation in the training dataset. The testing dataset did not require whole tumor masks. Data preprocessing steps included (a)co-registering to an anatomical template, skull-stripping, (b)N4BiasCorrection[5] to remove RF inhomogeneity & (c)intensity normalization to zero-mean and unit variance. Two separate networks were designed, developed and trained for a voxel-wise dual-class segmentation of whole tumor with two classes representing IDH mutated and wild type. T2-net was trained using only T2w images, and TS-net (three-sequence-net) was trained using multi-contrast MR data (T2w, FLAIR, and post-contrast T1). A 32x32x32 patch-based training and testing approach was implemented. Majority voting was used to classify the IDH status on a voxel-wise basis followed by logistic regression and ROC analysis.

RESULTS

Using majority voting T2-net achieved an accuracy of 96.1% with AUC of 0.972, and TS-net achieved accuracy of 96.9% with AUC of 0.981.

CONCLUSION

We developed an automated 3D deep learning voxel-wise network for IDH mutation classification in brain tumors. The network trained using only T2w images achieved comparable results to a network trained using multi contrast images, making it a promising tool for clinical implementation. Acknowledgement-NIH/NCI U01CA207091

CLINICAL RELEVANCE/APPLICATION

Classifying of IDH status has important implications regarding brain tumor diagnosis, treatment, and prognosis. Artificial intelligence can provide accurate noninvasive identification of IDH status using conventional MRI sequences.

SSQ15-08 Denoising MR Images of the Cervical Spine: Multi-Reader Assessment of a Deep Learning Approach

Thursday, Dec. 5 11:40AM - 11:50AM Room: S404AB

Participants
Javier Villanueva-Meyer, MD, San Francisco, CA (*Presenter*) Nothing to Disclose
David Shin, Menlo Park, CA (*Abstract Co-Author*) Employee, General Electric Company
Yi Li, MD, Larkspur, CA (*Abstract Co-Author*) Nothing to Disclose
Paula Alcaide Leon III, BS, BS, Sevilla, Spain (*Abstract Co-Author*) Nothing to Disclose
Suchandrima Banerjee, Menlo Park, CA (*Abstract Co-Author*) Employee, General Electric Company
Anja C. Brau, PhD, Menlo Park, CA (*Abstract Co-Author*) Employee, General Electric Company
R. Marc Lebel, Calgary, AB (*Abstract Co-Author*) Employee, General Electric Company
Christine M. Glastonbury, MBBS, San Francisco, CA (*Abstract Co-Author*) Author with royalties, Reed Elsevier

PURPOSE

To assess quality in MR images of the cervical spine after applying a deep learning reconstruction (DLRecon) algorithm for noise reduction.

METHOD AND MATERIALS

The DLRecon algorithm was constructed using a deep convolutional residual encoder network trained with a database of >10,000 images, designed to reduce thermal noise and ringing artifact while improving spatial resolution. DLRecon provides a tunable noise reduction factor (0-100%) to accommodate user preference (50% was used). The algorithm was integrated into the system vendor's reconstruction pipeline such that two sets of images were generated from a single set of raw K-space data with reconstruction time of <2 seconds per image.Three neuroradiologists reviewed 2D FSE T2 sagittal and axial MR images of the cervical spine acquired from 20 patients on 3T GE scanners. The original and DLRecon images were presented in a randomized order. The readers were asked to rate both pairs based on 1) Apparent signal-to-noise ratio (SNR); 2) Ability to discern anatomical structures; 3) Diagnostic confidence; 4) Overall image quality; and 5) Artifacts. The first 4 metrics were rated on a scale of 1 to 5 (5=excellent) while the last metric was rated on a scale of 1 to 4 (4=no artifacts). For each metric, the effect of DLRecon on the score was measured with the paired sample t-test for each reader.

RESULTS

All three readers rated a significantly higher score on apparent SNR, ability to discern anatomical structures, and overall image quality ($p<0.01$). There was no significant effect of DLRecon on artifacts ($p=0.16/0.16/0.33$). Two readers rated significantly higher diagnostic confidence ($p<0.01$) with the third reader reporting a higher trend that did not meet statistical significance ($p=0.083$). Fig 1 shows MR images before and after DLRecon in a patient with multiple sclerosis.

CONCLUSION

In this multi-reader study, the proposed DLrecon method at a 50% noise reduction factor demonstrated improvement in SNR and overall image quality on clinical MR images of the cervical spine. There was no loss of diagnostic confidence in the examined cases with pathology including degenerative disc disease, cord infarct, and multiple sclerosis.

CLINICAL RELEVANCE/APPLICATION

DLRecon is an automated image reconstruction process with minimal processing time that integrates into routine MR examinations and provides enhancement in overall image quality and SNR without compromising diagnostic confidence.

SSQ15-09 Tumor Texture Features of Head and Neck Squamous Cell Carcinoma from Different Primary Sites Differ Significantly and Impact on the Performance of Machine Learning Prediction Models

Thursday, Dec. 5 11:50AM - 12:00PM Room: S404AB

Participants
Xiaoyang Liu, MD, PhD, Toronto , ON (*Presenter*) Nothing to Disclose
Nikesh Muthukrishnan, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Behzad Forghani, MENG, Cote-saint-Luc, QC (*Abstract Co-Author*) Nothing to Disclose
Eugene Yu, MD,FRCPC, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Sahir Bhatnagar, PhD, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Caroline Reinhold, MD, MSc, Montreal, QC (*Abstract Co-Author*) Nothing to Disclose
Reza Forghani, MD,PhD, Cote Saint-Luc, QC (*Abstract Co-Author*) Researcher, General Electric Company; Institutional research collaboration, General Electric Company; Consultant, General Electric Company; Speaker, General Electric Company ; Founder, 4intelligent Inc; Stockholder, 4intelligent Inc; Stockholder, Real-Time Medical, Inc

PURPOSE

Radiomic studies for prediction of clinical and molecular endpoints of head and neck squamous cell carcinoma (HNSCC) frequently combine tumors from different primary sites, with the assumption that the tumor texture features are not site dependent. We studied here whether texture features from different sites vary significantly and whether these variations affect the performance of machine learning models.

METHOD AND MATERIALS

603 contrast enhanced pre-treatment neck CT scans were evaluated from patients diagnosed with HNSCC, with tumors arising in the larynx or hypopharynx (LHP), lip & oral cavity (OC), and oropharynx (OP), further stratified based on HPV status to avoid its confounding effects. First order texture features with additional filtrations were extracted from each tumor and used in conjunction with patient age, smoking status, drinking status, and tumor T-stage to construct models for predicting nodal status and the presence of lymphovascular invasion (LVI) and perineural invasion (PNI). Statistical analysis was performed using Wilks test and Roy's largest root test to evaluate for variations in texture features based on tumor primary site. Two machine learning approaches (Random Forests (RF) and support vector machine (SVM)) were used to construct prediction models , using separate training (70%) and independent testing (30%) sets.

RESULTS

There were statistically significant differences ($P < 0.05$) between texture features of tumors arising in the OC, LHP, and OP. To evaluate whether the differences in texture features could affect prediction model performance, the models were constructed using texture data from the entire population or texture data stratified based on primary tumor site. Sub-stratification of texture data based on primary tumor site resulted in up to 14 % improvement in accuracy of prediction model compared to models using the combined datasets.

CONCLUSION

Significant differences in texture features exist for HNSCC arising from different primary sites below the hard palate, which can impact the performance of prediction models. For optimal performance and reliability, radiomic studies may have to stratify patients based on primary tumor site.

CLINICAL RELEVANCE/APPLICATION

Radiomic analysis can be used to predict various clinical endpoints of interest but the features can vary based on HNSCC primary site, which should be taken into account in clinical investigations using radiomic analysis of HNSCC.

SSQ16

Neuroradiology (White Matter)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S404CD

MR NR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
John Kim, MD, Boston, MA (*Moderator*) Nothing to Disclose
Christopher T. Whitlow, MD, PhD, Winston-Salem, NC (*Moderator*) Nothing to Disclose
Avner Meoded, MD, Baltimore, MD (*Moderator*) Nothing to Disclose

Sub-Events

SSQ16-01 High-Resolution Myelin Imaging Using Synthetic MRI in 3D

Thursday, Dec. 5 10:30AM - 10:40AM Room: S404CD

Participants
Marcel Warntjes, Linkoping, Sweden (*Presenter*) Consultant, SyntheticMR AB
Peter Johansson, Linkoping, Sweden (*Abstract Co-Author*) Employee, SyntheticMR AB
Peter Lundberg, PhD, Linkoping, Sweden (*Abstract Co-Author*) Co-owner, AMRA AB Stockholder, AMRA AB
Anders Tisell, Linkoping, Sweden (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

marcel.warntjes@syntheticmr.com

PURPOSE

Intact myelin is crucial for efficient signal transfer in the central nervous system. Neurodegenerative diseases such as MS and dementia result in myelin damage and the associated impairment of motor and cognitive function. Quantitative assessment of myelination is an important clinical biomarker in the treatment and follow-up of patients. Myelin can be measured using synthetic MRI; the measurement of the R1 and R2 relaxation and proton density PD in conjunction with a myelin model can provide myelin partial volume maps for the entire brain. Recently, a 3D acquisition method was developed for high-resolution, isotropic synthetic MRI. The purpose of this work was to compare myelin detection based on the 3D method with the more established 2D method.

METHOD AND MATERIALS

The 3D QALAS sequence is a segmented spoiled gradient echo sequence with 5 parallel acquisitions, interleaved with a T2 preparation and inversion pulse. The 2D MDME sequence (MAGiC) is a saturation recovery multi-slice TSE sequence with multi-echo read-out. Both sequences had a scan time of 6:10 minutes. The scanner was a patched Philips Ingenia 3T. Post-processing was performed by a prototype version based on SyMRI 11.1 (SyntheticMR, Sweden). A group of 12 volunteers was acquired two times with 3D QALAS and 2 times MDME in SAG orientation, both at 1.5T and 3T, to correlate automatically segmented myelin volume and myelin fraction of the brain.

RESULTS

The mean myelin volume for the entire group was 183 mL and the mean brain volume was 1300 mL (14.1%). A high correlation was found between volumes determined by QALAS and MDME. The Pearson correlation coefficient was 0.94, the mean difference was 0±13 mL. The difference between measurement 1 and 2 was -2±10 mL at 1.5T and 1±13 mL at 3T for QALAS whereas it was 0±4 mL at 1.5T and -3±4 mL at 3T for MDME. In Fig.1 representative images are shown for myelin mapping using MDME SAG, MDME AX and 3D QALAS. The color scale range is 0-40% partial volume.

CONCLUSION

Myelin measurements using 3D QALAS provides very similar values myelin and brain volumes in comparison to 2D MDME. The advantage of 3D QALAS is the ability to view the data in all orientations.

CLINICAL RELEVANCE/APPLICATION

High-resolution 3D myelin imaging can be done in a short scan time using synthetic MRI. The same data also provides conventional T1W, T2W and FLAIR images.

SSQ16-02 Quantitative Susceptibility Weighted Imaging (SWI): A Novel Imaging Biomarker to Predict Disease Activity in Multiple Sclerosis

Thursday, Dec. 5 10:40AM - 10:50AM Room: S404CD

Participants
Vinayagamani S, Trivandrum, India (*Abstract Co-Author*) Nothing to Disclose
Sabarish S S JR, MBBS, MD, Madurai, India (*Presenter*) Grant, General Electric Company
Bejoy Thomas, Trivandrum, India (*Abstract Co-Author*) Stockholder, WIPRO LIMITED; Grant, General Electric Company

Chandrasekharan Kesavadas, MD, Trivandrum, India (*Abstract Co-Author*) Nothing to Disclose
Sruthi S Nair, Trivandrum, India (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

dr.vinayagamani@gmail.com

PURPOSE

Gadolinium(Gd) enhancement of multiple sclerosis (MS) lesions in T1W imaging (T1W+Gd) is the currently practiced method to differentiate active from inactive lesions. Our primary aim is to study the evaluation of Quantitative SWI in differentiating active from inactive lesions of MS using SWI phase values , there by assessing the variations in the iron content.

METHOD AND MATERIALS

In this prospective study, clinical data and images from patients who underwent MRI from September 2017 to January 2019 were reviewed. Lesions were divided into two groups; active (Group 1) and inactive (Group 2) lesions based on contrast enhancement. Phase values of the lesions (PL) and the contralateral normal white matter (PNWM) were calculated using SPIN software by drawing ROI. Subtracted phase values (PS=PL - PNWM) and iron content (PS /3) of the lesions were calculated in both groups. The means were compared by student T test and statistical significance was determined as p value < 0.05. Using ROC curve , a optimum cut off value with sensitivity and specificity were calculated

RESULTS

48 active lesions from 25 patients (Group 1) and 52 inactive lesions from 27patients (Group 2) were analysed. Mean subtracted phase values in group 1 and 2 were 3.64 and 15.84 respectively. The iron content (Mean±SD) of the inactive lesions was found to be higher (5.39 ±1.72 µg/g) than the active lesions (1.21±0.52 µg/g), which was statistically significant (P value <0.001). A cut off value of >2.5 µg/g will provide a sensitivity and specificity of 96.5% and 96.4% respectively to detect inactive lesion

CONCLUSION

Quantification of iron content using SWI phase values will differentiate active from inactive lesions, which can be a novel imaging biomarker in assessing disease activity.

CLINICAL RELEVANCE/APPLICATION

1.Various studies have concluded that repetitive use of Gd leads to deposition in brain accelerating secondary progression and atrophy inspite of normal renal function 2. Thus it can be a novel imaging biomarker to identify disease activity in patients who undergo routine neuroimaging for MS.

SSQ16-03 White Matter Hyperintensities on Magnetic Resonance Imaging and Aging: Comparison of Three Visual Rating Scales Using Convolutional Neural Networks

Thursday, Dec. 5 10:50AM - 11:00AM Room: S404CD

Participants
Josep Puig, MD,PhD, Winnipeg, MB (*Abstract Co-Author*) Nothing to Disclose
Ana Jimenez-Pastor, Valencia, Spain (*Abstract Co-Author*) Nothing to Disclose
Eduardo Camacho, Valencia, Spain (*Abstract Co-Author*) Nothing to Disclose
Carles Biarnes, Girona, Spain (*Abstract Co-Author*) Nothing to Disclose
Joan C. Vilanova, MD, PhD, Girona, Spain (*Abstract Co-Author*) Nothing to Disclose
Josep Garre-Olmo, Girona, Spain (*Abstract Co-Author*) Nothing to Disclose
Reinald Pamplona, Lleida, Spain (*Abstract Co-Author*) Nothing to Disclose
Rafel Ramos, Girona, Spain (*Abstract Co-Author*) Nothing to Disclose
Marco Essig, MD, Winnipeg, MB (*Abstract Co-Author*) Nothing to Disclose
Salvador Pedraza, MD, PhD, Girona, Spain (*Abstract Co-Author*) Nothing to Disclose
Angel Alberich-Bayarri, PhD, Valencia, Spain (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

jpuigmd@gmail.com

PURPOSE

White matter hyperintensities (WMH) on magnetic resonance imaging (MRI) increase with age and are associated with stroke, cognitive decline, and dementia. Although consistent assessment of WMH burden is crucial for epidemiological and clinical studies, little evidence is available about the performance of proposed visual rating scales. We used deep-learning-based models to compare three visual WMH rating scales.

METHOD AND MATERIALS

We studied 418 healthy participants (mean, 66.67±7.96 years [range, 50-96 years]) consecutively recruited in a population-based aging study. All imaging studies were obtained on a 1.5 T MRI system (Vantage Elan, Canon Medical Systems, Japan). WMHs were rated according to Fazekas' scale (FZ), Age-Related White Matter Change (ARWMC) scale, and van Swieten's (VS) scale. For each scale, WMH burden was categorized as none or slight, moderate, or severe. Artifacts, lacunae, and chronic territorial infarcts were excluded. We used convolutional neural networks to assess WMH-metrics, including volume, dissemination, number of lesions, and mean entropy. We used t-tests to compare group means.

RESULTS

The different scales classified WMH burden as none or slight (FZ=331 subjects [mean WMH volume 0.487±0.639 mL]; ARWMC=327 subjects [0.477±0.625 mL]; VS=186 subjects [0.231±0.361 mL]), moderate (FZ=69 subjects [3.529±2.652 mL], ARWMC=70 subjects [3.404±2.604 mL], VS=177 [1.192±1.561 mL]), and severe (FZ=18 subjects [9.568±4.795 mL], ARWMC=21 subjects [8.707±5.068 mL], VS=57 subjects [5.675±4.326 mL]). On FZ and ARWMC, WMH volumes in each category were similar. However, on SV, WMH volumes in all categories were smaller than on FZ and ARWMC (P<0.001). Additionally, on FZ and ARWMC, WMH dissemination, number of lesions and mean entropy in moderate and severe category were also similar.

CONCLUSION

Our results indicate that FZ and ARWMC ratings of WMH CNN-based quantification are similar; SV tends to underrate WMH burden. Therefore, FZ and ARWMC could be applied equally to assess WMH characterization.

CLINICAL RELEVANCE/APPLICATION

FZ and ARWMC scales and volumes provide near-equivalent estimates of WMH burden; therefore, either can be used.

SSQ16-04 Unsupervised Learning Approach for Multiple Sclerosis Lesion Segmentation in Brain MRI: Application of Minimum Distance Estimation with a Cramer-von Mises Type Statistic

Thursday, Dec. 5 11:00AM - 11:10AM Room: S404CD

Participants
Jiwoong Kim, PhD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Jin Hee Jang, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Spouse, Employee, VUNO Inc
Yoonho Nam, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Wojoon Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yangsean P. Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Na-Young Shin, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kookjin Ahn, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Bum-Soo Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

znee@catholic.ac.kr

PURPOSE

While recent advances in machine learning could enable automatic segmentation of multiple sclerosis (MS) lesions in brain MRI, many algorithms were based on the supervised learning. One caveat to this approach is its demand for large volume of labeled data with high quality. Considering difficulty of labeling, an approach of the unsupervised scheme can be an alternative solution to this self-contradictory problem. Here, we developed an algorithm based on the unsupervised learning to segment MS lesions on FLAIR MR image and validated its feasibility through open, clinical datasets.

METHOD AND MATERIALS

To segment MS lesions with using unlabeled data, we estimated their locations in the MR image. To obtain non-parametric and data-driven estimates, we used minimum distance estimation (MDE) with a Cramer-von Mises (CvM) type statistic which is known to be robust against anomalies. Briefly, starting from two randomly-generated regions of the MR image, our algorithm provided two segmented regions - MS lesions and another area - in a fast and stable manner. From pre-processed (brain extracted and bias-corrected) 3D FLAIR images, MS lesions were estimated for each axial image, using small-sized patches for sliding window scheme. After applying the median filtering to combined patches, final lesion maps were acquired. We applied a developed method for two different datasets: our hospital dataset (N=10, confirmed MS) and open dataset (MSSEG challenge, N=10). We calculated a dice coefficient for open dataset which has reference standard lesion segmentation results. Also we assessed visual appropriateness for two datasets.

RESULTS

A developed model was applied successfully to 3D FLAIR images, both in open and our hospital datasets. In general, there was good agreement for segmentation results with visual inspection of MS lesions and reference standard. Median DICE index for reference standards of open dataset was 0.39 (range 0.20-0.58), which was comparable with results of previous challenge winners. Even though some false negative lesions were found, they were small and subtle. Majoirty of false positive were cerebral cortices.

CONCLUSION

We demonstrated that MDE with a CvM type statistic could be a useful unsupervised method to segment MS lesions in FLAIR images.

CLINICAL RELEVANCE/APPLICATION

Unsupervised method for MS lesion segmentation could have clinical potential over supervised learning, when manual labeling data is limited.

SSQ16-05 New Multiple Sclerosis Clinical MR Protocol to Limit the Use of Intravenous Contrast Using CAD Software

Thursday, Dec. 5 11:10AM - 11:20AM Room: S404CD

Participants
Michel Bilello, MD, PhD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Jeffrey Rudie, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Raghav Mattay, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Saima Rathore, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Alexander C. Mamourian, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The growing concern about deposition of free gadolinium in the brain of patients that undergo serial contrast-enhanced MRI studies demands careful use of IV contrast. We have implemented a new, CAD-assisted clinical MR protocol for the purpose of limiting gadolinium-based contrast injections in our patients with multiple sclerosis (MS).

METHOD AND MATERIALS

Following the results of our recent publication that demonstrated that all MS patients with enhancing lesions on their followup brain MR scan also have new lesions on pregad imaging, the new protocol uses a CAD software to determine in real time which patients

have new brain lesions, and only those patients who do get IV contrast. There are two major components in this clinical decision support system: 1) The CAD program, which detects new brain lesions by comparing 3D T2/FLAIR images from current and prior studies. 2) Our department clinical 3D lab, staffed with technologists, who not only run the program, but also assess the CAD results for new brain lesions. The workflow goes like this: The patient (without IV) gets the 3D FLAIR sequence first. As soon as this is done, the 3D lab runs the CAD program. Then the 3D lab calls the MR tech with the results: If there is no new lesion, only non-contrast imaging gets performed. If there is at least one new lesion, the MR tech places a butterfly in the patient's arm, and proceed with a complete contrast-enhanced scan.

RESULTS

The new clinical protocol has been used for about 2 months, on 360 followup scans, and resulted in 60% reduction in the rate of gadolinium injection. The accuracy of 3D lab assessment of CAD results versus final radiologist interpretation was more than 95%. Our preliminary study predicted a rate of 75% reduction, and the main reason for not achieving this figure in the clinical implementation is the unavailability of the 3D lab after hours. In that case, patients get contrast automatically. There is still room for improvement in CAD sensitivity, and assessment of CAD results by 3D lab techs.

CONCLUSION

We have implemented a new MR clinical protocol to avoid unnecessary gadolinium injections in patients with MS with a real-time decision support system. We believe that this will address the growing concern of our patients, as well as save time and resources.

CLINICAL RELEVANCE/APPLICATION

This protocol is now being used on every MS followup case, and is poised to improve patient experience, and save resources.

SSQ16-07 Comparing Selective Inversion Recovery Quantitative Magnetization Transfer and Diffusion Tensor Imaging to Assess Myelin Integrity in Multiple Sclerosis

Thursday, Dec. 5 11:30AM - 11:40AM Room: S404CD

Participants
Dhairya Lakhani, MD, Nashville , TN (*Presenter*) Nothing to Disclose
Giulia Franco, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose
Michael Kammer, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose
Aneri Balar, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose
Fie Ye, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose
Run Fan, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose
Ipek Oguz, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose
Seth A. Smith, PhD, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose
Junzhong Xu, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose
Richard Dortch, PhD, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose
Francesca Bagnato, MD, Nashville, TN (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

dhairya.lakhani@gmail.com

PURPOSE

We propose to validate Quantitative Magnetization Transfer (qMT) protocol and its derived myelin-sensitive pool-size-ratio (PSR) by comparing it with conventional radial diffusivity (RD) derived from diffusion tensor imaging (DTI). We hypothesize that i) Both PSR and RD discriminate pathological versus healthy tissue in brain of persons with multiple MS, ii) PSR shows comparatively stronger associations with clinical measures due to its superior specificity to myelin integrity.

METHOD AND MATERIALS

In this prospective case-control study 18 persons with MS and nine age-and-sex-matched healthy controls(HC) underwent conventional scans, DTI and qMT protocol scan on 3T. Disability was measured using Expanded Disability Status Scale (EDSS) and Timed 25-Foot Walk Test (T25-FW). Generalized linear mixed models for binary outcome were used to assess differences in PSR and RD between white-matter-lesions(WMLs), chronic-black-holes(cBHs), normal-appearing-white matter(NAWM), and normal-white-matter(NWM) of HCs. Association between variables were measured using non-parametric Spearman's Rank correlation analyses.

RESULTS

PSR and RD differed ($p<0.001$) between cBH and WML, WML and NAWM, but not between NAWM and NWM. PSR derived from cBHs ($r=-0.83, p<0.001$) and WML ($r=-0.76, p<0.001$) correlated with volume of cBH. No correlation was observed between RD and lesion burden or between both PSR and RD with brain atrophy. PSR derived from cBHs and WML correlated with EDSS ($r=-0.44, p=0.005$; $r=-0.63, p=0.005$), T25-FW ($r=-0.62, p<0.05$; $r=-0.63$, $p=0.005$) and disease duration ($r=-0.61, p=0.05$; $r=-0.71$, $p=0.002$) respectively.(Figure 1) On the contrary, no significant associations were seen between RD values and clinical measures.

CONCLUSION

Both PSR and RD can discriminate tissues with different types of pathology, but only PSR is sensitive to clinical measures. The differences can be attributed to the fact that qMT provides an indirect measure of macromolecular content through its communication with surrounding water, whereas DTI only offers information related to the presence or absence of barriers, which in damaged tissue, is complex. Additionally, qMT is not sensitive to fiber orientation as DTI and thus may also have a pivotal role in explaining our results.

CLINICAL RELEVANCE/APPLICATION

SIR-qMT derived metrics add specificity to the assessment of myelin integrity in persons with MS, suggesting a role as biomarker of neurodegeneration and repair.

SSQ16-08 Imaging of Acute Optic Neuritis: Is It Possible to Diagnose Demyelinating Disorders based on Optic Nerve Enhancement Patterns?

Thursday, Dec. 5 11:40AM - 11:50AM Room: S404CD

Participants
Maximiliano Darakdjian, MD, Buenos Aires City, Argentina (*Presenter*) Nothing to Disclose
Hernan Chaves, MD, Vicente Lopez, Argentina (*Abstract Co-Author*) Consultant, ENTELAI
Jairo Hernandez, MD, MS, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Claudia P. Cejas, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

maxdarakdjian@gmail.com

PURPOSE

MRI patterns of optic nerve involvement have been described and correlated with underlying optic neuritis (ON) etiologies. Optic nerve enhancement is an accurate biomarker of acute ON. Our purpose is to analyze if there is any difference between patterns of optic nerve enhancement and acute ON etiologies.

METHOD AND MATERIALS

We retrospectively analyzed enhancement patterns on fat-suppressed T1-weighted images of 50 optic nerves (43 patients) with clinical and radiological acute ON, who presented at our institution over a 4-year period. We evaluated location and extension of enhancing optic nerve segments and the presence of perineural enhancement (PE). Images were analyzed in consensus by a third-year radiology resident and a neuroradiologist. The relation between optic nerve enhancement patterns and underlying etiology was evaluated. Fisher's exact test and chi2 were calculated.

RESULTS

Patients mean age was 30.7 years-old (range 6-79) and 28 were females (65.1%). Twenty-three (53.4%) were diagnosed with Multiple Sclerosis (MS), 8 (18.6%) Neuromyelitis Optica (NMO) and 12 (27.9%) anti-MOG. Seven patients had bilateral involvement [14.29% MS, 14.3% NMO, 71.3% anti-MOG (p=0.029)]. Nine nerves had PE (33.3% MS, 33.3% NMO and 33.3% anti-MOG). Thirty-five had intraorbital involvement [34.2% MS, 22.8% NMO, 42.8% anti-MOG (p=0.012)]. Canalicular involvement was seen in 28 patients (46.4% MS, 10.6% NMO, 42.9% anti-MOG), intracranial in 20 (45% MS, 15% NMO, 40% anti-MOG) and chiasmatic in 3 patients (33% MS, 33% NMO, 33% anti-MOG). Twenty-six patients had only 1 involved segment (61.54% MS, 19.23% NMO, 19.23% anti-MOG), 13 patients had 2 segments (38.5% MS, 15.4% NMO, 46.2% anti-MOG), 10 patients had 3 segments (30% MS, 20% NMO, 50% anti-MOG) and only one patient had 4 segments affected (anti-MOG). The median time from symptom onset to MRI was 8.7 days (range 0-33).

CONCLUSION

In acute ON, bilaterality and intraorbital involvement of optic nerves were more frequent in anti-MOG patients compared to MS and NMO groups. There was no statistically significant difference in the presence of PE or number of involved segments between groups.

CLINICAL RELEVANCE/APPLICATION

Despite acute ON treatment is similar in all demyelinating entities, prognosis and further management differs considerably. Patterns of nerve enhancement could differentiate between etiologies.

SSQ16-09 Neuromyelitis Optica Spectrum Disorders (NMOSD) - Is that Possible to Characterize Different Phenotypes by Magnetic Resonance Imaging?

Thursday, Dec. 5 11:50AM - 12:00PM Room: S404CD

Participants
Lucas L. Resende, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Luana M. Salles, Sao Paulo , Brazil (*Abstract Co-Author*) Nothing to Disclose
Eduarda L. Dias, MD, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
Eduardo A. Valadares, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Douglas K. Sato, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Samira A. Pereira, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Renata F. Simm, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Frederico M. Jorge, Sao Paulo , Brazil (*Abstract Co-Author*) Nothing to Disclose
Leandro T. Lucato, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Dagoberto Callegaro, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Claudia D. Leite, MD,PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Carolina M. Rimkus, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

lucaslresende@gmail.com

PURPOSE

Patients with neuromyelitis optica spectrum disorders (NMOSD) can be positive for antibodies against aquaporin-4 (anti-AQP4), against myelin oligodendrocyte glycoprotein (anti-MOG) or even double negative. Our goal in this study is to compare MRI findings between anti-AQP4 positive, anti-MOG positive and double negative patients.

METHOD AND MATERIALS

Two neuroradiologist blind for the antibody measures results retrospectively analyzed MRI scans from 72 NMOSD patients (29 patients positive for anti-MOG; 26 patients positive for anti-AQP4, and 17 patients negative for both antibodies). We compared the frequency and characteristics of optic neuritis, myelitis and brain lesions, including presence of medullary and area postrema lesions; the number of abnormal optic nerve and medullary segments, and the encephalic regions involved in each condition. We performed chi-square and person test for categorical variables and analysis of median with Mann-Whitney test for continuous variables.

RESULTS

When comparing anti-MOG versus anti-AQP4 patients, we observed significant differences in: presence of medullary lesions, MOG 44% AQP4 88% (p=0.001); presence of area postrema lesions MOG 3.7% AQP4 38% (p=0.002), normal brain MRI MOG 69% AQP4 23% (p=<0.001), optic chiasm lesions MOG 13,3% AQP4 61,1% (p=0.005); longitudinally extensive transverse myelitis (LETM) MOG 7% AQP4 80% (p<0.001); medullary bright spot lesions MOG 0% AQP4 50% (p<0.001). When comparing anti-MOG versus double negative (DN) we observed significant differences in: normal brain MRI MOG 69% DN 29% (p= 0.009); optic chiasm lesions MOG 13% DN 53% (p=0.042); median number of medullary segments involved MOG 4 DN 13 (p=0.01); corticospinal tract involvement MOG 3% DN 35% (p=0,048).

CONCLUSION

Anti-MoG related myelitis is less frequent and less extensive, compared to anti-AQP4 and double negative patients, and the bright spotty lesions are absent in anti-MoG patients. The anti-MOG related optic neuritis frequently spares the optic chiasm. These MRI findings might provide surrogate markers to differentiate NMOSD phenotypes.

CLINICAL RELEVANCE/APPLICATION

NMOSD patients showed different MRI patterns depending on the serological evaluation. To recognize specific MRI patterns for each autoantibody-related presentation might help understanding different pathological mechanisms and to guide personalized diagnostic and therapeutic interventions.

Printed on: 10/29/20

SSQ17

Pediatrics (Ultrasound)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S105AB

PD US

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Jennifer E. Lim-Dunham, MD, Maywood, IL (*Moderator*) Nothing to Disclose
Kassa Darge, MD,PhD, Philadelphia, PA (*Moderator*) Nothing to Disclose
Harriet J. Paltiel, MD, Boston, MA (*Moderator*) Nothing to Disclose

Sub-Events

SSQ17-01 Contrast-Enhanced Ultrasound (CEUS) in Pediatric Swine as a Pediatric Preclinical Model for Brain Imaging

Thursday, Dec. 5 10:30AM - 10:40AM Room: S105AB

Participants
Anush Sridharan, PhD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Laura Poznick, BA, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Anna L. Roberts, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Nile Delso, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Todd J. Kilbaugh, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Misun Hwang, MD, Ellicott City, MD (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Brain injury (direct and indirect) remains a leading cause of morbidity and mortality in children. We evaluate the feasibility of using a pediatric swine model to develop CEUS-based measures of brain perfusion to be applied in the setting of various types of brain injury.

METHOD AND MATERIALS

One-month old, 10kg pediatric swine (n=4) were anesthetized for the duration of the study. A 6 cm burr hole, dura intact, based on a template of the ultrasound transducer (Philips 10-3v), was created in the right frontal cranium to provide an acoustic window for visualization of an oblique coronal plane and bilateral thalami. All animals were pre-medicated with diphenhydramine to prevent any allergic reaction to the contrast. In this dataset, 3 sham animals were imaged, and 1 animal underwent asphyxial cardiac arrest. Ultrasound contrast agent (UCA) Lumason (Bracco Diagnostics) was administered as a a) weight-based (0.03 ml/kg) venous bolus or b) non-dilute steady infusion (0.4-1 ml/min) using an infusion pump. After localization of the imaging plane, CEUS cine clips were acquired for a) 90 seconds for bolus and b) 180 seconds including 2 or more flash-replenishment sequences for infusion while maintaining the mechanical index between 0.1-0.15.

RESULTS

In total, 13 bolus injections (average dose of 0.3 ml) and 17 flash-replenishment sequences were performed across all animals. The bolus provided global visualization of the perfusion while the infusion highlighted the microvasculature in the brain. CEUS provided adequate visualization of the vascular structures in the brain using both bolus and infusion in the sham and cardiac arrest model. Preliminary evaluation of bolus kinetics in the sham pigs showed a central gray nuclei to cortex ratio (GNC) similar to human neonates with a steep wash-in that crossed the 1.0 threshold and remaining above 1.0 for most of the enhancement period. This will be evaluated for the cardiac arrest model in future studies to identify any differences.

CONCLUSION

We demonstrated the similarity in brain perfusion between porcine and human neonates, specifically with respect to GNC and thus showing preliminary feasibility of its use as a neonatal model of brain pathology.

CLINICAL RELEVANCE/APPLICATION

CEUS can be performed in the bedside as a minimally invasive procedure and quantitative CEUS may provide critical information regarding changes in brain perfusion as a result of injury or as a response to therapy.

SSQ17-02 Transcranial Shear Wave Elastography (SWE) of Neonatal and Infant Brain for Quantitative Evaluation of Increased Intracranial Pressure

Thursday, Dec. 5 10:40AM - 10:50AM Room: S105AB

Participants
Timm Dirrichs, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose
Nadia Ayyad, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose
Anna Panek, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose

Christiane K. Kuhl, MD, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose
Thorsten Orlikowsky, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose
Johannes A. Thuering, MD, Aachen, Germany (*Presenter*) Nothing to Disclose
Simone Schrading, MD, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Increased intracranial pressure (ICP) is a severe disease state in infants that needs adequate diagnosis and a rapid therapy. Basic non-invasive diagnostic of increased ICP is based on clinical evaluation, B-mode ultrasound (B-US)as well as (Power-) Doppler ultrasound (D-US). Purpose of this prospective study was two-fold: first to analyse the technical possibility to perform SWE-measurements in infant brain and second to compare values between healthy neonates and those with hydrocephalus and suspected and/or invasively proven increased ICP.

METHOD AND MATERIALS

Prospective IRB-approved study in 166 neonates and infants (mean age 12 weeks, range 1 day up to 12 month), 110 of them healthy asymptomatic infants and 56 of them with diagnosed hydrocephalus, 38 with clinically increased ICP and 18 without clinically increased ICP. Invasive ICP-measurements were available in 37 children. All infants were examined with B-US, D-US and SWE with a high-res. linear 15 MHz probe (Aixplorer, Supersonic). Semi-quantitative and quantitative SWE-measurements were performed. SWE-values were compared to clinical symptoms and to results of invasive intracranial pressure measurements (37 participants). Correlations were calculated by Pearson and Spearman's correlations coefficients. Mean SWE-values in healthy children and those with increased ICP were compared by using student's t-test.

RESULTS

Brain-SWE was technically feasible in 110/124 (88.7%) healthy children and in 56/60 (93.3%) of children with hydrocephalus. SWE-values, thus rigidity of the brain parenchyma, were significantly higher in children with hydrocephalus compared to healthy children (mean 28.9 kPa vs. 18.2 kPa; p=0.0012). A correlation of invasive ICP measurements and SWE-values in a subgroup of patients with hydrocephalus revealed a direct correlation between increased ICP and increased SWE-values. Mean SWE-values were 30.3 kPa (range 26.0 - 45.2 kPa) in patients with proven increased ICP and 19.4 kPa (range 10.2 - 24.5 kPa) in patients with non-increased ICP (p<0.001).

CONCLUSION

SWE is feasible in neonates with increased ICP and might be a useful method for additional diagnostic imaging and monitoring of children with proven or suspected increased ICP. However, more evidence is necessary to further evaluate the usefulness of SWE measurements in neonates with hydrocephalus.

CLINICAL RELEVANCE/APPLICATION

SWE can be used as a surrogate marker for ICP in neonates and infants.

SSQ17-03 Incremental Role of Shear Wave Elastography and Sonographic Scoring Systems in the Imaging Diagnosis of Biliary Atresia

Thursday, Dec. 5 10:50AM - 11:00AM Room: S105AB

Participants
R. Praveen Kesav, MBBS, New Delhi, India (*Presenter*) Nothing to Disclose
Manisha Jana, MD, FRCR, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Raju Sharma, MD, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Arun K. Gupta, MBBS, MD, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Devasenathipathy Kandasamy, MD,FRCR, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Vireshwar Bhatnagar, MD, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Sandeep Agarwala, MBBS, MD, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Rohan Malik, MBBS,MD, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
S Datta Gupta, MBBS,MD, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Prasenjit Das, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

rpraveenkesav@gmail.com

PURPOSE

Infants with biliary atresia (BA) have a higher hepatic stiffness as compared to other causes of neonatal cholestasis (non-BA) because of early onset biliary cirrhosis, which has been evaluated in our study. To make greyscale and elastographic evaluation of BA more *objective* by means of scoring systems.

METHOD AND MATERIALS

Sixty-four infants with cholestatic jaundice were included in this prospectively conducted observational study. Hepatic SWE stiffness and other parameters were measured using Supersonic Aixplorer ultrasound system. The final diagnosis of BA was established based on intra-op cholangiogram and by liver biopsy wherever surgery was not feasible whereas BA was ruled out when there was gut excretion on HIDA scan or resolution of jaundice on follow-up. As liver stiffness in non-BA also slowly increases with age, we have grouped the patients into two age groups of <=60 days and >60 days for better validity.

RESULTS

1. Greyscale: Gall bladder wall irregularity was the most accurate (93.8%) greyscale feature in diagnosing BA; followed by fasting gall bladder length (89.1%) and triangular cord sign (84.4%). 2. SWE: SWE stiffness was significantly higher in BA as compared to non-BA in age-matched groups <=60 days: BA = 14.4kPa; Non-BA = 7.9kPa (p=0.003) >60 days: BA = 38.3kPa; Non-BA = 18.1kPa (p=0.0005) 3. Scoring systems *(Please refer to the image attached)*: *Grey Scale (GS) scoring system*, with a cut-off of >=7, developed solely on the basis of known greyscale parameters was most accurate (96.9%) in diagnosing BA in <=60 days infants. *Grey Scale + Elastography (GSE) scoring system*, with a cut-off of >=9, was most accurate (97.8%) in diagnosing BA in infants aged >60 days. *GSE scoring system*, with a cut-off of >=9, when implemented in <=60 days is more accurate (94.4%) than

conventional sonographic diagnosis (93.8%), but it is lower than that of GS scoring system (96.9%). Hence, it needs further validation with a larger sample size in infants <=60 days.

CONCLUSION

1. Scoring systems defined in our study are a simple yet effective way for accurate sonographic diagnosis of BA. 2. Recommendations for diagnosing BA GS score >=7 in <=60 days GSE score >=9 in >60 days when SWE is available GS score >=7 in all age groups when SWE is not available

CLINICAL RELEVANCE/APPLICATION

Our scoring systems are a significant step towards solving the decades of quandary persisting in the confident and early differentiation of biliary atresia from other causes of neonatal cholestasis.

SSQ17-04 Diagnostic Performance of Ultrasonography for Midgut Volvulus: A Pilot Study

Thursday, Dec. 5 11:00AM - 11:10AM Room: S105AB

Participants
Haithuy N. Nguyen, MD, Houston, TX (*Presenter*) Nothing to Disclose
Marla Sammer, MD, Spring, TX (*Abstract Co-Author*) Nothing to Disclose
R. Paul Guillerman, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Wei Zhang, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Matthew Ditzler, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Lynn S. Carlson, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Ray Somcio, MD, Sugar Land, TX (*Abstract Co-Author*) Nothing to Disclose
Robert Orth, MD,PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

hnnguyen@texaschildrens.org

PURPOSE

Ultrasound (US) has been suggested as an alternative to upper gastrointestinal series (UGI) to diagnose midgut volvulus, but diagnostic performance characteristics of US for midgut volvulus are currently not well-defined. This pilot study aims to evaluate the interrater reliability, sensitivity, and specificity of US for midgut volvulus.

METHOD AND MATERIALS

Following IRB approval, a case-control study was performed on US exams which were performed for the indication of vomiting in children. Inclusion criteria were US exams with cine clips through the entire SMA/SMV pedicle and the expected region of the third portion of the duodenum (D3). 13 consecutive surgically-proven midgut volvulus (MV) cases with US exams meeting inclusion criteria were identified. For controls, US exams in 23 children without MV (confirmed by UGI, other imaging, or resolution of symptomatology on clinical follow up) were selected. Deidentified imaging sets with a still SMA/SMV image at the pancreatic head, a SMA/SMV pedicle cine clip, and a D3 region cine clip were created. 2 MV and 2 normal exams were removed to create a training set. Blinded to all patient information, 3 pediatric radiologists (1-10 years experience) independently reviewed the randomly ordered unknowns and assessed 4 findings (SMA/SMV relationship, whirlpool sign, D3 location, duodenal dilatation) and an impression (+ or - for midgut volvulus). Inter-observer agreement was determined using intraclass correlation (ICC), and sensitivity and specificity for MV were calculated.

RESULTS

Sensitivity and specificity for midgut volvulus were 100% and 95-100%, respectively (Table 1). Agreement between radiologists was excellent (ICC 0.90, range 0.83-0.95). For findings, the best agreement was presence of a whirlpool sign (ICC 0.88, range 0.79-0.93), with ICC's for other findings between 0.73 and 0.84.

CONCLUSION

This pilot study shows US can be sensitive and specific for midgut volvulus with excellent interrater reliability. Larger studies are needed determine whether US can substitute for UGI as the first line imaging modality.

CLINICAL RELEVANCE/APPLICATION

Midgut volvulus is a surgical emergency with longer time intervals between symptom onset and surgical correction increasing morbidity and mortality. Since many hospitals have 24/7 in-house ultrasound but rely on radiologist call-back for UGI after hours, time to surgical correction could be decreased if ultrasound could replace UGI.

SSQ17-05 Volume Changes in Testicular Torsion: Utility of a Volume Ratio on Ultrasound to Help Predict Torsion

Thursday, Dec. 5 11:10AM - 11:20AM Room: S105AB

Participants
Swetapadma Tripathy, Chicago, IL (*Presenter*) Nothing to Disclose
Mary R. Wyers, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Ellen C. Benya, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Karen Rychlik, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

mwyers@luriechildrens.org

PURPOSE

Scrotal ultrasound (US) for testicular torsion may be challenging, particularly if there is preserved flow or early findings. We sought to determine if there is significant enlargement of the affected testis in pediatric patients with testicular torsion, in order to identify an additional criterion that may be helpful.

METHOD AND MATERIALS

A retrospective analysis of pediatric patients between the ages of 2-18 with testicular torsion and surgical confirmation from 2014-2018 was performed. The volumes of the torsed testes and unaffected sides were recorded, and a ratio of the abnormal to normal sides was calculated. Age matched controls with normal scrotal US were identified to determine typical testicular symmetry, and volume ratios were calculated by comparing the larger to smaller side. Finally, volumes in patients with testicular appendage torsion were recorded in order to determine whether any testicular volume changes were specific to torsion. Patients with preexisting conditions such as varicoceles or undescended testes were excluded from all groups. A comparison of the symptomatic testes and the volume ratios was performed using ANOVA statistical analysis. A ROC curve was used to evaluate a cut point ratio to maximize sensitivity and specificity for torsion.

RESULTS

34 patients with testicular torsion (mean age 13.2 yrs), 34 age matched controls (mean age 13.2 yrs), and 45 patients with testicular appendage torsion (mean age 9.5 yrs) were included. Mean testicular volume and ratio in the torsion group was 14.1 mL and 1.64, in the normal group was 7.8 mL and 1.15, and in the appendage torsion group was 1.83 mL and 1.06. Volume ratios in the testicular torsion group were significantly higher than in the controls ($p<0.05$), and were also higher than in the appendage torsion group ($p<0.05$). Volume ratios in the appendage torsion group were not statistically higher than the normal group. A volume ratio of 1.27 was determined to maximize sensitivity (72.97%) and specificity (90.79%) for torsion, yielding a PPV of 79.4% and a NPV of 87.3%.

CONCLUSION

Comparing the volume of the affected testis to the unaffected side may help in diagnosis of testicular torsion, particularly with a volume ratio > 1.27.

CLINICAL RELEVANCE/APPLICATION

The affected testicle in testicular torsion enlarges significantly compared to the normal side, and a volume ratio of 1.27 may be helpful as an additional criterion of torsion.

SSQ17-06 Contrast-Enhanced Ultrasound of Fetal Lung Perfusion in the Extra-Uterine Environment for Neonatal Development (EXTEND) System: Initial Experience in Congenital Diaphragmatic Hernia

Thursday, Dec. 5 11:20AM - 11:30AM Room: S105AB

Participants
Ryne Didier, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Anush Sridharan, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Barbara Coons, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Daphine C. Grassi, MD, Barueri, Brazil (*Abstract Co-Author*) Nothing to Disclose
Marcus Davey, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Holly L. Hedrick, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Beverly G. Coleman, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Alan Flake, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

didierr@email.chop.edu

PURPOSE

The purpose of this study was to determine whether contrast-enhanced ultrasound (CEUS) could evaluate fetal lung perfusion and if quantification methods could detect differences in a pre-clinical animal model of congenital diaphragmatic hernia (CDH).

METHOD AND MATERIALS

Two fetal lambs underwent surgical left-sided CDH creation at 72-74 days gestational age (GA) and were delivered at GA 118-121 days (term=145 days) to the EXTra-uterine Environment for Neonatal Development (EXTEND) system, per published protocols.1 Two normal fetal lambs served as controls. Bilateral pulmonary artery Doppler waveforms were obtained and resistive and pulsatility indices (RIs and PIs) were calculated. 0.9-1.3mL activated Definity® contrast was mixed with 50mL saline and administered into the umbilical vein at an infusion rate of 100-120mL/hr, depending on estimated weight. CEUS was performed at multiple timepoints in each animal over 14 days and flash-replenishment cine acquisitions were obtained. Perfusion metrics were quantified in each lung using MATLAB. 1Partridge EA et al. An extra-uterine system to physiologically support the extreme premature lamb. Nat Commun. 2017;8:15112.

RESULTS

When compared to controls, CDH animals had increased right and left pulmonary artery RIs (0.85 vs. 0.76 and 0.87 vs. 0.76, respectively; $p<0.05$) and PIs (2.85 vs. 2.03 and 2.91 vs. 1.66, respectively; $p<0.05$). Fetal lung parenchymal perfusion was visualized in all 29 CEUS examinations and a total of 107 flash-replenishment cine acquisitions were adequate for quantification. In both lungs, CDH animals had increased flash-replenishment rate (0.86 vs. 0.54 arbitrary units/sec; $p<0.01$) and decreased mean transit time (mTT) (1.97 vs. 3.24 sec; $p<0.01$) when compared to controls.

CONCLUSION

CEUS can be performed to assess aberrations in pulmonary artery Doppler measurements and differences in fetal lung perfusion can be quantified. Increased pulmonary artery RI/PI, increased flash-replenishment rate, and decreased mTT in CDH animals are consistent with pulmonary hypertension and decreased pulmonary capillary surface area.

CLINICAL RELEVANCE/APPLICATION

CEUS can be used to evaluate fetal lung perfusion with applications in future studies assessing efficacy of surgical and pharmacologic interventions for CDH with anticipated direct human translation.

SSQ17-07 Contrast-Enhanced Voiding Urosonography, Technique and Comparison with Voiding

Cystourethrogram

Thursday, Dec. 5 11:30AM - 11:40AM Room: S105AB

Participants
Marcelo S. Takahashi, MD, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
Maria Cristina Chammas, MD,PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Mauricio Gustavo Ieiri Yamanari, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Lisa Suzuki, MD, PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Roberto Iglesias, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Taisa D. Gasparetto, MD, PhD, Rio de Janeiro, Brazil (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

straus91@gmail.com

PURPOSE

To evaluate the feasibility and effectiveness of contrast enhanced voiding uronosography, compared to traditional voiding cystography (VCUG) in a tertiary hospital in Brazil

METHOD AND MATERIALS

This is an ongoing study that begun January 2016. Pediatric patients referred for VCUG were included in our study. Any patient with contraindication for the realization VCUG or who did not consent with the study was excluded. Equipment: GE precision 8000 Fluoroscopy and Toshiba Applio 500 Ultrasound Protocol: Written consent was obtained. Initial B mode ultrasound scan of the bladder and the kidneys was obtained. Afterwards bladder catheterization and emptying was performed, which was then slowly filled with the contrast solution (Sonovue 1,5 mL diluted in 500 mL of saline). During filling the kidneys and ureters were constantly checked for vesicoureteral reflux (VUR), characterized by the visualization of microbubbles in the ureter or renal pelvis. Filling was halted whenever bladder filling was complete, patient experienced symptoms of discomfort or urethral extravasation began. Patient were then asked to begin voiding (when possible) as to diagnose active vesicoureteral reflux. A second filling-voiding cycle was made afterwards. With the vesical catheter still in place, patients were submitted to a complete voiding cystography exam immediately afterwards. Two different radiologists interpreted each exam (one radiologist for ultrasound and a second radiologist for the voiding cystogram).

RESULTS

So far 34 patients (71 kidney ureter units(KUU)) were examined, with excellent agreement between both methods for VUR. Of the 71 KUU analyzed 20 were diagnosed with VUR in both urossonography and VCUG. 48 yielded negative results in both studies. There were 3 discordant results (2 moietys yielded positve results only in VCUG and 1 positive only in urossonography). No adverse reactions have been recorded

CONCLUSION

Voiding urossonography has showed excellent agreement with traditional voiding cystourethrogram for the diagnosis of vesicoureteral reflux. Advantages over traditional voiding cystourethrogram are absence of ionizing radiation and allowing a one-stop-shop approach to certain urologic conditions.

CLINICAL RELEVANCE/APPLICATION

Voiding urossonography is a viable and cost-effective alternative for VCUG in the diagnosis of VUR.

SSQ17-08 The Use of Contrast-Enhanced Ultrasound (CEUS) for Evaluation of Renal Perfusion Post-Angiography: A Preliminary Feasibility Study in Pediatrics

Thursday, Dec. 5 11:40AM - 11:50AM Room: S105AB

Participants
Anilawan Smitthimedhin, Philadelphia, PA (*Presenter*) Nothing to Disclose
Anush Sridharan, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Kassa Darge, MD,PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Susan J. Back, MD, Penn Valley, PA (*Abstract Co-Author*) Consultant, Bracco Group Grant, Bracco Group
Anne Marie Cahill, MBBCh, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

smitthimea@email.chop.edu

PURPOSE

Renal artery angioplasty endpoint determination and follow up currently can be challenging. Pressure gradient measurements can determine immediate endpoints, however cannot be used as a follow-up tool. To determine if the use of CEUS imaging can qualitatively and quantitatively provide objective assessment of renal arterial and parenchymal perfusion pre and post renal artery angioplasty in children and potentially be used as a follow up imaging tool.

METHOD AND MATERIALS

The more recent practice in our institution of performing pre and post angioplasty CEUS was reviewed for the ability to generate time intensity curves (TIC). Inclusion criteria were visibility of all three renal poles, minimal motion of the kidney/imaging plane and parenchymal wash-out. Pre and post angioplasty regions-of-interest (ROI) were identified in renal parenchyma and main renal artery, and average contrast intensity over the total duration was used to generate a TIC and time-to-peak (TTP) enhancement.

RESULTS

Two of 8 cases were identified as meeting inclusion criteria, both cases involving the use of the cutting balloon, a novel technique for resistant renal artery angioplasty. In the first case, a faster/steeper gradient on the wash-in leading to a shorter parenchymal TTP from 9.6 pre to 8.7 sec post angioplasty, which is comparable to main renal artery stenosis reduction from 70% to 25% and

gradient reduction from 13 mmHg to 6 mmHg. In the second case, post-angioplasty imaging did not show significant improvement of main renal artery stenosis (50% pre to 31% post angioplasty). However, TTP showed significant improvement in the flow (11 sec down to 6 sec in parenchyma and 8 sec down to 3 sec in renal artery), comparable to intra-procedural gradient measurement (12 mmHg down to 3 mmHg).

CONCLUSION

This feasibility study suggests that standardized CEUS imaging may be able to evaluate pre and post angioplasty renal perfusion and may be used as a follow-up imaging tool to monitor RAS. Currently instituted standardized imaging and contrast dose will enable the generation of additional quantitative measure of perfusion assessment, in the entire, or selected parenchymal regions.

CLINICAL RELEVANCE/APPLICATION

CEUS provides a real-time method of assessing renal perfusion during intervention and follow-up. It may also provide objective end point determination for renal artery angioplasty.

SSQ17-09 Application of Contrast-Enhanced Ultrasound in Pediatric Hepatoblastoma

Thursday, Dec. 5 11:50AM - 12:00PM Room: S105AB

Participants
Zijian Tang, Shenzhen, China (*Presenter*) Nothing to Disclose
Bei Xia, Shenzhen , China (*Abstract Co-Author*) Nothing to Disclose
Bin Wang, Shenzhen , China (*Abstract Co-Author*) Nothing to Disclose
Xiuli Yuan, Shenzhen , China (*Abstract Co-Author*) Nothing to Disclose
Feiqiu Wen, Shenzhen, China (*Abstract Co-Author*) Nothing to Disclose
Weiguo Yang, Shenzhen , China (*Abstract Co-Author*) Nothing to Disclose
Yungen Gan, Shenzhen, China (*Abstract Co-Author*) Nothing to Disclose
Jianming Song, Shenzhen , China (*Abstract Co-Author*) Nothing to Disclose
Zhou Lin, MD, Shenzhen, China (*Abstract Co-Author*) Nothing to Disclose
Shumin Fan, Shenzhen , China (*Abstract Co-Author*) Nothing to Disclose
Wei Yu, Shenzhen , China (*Abstract Co-Author*) Nothing to Disclose
Liezhen Hu, Shenzhen , China (*Abstract Co-Author*) Nothing to Disclose
Hongkui Yu, Shenzhen , China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

stesas@163.com

CONCLUSION

CEUS has better spatial resolution than B-mode sonography in hemorrhage and/or necrosis of hepatoblastoma and the similar perfusion pattern is in the CT and CEUS. The CEUS is used for improves guide needle biopsy.

Background

Hepatoblastoma is a malignant tumor arising fro embryonic liver tissue. It is a common malignant tumor in childhood, among about 79% of children's liver tumors, mostly occurs under 3 years old. Two-dimensional ultrasound has limitations in the diagnosis of hepatoblastoma, and the Contrast-enhanced Ultrasound (CEUS) is still inexperienced in the pediatric diagnosis. It is worth discussing how to use for image diagnose in the hepatoblastoma.

Evaluation

Materials and Methods: Our study included 8 patients (6 males, 2 females) with age range 1~3 years old of the surgically or pathology confirmed hepatoblastoma and available baseline abdominal imaging by CEUS and CT. Those CEUS abdominal images were retrospectively analyzed and compared with the Contrast-enhanced Computed Tomography (CT). According to the PRETreatment EXTent of disease (PRETEXT) system, there were one case for low risk, 5 cases of intermediate risk and 2 cases of high risk. A case with intermediate risk hepatoblastoma complicated with tumor rupture.

Discussion

Result: All 8 cases of giant type liver tumor showed solid mass by B-mode ultrasonography. Contrast agent SonoVue® (Sulphur hexafluoride microbubbles) was given intravenously, the 2 cases tumor appeared hyper-enhancing in arterial and portal venous phase, hypo-enhancing in venous phase; 5 cases appeared hyper-enhancing in arterial phase, hypo-enhancing in portal venous and venous phase, and one case showed hypo-enhancing in third phase by the CEUS. There were 7 cases appeared central non-enhancing area by the CEUS same as CT. One CEUS showed surround non-enhancing area of the tumor, and CT image suggested hematoma enclosure. In addition, the CT showed 2 cases of capsule and 2 cases of calcification, but CEUS had no characteristic features. One case of portal vein thrombus showed both by CEUS and CT, and 8 cases showed intrahepatic vascular compression. The 7 of 8 cases tumor were successfully performed needle biopsy by the CEUS guided.

SSQ18

Physics (Dual Energy/Spectral CT)

Thursday, Dec. 5 10:30AM - 12:00PM Room: E353A

CT PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Jerome Z. Liang, PhD, Stony Brook, NY (*Moderator*) Nothing to Disclose
Xinming Liu, PhD, Houston, TX (*Moderator*) Nothing to Disclose

Sub-Events

SSQ18-01 Noise Suppression in Image-Domain Multi-Material Decomposition for Dual-Energy CT by Noise Propagation Analysis

Thursday, Dec. 5 10:30AM - 10:40AM Room: E353A

Participants
Yangkang Jiang, Hangzhou, China (*Presenter*) Nothing to Disclose
Yi Xue, Hangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Lei Xu, Hangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Pengfei Yang, Hangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Chen Luo, Hangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Tianye Niu, PhD, Hangzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Dual-energy CT (DECT) strengthens the material characterization and quantification due to its capability of material discrimination. The image-domain multi-material decomposition (MMD) via matrix inversion suffers from serious degradation of the signal-to-noise ratios (SNRs) of the decomposed images and thus the clinical application of DECT is limited. In this work, we propose a noise suppression algorithm based on the noise propagation for image-domain MMD.

METHOD AND MATERIALS

The noise in the decomposed images only distributes in two perpendicular directions. The noise perturbation is minimal along the principal axis and is thus suppressed along the principal axis by estimating the center of mass of the same-material pixel group. The proposed method is evaluated using the line-pair and contrast-rod slices of the Catphan©600 phantom and one patient data. We compared the proposed method with the direct inversion and the block-matching and three-dimensional (BM3D) filtration methods.

RESULTS

The results of Catphan©600 phantom and the patient show that the proposed method successfully suppresses the noise of the basis material images by one order of magnitude and preserves the spatial resolution of the decomposed images. Compared with the BM3D filtration method, the proposed method maintains the texture distribution of the decomposed images at the same SNR and the accuracy of the electron density measurement.

CONCLUSION

The algorithm achieves effective noise suppression compared with the BM3D filtration while maintaining the spatial distribution of the decomposed material images. It is thus attractive for advanced clinical applications using DECT.

CLINICAL RELEVANCE/APPLICATION

Improve the accuracy of dual-energy CT material decomposition and can be used for iodine removal in CTPA.

SSQ18-02 Implementation of Multi-Energy CT with Triple-Beam Dual-Source CT

Thursday, Dec. 5 10:40AM - 10:50AM Room: E353A

Awards
Trainee Research Prize - Fellow

Participants
Liqiang Ren, PhD, Rochester, MN (*Presenter*) Nothing to Disclose
Thomas Allmendinger, Forchheim, Germany (*Abstract Co-Author*) Employee, Siemens AG
Ahmed Halaweish, PhD, Rochester, MN (*Abstract Co-Author*) Employee, Siemens AG
Bernhard Schmidt, PhD, Forchheim, Germany (*Abstract Co-Author*) Employee, Siemens AG
Thomas G. Flohr, PhD, Forchheim, Germany (*Abstract Co-Author*) Employee, Siemens AG
Cynthia H. McCollough, PhD, Rochester, MN (*Abstract Co-Author*) Research Grant, Siemens AG
Lifeng Yu, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

ren.liqiang@mayo.edu

PURPOSE

To implement triple-beam energy-integrating-detector multi-energy CT (EID-MECT) on a dual-source (DS) CT scanner and compare its material decomposition (MD) performance with EID dual-energy CT (EID-DECT) and photon-counting-detector CT (PCD-CT) for two potential multi-contrast clinical tasks: biphasic liver imaging with iodine (I) and gadolinium (Gd), and small bowel imaging with iodine (I) and bismuth (Bi).

METHOD AND MATERIALS

The EID-MECT was implemented on a DSCT platform by mounting a z-axis split filter (0.05 mm Au, 0.6 mm Sn) on Tube A, which was operated at 120 or 140 kV. With Tube B operated at 70 or 80 kV, four triple-beam configurations were calibrated for MECT measurements: 70/Au120/Sn120, 70/Au140/Sn140, 80/Au120/Sn120, and 80/Au140/Sn140 kV. Mixed I/Gd samples were prepared, where the I/Gd enhancement values corresponded to late arterial/portal-venous phases, respectively, for biphasic liver imaging. Mixed I/Bi samples were prepared, where the I/Bi enhancement values corresponded to arterial/enteric enhancement, respectively, for small bowel imaging. Samples were placed in a 25-cm wide water phantom and scanned using the four configurations. The same phantom was scanned using twin-beam DECT (TB-DECT) (Au120/Sn120 kV), DS-DECT (80/Sn140 kV), and PCD-CT (80 kV: 25/35/50/55 keV for I/Gd; 140 kV: 25/50/75/90 keV for I/Bi), all at equivalent CTDIvol. Image-based MD was performed and mean (± std dev) material concentrations measured.

RESULTS

The optimal triple-beam configuration was 70/Au120/Sn120 and 70/Au140/Sn140 kV for I/Gd and I/Bi quantification, respectively. At equivalent radiation dose, noise in material concentration measurements was reduced for the triple-beam by 93%, 46%, and -2% for I/Gd quantification, and 62%, 24%, and 40% for I/Bi quantification, compared to TB-DECT, DS-DECT, and PCD-CT, respectively.

CONCLUSION

For the first time, the use of EIDs to perform MECT was experimentally demonstrated. Implemented with use of a Au/Sn split filter, three unique energy spectra were simultaneously measured using a DS system. Noise measured in material concentration was decreased relative to EID-DECT and comparable to or better than PCD-CT for two potential multi-contrast clinical tasks.

CLINICAL RELEVANCE/APPLICATION

With the triple-beam technique, the wide availability of DS-DECT in academic radiology departments can facilitate investigations of multi-contrast clinical tasks.

SSQ18-03 Multi-Contrast Imaging with Dual-Source (DS) Photon Counting Detector (PCD) CT and a Material Decomposition Technique Using Prior Knowledge Aware Iterative Denoising (MD-PKAID)

Thursday, Dec. 5 10:50AM - 11:00AM Room: E353A

Participants
Shengzhen Tao, Rochester, MN (*Presenter*) Nothing to Disclose
Kishore Rajendran, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Cynthia H. McCollough, PhD, Rochester, MN (*Abstract Co-Author*) Research Grant, Siemens AG
Shuai Leng, PHD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

leng.shuai@mayo.edu

PURPOSE

Multi-energy data acquired on photon counting detector (PCD) suffer from considerable energy overlap due to imperfect detector response. This work aims to use dual source (DS)-PCD-CT to improve energy separation of multi-energy data, and a recently developed material decomposition method (MD-PKAID) to enable high fidelity simultaneous multi-contrast imaging of iodine (I), gadolinium (Gd), and bismuth (Bi).

METHOD AND MATERIALS

Head/body phantoms including solution vials containing I/Gd/Bi contrast agents of different concentrations were scanned on a single-source (SS) whole-body PCD-CT (chess mode with 4 thresholds = 25/50/75/90keV) and two times of clinical doses. The energy thresholds were chosen to capture the K edges of Gd/Bi. Energy bin images were reconstructed using a quantitative kernel (D30). An image-domain least-square material decomposition (MD-LS) was used to generate I/Gd/Bi specific images. Next, the same phantoms were scanned on DS-PCD-CT which was emulated by two consecutive scans with 80 kV / Sn140 kV for low/high energy tubes (Sn=tin filter). Total radiation dose of DS-PCD was 52.8/14.0 mGy for the head/body scans, similar to clinical exams. The energy thresholds were set as 25/50 keV for 80kV scan, and 25/90 keV for Sn140 kV scan. A recently developed material decomposition method (MD-PKAID) was applied, which used the energy threshold-low images as a prior image to denoise individual material-specific images. The root-mean-square-errors (RMSE) of material concentration relative to the true concentrations were measured for each material.

RESULTS

The improved energy separation offered by DS-PCD-CT, combined with MD-PKAID, was able to achieve excellent performance of multi-contrast imaging of I/Gd/Bi contrasts. The material concentration RMSEs for I/Gd/Bi were 0.26/0.11/0.21 mg/mL for head phantom, and 0.50/0.31/0.29 mg/mL for body phantom, in comparison to the RMSEs of 1.82/1.44/0.63 mg/mL (head) and 10.88/7.54/1.76 mg/mL (body) using SS-PCD with MD-LS.

CONCLUSION

The combination of DS approach and PCD technology, coupled with an iterative material decomposition algorithm, allowed simultaneous multi-contrast imaging using I/Gd/Bi with low (<0.50mg/mL) quantification error.

CLINICAL RELEVANCE/APPLICATION

DS-PCD-CT and a novel material decomposition algorithm may allow successful multi-contrast imaging, which may enable novel molecular imaging with nanoparticles and extend the frontier of clinical CT.

SSQ18-04 Evaluation of a Novel Multi-Energy CT Phantom with High-Precision Low Iodine and Calcium Concentration Inserts Using a Third Generation Dual-Source CT System

Thursday, Dec. 5 11:00AM - 11:10AM Room: E353A

Participants
Juan Carlos Ramirez-Giraldo, PhD, Cary, NC (*Presenter*) Employee, Siemens AG
Andrew Primak, PhD, Cleveland, OH (*Abstract Co-Author*) Employee, Siemens AG
Vladimir Varchena, MS, Norfolk, VA (*Abstract Co-Author*) Employee, CIRS
Till Schuermann, BS, Cary, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate a novel multi-energy CT (MECT) phantom with multiple radiologically relevant inserts representing blood and water with contrast elements at low concentrations.

METHOD AND MATERIALS

A prototype of MECT phantom Model 662 (CIRS Inc, Norfolk, VA), with dimensions 33 x 27 x 25 cm was designed based on CIRS standard Electron Density Phantom Model 062 and comprised of the 5 cm thick target section in between two scatter 10 cm sections. It can be used in the "head" configuration Ø18 cm or full-size "body" configuration. The phantom is manufactured from Plastic Water-LR® and includes numerous material targets encapsulated inside the Ø1cm inserts made of PW-LR. Solid iodine inserts in water and blood included 0, 0.2, 0.5, 1.0, and 2.0, 5, 10 and 15mg/cc. Calcium inserts included 10, 20, 40, 60, 120 and 240 mg/cc concentrations. The phantom was scanned using dual-source CT (SOMATOM Force, Siemens) in the conventional SECT mode to assess linearity with kV ranging 70-150 (plus 100Sn and 150Sn). The iodine inserts were also evaluated with the MECT technique using kV pair combinations: 80/Sn150, 90/Sn150, and 100/Sn150 kV.

RESULTS

The HU values of all materials (including background 'water') in the phantom behaved as expected in the investigated kV range. The HU vs. concentration curves measured in the 'head' phantom showed excellent linearity with R2 values of 0.9990 (iodine in water), 0.9995 (iodine in blood) and 0.9998 (calcium in water). Iodine accuracy in the 'body' phantom varied from -0.5 to +0.2 mg/cc under all conditions except the highest iodine concentration (15 mg/cc) measured with 90/150Sn and 80/150Sn kV pairs where the absolute error increased to -0.8 and -1.1 mg/cc, respectively. With exception of the lowest concentrations <=0.5 mg/cc, percent errors were consistently below 10%. At lower concentrations, the 100/Sn150 kV had the highest accuracy. Iodine DE ratio values in the 'body' phantom were in excellent agreement with the previously published results (Krauss et al, Invest Radiol 2015).

CONCLUSION

The evaluated MECT phantom showed excellent characteristics in terms of concentration linearity, expected kV dependence of all clinically relevant materials, appropriate iodine DE ratio values, and enabled evaluation of low concentrations of materials.

CLINICAL RELEVANCE/APPLICATION

With MECT gaining more clinical attention, carefully designed phantoms are desired for assessing performance of state-of-the-art MECT systems.

SSQ18-05 K-Edge Subtraction Imaging with a Mono-Energetic Compact Synchrotron X-Ray Source

Thursday, Dec. 5 11:10AM - 11:20AM Room: E353A

Participants
Stephanie Kulpe, MSc, Garching, Germany (*Presenter*) Nothing to Disclose
Martin Dierolf, Garching, Germany (*Abstract Co-Author*) Nothing to Disclose
Benedikt Gunther, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Madleen Busse, PhD, Garching, Germany (*Abstract Co-Author*) Nothing to Disclose
Klaus Achterhold, Garching, Germany (*Abstract Co-Author*) Nothing to Disclose
Bernhard Gleich, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Julia Herzen, Garching, Germany (*Abstract Co-Author*) Nothing to Disclose
Ernst J. Rummeny, MD, Muenchen, Germany (*Abstract Co-Author*) Nothing to Disclose
Franz Pfeiffer, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Daniela Pfeiffer, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

X-ray computed tomography (CT) is one of the most important diagnostic techniques in clinics. Yet, this method lacks the ability to differentiate similarly absorbing substances like commonly used iodine contrast agent and calcium, which is contained in calcifications, kidney stones and bones. K-edge subtraction (KES) imaging overcomes this limitation by subtracting two CT scans recorded at X-ray energies above and below the K-edge of the element in question. Thereby, reliable discrimination of contrast agent and calcium is achieved.

METHOD AND MATERIALS

KES benefits from monochromatic X-rays. Therefore, it has been mainly applied at synchrotron facilities. Here, we present the first proof-of-principle experiment of a filter-based KES CT performed at a compact synchrotron X-ray source based on inverse-Compton scattering, which provides a quasi-monochromatic X-ray beam of tunable energy in a laboratory setup. Two CT scans of an excised porcine kidney containing a kidney stone were performed. One scan was done with an iodine filter in the beam shifting the mean X-ray energy below the iodine K-edge energy, while the other one was performed with the full spectrum of the X-ray source.

RESULTS

KES CT allows for iodine contrast agent and calcium to be clearly separated, c.f. Figure 1. While both materials show almost the

same absorption values in the unfiltered CT scans (Figure 1a), KES and inverse KES allow to discriminate the two materials (Figure 1c, d) due to the step increase in absorption of iodine between the X-ray energies employed for the two CTs.

CONCLUSION

The results show that KES CT is feasible at a compact inverse-Compton scattering X-ray source, which is going to provide benefits for contrast enhanced 3D imaging in a pre-clinical setting. KES CT allows for a discrimination of iodine and calcium, which will be of special interest in various clinical situations like kidney stones, atherosclerosis and bone imaging. We believe that KES at a compact synchrotron source can become an important tool in pre-clinical research and possible future clinical diagnostics.

CLINICAL RELEVANCE/APPLICATION

KES CT solves the clinically faced issue of the discrimination of iodine contrast agent and calcium, providing two CT volumes only showing one of the two materials, respectively.

SSQ18-06 The Potential Effects of Scout Scan Parameters on Image Quality and Radiation Dose in Chest CT on a 16cm Wide-Detector Dual-Energy CT

Thursday, Dec. 5 11:20AM - 11:30AM Room: E353A

Participants
Dandan Liu, Beijing, China (*Presenter*) Nothing to Disclose
Niu Yantao, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Sen Lin Guo, Beijing , China (*Abstract Co-Author*) Nothing to Disclose
Zhang Yongxian, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

trdandan@hotmail.com

PURPOSE

To explore the effects of scout scan parameters (tube position, tube voltage, mA) on image quality and radiation dose of chest CT scan under Smart mA and KV Assist modes on a chest phantom

METHOD AND MATERIALS

The CT scan was performed on a chest phantom by a 16cm wide-detector dual-energy CT (Revolution CT, GE Healthcare, Milwaukee) under Smart mA and KV Assist modes. During the scout scanning,the tube was positioned at 0°, 90 and 180°, separately corresponding to 5 different tube voltages (70, 80, 100, 120 and 140kV); 5-6 mA values were selected from a range of 10-110mA. Scan parameters were set as follows: KV Assist, Smart mA, detector width: 80mm, pitch: 0.992:1, rotation time: 0.5s/r, slice thickness: 5mm, NI: 10. The mA values atpulmonary apex, tracheal bifurcation, nipple, and right diaphragmatic dome were recorded. The CT dose index-volume (CTDIvol) in each scan was recorded as well. The radiation dose of breast in each scan was measured by the thermal leak detector (TLD). The regions of interest (ROIs) were placed at the tracheal bifurcation and right diaphragmatic dome to calculate the contrast-to-noise ratio (CNR).

RESULTS

Under Smart mA and KV Assist modes with tube positions at 90° and 180°, a tube voltage of 100kV was automatically selected for scanning. With the scanning parameters of 70kV and 10mA at the tube position of 0°, the automatically selected tube voltage was 100kV as well. For other scanning conditions, tube voltage was automatically selected as 80kV. At the tube position of 0°, the mean CTDIvol was 3.33mGy, the mean breast dose was 6.79mGy, and the mean CNR were 120.34 and 124.81 at a level of tracheal bifurcation and diaphragmatic dome, respectively . At the tube position of 90°, the above measurements were 4.87mGy, 8.42mGy, 168.00 and 144.33, respectively. At the tube location of 180°, measurements were 4.38mGy, 7.45mGy, 143.35 and 141.48, respectively.

CONCLUSION

In chest CT scout scan, the tube position has great influence on the radiation dose and particularly the organ dose of breast.

CLINICAL RELEVANCE/APPLICATION

A proper scan mode shall be selected according to the specific requirements of clinical examinations.

SSQ18-07 Assessment of Texture Feature Reproducibility in Dual-Energy Computed Tomography Virtual Monoenergetic Images

Thursday, Dec. 5 11:30AM - 11:40AM Room: E353A

Participants
Faraz Farhadi, Bethesda, VA (*Presenter*) Nothing to Disclose
Jayasai R. Rajagopal, BA, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Moozhan Nikpanah, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Michael Morris, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Paul Wakim, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Ziyue Xu, PhD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose
Mohammad Hadi Bagheri, MD, Rockville, MD (*Abstract Co-Author*) Nothing to Disclose
William F. Pritchard JR, MD,PhD, Chevy Chase, MD (*Abstract Co-Author*) Research collaboration, Koninklijke Philips NV; Research collaboration, Biocompatibles International plc; Research collaboration, BTG International Ltd; Research collaboration, Siemens AG; Research collaboration, XACT Robotics; Research collaboration, W. L. Gore & Associates, Inc; Research collaboration, Celsion Corporation
Ashkan A. Malayeri, MD, Andover, MA (*Abstract Co-Author*) Nothing to Disclose
Babak Saboury, MD, MPH, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Elizabeth C. Jones, MD, Bethesda, MD (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

Faraz.Farhadi@nih.gov

PURPOSE

To explore the reproducibility of radiomic texture features across virtual monenergitic images generated from dual-energy CT (DECT) acquisitions used in clinical practice and clinical trials at our institution.

METHOD AND MATERIALS

A phantom containing liver and lung texture modules was scanned in triplicate with a clinical dual source DECT scanner. Three fixed volumes of interest (VOIs) were drawn in mixed images (weighted images of low (90kV) and high (150kV) energy acquisitions) and monoenergetic images at 8 different energy levels (40,50,60,70,80,100,120,140 keV) to compare four Harlick texture features (energy, entropy, contrast, and homogeneity). Percentage difference of texture values from the mixed image was calculated for each VOI and keV level.

RESULTS

For VOIs placed in the lung portion of the phantom, texture value difference from mixed the image was on average 10% (range:1-17%) for energy, 4% (range:0.5-8%) for contrast, 3% (range:0.3-6%) for correlation, and 1% (range:0.1-2%) for homogeneity. In liver these values included 7% (range: 0.4-16%) for energy, 11% (range: 0.4-39%) for contrast, 10%(range: 2-29%) for correlation, and 2%(range: 0.3-6%) for homogeneity.

CONCLUSION

All four texture features reviewed showed variance across monoenergetic images of DECT.

CLINICAL RELEVANCE/APPLICATION

Defining imaging device characteristics and their effect on imaging features with an empirical manner is a critical step for utilization of radiomics in the precision medicine era.

SSQ18-09 Image-Domain Synthesis of Spectral CT Virtual Monoenergetic Images Using Stacked Deep Convolutional Neural Networks

Thursday, Dec. 5 11:50AM - 12:00PM Room: E353A

Participants
Hao Gong, PhD, Rochester,, MN (*Presenter*) Nothing to Disclose
Nathan Huber, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Kishore Rajendran, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Shengzhen Tao, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Cynthia H. McCollough, PhD, Rochester, MN (*Abstract Co-Author*) Research Grant, Siemens AG
Shuai Leng, PHD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

Gong.Hao@mayo.edu

PURPOSE

To develop a deep convolutional neural network (CNN) based technique to synthesize virtual monoenergetic images (VMIs) from spectral CT data and to compare results to conventional VMIs created from the same data.

METHOD AND MATERIALS

The developed technique consists of a VMI-synthesis CNN (CNNVMI) and a texture-synthesis CNN (CNNTEXT), with fully-customized architecture and loss functions. A two-stage training strategy was used. CNNVMI was trained using spectral CT polychromatic images and theoretical monoenergetic linear attenuation coefficients as inputs and labels, respectively. After CNNVMI training, the parameters were fixed, and CNNTEXT was stacked to the end of CNNVMI. CNNTEXT was trained to synthesize the image noise texture of a low noise image, using water phantom images as labels. CT images of an abdomen-sized water phantom with varying inserts were used to train and validate the CNNs. Additional porcine CT images were acquired to evaluate the generalizability of the CNNs for anatomical features. Images were acquired on a whole-body research photon-counting-detector (PCD) CT, using 140 kV and a two-threshold (25 and 65 keV) data acquisition mode. Phantom scans were acquired multiple times across three radiation dose levels (CTDIVOL: 23 mGy, 11.5 mGy, 5.75 mGy) and animal scans were acquired with 23 mGy. Results were compared with baseline images created using a conventional least-squares-based two-material decomposition.

RESULTS

Relative to baseline VMIs, CNN-synthesized VMIs demonstrated substantially lower noise and improved contrast resolution at all dose levels, especially for low-contrast inserts or tissues. Image details and noise texture were well maintained using the CNN synthesis compared to that of routine dose input images. The proposed CNNs accurately estimated the CT numbers of all inserts (mean absolute percent difference <5%), across all dose levels. Importantly, noise of the CNN VMIs was not substantially affected by the dose level of the input CT images (noise in water 12.6±0.14 HU across all dose levels).

CONCLUSION

The proposed CNN-based VMI synthesis provided high quality VMI images with accurate CT number, suppressed image noise, and improved contrast resolution.

CLINICAL RELEVANCE/APPLICATION

The clinical value of low keV VMIs could be dramatically increased by use of the described method to suppress image noise with maintaining CT number accuracy.

SSQ19

Physics (Deep Learning - Dose Reduction and Image Quality)

Thursday, Dec. 5 10:30AM - 12:00PM Room: E353B

AI CT PH SQ

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Lubomir M. Hadjiiski, PhD, Ann Arbor, MI (*Moderator*) Nothing to Disclose
Patrick J. La Riviere, PhD, Chicago, IL (*Moderator*) Research funded, Canon Medical Systems Corporation; Research funded, Accuray Incorporated; Research Consultant, MetriTrack, Inc

Sub-Events

SSQ19-01 Radiation Dose Reduction for CT Assessment of Urolithiasis Using Deep Learning Reconstruction Algorithm: A Prospective Intra-Individual Study

Thursday, Dec. 5 10:30AM - 10:40AM Room: E353B

Participants
Xiaohu Li, MD, Hefei, China (*Presenter*) Nothing to Disclose
Jianying Li, Beijing, China (*Abstract Co-Author*) Employee, General Electric Company
Huayang Liu, MD, Beijing, China (*Abstract Co-Author*) Employee, General Electric Company
Yongqiang Yu, MD, Hefei, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the performance of ASIR-V and Deep learning reconstruction algorithm(DL) in patients with urolithiasis at ultralow-dose CT

METHOD AND MATERIALS

13 patients scheduled for unenhanced abdominal CT for follow-up of urolithiasis were prospectively included. Routine dose acquisition was followed by two low-dose acquisitions at 60% and 90% reduced doses. All images were reconstructed with FBP, ASIR-V and DL. Urolithiasis detection rates, gall bladder, appendix and rectosigmoid evaluation and overall subjective image quality were evaluated by two observers.

RESULTS

52 stones were present in 13 patients. 65% stones were not detected on FBP at the lowest dose level, but this improved with DL to a sensitivity of 100%. ASIR-V resulted in a slight decrease in sensitivity at the lowest dose to 82 %, but out performed FBP. Evaluation of other structures with ASIR-V at 60% and with DL at 90% dose reductions was comparable to FBP at routine dose, but 80% and 90% dose reduction resulted in non-evaluable images.

CONCLUSION

CT radiation dose for urolithiasis detection can be safely reduced by 60(ASIR-V)-90(DL)% without affecting assessment of urolithiasis, possible extra-urinary tract pathology or overall image quality.

CLINICAL RELEVANCE/APPLICATION

The most frequent cause of acute flank pain is urolithiasis, which affects 3-5% of the population.Technical advancements like iterative reconstruction (IR) algorithms have resulted in substantial radiation dose reduc- tions. IR results in reduced noise, allowing acquisition ofim- ages at reduced radiation dose levels without intrinsically hampering image quality.

SSQ19-02 Radiation Dose Reduction in Chest CT at a Micro-Dose (mD) Level by Noise Simulation and Noise-Specific Anatomic Neural Network Convolution (NNC) Deep-Learning (DL) with K-Means Clustering

Thursday, Dec. 5 10:40AM - 10:50AM Room: E353B

Participants
Yuji Zhao, MSc, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Amin Zarshenas, MSc, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Toru Higaki, PhD, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose
Kazuo Awai, MD, Hiroshima, Japan (*Abstract Co-Author*) Research Grant, Canon Medical Systems Corporation; Research Grant, Hitachi, Ltd; Research Grant, Fujitsu Limited; Research Grant, Bayer AG; Research Grant, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd;
Kenji Suzuki, PhD, Chicago, IL (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

yzhao104@hawk.iit.edu

PURPOSE

Radiation dose reduction in chest CT is highly demanded since current radiation dose is high for lung cancer screening. Our purpose was to develop new noise-specific 3D NNC DL experts by means of K-means clustering with mDCT simulation to convert mDCT to 'virtual' high-dose (HD) CT where noise and artifacts are significantly reduced.

METHOD AND MATERIALS

We developed a mixture of noise-specific, anatomical NNC experts, employing volume-based neural network regression in a convolutional manner, with soft-gating layers to convert mDCT to HD-like CT. We trained 9 noise-specific, anatomical NNC models for 3 noise-specific clusters in 3 anatomic areas by means of K-means clustering. We trained our NNCs with simulated mDCT as input and corresponding HDCT (120 kVp, 92 mAs, 3.0 mSv) from our diagnostic CT database as 'teaching' images. Our mDCT simulation consisted of forward-projection of HDCT, addition of photons and electric noise to sinogram images, filtered back-projection of the noise component, and addition of the noise image to the original HDCT. Through training, our noise-specific, anatomical NNCs learned to convert lower-dose CT to HD-like CT, where noise and artifacts are substantially reduced; thus, termed 'virtual' HD (VHD) CT. To evaluate the performance, we collected mD (120 kVp, 5 mAs, 0.2 mSv) and full-dose (120 kVp, 50 mAs, 2.0 mSv) CT (Aquilion One, Toshiba, Japan) of 50 clinical cases including 30 cases with solid nodule and ground-glass (GG) nodule.

RESULTS

Our new VHD technology with clustering converted mDCT to 'virtual' HDCT and improved the image quality by reducing noise and artifacts substantially, while anatomic structures and pathological characteristics of both solid and GG nodules were well preserved. With our NNCs trained with simulated mDCT, contrast-to-noise-ratio (CNR) of mDCT of clinical cases was improved from 4.1±3.9 dB to 22.9±3.4 dB, which was also higher than that of 'reference-standard' full-dose CT (CNR: 13.4±5.1 dB).

CONCLUSION

Our noise-specific anatomical NNC models trained with simulated mDCT images was able to convert thin-slice mDCT of clinical cases to VHDCT that have higher image quality (in terms of CNR) than 'reference-standard' full-dose CT, achieving 90% dose reduction.

CLINICAL RELEVANCE/APPLICATION

Substantial reduction of radiation dose in CT by our new noise-specific VHD technology would potentially make mDCT screening possible, and it would be beneficial to screening population.

SSQ19-03 A Deep-Learning-Based Framework for Synthesizing Virtual CT Exams in the Image Domain

Thursday, Dec. 5 10:50AM - 11:00AM Room: E353B

Participants
Hao Gong, PhD, Rochester,, MN (*Presenter*) Nothing to Disclose
Shuai Leng, PHD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Joel G. Fletcher, MD, Rochester, MN (*Abstract Co-Author*) Grant, Siemens AG; Consultant, Medtronic plc; Consultant, Takeda Pharmaceutical Company Limited; Grant, Takeda Pharmaceutical Company Limited; ;
Cynthia H. McCollough, PhD, Rochester, MN (*Abstract Co-Author*) Research Grant, Siemens AG
Lifeng Yu, PhD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

Gong.Hao@mayo.edu

PURPOSE

To develop a deep convolutional-neural-network (CNN) based framework to synthesize virtual patient CT exams having varying lesion characteristics and simulating varying radiation dose levels.

METHOD AND MATERIALS

The developed framework consists of a lesion-insertion CNN (CNNLesion) and a noise-insertion CNN (CNNNoise). Both CNNs were implemented with in-house-developed network architectures. CNNLesion inserts lesions into different locations of patient images by fusing multi-scaled features of patient lesion models with anatomical background. A cohort of lesion-free abdominal CT patient cases (n=10) was used to generate training data and validate CNNLesion. A previously-validated projection-based lesion insertion technique was used to generate reference images across 10 conditions: lesion sizes 5 - 11 mm, contrast levels 15 - 25 HU, and reconstruction types (filtered-backprojection and iterative reconstruction). CNNNoise used routine dose CT images and white noise as inputs to synthesize image noise magnitude and texture at lower dose levels. The architecture of CNNNoise approximates the underlying noise correlation in CT images. The loss function of CNNNoise consisted of a perceptual loss, a frequency-spectrum loss, and a diversity loss. Patient cases from the NIBIB/AAPM Low Dose CT Grand Challenge and water phantom scans were used to train and validate CNNNoise.

RESULTS

The CNNLesion-synthesized lesion-present images showed strong perceptual similarity compared to the reference images. The mean structural similarity index and the mean absolute CT number difference between the CNNLesion-inserted lesions and the reference were 0.983±0.004 and 1.9±0.3 HU, respectively. The CNNNoise-synthesized low-dose images had comparable noise texture to that of the reference images. The mean absolute percent difference of noise measured in the liver parenchyma was <3%. The noise power spectra measured from CNNNoise-synthesized water phantom scans were very close to those from real scans (mean absolute difference < 1.1 HU2cm2).

CONCLUSION

The developed deep CNN-based framework accurately and efficiently synthesized virtual patient CT exams with prescribed lesion characteristics and radiation dose levels.

CLINICAL RELEVANCE/APPLICATION

The developed CNN-based method can accurately and efficiently create patient cases with known pathology and dose to perform virtual clinical trials in CT for radiation dose and protocol optimization.

SSQ19-04 Nonlinear Analysis of Machine Learning in CT Image Formation

Thursday, Dec. 5 11:00AM - 11:10AM Room: E353B

Participants
Grace J. Gang, PHD, Baltimore, MD (*Presenter*) Nothing to Disclose
Xueqi Guo, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Cheng Ting Lin, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Joseph W. Stayman, PhD, Baltimore, MD (*Abstract Co-Author*) Research Grant, Canon Medical Systems Corporation; Research Grant, Carestream Health, Inc; Research Grant, Elekta AB; Research Grant, Fischer Medical; Research Grant, Medtronic plc; Research collaboration, Koninklijke Philips NV; Research collaboration, Varex Imaging Corporation; Research Grant, Siemens AG; Research Grant, General Electric Company;

For information about this presentation, contact:

grace.j.gang@jhu.edu

PURPOSE

The proliferation of nonlinear machine learning algorithms poses significant challenges to image quality assessment. Performance characterization typically relies on qualitative 'beauty contests' or metrics like resolution and structural similarity which may not relate to diagnostic outcome. We propose a quantitative image quality metric for nonlinear algorithm analysis and present example applications in a neural network denoising algorithm in low dose CT imaging of the lung.

METHOD AND MATERIALS

We propose perturbation response analysis as a quantitative measure of image quality suitable for general nonlinear algorithms. Perturbation response is defined as the difference in the mean output between an image with a stimulus and an image without. Such analysis captures the various dependencies of the algorithms, including that on the stimulus itself. We performed the analysis for an example denoising algorithm based on a convolutional neural network. For stimuli inputs, we developed procedurally generated lesions to systematically sample ranges of clinically relevant features, including size, contrast, and speculation characteristics. The lesions were inserted into the projection data and propagated through the imaging chain.

RESULTS

The perturbation response for FBP reconstruction exhibits linear behavior. The denoising algorithm is effective in reducing noise in the image. However, perturbation response analysis reveals highly nonlinear behavior on the lesion stimuli. Spherical lesions of lower contrast may disappear completely (for contrast at ~0.001 mm-1) or appear at the right contrast but smaller in size (for contrast at ~0.005 mm-1). Lesions with thinner and shorter spiculations can appear with smooth boundaries. These results allow quantitative characterization that identify the range of lesion features that cannot be admitted or faithfully represented by the algorithm.

CONCLUSION

We applied perturbation response analysis in identifying the performance limits of an algorithm in terms of lesion contrast, size, and spiculation. This work provides a quantitative method for characterizing the performance of nonlinear algorithms in relation to clinically relevant features.

CLINICAL RELEVANCE/APPLICATION

This work provides an image quality analysis method that is generally applicable to nonlinear image processing. The analysis allows quantitative image quality assessment and can be used to guide algorithm development.

SSQ19-05 Quantitative Comparison of a Deep Learning-Based CT Reconstruction Algorithm (AiCE) to Other Reconstruction Techniques

Thursday, Dec. 5 11:10AM - 11:20AM Room: E353B

Participants
Samuel L. Brady, PHD, Cincinnati, OH (*Presenter*) Nothing to Disclose
Elanchezhian Somasundaram, Cincinnati, OH (*Abstract Co-Author*) Nothing to Disclose
Andrew T. Trout, MD, Cincinnati, OH (*Abstract Co-Author*) Author, Reed Elsevier; Author, Wolters Kluwer nv; Research Grant, Canon Medical Systems Corporation; Board Member, Joint Review Committee on Educational Programs in Nuclear Medicine Technology; Speakers Bureau, Reed Elsevier; Speakers Bureau, iiCME
Jonathan R. Dillman, MD, MSc, Cincinnati, OH (*Abstract Co-Author*) Research Grant, Siemens AG; Research Grant, Guerbet SA; Travel support, Koninklijke Philips NV; Research Grant, Canon Medical Systems Corporation; Research Grant, Bracco Group

For information about this presentation, contact:

samuel.brady@cchmc.org

PURPOSE

To compare, in pediatric patients, a deep learning-based (DL) CT reconstruction algorithm (AiCE) to filtered back projection (FBP), statistical-based (AIDR3D), and model-based iterative (FIRST) reconstruction algorithms at different contrast levels and object sizes using quantitative image analysis.

METHOD AND MATERIALS

Patient raw image data acquired on a Genesis CT scanner (Canon Medical Systems) were reconstructed axially using FBP, AIDR3D, FIRST, and AiCE at 0.5mm and 3mm thicknesses. AiCE used a Deep Convolutional Neural Network (DCNN) in the regularization term of its iterative reconstruction algorithm. The DCNN was trained to differentiate signal from noise to reduce noise in the image. A non-prewhitening matched observer model with eye filter (d'NPWE) was used to characterize the signal-to-noise ratio (SNR) of objects of varying sizes (1-10mm) at three different CT contrast levels (-100, 100, & 350HU). To calculate d'NPWE, a Task Transfer Function for each reconstruction algorithm and contrast level was calculated using a water phantom with sensitometry inserts. A power spectrum was calculated by sampling noise characteristics from uniform regions of the patients' liver parenchyma.

Object signal differentiation due to reconstruction algorithm was estimated by calculating the area under the curve (AUC). AUC results for FBP, FIRST, and AiCE were normalized to AIDR3D, the routinely clinically employed reconstruction algorithm for this scanner.

RESULTS

Power spectrum magnitude for 3mm AiCE images were an average 58% lower (range: 45-70%) than 3mm AIDR3D images. Power spectrum frequency content of AiCE agrees to better than 28% with AIDR3D compared to 50% for FIRST. On average, AiCE 3mm images demonstrated greater distinction for all object sizes and contrast levels than all other algorithms. AiCE 0.5mm SNR agreed with 3mm AIDR3D to better than 0.4%.

CONCLUSION

Analysis demonstrates substantial improvement of object signal detection and noise magnitude using DL CT reconstruction (AiCE) leading to less noisy images with noise texture comparable with AIDR3D. Noise magnitude of AiCE 0.5mm images is comparable to AIDR 3mm images showing substantial dose reduction potential of AiCE.

CLINICAL RELEVANCE/APPLICATION

Deep learning-based CT reconstruction (AiCE) improves image signal detection of objects down to 1 mm in diameter at all contrast levels with the potential to substantially reduce dose without compromising image quality.

SSQ19-06 The Image Quality of the Newest Deep Learning Image Reconstruction on Chest CT

Thursday, Dec. 5 11:20AM - 11:30AM Room: E353B

Participants
Akinori Hata, MD, Suita, Japan (*Presenter*) Support, Canon Medical Systems Corporation
Masahiro Yanagawa, MD, PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Yuriko Yoshida, Osaka, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomo Miyata, MD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Osamu Honda, MD, PhD, Amagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose
Noriyuki Tomiyama, MD,PhD, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose
Noriko Kikuchi, Suita, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the image quality of the newest deep learning image reconstruction (DLIR) on chest CT in comparison with filtered back projection (FBP) and iterative reconstruction (IR).

METHOD AND MATERIALS

Thirty-six patients were evaluated retrospectively. All patients underwent routine contrast enhanced CTs (Revolution CT, GE Healthcare, WI) and images with 0.625-mm slice thickness were reconstructed using FBP, hybrid IR (ASiR-V), and DLIR (Truefidelity, GE Healthcare). The three settings of DLIR (low, medium, and high) and ASiR-V 60% were used. Regions of interest were placed at the axillary fat and the pectoralis major muscle, and the standard deviation (SD), the signal-to-noise ratio (SNR), and the contrast-to-noise ratio (CNR) were calculated objectively on the five image sets (FBP, ASiR-V, DLIR-low, DLIR-med, and DLIR-high). Two independent radiologists evaluated ASiR-V, DLIR-low, DLIR-med, and DLIR-high comparing with FBP on a 5-point scale (1=worst<2<3<4<5=best) in terms of noise, streak artifact, the visibility of lymph nodes, the clarity of small vessels in the chest wall, and overall image quality on mediastinum window setting (width 400 HU; level 60 HU). The objective parameters were analyzed statistically using one-way repeated measures ANOVA and the post hoc Tukey-Kramer test. The subjective scores were analyzed using the Wilcoxon signed-rank test with the Bonferroni correction.

RESULTS

DLIR-high significantly showed the least SD and the largest SNR and CNR among the reconstructions ($p<0.001$). The higher the DLIR setting, the lower the SD and the higher the SNR and CNR ($p < 0.01$). In the subjective analysis, DLIR-high showed the best score in terms of noise, streak artifact, and overall image quality among the reconstructions (significant in both readers' result: $p < 0.001$). The scores of DLIR-med and DLIR-high tended to be better in terms of lymph nodes and poor in terms of small vessels compared with ASiR-V (significant in 1 reader's result: $p <= 0.005$).

CONCLUSION

DLIR-high improved the objective parameters and the subjective image quality compared with ASiR-V by reducing noise and streak artifact on chest CT.

CLINICAL RELEVANCE/APPLICATION

With improved image quality, the DLIR may contribute to the diagnosis and the clinical practice on the chest CT.

SSQ19-07 Quantitative Comparison of Noise Texture between CT Images Reconstructed Using Filtered Back-Projection (FBP), Iterative Reconstruction, and Deep Learning Techniques

Thursday, Dec. 5 11:30AM - 11:40AM Room: E353B

Participants
Lusik Cherkezyan, Waukesha, WI (*Presenter*) Employee, General Electric Company
Brian E. Nett, PhD, Wauwatosa, WI (*Abstract Co-Author*) Employee, General Electric Company
Jie Tang, PhD, Madison, WI (*Abstract Co-Author*) Employee, General Electric Company
Meghan Yue, BS, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company
Roy A. Nilsen, BS, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company
Jiahua Fan, PHD, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric company
Jean-Baptiste Thibault, PhD, Brookfield, WI (*Abstract Co-Author*) Employee, General Electric Company
Jiang Hsieh, PhD, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company

For information about this presentation, contact:

lusik.cherkezyan@ge.com

PURPOSE

To quantitatively compare noise texture via noise power spectra of computed tomography (CT) images reconstructed using filtered back-projection (FBP), iterative reconstruction (ASiR-V), and TrueFidelity (TF) deep learning image reconstruction (DLIR) at different dose levels.

METHOD AND MATERIALS

To measure the noise texture across image reconstruction algorithms, we calculated the normalized noise power spectra (nNPS) of uniform phantom images acquired at six dose levels (CTDIvol 2.5, 4.9, 7.4, 10.2, 12.6, 15.1mGy), and reconstructed using FBP, iterative reconstruction (ASiR-V, 100%), and deep learning (TrueFidelity DLIR, high). A 20cm water phantom was scanned on Revolution CT (GE Healthcare, five scans per condition), and images were reconstructed using the three algorithms above. From each scan, the difference-image was calculated between two 2.5mm-thick slices 2.5mm above and below the axial center. Then, the 2D NPS of the difference image was calculated, normalized to its own area, and radially averaged to yield the final 1-D normalized NPS (nNPS). To compare the nNPS, the average frequencies fa were calculated as first-order moments of nNPS normalized by the area under the curves. In addition, the root-mean squared of nNPS difference (RMSD) between nNPS of ASiR-V/TF and the corresponding nNPS of FBP was calculated.

RESULTS

nNPS of Images reconstructed with TF DLIR and FBP show a close match, with a slight shift towards lower frequencies occurring in TF images at CTDIvol of 2.5mGy. For all dose levels studied, fa of TF images was only 0.20 +/- 0.08lp/cm below that of FBP (a 6% difference), while fa of ASiR-V was 1.37+/- 0.01lp/cm below FBP (42% difference). RMSD_TF was 0.10+/-0.04mm2 and RMSD_ASiR-V was 1.14+/-0.01mm2.

CONCLUSION

Consistent with previous reports, normalized NPS of ASiR-V images is shifted towards lower spatial frequencies. The normalized NPS of TrueFidelity DLIR closely matches that of traditional high dose FBP images across a wide range of dose levels as quantified via RMSD and average frequency.

CLINICAL RELEVANCE/APPLICATION

Without the typical compromises in image texture occasioned by iterative methods even when the dose is reduced, deep learning image reconstruction (TrueFidelity, GE Healthcare) should help accelerate the adoption of low dose techniques into routine clinical practice.

SSQ19-08 Deep Learning-Based Metal Artifact Reduction in CT for Total Knee Arthroplasty

Thursday, Dec. 5 11:40AM - 11:50AM Room: E353B

Participants
Jimin Lee, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Hee-Dong Chae, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyungjoo Cho, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sung Hwan Hong, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ja-Young Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hye Jin Yoo, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sung-Joon Ye, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

sye@snu.ac.kr

PURPOSE

To investigate the metal artifact reduction (MAR) performance of deep learning (DL)-based MAR technique in the evaluation of postoperative CT of total knee arthroplasty (TKA) patients

METHOD AND MATERIALS

The training dataset consisted of 640 image pairs obtained from 10 lower extremity CT scans without a metal prosthesis. Each image pair consists of a metal artifact-free image with a virtual metal shape embedded in the original image and a metal artifact image simulated through sinogram handling. Our DL network is a convolutional neural network (CNN) with encoder-decoder structure and skip connections. The summation of MSE and SSIM losses were implemented for parameter updating. For the test dataset, we used 10 lower extremity CT examinations from 10 patients who had a previous history of TKA (7 patients with unilateral TKA; 3 patients with bilateral TKA), and a total of 13 knee joints were used for analysis. To evaluate the metal artifacts quantitatively, the area, mean attenuation, and artifact index (AI) within the dark streak artifacts were calculated in the original, O-MAR, and DL-MAR images. For qualitative analysis, images were rated with a 5-point Likert scale regarding the degree of overall metal artifacts, conspicuity of bone cortex and trabeculae, and assessment of soft tissue around the prosthesis. Continuous variables were compared between different MAR protocols using the repeated measures ANOVA and qualitative grading results were analyzed by using the Friedman test.

RESULTS

The O-MAR showed a 24% reduction in metal artifact area, while the DL-MAR showed an area reduction of more than 99%, almost completely eliminating the dark streak artifact. In terms of mean attenuation and AI, DL-MAR also showed better performance than O-MAR ($P < 0.001$). In qualitative analysis, DL-MAR showed significantly lower overall metal artifacts ($P = 0.008$) and better bone delineation ($P = 0.020$) compared to O-MAR. However, there was no significant difference in the assessment of soft tissue between two MAR protocols ($P = 0.054$), and DL-MAR showed unusual blurring of periarticular soft tissue.

CONCLUSION

The DL-MAR technique has been successfully developed and shown comparable performance with conventional projection

completion algorithm.

CLINICAL RELEVANCE/APPLICATION

The DL-MAR can effectively reduce severe metal artifacts caused by large TKA components, hence enabling its use in the diagnosis of postoperative complications of TKA.

SSQ19-09 Basic CT Physics Scaling Laws for Noise and CNR as a Function of Slice Thickness and Dose for a New Deep-Learning CT Image Reconstruction Method

Thursday, Dec. 5 11:50AM - 12:00PM Room: E353B

Participants
Timothy P. Szczykutowicz, PhD, Madison, WI (*Presenter*) Equipment support, General Electric Company; License agreement, General Electric Company; Founder, Protocolshare.org LLC; Medical Advisory Board, medInt Holdings, LLC; Consultant, General Electric Company; Consultant, Takeda Pharmaceutical Company Limited
Brian E. Nett, PhD, Wauwatosa, WI (*Abstract Co-Author*) Employee, General Electric Company
Jie Tang, PhD, Madison, WI (*Abstract Co-Author*) Employee, General Electric Company
Jiang Hsieh, PhD, Waukesha, WI (*Abstract Co-Author*) Employee, General Electric Company

For information about this presentation, contact:

tszczykutowicz@uwhealth.org

PURPOSE

The relationships between noise, slice thickness, and dose in CT are well understood for filtered back projection. This work characterizes these relationships for an implementation of TrueFidelity, a new deep learning image reconstruction (DLIR) approach.

METHOD AND MATERIALS

We imaged an ACR phantom at 5 slice thicknesses: 0.625, 1.25, 2.5, 3.75, and 5 mm. We imaged at doses of 16, 8, and 4 mGy using 120 kV, 80 mm collimation, and 0.992:1 pitch. All measurements were repeated 5 times. Images were reconstructed using: filtered back projection (FBP), two levels of a statistical iterative reconstruction (ASiR-V), and three levels of a vendor's deep learning image reconstruction (DLIR) approach. The ASiR-V levels were chosen based on institution (20%) and vendor (50%) recommendations. We fit image noise and CNR as a function of dose and slice thickness. Confidence intervals for all fit parameters were determined.

RESULTS

FBP and ASIR-V 20%/50% had similar scaling exponents: for CNR as a function of slice thickness 0.47(0.43-0.51) and 0.46(0.43-0.50)/0.45(0.36-0.54) and for noise as a function of slice thickness -0.49(-0.50 -0.48) and -0.49(-0.52 -0.47)/-0.49(-0.59 -0.39) respectively. DLIR low/medium/high had exponents of 0.37(0.23-0.51)/0.37(0.20-0.53)/0.36(0.15-0.56) for CNR as a function of slice thickness and of -0.39(-0.51 -0.28)/-0.38(-0.51 -0.26)/-0.37(-0.51 -0.23) for noise as a function of slice thickness. For noise and CNR as a function of dose, all methods had similar scaling exponents across slice thickness. As a function of dose at 5 mm, the image noise exponents for FBP and ASIR-V 20%/50% were: -0.48(-0.66 -0.30) and -0.48(-0.65 -0.31)/-0.47(-0.65 -0.29). DLIR low/medium/high for noise as a function of dose at 5 mm had scaling exponents of -0.44(-0.72 -0.17)/-0.44(-0.88 0.00)/-0.42(-1.08 0.23).

CONCLUSION

The CNR and noise scaling laws for FBP were found to hold for all recon methods. TrueFidelity DLIR did tend to have smaller changes in CNR and noise as the slice thickness/dose was reduced. The performance of DLIR was predictable and better than FBP and ASiR-V at all slice thicknesses and doses.

CLINICAL RELEVANCE/APPLICATION

New deep-learning based CT reconstruction (TrueFidelity, GE Healthcare) follows the noise and CNR rules of FBP reconstruction. This new reconstruction approach can mitigate some of the noise penalty incurred by reducing slice thickness or dose.

SSQ20

Vascular/Interventional (Lymphatic, AVM, and Venous Interventional Radiology)

Thursday, Dec. 5 10:30AM - 12:00PM Room: S503AB

VA IR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Nikunj R. Chauhan, MD, Cleveland, OH (*Moderator*) Nothing to Disclose
Roshni A. Parikh, MD, Kirkwood, MO (*Moderator*) Nothing to Disclose

Sub-Events

SSQ20-01 Comparison of Indocyanine Green Lymphangiography and Magnetic Resonance Lymphangiography for Planning Lymphaticovenous Anastomoses

Thursday, Dec. 5 10:30AM - 10:40AM Room: S503AB

Participants
Francesco Gentili, MD, Siena, Italy (*Presenter*) Nothing to Disclose
Francesco G. Mazzei, MD, Siena, Italy (*Abstract Co-Author*) Nothing to Disclose
Gabriele Lucii, Siena, Italy (*Abstract Co-Author*) Nothing to Disclose
Paolo Gennaro, Siena, Italy (*Abstract Co-Author*) Nothing to Disclose
Federico Zerini, Siena, Italy (*Abstract Co-Author*) Nothing to Disclose
Luca Volterrani, Siena, Italy (*Abstract Co-Author*) Nothing to Disclose
Maria Antonietta Mazzei, MD, Siena, Italy (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

francescogentili@gmail.com

PURPOSE

Lymphedema is a prevalent disease, often misdiagnosed, without a defined gold standard treatment. However supermicrosurgical lymphaticovenular anastomosis (LVA), where collecting lymphatic vessels are anastomosed to a cutaneous vein under surgical microscopy, is demonstrated a valid treatment alternative of lymphedema compared to compression treatment. The purpose of this study is to compare two dynamic imaging modalities employed to study the lymphatic system, Magnetic Resonance Lymphangiography (MRL) and Indocyanine Green Lymphangiography (IGL), evaluating their role for planning LVA treatment in patients with lymphedema.

METHOD AND MATERIALS

We conducted a retrospective study of 32 patients (26 women) with a mean age of 38 years (range 18-73) enrolled from January 2014 to December 2018; 20 out of 32 were affected by lower limb lymphedema with 6 cases of primary lymphedema; 84% of them have a disease stage >=II. All the patient underwent IGL and MRL, by injecting different contrast medium into interdigital web spaces, between 18 and 72 hours before LVA supermicrosurgical treatment. In each patient we rated the number of lymphatic vessels visualized, considering the region of forearm for the upper limb and the leg for the lower limb. Student's t-test was applied.

RESULTS

All patients completed both the diagnostic examinations without any significant complications. A statistically significant difference ($p<0.05$) was found between the number of lymphatic vessels identified on the leg/forearm (34 on IGL vs 70 on MRL and 82 on IGL vs 26 on MRL, considering affected and healthy limbs respectively). In particular dermal backflow in advanced lymphedema seems to hinder lymphatic vessels detection on IGL. Conversely, on healthy limbs, MRL hardly identify lymphatics, because of their fast lymphatic flow, that limited contrast medium detection by MR sequences.

CONCLUSION

Both MRL and IGL are dynamic diagnostic modalities that permit an effective evaluation of lymphatic vessels anatomical and functional status in extremities lymphedema. They may be considered complementary in the preoperative planning for identyfing suitable functional lymphatic vessels for LVA treatment.

CLINICAL RELEVANCE/APPLICATION

MRL and IGL are two complementary imaging modalities for the surgical planning of LVA treatment.

SSQ20-02 Ear Arteriovenous Malformation Management

Thursday, Dec. 5 10:40AM - 10:50AM Room: S503AB

Participants
Wayne F. Yakes, MD, Englewood, CO (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

info@yakesvascularmalformationcenter.com

PURPOSE

To determine the efficacy of Ethanol Endovascular Repair of Ear Arteriovenous Malformation (AVMs).

METHOD AND MATERIALS

14 patients (9 female, 5 males; age range 6-39 years; mean age: 22 years) with ear AVMs presented for therapy. Two patients had failed prior embolizations (PVA/coils/nBCA/steroids) and 2 patients had other therapies (laser/excisions/grafting). All presented with a grossly enlarged painful ear, and 5 patients had intermittent bleeding. All patients underwent transcatheter and direct puncture ethanol treatments. (86 procedures).

RESULTS

All 14 patients were cured of their AVM at long-term follow-up (mean follow-up: 52 months). One patient had transient partial VII nerve palsy. Two patients had minor blisters and ear injuries that healed on the outer tragus. The longest follow-up demonstrating cure was 12 years.

CONCLUSION

Ethanol endovascular repair of Ear AVMs can achieve cures in this vexing lesion that previously was treated with resection of the ear and with high recurrence rates. This series documents long-term cures of AVMs of the ear and scalp that were not treatable by endovascular approaches as previously documented in the world's literature. Permanent treatment of the auricular AVMs is documented and no recurrence occurred in any patient. Only one article is published (group from Shanghai, China) emulating this technique.

CLINICAL RELEVANCE/APPLICATION

This series documents long-term cures of AVMs of the ear and scalp that were not treatable by endovascular approaches as previously documented in the world's literature.

SSQ20-03 An Alternative Method for Adrenal Venous Sampling in Cases in which Right Adrenal Vein Sampling is Difficult

Thursday, Dec. 5 10:50AM - 11:00AM Room: S503AB

Participants
Akira Yamamoto, MD, Kurashiki, Japan (*Presenter*) Nothing to Disclose
Takeshi Fukunaga, Kurashiki, Japan (*Abstract Co-Author*) Nothing to Disclose
Mitsuru Takeuchi, MD, PhD, Nagoya, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroki Nakamura, Kurashiki, Japan (*Abstract Co-Author*) Nothing to Disclose
Akihiko Kanki, MD, Kurasiki, Japan (*Abstract Co-Author*) Nothing to Disclose
Atsushi Higaki, MD, Kurashiki, Japan (*Abstract Co-Author*) Nothing to Disclose
Tsutomu Tamada, MD,PhD, Kurashiki, Japan (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

jiro@med.kawasaki-m.ac.jp

PURPOSE

Catheterization of the right adrenal vein (rt.AdV) to obtain blood samples can often be difficult, reducing the feasibility of adrenal venous sampling (AVS). The aim of present study was to investigate whether blood sampling from the IVC at its juncture with the rt.AdV can be an alternative method to sampling of blood directly from the rt.AdV.

METHOD AND MATERIALS

This study included 44 patients diagnosed with primary aldosteronism (PA) in whom AVS with adrenocorticotropic hormone (ACTH) was performed for a local diagnosis of the lesion, resulting in a diagnosis with idiopathic hyperaldosteronism (IHA) (n=24), and patients diagnosed with unilateral aldosterone-producing adenoma (APA) (n=20; rt.APA=8, lt.APA=12) who had improved PA postoperatively. In addition to regular blood sampling, blood was also sampled from the IVC at its confluence with the rt.AdV, as the substitute rt.AdV [S-rt.AdV]. The local diagnostic performance with the conventional lateralized index (LI) and the Modified LI ((Lt.AdV A/C ratio) / (S-rt.AdV A/C ratio)) using S-rt.AdV was compared to examine the utility of the Modified LI.

RESULTS

Both conventional LIs of rt.APA (23.3±25.8) and lt.APA (7.0±5.3) were significantly higher than that of IHA (1.8±2.5) ($p=0.003$ and $p<0.001$). Modified LI of rt. APA (0.4±0.4) were significantly lower than those of IHA (1.4±0.7) ($p<0.001$) and lt.APA (3.5±2.0) ($p<0.001$). Modified LI of lt.APA were significantly higher than those of IHA ($p<0.001$) and rt.APA ($p<0.001$). The results of ROC curve analysis for diagnostic performance of conventional LI was area under the curve (AUC) of 0.90 in unilateral APA, whereas modified LI was AUC of 0.92 in rt.APA and 0.81 in lt.APA. Sensitivity and specificity to diagnose unilateral APA using conventional LI were 95% and 83% in threshold value was set at 1.9, and to diagnose rt.APA and lt.APA using modified LI were 87% and 75%, and 94% and 94% in threshold values were set at 0.7 and 2.2 respectively.

CONCLUSION

Modified LI has the potential to be an alternative method for rt.AdV sampling in cases in which rt.AdV sampling is difficult. Modified LI is an extremely simple procedure, it might complement conventional AVS.

CLINICAL RELEVANCE/APPLICATION

Modified LI using blood sampled from the IVC at the juncture of the right adrenal vein, which can be done easily in such patients, is a potentially useful clinical method.

SSQ20-04 Participants

Abnormal Pulmonary Lymphatic Perfusion in Patients with Plastic Bronchitis and Non-Traumatic Chylothorax on Dynamic Contrast-Enhanced Magnetic Resonance Lymphangiography and Thoracic Duct Catheterization Suggesting a Common Etiology

Thursday, Dec. 5 11:00AM - 11:10AM Room: S503AB

Cathal O'Leary, MBBCh, Philadelphia, PA (*Presenter*) Nothing to Disclose
Gregory J. Nadolski II, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Maxim Itkin, MD, Bala Cynwyd, PA (*Abstract Co-Author*) Stockholder, ControlRad Systems, Inc Consultant, ControlRad Systems, Inc

For information about this presentation, contact:

cathal.o'leary@pennmedicine.upenn.edu

PURPOSE

To evaluate imaging findings of dynamic contrast-enhanced magnetic resonance lymphangiography (DCMRL) and thoracic duct catheterization (TDC) in patients with lymphatic plastic bronchitis and nontraumatic chylothorax.

METHOD AND MATERIALS

This is a retrospective review of 33 patients (M/F = 15/18, median age 59 years) who presented in our institution with plastic bronchitis (n=20) or nontraumatic chylothorax (n=13). DCMRL was performed following US-guided administration of gadolinium-based contrast material into the groin lymph nodes. Time resolved contrast-enhanced dynamic lymphangiography and post contrast steady state 3-D IR FLASH sequences were performed. Intranodal lymphangiography with oil based iodinated contrast and TDC were subsequently performed.

RESULTS

DCMRL demonstrated the thoracic duct (TD) and abnormal pulmonary lymphatic perfusion (APLP) in 19/20 plastic bronchitis patients. Corresponding findings were seen on TDC. In 1/20 patients with non-visualization of TD on DCMRL, TDC showed delayed filling of TD with APLP. DCMRL demonstrated the TD and APLP in 11/13 non-traumatic chylothorax patients. TDC showed corresponding findings in 11/13. In 1/13 patients, DCMRL demonstrated TD with no APLP, however, APLP was seen on TDC. In 1/13 patients, the TD was not seen on DCMRL but APLP was visualized on TDC.

CONCLUSION

Lymphatic imaging (DCMRL / TDC) demonstrated abnormal pulmonary lymphatic perfusion in all patients with plastic bronchitis and non-traumatic chylothorax. In both entities, imaging findings were strikingly similar suggesting a common etiology. We hypothesize that the clinical presentation depends on the proximity of abnormal lymphatic vessels to the pleural cavity, resulting in chylothorax; or bronchial surface, resulting in plastic bronchitis. DCMRL offers a sensitive, minimally invasive diagnostic alternative to TDC in demonstrating the TD and abnormal pulmonary lymphatic flow in the majority of cases. In cases with negative DCMRL, there was a slow progression of contrast from the inguinal area to the TD. Extension of DCMRL imaging duration in cases of TD non-visualization is suggested as a technical modification.

CLINICAL RELEVANCE/APPLICATION

Abnormal pulmonary lymphatic perfusion can result in severe morbidity and mortality. DCMRL provides a minimally-invasive dynamic evaluation of the lymphatic system that can further our understanding of the mechanism of pulmonary lymphatic perfusion syndromes

SSQ20-05 Investigation of Hepatic Venous Anatomy and Its Variations in Donors of Our Population Using 320 Slice Computed Tomography Before Live Donor Liver Transplantation

Thursday, Dec. 5 11:10AM - 11:20AM Room: S503AB

Participants
Belqees Y. Faiz, FRCR,MBBS, Islamabad, Pakistan (*Presenter*) Nothing to Disclose
Laiba Masood, MBBS , Rawalpindi, Pakistan (*Abstract Co-Author*) Nothing to Disclose
Samina Akhtar, MBBS, Islamabad, Pakistan (*Abstract Co-Author*) Nothing to Disclose
Rashed Nazir, MBBS, Islamabad, Pakistan (*Abstract Co-Author*) Nothing to Disclose
Atif I. Rana, MBBS, Islamabad, Pakistan (*Abstract Co-Author*) Nothing to Disclose
Abu Bakar Hafeez, MBBS, Islamabad , Pakistan (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

laibamasood66@gmail.com

PURPOSE

To delineate details of hepatic venous drainage with its variation and details of accessory hepatic veins in live donor liver transplant (LDLT) donors.

METHOD AND MATERIALS

After IRB approval a retrospective study was conducted, analyzing 106 potential liver donors from hospital database from January 2013 to December 2016. CT scans were obtained using Toshiba acquilon 320 slice CT scanner, transferred and reviewed on Vitrea Enterprise 7.7 by two radiologists. Quantitative assessment of hepatic veins was done in which mean caliber of hepatic veins, main venous drainage of segment IV, presence of accessory hepatic veins, their number and calibers, along with their distance from inferior vena cava (IVC) was assessed. Data analysis was done using SPSS version 21 and results were complied.

RESULTS

Out of 106 donors, conventional hepatic venous anatomy with three hepatic veins was seen in 99 subjects. 7 showed more than three main hepatic veins. Out of these 6 showed two left hepatic veins (LHV) and 1 showed a small right hepatic vein (RHV). Mean calibers of RHV, middle hepatic vein (MHV) and LHV were 14.5, 9.9 and 9.5 mm respectively. Classic segment IV drainage from both

MHV and LHV was in 79 donors (74.5%). Segment IV was mainly drained by MHV and LHV in 19 (17.9%) and in 8 (7.5%) it was mainly from LHV. 69 subjects had accessory hepatic veins with caliber of 5 mm or more. Out of these 36 cases (33.9%) had single accessory hepatic vein while 17 (16%) had two or more accessory hepatic veins. The results showed that caliber of RHV in donors having single accessory vein was larger than in those donors having two or more accessory hepatic veins, 9.57 mm +/- 1.87 vs 8.21 mm +/- 1.73, p =0.007.

CONCLUSION

Multidetector CT with image post processing, allows accurate identification of areas at risk for venous congestion and devascularization. Presence of accessory hepatic veins or variation in main hepatic veins may influence surgical planning with regard to the extent of hepatic resection or the need for vascular reconstruction including PTFE grafts, allowing surgeon to prepare well in time and anticipate the possible alterations in surgical management.

CLINICAL RELEVANCE/APPLICATION

Image aquisition on multidetector CT with post processing on Vitrea beautifully delineates hepatic venous anatomy in this pilot study which will provide a guideline to the radiologists and surgeons aspiring to start liver transplant program at their centers.

SSQ20-06 Pre-Interventional Determination of the Right Renal Vein to Right Adrenal Vein Distance Reduces Procedure Time and Contrast Agent Exposure during Adrenal Vein Sampling

Thursday, Dec. 5 11:20AM - 11:30AM Room: S503AB

Participants
Clemens Spink, Hamburg, Germany (*Presenter*) Nothing to Disclose
Maxim Avanesov, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Gerhard B. Adam, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Alexander Lenz, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Johannes M. Salamon, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Lennart Well, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Bjoern Schoennagel, MD, Hamburg, Germany (*Abstract Co-Author*) Co-founder and Stakeholder, Northh-Medical GmbH
Frank Oliver G. Henes, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Peter Bannas, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To reduce procedure time and contrast agent exposure during adrenal vein sampling (AVS) by pre-interventional determination of the right renal vein (RRV) to right adrenal vein (RAV) distance.

METHOD AND MATERIALS

20 patients were included in this study undergoing AVS. The RRV-RAV-distance was determined for 10 patients (study group) in CT and MRI pre-interventionally. During AVS a radiopaque planning ruler was placed underneath each patient. The RRV was probed and delineated by injection of contrast agent. Probing of the RAV was then focused at the height of the pre-interventionally determined RRV-RAV-distance. The angiographically measured RRV-RAV-distance was then correlated with the cross-sectional-derived pre-interventional distances. Procedural parameters such as fluoroscopy time, contrast agent, cumulative air kerma (AK), and cumulative dose area product (DAP) were compared to a control group of 10 patients undergoing conventional AVS without pre-interventional measurement using two-tailed t-tests.

RESULTS

The angiographic RRV-RAV-distance of 4.2±0.7 cm (95%-CI: 3.7-4.8 cm) was 0.5±0.4 cm lower than cross-sectional-derived measurements of 4.7±0.8 cm (95%-CI: 4.2-4.9 cm) and showed a good correlation (r=0.852, 95%-CI: 0.4335-0.9683; p<0,01). Fluoroscopy time (48±19 vs. 22 ±11 min, p<0.001) and contrast agent (235±88 vs. 142 ±44 ml, p<0.001) of the study group were significantly decreased by 56% and 39%, respectively. Radiation doses of AK (1429±1683 vs. 960±843 mGy, p=0.44) and DAP (242±256 vs. 158±151 Gycm2, p=0.38) were decreased by 32% and 34%, however without reaching statistical significance.

CONCLUSION

Pre-interventional estimation of the RRV-RAV-distance reduces procedure time and contrast agent exposure during adrenal vein sampling.

CLINICAL RELEVANCE/APPLICATION

Pre-interventional planning before AVS does not only reduce radiation and contrast agent dose during intervention, it could also benefit younger colleagues in training complex angiographic interventions.

SSQ20-07 Diagnosis and Management of Thoracic and Shoulder Arteriovenous Malformations

Thursday, Dec. 5 11:30AM - 11:40AM Room: S503AB

Participants
Wayne F. Yakes, MD, Englewood, CO (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

info@yakesvascularmalformationcenter.com

PURPOSE

To determine the efficacy of Endovascular Repair of Thoracic and Shoulder Arteriovenous Malformations (AVMs). Previous reports have documented the utter futility of Onyx, Coils, and nBCA and amputation of the extremity was required.

METHOD AND MATERIALS

13 patients (9 female, 4 male) presented for repair of shoulder and thoracic AVMs. 3 patients had extension of AVM to the supraclavicular and axillary areas. 3 patients had multiple AVMs. 7 patients had previous failed therapies (embo: PVA/coils/gelfoam;

Onyx, nBCA; surgeries: excisions/arterial bypass Left subclavian Axillary, Brachial, and Radial). All patients underwent ethanol endovascular AVM repair; 4 patients had additional coil embolizations (132 treatments). Patient age range 18-76 years; mean age 36.

RESULTS

12 patients are cured at long-term arteriographic follow-up (follow-up 22 - 192 months; mean follow-up: 42 months). 1 patient with bilateral shoulder AVM and multiple other AVMs therapy is on-going. Complications include 2 patients with minor superficial blisters, 1 patient with transient left radial nerve injury with complete recovery and 1 patient with clot embolus to hand, Rx with urokinase w/distal 3rd phalanx removed. Thus, major complications were 2/132 procedures, 1 being transient. 1 patient at 27-year arteriographic follow-up remains cured.

CONCLUSION

A JVIR report of shoulder AVM endovascular repair documented total failure of the current approaches even when coupled with shoulder quadrant amputation whereby recurrence was universal. These authors stated that shoulder AVMs were not possible to treat. This report documents that cure of these difficult lesions is possible with ethanol endovascular approaches and direct puncture approaches. No other publications in the world literature documents cure of AVMs in this anatomy consistently. Long-term cures are noted with the use of ethanol, and ethanol and coils to successfully treat these complex, problematic lesions. A low major complication rate is noted. This patient series finally documents a curative procedure for this daunting lesion.

CLINICAL RELEVANCE/APPLICATION

Long-term cures are noted with the use of ethanol, and ethanol and coils to successfully treat these complex, problematic lesions. A low major complication rate is noted.

SSQ20-08 The Retrograde Vein Approach as a Curative Treatment Strategy for Yakes Type I, IIb AVMs, Type IIIa AVMs, and Type IIIb AVMs

Thursday, Dec. 5 11:40AM - 11:50AM Room: S503AB

Participants
Wayne F. Yakes, MD, Englewood, CO (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

info@yakesvascularmalformationcenter.com

PURPOSE

To evaluate the role of Retrograde Vein and Direct Puncture Retrograde Vein Endovascular Repair of Large Peripheral AVMs.

METHOD AND MATERIALS

Eighty-seven patients (45 males, 42 females; age: 14 - 72, mean age: 27 years) presented for repair of AVMs involving head and neck, shoulder, chest wall, intra-thoracic, abdominal, renal, pelvic, buttock, and extremities. Ethanol and ethanol/coils were the embolic agents used. Retrograde transvenous catheterizations and vein direct puncture retrograde vein approaches were used in all patients.

RESULTS

Eighty-five of 87 patients are cured at long-term follow-up (f/up: 14 months to 138 months; mean: 42 months) and 2 patients' therapy is on-going. Complications include 1 pelvic AVM post-Rx small bleed not requiring transfusion; 1 pelvic AVM coils eroded into bladder wall removed uneventfully via trans-urethra endoscopy; 2 infections treated with antibiotics; 2 patients' coils superficially eroded and uneventfully removed; and 1 patient subcutaneous hematoma removed (7/87 patients; 8% minor complications).

CONCLUSION

Retrograde vein and direct puncture vein access and embolization of AVMs in many anatomic locations have proven curative at long-term f/up of AVMs in multiple anatomic locations with a low complication rate. Reproducible and consistent results of this technique have been reported only in 3 publications in the world's literature: by Yakes (1990), Jackson (1996) and Cho (2008). In the Yakes AVM Classification System, these approaches can routinely effect AVM cures in Yakes Types I, IIa, IIIa, and IIIb.

CLINICAL RELEVANCE/APPLICATION

Retrograde vein and direct puncture vein access and embolization of AVMs in many anatomic locations have proven curative at long-term f/up of AVMs in multiple anatomic locations with a low complication rate.

SSQ20-09 Facilitating Successful Adrenal Venous Sampling with Pre-Procedural CT to Localize the Right Adrenal Vein and Intra-Procedural CT to Verify Correct Catheter Placement

Thursday, Dec. 5 11:50AM - 12:00PM Room: S503AB

Participants
Meesha K. Khatker, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Rony Avritscher, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Kyle M. Jones, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Mouhammed Amir Habra, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Paul H. Graham, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Nancy Perrier, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Steven Y. Huang, MD, Houston, TX (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

syhuang@mdanderson.org

PURPOSE

Adrenal venous sampling (AVS) is associated with failure rates as high as 30-40% due to difficulties in cannulating the right adrenal vein (RAV). Our purpose was: (1) to evaluate the accuracy of pre-AVS computed tomography (CT) imaging to localize the RAV and (2) to assess whether intra-procedural CT imaging would improve success rates of RAV catheterization.

METHOD AND MATERIALS

A total of 100 AVS procedures on 85 patients with primary aldosteronism from 2000 to 2018, were included in this retrospective study. Successful cannulation of the RAV and left adrenal vein (LAV) was defined by a selectivity index > 3. Comparison of RAV location on pre-AVS CT and during AVS was performed if the RAV was identified on pre-AVS CT and RAV sampling during AVS yielded a SI > 3. Using the spine as a stationary reference, the location of the RAV was compared between the pre-AVS CT and fluoroscopic images acquired during AVS. AVS procedures were also classified according to whether intra-procedural CT (i.e. C-arm CT) was used and success rates of successful RAV cannulation were compared (Fisher's exact test).

RESULTS

Concomitant identification of the RAV on pre-AVS CT and successful RAV catheterization during AVS occurred in 48 (56.5%) of 85 patients. The RAV was located at the same spinal level in 20 patients (41.7%) and within two-thirds of a vertebral body level in 43 patients (89.6%). Intra-procedural CT was used in 39 of 100 procedures (Figure 1). Successful cannulation of the RAV occurred in 35 of 39 (89.7%) procedures in which intra-procedural CT was used compared to 39 of 61 (63.9%) procedures in which intra-procedural CT was not used (P=0.0047). A reformatted image (attached) obtained during an intra-procedural CT scan with the catheter tip in the RAV and contrast injected through the catheter demonstrates opacification of the right adrenal gland indicating successful RAV cannulation. Successful cannulation of the LAV occurred in 99 of 100 (99%) procedures, and intra-procedural CT was not used to delineate the location of the LAV.

CONCLUSION

Pre-AVS CT imaging can be used to predict the location of the RAV during AVS. Intra-procedural CT imaging during AVS significantly improves rates of successful RAV catheterization.

CLINICAL RELEVANCE/APPLICATION

Successful cannulation of the right adrenal vein can be improved with adjunctive use of intra-procedural CT imaging during adrenal venous sampling for diagnosis of primary hyperaldosteronism.

Printed on: 10/29/20

MSRT54

ASRT@RSNA 2019: Quantitative Liver MR Imaging

Thursday, Dec. 5 11:45AM - 12:45PM Room: N230B

BQ GI MR

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

Participants
Nancy Talbot, MSc, RT, Toronto, ON (*Presenter*) Contract, Siemens AG

LEARNING OBJECTIVES

1) Introduce three main areas of quantitative imaging/biomarkers in Liver MRI Imaging: Iron, Fat, and Stiffness (fibrosis). 2) Discuss rationale for implementation of each area into routine MRI Imaging. 3) Discuss process for implementation of each area of Liver Imaging biomarkers software and hardware. 4) Discuss technical considerations and required training for technologists to produce diagnostic results.

ABSTRACT

MRI Imaging is progressively moving towards quantitative methods, and this is seen extensively in Liver Imaging. Over the last ten years, increasing developments have occured that non-invasively quantify iron and fat in the liver, as well as stiffness. Determining the amount of iron in the liver is critical for patient populations with thalassemia and leukemia for example. There are non invasive methods that can quantify the iron content and therefore change the patient management. These patients my have been recieving annual liver biopsies in the past. The amount of fat int he liver is a marker for predicting changes that can lead to cirrhosis and hepatocellular carcinoma. New software developments have been created that can quantify this beyond the radiologists observations of increased fat. MR elastography is a technique that non invasively measures the amount of stiffness in the liver. Additional hardware and software are required, however the implementation from a technologist perspective is not overly difficult. All of these advancements and use of biomarkers are becoming mainstream in MRI Imaging of the liver.

RCA53

Querying, Parsing, and Extracting DICOM Data: Basic Functionality with Real-World Use Cases and Applications (Hands-on)

Thursday, Dec. 5 12:30PM - 2:00PM Room: S401AB

IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Ross W. Filice, MD, Washington, DC (*Moderator*) Co-founder, DexNote LLC; Research Grant, NVIDIA Corporation; Advisor, BunkerHill Health, Inc
Ross W. Filice, MD, Washington, DC (*Presenter*) Co-founder, DexNote LLC; Research Grant, NVIDIA Corporation; Advisor, BunkerHill Health, Inc
Simon Rascovsky, MD, MSc, Bogota, Colombia (*Presenter*) Director, Nucleus Health, LLC
Marc D. Kohli, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn how to use command line tools and a collaborative web-based environment to query and retrieve studies from an archive. 2) Parse these studies to find useful DICOM elements and metadata. 3) Summarize metadata to gain insight into exams. 4) Extract pixel data and render jpegs or other file formats and even create movies or animated gifs.

Active Handout:Ross Warren Filice

http://abstract.rsna.org/uploads/2019/18001623/Active RCA53.pdf

Printed on: 10/29/20

RCC53

Next Generation Reporting: Informatics to Improve the Value of Reporting

Thursday, Dec. 5 12:30PM - 2:00PM Room: E351

IN SQ

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Arun Krishnaraj, MD, MPH, Charlottesville, VA (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify unmet needs of current and future practices with regards to radiology reporting. 2) Apply existing and emerging informatics applications to improve report generation, including a focus on patient centered reporting. 3) Demonstrate an understanding of how best to apply emerging machine intelligence tools to create structured automated recommendations.

Sub-Events

RCC53A The Actionable Patient Facing Report

Participants
Arun Krishnaraj, MD, MPH, Charlottesville, VA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Appreciate the current state of radiology reporting in the United States. 2) Identify areas for improvement in reporting. 3) Demonstrate an understanding of the potential of patient portals. 4) Understand how patient facing actionable reports can lead to better care through shared decision making

RCC53B The Multimedia Report: Ready for Prime Time?

Participants
Cree M. Gaskin, MD, Keswick, VA (*Presenter*) Author with royalties, Oxford University Press; Author with royalties, Thieme Medical Publishers, Inc; Research Grant, Carestream Health, Inc; Consultant, IBM Corporation;

For information about this presentation, contact:

cree@virginia.edu

LEARNING OBJECTIVES

1) Identify characteristics of an interactive multimedia radiology report. 2) Comprehend the value of improved communication that occurs with interactive multimedia reporting. 3) Describe barriers to overcome during the implementation of interactive multimedia reporting and integration of advanced reports into the electronic health record.

RCC53C Interactive Reporting

Participants
Les R. Folio, MPH,DO, Bethesda, MD (*Presenter*) Institutional research agreement, Carestream Health, Inc

LEARNING OBJECTIVES

1) Comprehend the difference between plain text and interactive multimedia radiology reports. 2) Identify characteristics and components suitable for an interactive multimedia radiology report. 3) Demonstrate objective evidence of radiology report value using interactive reports now that we can analyze click through behaviours of hyperlinked text.

ABSTRACT

For the past several years, the NIH Clinical Center has been routinely producing multimedia-enhanced interactive reports (Folio L. Multimedia Reports. Radiographics. April/ May 2018) in which radiologist reports contain hyperlinked text, directing clinicians to the corresponding image annotation (most often two-diameter measurements). Our prior studies have also demonstrated notable time savings for oncologists (three times faster) when they use the hyperlinked target lesion measurements for their patients (Folio L. RSNA 2015) as they spend significantly less time "hunting" for measurements in the previous text-only reports. Bookmark tables within our PACS (VuePACS V12, Carestream Health, Rochester, NY) contain fields where "radiologist assistants" (RAs) can label target lesions. In one ongoing study (Toscano A. SCBT.MR 2018), RAs simulate an AI workflow where target lesions are measured before radiologists open the exam for interpretation. This improves target lesion selection and measurement concordance while saving radiologists time by not having to identify or measure these lesions. Once verified, radiologists import the active annotation as a link into our report by dictating the word "hyperlink," which minimizes the potential transcription error of three sets of numbers (measurement, series and image numbers) and other metadata (e.g. x,y image and z table space, comparison of current with prior measurements for RECIST calculations, lesion measurement creator). We have followed adoption of hyperlinks since we started the capability and showed a rapid rise of use and that body radiologists use the most hyperlinks (about 80% of all CT), followed by body MR, PET CT and nueroradiology. We also collect data on use of annotations, with two-diameter the most frequent, followed by linear, ovals then arrows (least frequent). Preliminary work indicates that two-diameter and ovals better guide bounding boxes for deep learning with the annotations directly associated with the the hyperlinked text. Lastly, we have been analyzing clinician click-through behaviors where we can objectively demonstrate report value as a function of number of clicks on linked text, thus

verifying clinician interaction with radiologist reports. We can also analyze radiologists' clicks on prior report text and noted that body radiologists (for example) frequently click on these reports while dictating their interpretations.

RCC53D Structured Automated Recommendations: Reporting in the Era of Artificial Intelligence

Participants
Tarik K. Alkasab, MD,PhD, Boston, MA (*Presenter*) Consultant, Nuance Communications, Inc

Printed on: 10/29/20

SPAI52

RSNA AI Deep Learning Lab: Segmentation

Thursday, Dec. 5 1:00PM - 2:30PM Room: AI Showcase, North Building, Level 2, Booth 10342

AI CT MR NR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants

George L. Shih, MD, New York, NY (*Presenter*) Consultant, MD.ai, Inc; Stockholder, MD.ai, Inc;

Special Information

In order to get the best experience for this session, it is highly recommended that attendees bring a laptop with a keyboard, a decent-sized screen, and the latest version of Google Chrome. Additionally, it is recommended that attendees have a basic knowledge of deep learning programming and some experience running a Google CoLab notebook. Having a Gmail account is also helpful. Here are instructions for creating and deleting a Gmail account.

ABSTRACT

This session will focus on the use of deep learning methods for image segmentation, applied to the challenge of CT or MR brain segmentation. While focused on this particular problem, the concepts should generalize to other organs and image types.

Printed on: 10/29/20

VSIO51

Interventional Oncology Series: Musculoskeletal Intervention

Thursday, Dec. 5 1:00PM - 3:00PM Room: S405AB

IR MK OI RO

AMA PRA Category 1 Credits ™: 2.00
ARRT Category A+ Credits: 2.25

FDA Discussions may include off-label uses.

Participants
Steven Yevich, MD, MPH, Houston, TX (*Moderator*) Speakers Bureau, Endocare, Inc
Matthew R. Callstrom, MD,PhD, Rochester, MN (*Moderator*) Research Grant, EDDA Technology, Inc Research Grant, Galil Medical Ltd Consultant, Medtronic plc Consultant, Endocare, Inc Consultant, Johnson & Johnson Consultant, Thermedical, Inc

For information about this presentation, contact:

callstrom.matthew@mayo.edu

Sub-Events

VSIO51-01 Treatment of Non-malignant MSK Tumors

Thursday, Dec. 5 1:00PM - 1:10PM Room: S405AB

Participants
Steven Yevich, MD, MPH, Houston, TX (*Presenter*) Speakers Bureau, Endocare, Inc

VSIO51-02 Top 10 Lessons Learned in MSK Ablation and Embolization

Thursday, Dec. 5 1:10PM - 1:20PM Room: S405AB

Participants
Anil N. Kurup, MD, Rochester, MN (*Presenter*) Research Grant, Galil Medical Ltd; Research Grant, EDDA Technology, Inc; Royalties, Wolters Kluwer nv

For information about this presentation, contact:

kurup.anil@mayo.edu

LEARNING OBJECTIVES

1) To describe common complications that occur with MSK intervention. 2) To share tips and tricks to facilitate effective MSK interventions. 3) To highlight necessary pre-procedural patient preparation and post-procedural expectations.

VSIO51-03 Ablation in the Spine and Paraspinal Tissues

Thursday, Dec. 5 1:20PM - 1:30PM Room: S405AB

Participants
Jack W. Jennings, MD, Saint Louis, MO (*Presenter*) Speakers Bureau, Merit Medical Systems, Inc; Consultant, Merit Medical Systems, Inc; Consultant, Medtronic plc; Consultant, Galil Medical Ltd; Consultant, BTG International Ltd; Consultant, C. R. Bard, Inc

VSIO51-04 Spine SBRT: Local Control and Fracture Risks

Thursday, Dec. 5 1:30PM - 1:40PM Room: S405AB

Participants
Sean S. Park, MD, PhD, Rochester, MN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe spine SBRT: indications and patient selection, technique and delivery, and oncologic outcomes and toxicities.

VSIO51-05 Transarterial Embolization with Microsphere for Treatment-Refractory Malignant Bone and Soft-Tissue Tumors

Thursday, Dec. 5 1:40PM - 1:50PM Room: S405AB

Participants
Junichi Taniguchi, Nishinomiya, Japan (*Presenter*) Nothing to Disclose
Haruyuki Takaki, MD, Nishinomiya, Japan (*Abstract Co-Author*) Nothing to Disclose
Ryo Kunimoto, Nishinomiya, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Yokoyama, Nishinomiya, Japan (*Abstract Co-Author*) Nothing to Disclose
Atsushi Ogasawara, Kitakyushu, Japan (*Abstract Co-Author*) Nothing to Disclose

Hiroshi Kodama, MD, Nishinomiya , Japan (*Abstract Co-Author*) Nothing to Disclose
Yasukazu Kako, Nishinomiya, Japan (*Abstract Co-Author*) Nothing to Disclose
Kaoru Kobayashi, MD, Nishinomiya, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Futani, Nishinomiya, Japan (*Abstract Co-Author*) Nothing to Disclose
Koichiro Yamakado, MD, PhD, Nishinomiya, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To retrospectively evaluate the clinical utility of transarterial embolization using microsphere (MS) in patients with treatment-refractory malignant bone and soft tissue tumors.

METHOD AND MATERIALS

Between 2014 and 2018, 11 patients (7 female and 4 males) with a median age of 69 years (range, 49-89 years) underwent embolization using MS for the treatment of treatment-refractory malignant bone and soft tissue tumors. Tumors were located in the body trunk in 8 patients (73%) and in the limb in 3 patients (27%) with a median maximum tumor diameter of 9.2 cm (range, 2.1-24.6 cm). Seven patients (64%, 7/11) complained of pain caused by tumors before embolization. The response [complete remission (CR) + partial remission (PR)] and the disease control [CR + PR + stable disease (SD)] rates were evaluated by modified Response Evaluation Criteria in Solid Tumor (mRECIST) criteria, adverse events by Common Terminology Criteria for Adverse Events (CTCAE) version 5.0, and survival rate after embolization by Kaplan-Meyer method. Visual analog scale (VAS) scores were evaluated before and within 1 week after embolization.

RESULTS

The response rate was 36% [CR, 18% (2/11); PR, 18% (2/11)], and disease control rate 82% [SD, 45% (5/11)] at 1 month after embolization. Grade 3 skin ulcer developed in 2 patients (18%, 2/11), and paresthesia in a patient (9%, 1/11). The cumulative overall survival rates were 40% (95% confidence interval (CI), 6-74%) at 1 year and 20% (95% CI, 1-58%) at 3 years, and with a median survival time of 11 months. VAS scores decreased 2 or more in 5 patients (71%, 5/7).

CONCLUSION

This preliminary study demonstrated possibility that MS embolization may help to control treatment-refractory bone and soft tissue tumors and relieve pain caused by tumors.

CLINICAL RELEVANCE/APPLICATION

Transarterial embolization with microsphere for treatment-refractory malignant bone and soft tissue tumors can be effective for local tumor control and pain relief.

VSIO51-06 Vertebral Augmentation in Cancer Patients

Thursday, Dec. 5 1:50PM - 2:00PM Room: S405AB

Participants
Rahul A. Sheth, MD, Houston, TX (*Presenter*) Nothing to Disclose

VSIO51-07 Ablation-Osteoplasty-Reinforcement-Internal Fixation (AORIF) for Osteolytic Skeletal Metastases

Thursday, Dec. 5 2:00PM - 2:10PM Room: S405AB

Participants
Nariman Nezami, MD, New Haven, CT (*Presenter*) Nothing to Disclose
Francis Y. Lee, MD,PhD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Igor Latich, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

dr.nezami@gmail.com

PURPOSE

Open surgical repair is often not feasible or safe in patients with osseous metastatic disease, particularly in areas at risk for pathologic fracture adjacent to weight-bearing articular surfaces. However, percutaneous cementoplasty and internal fixation with screws have each shown to be effective independently. This study reports Ablation-Osteoplasty-Reinforcement-Internal Fixation (AORIF) technique and technical success for osteolytic skeletal metastases adjacent to weight-bearing articular surfaces.

METHOD AND MATERIALS

This is a retrospective analysis of 18 patients who underwent image guided percutaneous internal screw fixation, radiofrequency ablation, balloon osteoplasty, and cementoplasty in 16 sites of osseous metastasis. Post-procedural outcomes, improvement of pain and mobility were evaluated. All of the patients had advanced osseous metastatic disease with impending pathologic fractures and persistent pain refractory to radiotherapy or systemic treatment.

RESULTS

100% of the procedures were technically successful without post-procedural complications. All of the patients who received the modified technique were found to have improved pain and mobility after the procedure. Importantly, all patients, except for one, were treated on outpatient basis and none required conversion to open repair.

CONCLUSION

The AORIF is an effective strategy in improving pain and reducing the risk of pathologic fracture in patients with advanced osteolytic metastatic disease near articular surfaces. Concomitant RFA provides a degree of local tumor control and in conjunction with balloon osteoplasty creates increases the penetration of cement within the diseased bone.

CLINICAL RELEVANCE/APPLICATION

The AORIF is an effective strategy in improving pain and reducing the risk of pathologic fracture in patients with advanced

osteolytic metastatic disease near articular surfaces.

VSIO51-08 MSK Immuno-Oncology: Talk the Talk

Thursday, Dec. 5 2:10PM - 2:20PM Room: S405AB

Participants
Muneeb Ahmed, MD, Boston, MA (*Presenter*) Research Grant, General Electric Company Stockholder, Agile Devices, Inc Scientific Advisory Board, Agile Devices, Inc

VSIO51-09 Pediatric MSK Interventions

Thursday, Dec. 5 2:20PM - 2:30PM Room: S405AB

Participants
Allison S. Aguado, MD, Wilmington, DE (*Presenter*) Nothing to Disclose

VSIO51-10 Advanced Imaging Techniques for MSK IO

Thursday, Dec. 5 2:30PM - 2:40PM Room: S405AB

Participants
Julien Garnon, MD, Strasbourg, France (*Presenter*) Proctor, Galil Medical Ltd

LEARNING OBJECTIVES

1) To understand the role of multimodality image guidance for MSK procedures to see the clinical benefit of combined fluoroscopy and CT-scan for complex bone procedures. 2) To understand how ultrasound and MRI can improve the precision of soft tissue interventions.

VSIO51-11 Approach to Pelvic Fixation

Thursday, Dec. 5 2:40PM - 2:50PM Room: S405AB

Participants
Frederic Deschamps, Villejuif, France (*Presenter*) Research Consultant, Medtronics plc; Research Consultant, BTG International Ltd; Research Consultant, General Electric Company

VSIO51-12 Fixation Outside of the Pelvis

Thursday, Dec. 5 2:50PM - 3:00PM Room: S405AB

Participants
Sean M. Tutton, MD, Milwaukee, WI (*Presenter*) Consultant, BTG International Ltd; Consultant, Galil Medical Ltd; Consultant, Biocompatibles International plc; Consultant, IZI Medical; Consultant, Stryker Corporation; Researcher, Siemens AG; Consultant, Siemens AG;

For information about this presentation, contact:

stutton@mcw.edu

Printed on: 10/29/20

MSCB51

Case-based Review of the Breast (Interactive Session)

Thursday, Dec. 5 1:30PM - 3:00PM Room: N230B

BR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Jiyon Lee, MD, Scarsdale, NY (*Director*) Nothing to Disclose

For information about this presentation, contact:

Jiyon.Lee@nyumc.org

LEARNING OBJECTIVES

1) Identify appropriate application of multi-modality breast imaging for routine screening, supplemental screening, and diagnostic indications. 2) Select appropriate methods for image-guided percutaneous biopsy and perform post-biopsy radiologic pathologic correlation for next management recommendation. 3) Review appropriateness criteria and performance benchmarks , and guidelines for ongoing breast imaging audits as they apply. 4) Appreciate the range of reassuringly common and sometimes not-so common among the international faculty's portrayal of their piece of the globe. Special presentations by PBG and DBK provide historical perspective to enable appreciation for our breast imaging subspecialty.

ABSTRACT

ABSTRACT Title: Managing expectations in breast imaging around the world. 'Best' versus sufficient? Abstract: Our case-based review course will walk and skip through the fundamentals of breast imaging. We will present how we use mammography, ultrasound, and MRI in daily screening and diagnostic scenarios, along with reminders of the overarching principles of BI-RADS lexicon for effective communication, and ACR appropriateness criteria and performance metrics as applicable or adapted around the world. Our international faculty (sessions 1 and 2) will also add depth, and the fun added dimensions of how breast imaging works around the world. Varying breast cancer statistics, possible innate ethnic variations, differing cultural expectations and socioeconomic context can and do impact how we carry out our discretionary work. Such interesting details will inform the narrative of the speakers' case scenarios, while the core diagnostic radiology skills aim to be constant, and teachable. Cases help demonstrate breast imaging now and evolving. Special historical perspectives by PBG and DBK (session 1) impress with how far we have come as a subspecialty and where we are headed for the people we serve. Please join us for smart fun!

Sub-Events

MSCB51A Ultrasound from the Beginning to Now in All Its Humble Glory

Participants
Paula B. Gordon, MD, Vancouver, BC (*Presenter*) Stockholder, OncoGenex Pharmaceuticals, Inc ; Stockholder, Volpara Health Technologies Limited; Scientific Advisory Board, Real Imaging Ltd; Scientific Advisory Board, DenseBreast-info, Inc; Scientific Advisor, Dense Breasts Canada

LEARNING OBJECTIVES

1) Understand the evolution of breast ultrasound and be introduced to the pioneers in the subspecialty; Illustrative cases will be shown, with audience electronic responses.

MSCB51B Our 3D Modalities: Expanding Utility, Increasing Efficiency and Improving Specificity: A US-German Perspective

Participants
Ingolf Karst, MD, Chicago, IL (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

ingolf.karst@nm.org

LEARNING OBJECTIVES

1) Compare distinguished breast imaging strategies in the US and Germany to help increase specificity in breast cancer detection.
2) List ways to increase efficiency in breast imaging by using modern breast imaging modalities and optimize the use of resources.
3) Assess current breast imaging technologies to reach desired goals in the daily practice to improve cancer detection.

ABSTRACT

This case rich review will highlight adoption of modern 3D modalities in breast imaging to enhance the daily routine with an emphasis on what to learn from different strategy approaches in the US and German healthcare environment.

Active Handout:Ingolf Karst

http://abstract.rsna.org/uploads/2019/19000806/RSNA_2019_3D_Case_Review_Handout.pdf

MSCB51C Breast Imaging in Western Australia: How We Do It in the Land Down Under

Participants
Vanessa Atienza-Hipolito, MD,FRANZCR, Cottesloe, Australia (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

VanessaA@wbi.net.au

LEARNING OBJECTIVES

1) To learn the imaging features of interesting breast cases encountered in public and private centres. 2) To understand the imaging tests performed and further management of these breast cases. 3) To learn the standard practice of breast cases in screening (public) versus diagnostic (private) imaging setting in Western Australia.

ABSTRACT

Australia has a national breast screening program which provides FREE screening mammogram to women 40 years and over with no breast symptoms. The target age group is 50-74 years whereby these women receives a reminder letter every 2 years. Women who are recalled for further investigation are invited to attend in different Breast Assessment Centres across Australia.

Active Handout:Vanessa Atienza-Hipolito

http://abstract.rsna.org/uploads/2019/19000808/RSNA 2019 CB RC 05december2019 handout.pdf

MSCB51D Major Advances in Women's Health Over the Last 50 Years

Participants
Daniel B. Kopans, MD, Waban, MA (*Presenter*) Royalties, Cook Group Incorporated; Research Consultant, Deep Health; Scientific Advisory Board, Dart, Inc

LEARNING OBJECTIVES

1) Understand the history of Breast Imaging in the U.S.. 2) Understand the evolution of breast evaluation in the U.S.. 3) Understand the major milestones in imaging the breast dating back to the 1960's.

ABSTRACT

Randomized, controlled trials proved that early detection reduces deaths from breast cancer for women ages 40-74. This has been confirmed by numerous observational studies as well as a large 'failure analysis' performed in the Harvard teaching hospitals that showed that more than 70% of the women who died from breast cancer, despite having access to modern therapy, were among the 20% of women who were not participating in screening. A very large study in Sweden showed that the incidence of death from breast cancer was 60% lower at 10 years and 47% lower at 20 years for women who particiatped in screening than those who did not, again despite all having access to modern theapy. Despite an almost continuous effort required to address over 40 years of misinformation denigrating breast cancer screening, imaging the breast has undergone a steady evolution in our effort to improve our ability to detect more cancers at a time when cure is possible. This progression will be presented.

MSCU51

Case-based Review of Ultrasound (Interactive Session)

Thursday, Dec. 5 1:30PM - 3:00PM Room: E450B

US

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Deborah J. Rubens, MD, Rochester, NY (*Director*) Nothing to Disclose

For information about this presentation, contact:

Deborah_rubens@urmc.rochester.edu

LEARNING OBJECTIVES

1) Learn current techniques and advances in ultrasound imaging. 2) Become familiar with current guidelines for diagnosis and management of imaging findings. 3) Review critical physiology and pathology as it is depicted by ultrasound. 4) Understand the vital role of Ultrasound imaging in optimum patient care.

ABSTRACT

This course is designed to highlight the vital role ultrasound plays in imaging and diagnosis throughout the body. Special emphasis will be placed on technical advances including ultrasound contrast and elastography and interventional guidance. A wide range of applications will be covered including vascular, general abdominal, pediatric, gynecologic, small parts and obstetrical ultrasound. Our goal is to provide a broad update in the field while addressing new opportunities and challenges for everyday practice.

Sub-Events

MSCU51A Small Parts Ultrasound

Participants
William D. Middleton, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose

MSCU51B Interventional Ultrasound

Participants
Hisham A. Tchelepi, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose

MSCU51C Obstetric Ultrasound-Urgent and Emergent Cases

Participants
Phyllis Glanc, MD, Toronto, ON (*Presenter*) Nothing to Disclose

MSCU51D Abdominal Emergencies

Participants
Daniel C. Oppenheimer, MD, Rochester, NY (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

daniel_oppenheimer@urmc.rochester.edu

RCA54

Generating AutoHotkey Scripts to Automate Repetitive Tasks and Optimize Radiology Workflow (Hands-on)

Thursday, Dec. 5 2:30PM - 4:00PM Room: S401AB

IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Nicholas Said, MD, MBA, Chapel Hill, NC (*Moderator*) Nothing to Disclose
Christopher J. Roth, MD, Raleigh, NC (*Presenter*) Nothing to Disclose
Nicholas Said, MD, MBA, Chapel Hill, NC (*Presenter*) Nothing to Disclose
Matthew P. Thorpe, MD, PhD, Rochester, MN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn about AutoHotkey, the free, open-source custom scripting language for Microsoft Windows, and how it can be applied to adapt the system to the user by reducing repetitive tasks embedded in radiology workflow. 2) Learn to use the AutoHotkey platform to program your first scripts.

ABSTRACT

Radiology workflow is often riddled with inefficiencies requiring Radiologists to perform repetitive tasks as they adapt to complex systems. AutoHotkey is a free, open-source custom scripting language for Microsoft Windows that allows users of most levels of computer skill to automate repetitive tasks in any Windows application. This hands-on session will introduce attendees to the AutoHotkey platform and how it can be leveraged to adapt systems to users and institutions. Attendees will learn to program their first scripts and how to access script generation resources.

Active Handout:Nicholas Said

http://abstract.rsna.org/uploads/2019/19020401/Active RCA54.pdf

Printed on: 10/29/20

RCC54

Building a Social Media and Web Brand

Thursday, Dec. 5 2:30PM - 4:00PM Room: E351

IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Alex Towbin, MD, Cincinnati, OH (*Moderator*) Author, Reed Elsevier; Grant, Guerbet SA; Grant, Cystic Fibrosis Foundation; Consultant, Reed Elsevier; Advisory Board, IBM Corporation; Advisory Board, KLAS Enterprises LLC;

For information about this presentation, contact:

alexander.towbin@cchmc.org

LEARNING OBJECTIVES

1) Describe the importance of building a brand for themselves and for their department. 2) Describe how social media can be used to impact radiology education. 3) Describe how a hashtag can help to galvanize a specialty around a common theme.

Sub-Events

RCC54A The Importance of Branding for Radiologists and Radiology Departments

Participants
Alex Towbin, MD, Cincinnati, OH (*Presenter*) Author, Reed Elsevier; Grant, Guerbet SA; Grant, Cystic Fibrosis Foundation; Consultant, Reed Elsevier; Advisory Board, IBM Corporation; Advisory Board, KLAS Enterprises LLC;

For information about this presentation, contact:

alexander.towbin@cchmc.org

LEARNING OBJECTIVES

1) List three social media platforms that can be used to promote a practice. 2) Provide three examples of content that can be delved for social media platforms.

RCC54B How Building Your Brand Can Open Opportunities for Residents

Participants
Lindsey A. Shea, MD, Indianapolis, IN (*Presenter*) Nothing to Disclose

RCC54C Using Multiple Social Media Channels to Educate

Participants
Vikas Shah, MRCP, FRCR, Leicester, United Kingdom (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

vikasshah99@gmail.com

LEARNING OBJECTIVES

1) Describe the benefits and limitations of using social media to educate. 2) Contrast the features of the most popular social media channels used to convey radiology education. 3) Develop a strategy to commence educational activities using social media. 4) Understand rules, regulation and best practice suggestions to protect patient privacy and data. 5) Recognise how online educational activity can help to build a personal brand.

RCC54D Social Marketing and the Power of a Hashtag

Participants
Catherine Slotnick, New York, NY (*Presenter*) Nothing to Disclose

SPDL51

Peds, IR, Potpourri (Case-based Competition)

Thursday, Dec. 5 3:00PM - 4:00PM Room: E451B

IR PD

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

Participants
Paul J. Chang, MD, Chicago, IL (*Presenter*) Co-founder, Koninklijke Philips NV; Researcher, Koninklijke Philips NV; Researcher, Bayer AG; Advisory Board, Bayer AG; Advisory Board, Aidoc Ltd; Advisory Board, EnvoyAI; Advisory Board, Inference Analytics; Advisory Board, Subtle Medical
Kate A. Feinstein, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Brian S. Funaki, MD, Riverside, IL (*Presenter*) Speaker, Canon Medical Systems Corporation

For information about this presentation, contact:

pchang@radiology.bsd.uchicago.edu

Special Information

This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

LEARNING OBJECTIVES

1) Be introduced to a series of radiology case studies via an interactive team game approach designed to encourage 'active' consumption of educational content. 2) 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) Receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance.

ABSTRACT

The extremely popular audience participation educational experience, Diagnosis Live!, is an expert-moderated session featuring a series of interactive case studies that will challenge radiologists' diagnostic skills and knowledge. The session features a lively, fast-paced game format: participants will be automatically assigned to teams who will then use their personal mobile devices to test their knowledge in a fast-paced session that will be both educational and entertaining. After the session, attendees 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.

SPSH51

Hot Topic Session: Management of the Axilla-Biopsy and Staging

Thursday, Dec. 5 3:00PM - 4:00PM Room: E353C

BR

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

Participants
Fiona J. Gilbert, MD, Cambridge, United Kingdom (*Moderator*) Research Grant, Hologic, Inc; Research Grant, General Electric Company ; Research Consultant, Alphabet Inc; Research support, Bayer AG; Research collaboration, Volpara Health Technologies Limited

Sub-Events

SPSH51A Imaging of the Axilla

Participants
Fleur Kilburn-Toppin, MBBChir, MA, Cambridge, United Kingdom (*Presenter*) Nothing to Disclose
Nisha Sharma, MBChB, Leeds, United Kingdom (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

nisha.sharma2@nhs.net

LEARNING OBJECTIVES

1) To understand the clinical role of axillary staging. 2) To appreciate the importance of discriminating minimal versus advanced nodal disease. 3) To assess the role of axillary imaging in patients undergoing neoadjuvant chemotherapy. 4) To learn novel techniques for accurate axillary lymph node marking.

ABSTRACT

Axillary grey scale ultrasound is considered the gold standard for staging the axilla in the context of breast cancer. This talk will discuss the current limitations with axillary grey ultrasound and the importance standardising axillary reporting of the axilla. New innovations regarding axillary ultrasound will also be explored and how this may impact on current practice. The role of imaging in the context of neoadjuvant chemotherapy will also be touched upon.

SPSH51B Image Guided Biopsy of the Axilla

Participants
Alexandra Athanasiou, MD, MSc, Athens, Greece (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

aathanasiou@mitera.gr

LEARNING OBJECTIVES

1) To assess clinical importance of Image Guided Biopsy of the Axilla. 2) To describe various techniques of performing Image Guided Biopsy of the Axilla. 3) To explain tips and tricks of how to proceed in technically challenging cases of Image Guided Biopsy of the Axilla. 4) To list current methods of lymph node marking in patients undergoing neoadjuvant treatment. 5) To explain rationale behind lymph node marking in the neoadjuvant setting.

ABSTRACT

Image-Guided Biopsy of the Axilla is an important step of completing pre-operative local staging and diagnosis, thus ensuring an optimal personalized treatment for patients presenting with a suspicious breast lesion. Thorough knowledge of axillary anatomy is mandatory Familiarity with available techniques and biopsy devices ensures a technically accurate and safe procedure. As for any image-guided biopsy procedure, radiologic-pathologic correlation is mandatory in order to ensure the lowest possible rate of false negative results

SPSH51C Surgical Management of the Axilla

Participants
Richard J. Bleicher, MD, Philadelphia, PA (*Presenter*) Speaker, Genomic Health, Inc

LEARNING OBJECTIVES

1) To understand current methods and standards for surgical assessment and management of the axilla vis-à-vis imaging assessment. 2) To understand controversies in surgical axillary management in the adjuvant setting. 3) To understand controversies in surgical axillary management in the neoadjuvant setting.

ABSTRACT

Axillary management is a critical component of breast cancer evaluation and treatment. Surgical evaluation of the axilla and lymph nodes have long been standard, but the paradigms for assessment of the axilla have been changing. These changes have been

rapid due to clinical trial results, advances in imaging assessment and localization, and paradigm shifts in management of some breast phenotypes using neoadjuvant chemotherapy. Practice patterns also vary within the US and around the world. This session will review standard surgical management as well as where controversies exist both in the surgical management of the axilla as well as in the changing dynamics between surgical and imaging assessment of the axilla in the adjuvant and neoadjuvant settings.

Printed on: 10/29/20

SPSH52

Hot Topic Session: 4D Flow Imaging in Congenital and Acquired Cardiovascular Disease-Clinical Impact

Thursday, Dec. 5 3:00PM - 4:00PM Room: S401CD

CA

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

FDA Discussions may include off-label uses.

Participants
Gautham P. Reddy, MD, Seattle, WA (*Moderator*) Researcher, Koninklijke Philips NV

Sub-Events

SPSH52A Congenital Heart Disease

Participants
Cynthia K. Rigsby, MD, Chicago, IL (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

crigsby@luriechildrens.org

LEARNING OBJECTIVES

1) Discuss the potential benefit of 4D flow in congenital heart disease. 2) Describe the clinical implementation of 4D flow. 3) Demonstrate the utility of 4D flow in congenital heart disease using case examples.

SPSH52B Structural Heart Disease

Participants
Albert Hsiao, MD,PhD, La Jolla, CA (*Presenter*) Founder, Arterys, Inc; Consultant, Arterys, Inc; Shareholder, Arterys, Inc; Speaker, Bayer AG; Research Grant, Bayer AG; Speaker, General Electric Company; Research Grant, General Electric Company;

LEARNING OBJECTIVES

1) Briefly review the technical foundations of 4D Flow MRI. 2) Explore several typical clinical cases of 4D Flow for evaluation of structural heart disease in adults, including both acquired and congenital heart disease. 3) Highlight clinical pearls and potential pitfalls of 4D Flow MRI.

ABSTRACT

Until recently, clinical application of 4D Flow MRI has been limited by the absence of clinically-viable pulse sequences from MRI vendors and software systems capable of managing these large high-dimensional data sets. Many groups have published on research potential of this technology over the last few decades, but only a few institutions have yet obtained the core clinical skill sets required to adopt the technology into routine clinical practice. In this session, we will review some of the technical evidence and background behind 4D Flow, but primarily focus on its every day clinical use for the evaluation of adult acquired and congenital heart disease. We will highlight clinical pearls and potential pitfalls from our early experience using this new technology in routine practice, as we adopted this technology to accelerate the rapid growth of our structural heart disease program at UC San Diego.

SPSH52C Aorta

Participants
Michael D. Hope, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify potential clinical applications for the assessment of aortic disease with 4D Flow. 2) Outline pathway for clinical adoption of 4D Flow for common aortic conditions. 3) Assess literature supporting the use of 4D Flow for the evaluation of aortic flow.

ABSTRACT

4D Flow MRI has been available for well over a decade, but has yet to make it into routine clinical practice. Evaluation of aortic flow has long been championed as a unique and potentially impactful application of 4D Flow. We will review the various clinical applications that have been proposed for evaluation of aortic flow, and examine the literature that supports the use of 4D Flow for assessment of aortic disease.

SPSH52D Panel Discussion

SPSH53

Hot Topic Session: Imaging of the Placenta-Where Do We Stand in 2019?

Thursday, Dec. 5 3:00PM - 4:00PM Room: S404AB

GU OB

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

Participants
Liina Poder, MD, Mill Valley, CA (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

liina.poder@ucsf.edu

LEARNING OBJECTIVES

1) Understanding the epidemiology and impact of Placenta Accreta Spectrum (PAS) disorders on maternal fetal health. 2) Understanding the current concepts of pathophysiology of Placenta Accreta Spectrum (PAS) disorders. 3) Understanding the role and impact of imaging in diagnosis and treatment of Placenta Accreta Spectrum (PAS) disorders. 4) Understanding current FIGO guidelines in diagnosis and treatment and most current consensus on Placenta Accreta Spectrum (PAS) disorders.

Sub-Events

SPSH53A Impact of PASD in Maternal Fetal Health: The Big Picture

Participants
Dana R. Gossett, MD, San Francisco, CA (*Presenter*) Consultant, Bayer AG

For information about this presentation, contact:

dana.gossett@ucsf.edu

LEARNING OBJECTIVES

1) Review clinical risk factors, clinical presentation, and morbidity associated with invasive placentation. 2) Present current evidence regarding timing and surgical technique for delivery with invasive placentation. 3) Review team structure and coordination with surgical, obstetric, anesthetic, and radiologic teams for optimal patient outcomes.

SPSH53B What We Know of Pathophysiology of PAS Disorder in 2019

Participants
Jonathan Hecht, MD, PhD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

JLHecht@BIDMC.Harvard.edu

LEARNING OBJECTIVES

1) Understanding the current concepts of pathophysiology of Placenta Accreta Spectrum (PAS) disorders. 2) Pathologic correlates of PAS imaging. 3) Potential biomarkers of PAS.

ABSTRACT

Pathophysiology of the placenta accreta spectrum (PAS) will be discussed with reference to defects of trophoblast biology that lead to excessive invasion of the myometrium, the role of abnormal decidualization at the endometrium-myometrial interface in pregnancy, and uterine remodeling in the setting of placenta previa and dehiscence of prior cesarean scar. Potential serum or imaging biomarkers of PAS will be discussed.

SPSH53C Current Status and International Consensus on Imaging of PAS Disorders

Participants
Priyanka Jha, MBBS, San Francisco, CA (*Presenter*) Nothing to Disclose
Charis Bourgioti, MD, Athens, Greece (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

priyanka.jha@ucsf.edu

charisbourgioti@gmail.com

LEARNING OBJECTIVES

1) Review current updates on US and MR imaging findings of PAS disorders. 2) Develop a checklist of observations for dedicated US evaluation once abnormality is detected. 3) Develop an approach for troubleshooting difficult and equivocal cases.

ABSTRACT

Placenta accreta spectrum disorders may account for a number of important adverse maternal events during the course of delivery; therefore, prenatal diagnosis of the presence and extent of myometrial invasion or placental extrauterine spread is critical for optimal management. Sonography is the frontline imaging modality for the evaluation of abnormal placenta; MRI performs equally well and can be used as a reliable alternative in cases of equivocal sonographic findings or for better topography in case of placental lateral extension. The aim of this presentation is to review current updates on the imaging of PAS disorders and comment on US and MRI indications, in an attempt to familiarize radiologists with the 'hot' topic of abnormal placentation.

SPSH53D Current Role and Impact of Interventional Radiology in PAS Disorders

Participants
Philippe A. Soyer, MD, PhD, Paris, France (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the role of interventional radiology in women with postpartum hemorrhage due to placenta accreta spectrum (PAS) disorders. 2) To know the different options provided by interventional radiology in PAS disorders. 3) To understand the advantages and limitations of each approach.

ABSTRACT

To date, embolization of pelvic arteries in women with postpartum hemorrhage due to PAS disorder is the treatment option for which highest degrees of evidence are available. However, other options have been tested, including prophylactic catheter placement, balloon occlusion of the internal iliac arteries and abdominal aorta balloon occlusion. This presentation will provide an overview of the currently reported interventional radiology procedures that are used for the treatment of postpartum hemorrhage due to PAS disorders and suggest recommendations based on current evidences.

Printed on: 10/29/20

SPSH54

Hot Topic Session: Imaging of Traumatic Brain Injury-Present and Future

Thursday, Dec. 5 3:00PM - 4:00PM Room: E451A

ER MI NR

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

Participants
Donna J. Cross, PhD, Salt Lake City, UT (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe new and universal approaches for the visual examination of acute brain injury. 2) Examine novel approaches for the assessment of traumatic brain injury. 3) Describe methods under development to assess traumatic brain injury-related neurodegenerative disorders.

ABSTRACT

This session will highlight molecular imaging of traumatic brain injuries from current clinical work up of acute injury to tracer development for the assessment of chronic brain injury such as Chronic Traumatic Encephalopathy. Topics will include new PET tracers, MRI methodologies and quantitative analyses currently used in research.

Sub-Events

SPSH54A Imaging of Acute TBI

Participants
Yoshimi Anzai, MD, Salt Lake City, UT (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

yoshimi.anzai@hsc.utah.edu

SPSH54B PET Tracers to Assess TBI and CTE

Participants
Gerard N. Bischof, PhD, Cologne, Germany (*Presenter*) Nothing to Disclose

SPSH54C Advanced MRI Techniques for TBI Research

Participants
Pratik Mukherjee, MD, PhD, San Francisco, CA (*Presenter*) Research Grant, General Electric Company; Medical Adivisory Board, General Electric Company; Patent Pending USPTO No. 62/269,778

SPSH55

Hot Topic Session: Integrating Immunotherapy with Radiation Therapy

Thursday, Dec. 5 3:00PM - 4:00PM Room: S402AB

RO

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

Participants
Zachary S. Morris, MD,PhD, Madison, WI (*Moderator*) Scientific Advisory Board, Archeus Technologies LTD; Speaker, ViewRay, Inc

Sub-Events

SPSH55A Preclinical Rationale for Combining Immunotherapy with Radiation Therapy

Participants
Kristina Young, MD, PhD, Portland, OR (*Presenter*) Research Grant, Eli Lilly and Company; Institutional support, Bristol-Myers Squibb Company;

For information about this presentation, contact:

kristina.young@providence.org

LEARNING OBJECTIVES

1) Identify immunotherapy mechanism of action. 2) Understand preclinical evidence for immunomodulatory effects of radiation.

ABSTRACT

Radiation is a common antineoplastic treatment modality primarily related to its efficacy as a focal cytotoxic agent. An additional benefit to radiation is its ability to expose tumor antigens, enhance MHC I upregulation, induce maturation of APCs, lead to DAMP/PAMP expression, and sensitize tumor cells to immune mediated killing. Combination radiation and immunotherapy can enhance efficacy over either modality alone. Immune checkpoint blockade with anti-CTLA4 or anti-PD1/PDL1 have demonstrated clinical efficacy in a variety of malignancies. Also in development are agonist antibodies to T cell costimulatory molecules such as OX40 and ICOS. Additional immunotherapies targeting immunosuppressive pathways such as transforming growth factor beta (TGFß), are in development. We will discuss the preclinical rationale for combination radiation and immunotherapy.

SPSH55B Clinical Rationale and Approaches for Testing Combinations of Immunotherapy with Radiation Therapy

Participants
Jonathan D. Schoenfeld, MD, Boston, MA (*Presenter*) Institutional Research Grant, Merck & Co, Inc; Institutional Research Grant, Bristol-Myers Squibb Company; Research Consultant, Tilos; Research Consultant, LEK; Research Consultant, Catenion; Research Consultant, Debiopharm

For information about this presentation, contact:

jdschoenfeld@partners.org

LEARNING OBJECTIVES

1) Describe clinical data relevant to radiation / immunotherapy combinations. 2) Identify toxicity concerns relevant to radiation / immunotherapy treatment. 3) Assess immunotherapy clinical trial design.

ABSTRACT

NA

SPSH55C Clinical Trials Combining Immunotherapy with Radiation Therapy

Participants
Sean M. McBride, MD, New York, NY (*Presenter*) Research funded, Johnson & Johnson; Research funded, F. Hoffmann-La Roche Ltd;

LEARNING OBJECTIVES

1) Present current data from clinical trials involving radiation and immunotherapy. 2) Review trials in progress. 3) Suggest next step trials based on preclinical and correlative data.

SPSH55D Next Generation Approaches to Enhancing the Cooperative Interaction between Radiation and Immunotherapy

Participants
Ravi Patel, MD, PhD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Development of theragnostic radionuclides and their role in combination immunotherapy regimens. 2) Assess the role of particle therapy and high LET radionuclides to deliver immunostimulatory radiation. 3) Assess a potential role of immunostimulatory radiation with cellular therapies.

ABSTRACT

NA

Printed on: 10/29/20

VSIO52

Interventional Oncology Series: International Interventional Oncology-South Korea Presents

Thursday, Dec. 5 3:15PM - 5:15PM Room: S405AB

IR OI RO

AMA PRA Category 1 Credits ™: 2.00
ARRT Category A+ Credits: 2.25

FDA Discussions may include off-label uses.

Participants
Hyunchul Rhim, MD,PhD, Seoul, Korea, Republic Of (*Moderator*) Consultant, STARmed Co Ltd; Research Grant, Johnson & Johnson
Jeong Min Lee, MD, Seoul, Korea, Republic Of (*Moderator*) Grant, Bayer AG; Speaker, Bayer AG; Grant, Canon Medical Systems Corporation; Grant, Koninklijke Philips NV; Grant, General Electric Company; Grant, Guerbet SA; Speaker, Guerbet SA; Grant, Samsung Electronics Co, Ltd; Speaker, Samsung Electronics Co, Ltd; Grant, Bracco Group; Speaker, Siemens AG

Sub-Events

VSIO52-01 30 Years of Interventional Oncology in Korea

Thursday, Dec. 5 3:15PM - 3:30PM Room: S405AB

Participants
Hyunchul Rhim, MD,PhD, Seoul, Korea, Republic Of (*Presenter*) Consultant, STARmed Co Ltd; Research Grant, Johnson & Johnson

For information about this presentation, contact:

rhim.hc@gmail.com

LEARNING OBJECTIVES

1) To understand 30 years history of interventional oncology in Korea. 2) To understand the current status of interventional oncology in Korea.

VSIO52-02 Radiofrequency Ablation for HCC: Where Are We?

Thursday, Dec. 5 3:30PM - 3:45PM Room: S405AB

Participants
Min Woo Lee, Seoul, Korea, Republic Of (*Presenter*) Grant, STARmed Co Ltd; Consultant, STARmed Co Ltd

For information about this presentation, contact:

leeminwoo0@gmail.com

LEARNING OBJECTIVES

1) To know recent advances in local ablation therapy of hepatocellular carcinoma (HCC). 2) To understand the importance of tumor biology and tumor location for local ablation therapy of HCCs.

VSIO52-03 Manual Versus Automated Image Fusion of Real-time Ultrasonography and MRI/CT Images for Radiofrequency Ablation of Hepatic Malignancies: Results of a Randomized Prospective Clinical Trial (NCT********)

Thursday, Dec. 5 3:45PM - 3:55PM Room: S405AB

Participants
Moon Hyung Choi, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Joon-Il Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Youngjun Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Seo Yeon Youn, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Soyoung Cho, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

dumkycji@gmail.com

PURPOSE

Automatic registration technique for imaging fusion of ultrasonography and MRI/CT can simplify the steps of imaging fusion. The purpose of this trial is to compare the technical and clinical outcomes of manual and automatic registration system for radiofrequency ablation (RFA) of hepatic malignancies.

METHOD AND MATERIALS

Inclusion criteria are 1) patients older than 40 years of age who are undergoing RFA for hepatocellular carcinoma (HCC) or colorectal cancer liver metastasis (CRLM), 2) a tumor <= 4 cm in longest diameter, number of tumors <= 3. 70 consecutive patients

(M:F=47:23, 67.1±10.9 years old) were prospectively enrolled and randomly assigned to manual or automatic registration group. Two operators performed RFA using one of two fusion techniques. Registration error, time required for image registration, number of point registrations were compared between manual and automatic registration groups. Clinical outcomes including technical success, technical effectiveness, local tumor progression (LTP)-free survival and disease-free survival (DFS) were also compared.

RESULTS

35 HCC patients were treated using the automatic registration, and 34 HCCs and 1 CRLM patient were treated using the manual registration. There was no significant difference in registration error, time required for the registration, and number of point registrations between both groups (5.7±4.3 mm, 147.8±78.2 sec and 3.26±1.20 for automatic registration, and 6.3±5.0 mm, 150.3±89.7 sec and 3.20±1.13 for manual registration, respectively). Both technical success and effectiveness rate were 97.1% for automatic registration and 100.0% for manual registration without any significant difference. LTP-free survival and DFS between both groups (14.2 months and 12.2 months, respectively, for automatic registration, and 15.6 months and 12.9 months, respectively, for manual registration) showed no significant difference during the mean follow-up period of 20.1 months.

CONCLUSION

The technical performance and clinical outcomes of the manual and automatic registration, including long-term follow-up, are comparable for RFA of hepatic malignancies.

CLINICAL RELEVANCE/APPLICATION

Considering its easy application and comparable technical and clinical outcomes, automatic imaging fusion technique can be helpful for physicians performs interventional procedures targeting hepatic lesions under US-guidance, especially for physicians with little experience.

VSIO52-04 Superselective Chemoembolization and Radioembolization: Is This Going Far Enough?

Thursday, Dec. 5 3:55PM - 4:10PM Room: S405AB

Participants
Hyo-Cheol Kim, MD, Seoul, Korea, Republic Of (*Presenter*) Speaker, Guerbet SA; Speaker, BTG International Ltd

For information about this presentation, contact:

angiointervention@gmail.com

LEARNING OBJECTIVES

1) Define superselective and ultraselective catheterization. 2) List the benefit of superselective catheterization. 3) Describe the possible pre-shaping of microcatheter and micro-guide wire. 4) Explain the dosimetry in superselective radioembolization.

VSIO52-05 Combined Treatment of Chemotherapy (Gem/nPac) and Focused Ultrasound for Unresectable Pancreatic Cancer: Prospective Study for Safety and Initial Efficacy

Thursday, Dec. 5 4:10PM - 4:20PM Room: S405AB

Participants
Jae Young Lee, MD,PhD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Do-Youn O. Oh, Seoul , Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyung-Hun O. Lee, Seoul , Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Hyub O. Lee, Seoul , Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Soo Yeon Kang, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Keonho Son, Seoul, Korea, Republic Of (*Abstract Co-Author*) Employee, Alpinion Medical Systems Co, Ltd
Joon Koo Han, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

leejy4u@gmail.com

PURPOSE

To check safety of combined treatment of focused ultrasound (FUS) and anticancer drug (Gemcitabine+nab-Paclitaxel, Gem/nPac) for patients with unresectable pancreatic cancer and determine the optimal FUS intensity by comparing efficacy

METHOD AND MATERIALS

According to FUS intensity, low (1.5 kw/cm2), intermediate (1.5 kw/cm2) and high (2.5 kw/cm2) intensity treatment groups were predefined (duty cycle of 1%, exposure time of 3 seconds, PRF of 10). Beginning low intensity, at least three patients with unresectable pancreatic cancer were designed to be enrolled in each treatment group. If adverse device effect or dose-limiting toxicity (DLT) occurred during treatment, the number of enrolled patients increased up to 6 patients in each group. The combined treatment of FUS and Gem/nPac was repeated weekly for 2 months (total 6 times) per patient. The presence of adverse effect was monitored. Tumor size change and tumor response of pancreatic cancer at follow-up CT were evaluated. CA 19-9, Karnofsky performance status, pain scale and life quality (QLQ-C30 and QLQ-PAN26) were also evaluated.

RESULTS

Each 3 patients were enrolled in each intensity treatment group (total, 9 patients). Because no adverse effects or DLT occurred in any patients, increase in number of patient enrollment was not needed. Seven of nine patients were decreased in size on immediate follow-up CT. CA 19-9 decreased in all patients. Pain scale was not changed significantly. Intermediate intensity treatment group showed tumor size decrease in all patients, partial remission (n=2) or stable disease (n=1) in tumor response and complete cancer-pain relief in two patients.

CONCLUSION

The 1.5 kW/cm2 to 2.5kw/cm2 FUS intensity with very low duty cycle were safe in the combined treatment of FUS and Gem/nab. Intermediate intensity group showed the best results in tumor size change, tumor response and pain reduction.

CLINICAL RELEVANCE/APPLICATION

1. Drug enhancement by focused ultrasound is well-established fact in many preclinical studies. This study shows the potential that FUS treatment can be used to enhance the effect of anticancer drug in clinical practices.

VSIO52-06 Image-guided Ablation in Treating Recurrent Genitourinary Tumors Following Conventional Treatments

Thursday, Dec. 5 4:20PM - 4:35PM Room: S405AB

Participants
Byung Kwan Park, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

1436park@gmail.com

LEARNING OBJECTIVES

1) To know how to do patient selection or what to tell patients prior to thermal ablation. 2) To determine what type of thermal ablations is appropriate for patients with recurrent tumors. 3) To show treatment techniques leading to successful ablation. 4) To describe how to follow patients.

ABSTRACT

Image-guided ablation is usually performed as an alternative treatment in patients with early staged cancer. This treatment technique is known to be useful in treating patients with small hepatocellular carcinoma or renal cell carcinoma. However, it is not still widely used for those who have recurrent cancers occurring after conventional treatments such as surgery, radiation therapy, and chemotherapy are done. There are very few investigations for beginners who want to perform thermal ablation in patients with recurrent cancers. The purpose of my presentation is to know how to do patient selection or what to tell patients prior to ablation treatment, to determine what type of thermal ablations is appropriate for recurrent cancers, and to show ablation techniques leading to successful treatment.

VSIO52-07 Thyroid RFA: Complications and Solutions

Thursday, Dec. 5 4:35PM - 4:50PM Room: S405AB

Participants
Jung Hwan Baek, MD,PhD, Seoul, Korea, Republic Of (*Presenter*) Consultant, STARmed Company; Consultant, RF Medical Company

For information about this presentation, contact:

radbaek@naver.com

LEARNING OBJECTIVES

1) Understand the types and incidence of complications that can occur during thyroid RFA. 2) Understand the ultrasound features of critical structures around the thyroid tumors. 3) Understand the solutions to minimize complications during thyroid RFA.

ABSTRACT

Thyroid radiofrequency ablation (RFA) is effective treatment tool for benign and malignant thyroid tumors. Generally speaking, the incidence and severity of complications are lower than surgery. However, several types of serious complications have been reported. Therefore understanding of broad spectrum of complications and solutions enables the interventional radiologists to minimize complications during thyroid RFA. In this lecture, we will discuss possible complications of thyroid RFA, related anatomy of critical structures and commplication prevention methods.

VSIO52-08 Stent Development and Application in Interventional Oncology

Thursday, Dec. 5 4:50PM - 5:05PM Room: S405AB

Participants
Ji Hoon Shin, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

jhshin@amc.seoul.kr

LEARNING OBJECTIVES

1) To understand indications and roles of various stents in the oncology field. 2) To understand limitations and complications of stents in the oncology field. 3) To know application plan of stent graft for bleeding complications in the oncology field.

VSIO52-09 Panel Discussion

Thursday, Dec. 5 5:05PM - 5:15PM Room: S405AB

MSCB52

Case-based Review of the Breast (Interactive Session)

Thursday, Dec. 5 3:30PM - 5:00PM Room: N230B

BR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Jiyon Lee, MD, Scarsdale, NY (*Director*) Nothing to Disclose

For information about this presentation, contact:

Jiyon.Lee@nyumc.org

LEARNING OBJECTIVES

1) Identify appropriate application of multi-modality breast imaging for routine screening, supplemental screening, and diagnostic indications. 2) Select appropriate methods for image-guided percutaneous biopsy and perform post-biopsy radiologic pathologic correlation for next management recommendation. 3) Review appropriateness criteria and performance benchmarks, and guidelines for ongoing breast imaging audits as they apply. 4) Appreciate the range of reassuringly common and sometimes not-so common among the international faculty's portrayal of their piece of the globe. Special presentations by PBG and DBK provide historical perspective to enable appreciation for our breast imaging subspecialty.

ABSTRACT

ABSTRACT Title: Managing expectations in breast imaging around the world. 'Best' versus sufficient? Abstract: Our case-based review course will walk and skip through the fundamentals of breast imaging. We will present how we use mammography, ultrasound, and MRI in daily screening and diagnostic scenarios, along with reminders of the overarching principles of BI-RADS lexicon for effective communication, and ACR appropriateness criteria and performance metrics as applicable or adapted around the world. Our international faculty (sessions 1 and 2) will also add depth, and the fun added dimensions of how breast imaging works around the world. Varying breast cancer statistics, possible innate ethnic variations, differing cultural expectations and socioeconomic context can and do impact how we carry out our discretionary work. Such interesting details will inform the narrative of the speakers' case scenarios, while the core diagnostic radiology skills aim to be constant, and teachable. Cases help demonstrate breast imaging now and evolving. Special historical perspectives by PBG and DBK (session 1) impress with how far we have come as a subspecialty and where we are headed for the people we serve. Please join us for smart fun!

Sub-Events

MSCB52A France: The Usual and the Bizarre of our Breast Imaging and Vacuum-assisted Breast Biopsy Findings

Participants
Foucauld Chammings, MD,PhD, Bordeaux, France (*Presenter*) Speakers Bureau, Hologic, Inc; Speakers Bureau, Devicor Medical Products, Inc;

LEARNING OBJECTIVES

1) Identify the situations where core needle biopsy might no yield reliable pathology results. 2) List the diagnostic and therapeutic indications of VABB. 3) Specify in which cases VABB can be recommended for the removal of lesions with uncertain malignant potential (B3). 4) Define the adequate technique of guidance ((ultrasound, tomosynthesis, MRI)) of vacuum-assisted breast biopsy according to imaging features.

ABSTRACT

Vacuum-assisted breast biopsy (VABB), which provides bigger specimen than core needle biopsy, is more and more used In France. Thanks to a better sampling, VABB reduces the likehood of underestimation and can provide more reliable diagnosis for some type of breast lesions This presentation shows various clinical breast cases, usual or unusual, illustrating the place and interest of VABB in breast imaging. The current diagnostic and therapeutic indications of VABB in France are reviewed and different techniques of guidance, ultrasound, tomosynthesis and MRI, are presented.

Active Handout:Foucauld Chammings

http://abstract.rsna.org/uploads/2019/19000816/Active MSCB52A.pdf

MSCB52B Croatia: Breast Imaging in a Small European Country

Participants
Boris Brkljacic, MD,PhD, Zagreb, Croatia (*Presenter*) Advisory Board Member, contextflow GmbH

For information about this presentation, contact:

boris@brkljacic.com

LEARNING OBJECTIVES

1) To present the health care system and organization of breast imaging in Croatia. 2) To present the national mammographic

screening programme running in Croatia. 3) To present several breast imaging cases from the clinical practice.

ABSTRACT

Croatia is a small central and south east European country with population of 4.2 million and with the national health care system with many similarities to the UK and other EU member states. Some 2.700 breast cancers are diagnosed annually, and 800-850 women die because of the breast cancer. National mammographic screening program is running since October 2006, with attendance rate of 60-63%. Utilization of breast ultrasound in Croatia differs compared to North America, since radiologists perform ultrasound examination themselves, and sonographers do not exist. Ultrasound is used extensivelly in addition to mammography, and all patients with mammographic breast density ACR C and D are referred to aditional sonographic examinations. Several breast imaging cases will be presented, related to mammography, ultrasound and MRI findings of different breast cancers, and different benign lesions, including unusual cases, cases of minimally invasive treatment of small breast cancers with radiofrequency ablation.

Active Handout:Boris Brkljacic

http://abstract.rsna.org/uploads/2019/19000817/Active MSCB52B.pdf

MSCB52C India: Navigating Cultural and Socio-economic Challenges in Pursuit of Global Breast Health

Participants
Shilpa V. Lad, MD, Ottawa, ON (*Presenter*) Faculty, C. R. Bard, Inc; Faculty, FUJIFILM Holdings Corporation

For information about this presentation, contact:

lad_shilpa@hotmail.com

LEARNING OBJECTIVES

1) To address the factors that are responsible for higher incidence of locally advanced breast cancer and higher mortality associated with breast cancer in India as compared to North America. 2) Does breast cancer awareness and screening for breast cancer indeed make a difference? 3) Other factors that contribute to the higher incidence of locally advanced breast cancer and higher mortality such as cultural taboos, uninsured population with economic limitations and lack of a robust public healthcare system. 4) To understand the outcomes of no screening in a world where screening for breast cancer is constantly debated.

ABSTRACT

Breast cancer in India is more serious than one can imagine. Although the incidence of breast cancer in India (1 in 22) is lower than that in North America (1 in 8) , the mortality associated with breast cancer is much higher in India (50%). One of the primary reasons for the high mortality is locally advanced breast cancer at diagnosis. The reason for this is multifactorial. Lack of breast cancer awareness, lack of a standardised breast screening program, cultural taboos and financial constraints. In other words awareness & screening are key factors for timely diagnosis. The success story in North America is due to early diagnosis which is a result of awareness and screeing.

Active Handout:Shilpa Vidyadhar Lad

http://abstract.rsna.org/uploads/2019/19000818/Active MSCB52C.pdf

MSCB52D Breast Imaging Challenges in the World's Most Populous Country: China

Participants
Dengbin Wang, MD, Shanghai, China (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To get knowledge from the Chinese cases in which there may be some dense breast management issues, big mass, and novel technology applications as well. 2) The multimodality technologies are supposed to be implemented for the cases in the lecture. 3) Some rare cases will be delivered and it should be good to know them.

ABSTRACT

The lecture will present a couple of cases really from Chinese domestic Hospital (Xinhua Hospital, Shanghai Jiao Tong University School of Medicine). The full field digital mammography, DBT, ultrasound, and MRI will be introduced for the clinical applications in the breast cases including benign and maligant tumors. Some cases will be involved in the management of dense breasts in China. Some may have a big palpable mass which should be rare in the Western countries. As usual, some handout materials will be provided for the background in China.

Active Handout:Dengbin Wang

http://abstract.rsna.org/uploads/2019/19000819/Active MSCB52D.pdf

Handout:Dengbin Wang

http://abstract.rsna.org/uploads/2019/19000819/Active MSCB52D.pdf

MSCU52

Case-based Review of Ultrasound (Interactive Session)

Thursday, Dec. 5 3:30PM - 5:00PM Room: E450B

US

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Deborah J. Rubens, MD, Rochester, NY (*Director*) Nothing to Disclose

For information about this presentation, contact:

Deborah_rubens@urmc.rochester.edu

LEARNING OBJECTIVES

1) Learn current techniques and advances in ultrasound imaging. 2) Become familiar with current guidelines for diagnosis and management of imaging findings. 3) Review critical physiology and pathology as it is depicted by ultrasound. 4) Understand the vital role of Ultrasound imaging in optimum patient care.

ABSTRACT

This course is designed to highlight the vital role ultrasound plays in imaging and diagnosis throughout the body. Special emphasis will be placed on technical advances including ultrasound contrast and elastography and interventional guidance. A wide range of applications will be covered including vascular, general abdominal, pediatric, gynecologic, small parts and obstetrical ultrasound. Our goal is to providfe a broad update in the field while addressing new opportunities and challenges for everyday practice.

Sub-Events

MSCU52A Ultrasound Advances: Elastography and Contrast

Participants
Richard G. Barr, MD, PhD, Campbell, OH (*Presenter*) Consultant, Siemens AG; Consultant, Koninklijke Philips NV; Research Grant, Siemens AG; Research Grant, SuperSonic Imagine; Speakers Bureau, Koninklijke Philips NV; Research Grant, Bracco Group; Speakers Bureau, Siemens AG; Consultant, Canon Medical Systems Corporation; Research Grant, Esaote SpA; Research Grant, BK Ultrasound; Research Grant, Hitachi, Ltd

LEARNING OBJECTIVES

1) Learn how to differentiate benign from malignant breast lesions using elastography. 2) Be able to characterize focal liver lesions with contrast enhanced ultrasound. 3) Be able to characterize indeterminate renal masses with contrast enhanced ultrasound.

MSCU52B Vascular Ultrasound

Participants
Leslie M. Scoutt, MD, Essex, CT (*Presenter*) Speaker, Koninklijke Philips NV

For information about this presentation, contact:

leslie.scoutt@yale.edu

LEARNING OBJECTIVES

1) Describe the role of US in evaluating an arteriovenous fistula that is failing to mature. 2) Discuss the approach to evaluating a patient following carotid stent placement to assess for complications including in-stent restenosis. 3) Describe unusual carotid and mesenteic pathology.

ABSTRACT

Uunusual vascular pathology will be presented in a case based format

MSCU52C Pediatric Ultrasound

Participants
Harriet J. Paltiel, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn current techniques and advances in ultrasound imaging. 2) Become familiar with current guidelines for diagnosis and management of imaging findings. 3) Review critical physiology and pathology as it is depicted by ultrasound. 4) Understand the vital role of Ultrasound imaging in optimum patient care.

MSCU52D Gynecologic and Endovaginal Ultrasound

Participants
Mindy M. Horrow, MD, Philadelphia, PA (*Presenter*) Spouse, Employee, Merck & Co, Inc

For information about this presentation, contact:

horrowm@einstein.edu

LEARNING OBJECTIVES

1) Review O-RADS descriptors for common adnexal masses. 2) Appreciate typical, atypical appearance of ovarian/adnexal torsion.

ABSTRACT

Highlight several seminal uses of ultrasound for imaging of gynecologic diagnoses.

Printed on: 10/29/20

RC701

Imaging and Management of Patients with Lung Cancer

Thursday, Dec. 5 4:30PM - 6:00PM Room: E451A

CH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Girish S. Shroff, MD, Houston, TX (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

gshroff@mdanderson.org

Sub-Events

RC701A Lung Nodule Management

Participants
Jin Mo Goo, MD, PhD, Seoul, Korea, Republic Of (*Presenter*) Research Grant, INFINITT Healthcare Co, Ltd; Research Grant, DONGKOOK Pharmaceutical Co, Ltd;

For information about this presentation, contact:

jmgoo@plaza.snu.ac.kr

LEARNING OBJECTIVES

1) List the major components in determining lung nodule management. 2) Compare the management guidelines for lung cancer screening and those for incidental nodules. 3) Describe how to measure lung nodules at CT.

RC701B Lung Cancer Staging: TNM 8th Edition

Participants
Girish S. Shroff, MD, Houston, TX (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

gshroff@mdanderson.org

LEARNING OBJECTIVES

1) Review the TNM-8 classification for lung cancer.

RC701C Imaging of Precision Therapy in Lung Cancer: Recent Advances and Updates

Participants
Mizuki Nishino, MD, Newton, MA (*Presenter*) Institutional Research Grant, Merck & Co, Inc; Institutional Research Grant, Canon Medical Systems Corporation; Institutional Research Grant, AstraZeneca PLC; Consultant, DAIICHI SANKYO Group; Research Grant, DAIICHI SANKYO Group; Consultant, AstraZeneca PLC

For information about this presentation, contact:

mizuki_nishino@dfci.harvard.edu

LEARNING OBJECTIVES

1) Describe the recent advances of precision therapy for lung cancer and their implications on imaging. 2) Understand the emerging approaches in biomarker and genomic analyses of lung cancer with correlative imaging observations. 3) Function as a key member of multidisciplinary team with the up-to-date knowledge in the rapidly evolving world of lung cancer.

RC701D Radiomics in Lung Cancer: Opportunities and Challenges

Participants
Anastasia Oikonomou, MD,PhD, Toronto, ON (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

anastasia.oikonomou@sunnybrook.ca

LEARNING OBJECTIVES

1) To understand the concept of radiomics and the steps of radiomics analysis based on medical images for lung cancer. 2) To learn about the most significant opportunities and challenges related to radiomics analysis. 3) To discuss the positive impact of these opportunities in the future and ways to overcome the challenges related to radiomics.

RC701E Lung Biopsy in the Era of Personalized Medicine

Participants
Joseph G. Mammarappallil, MD,PhD, Durham, NC (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

joseph.mammarappallil@duke.edu

LEARNING OBJECTIVES

1) Identify the imaging characteristics for pulmonary lesions that make them suspicious for neoplasm. 2) Evaluate the role of percutaneous biopsy in the current era of thoracic oncologic treatment. 3) Determine safety and efficacy of percutaneous lung biopsy to obtain tissue for molecular diagnostics.

Printed on: 10/29/20

RC702

Assessment in Education

Thursday, Dec. 5 4:30PM - 6:00PM Room: S401CD

ED

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Sheryl G. Jordan, MD, Chapel Hill, NC (*Moderator*) Nothing to Disclose
Tara M. Catanzano, MD, Springfield, MA (*Moderator*) Nothing to Disclose

Sub-Events

RC702A Assessing Procedural Skills

Participants
Eric M. Goodman, MD, Mineola, NY (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

egoodman2@northwell.edu

LEARNING OBJECTIVES

1) Define procedural assessment and examine how it differs from cognitive assessment. 2) Compare and contrast different methods of procedural assessment. 3) Integrate the use of objective procedural assessment into the education of medical students, residents, and fellows.

RC702B Mirror, Mirror: Assessing our Own Teaching Skills

Participants
Teresa Chapman, MD,MA, Seattle, WA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

Teresa.chapman@seattlechildrens.org

LEARNING OBJECTIVES

1) Contemplate the specific components of your didactic lectures that boost your trainees' skills. 2) Develop three new questions on your lecture evaluations that will generate information that can improve your next lecture. 3) Generate a dialogue and pattern of engagement with your trainees that will provide you feedback on your teaching at the workstation.

RC702C Item Writing Workshop

Participants
Sheryl G. Jordan, MD, Chapel Hill, NC (*Presenter*) Nothing to Disclose
Tara M. Catanzano, MD, Springfield, MA (*Presenter*) Nothing to Disclose

RC703

CT of Structural Heart Disease: Guiding Interventional Procedures

Thursday, Dec. 5 4:30PM - 6:00PM Room: E350

CA CT IR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Eric E. Williamson, MD, Rochester, MN (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the changes in the most recent guidelines for the use of CTA in TAVR. 2) Apply these to reproducibly quantify the annulus, root, and sinus features of the valve. 3) Develop a technique to translate these techniques into non-standard root anatomy such as in patients with bicuspid aortic valves. 4) Stratify the risk of complications from TAVR based on the CT features. 4) To review the role of MDCT for the diagnosis and characterization of mitral regurgitation. 5) Discuss the role of MDCT to guide transcatheter mitral interventions. 6) Review the ongoing limitations and challenges with regards to procedural planning and resultant opportunities for improved imaging guidance.

Sub-Events

RC703A TAVR Planning: Review of the Guidelines

Participants
Jonathan Weir-McCall, MBBCh, FRCR, Vancouver, United Kingdom (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

jweirmccall@gmail.com

LEARNING OBJECTIVES

1) Identify the changes in the most recent guidelines for the use of CTA in TAVR. 2) Apply these to reproducibly quantify the annulus, root, and sinus features of the valve. 3) Develop a technique to translate these techniques into non-standard root anatomy such as in patients with bicuspid aortic valves. 4) Stratify the risk of complications from TAVR based on the CT features.

RC703B Planning Mitral Interventions

Participants
Jonathon A. Leipsic, MD, Vancouver, BC (*Presenter*) Speakers Bureau, General Electric Company Speakers Bureau, Edwards Lifesciences Corporation Consultant, Heartflow, Inc Consultant, Circle Cardiovascular Imaging Inc Consultant, Edwards Lifesciences Corporation Consultant, Neovasc Inc Consultant, Samsung Electronics Co, Ltd Consultant, Koninklijke Philips NV Consultant, Arineta Ltd Consultant, Pi-Cardia Ltd

For information about this presentation, contact:

jleipsic@providencehealth.bc.ca

LEARNING OBJECTIVES

1) To review the role of MDCT for the diagnosis and characterization of mitral regurgitation. 2) Discuss the role of MDCT to guide transcatheter mitral interventions. 3) Review the ongoing limitations and challenges with regards to procedural planning and resultant opportunities for improved imaging guidance.

RC703C Left Atrial Appendage Closure

Participants
Prabhakar Rajiah, MD, FRCR, Dallas, TX (*Presenter*) Royalties, Reed Elsevier

RC704

Advanced Imaging of Arthritis

Thursday, Dec. 5 4:30PM - 6:00PM Room: S402AB

MR MK

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Thomas M. Link, MD, PhD, San Francisco, CA (*Director*) Research Grant, General Electric Company; Research Consultant, General Electric Company; Research Consultant, InSightec Ltd; Research Grant, InSightec Ltd; Consultant, Springer Nature; Research Consultant, Pfizer Inc;

For information about this presentation, contact:

thomas.link@ucsf.edu

LEARNING OBJECTIVES

1) Specify a systematic approach to classify inflammatory and degenerative arthropathies. 2) Identify pitfalls in interpreting imaging studies obtained in inflammatory arthropathies. 3) Describe imaging findings in spondylarthropathies with a focus on MRI. 4) Develop cartilage mapping protocols that can be implemented in clinical practice. 5) Apply advanced osteoarthritis imaging techniques clinically.

Sub-Events

RC704A My Approach to Imaging of Arthritis

Participants
Thomas M. Link, MD, PhD, San Francisco, CA (*Presenter*) Research Grant, General Electric Company; Research Consultant, General Electric Company; Research Consultant, InSightec Ltd; Research Grant, InSightec Ltd; Consultant, Springer Nature; Research Consultant, Pfizer Inc;

For information about this presentation, contact:

thomas.link@ucsf.edu

LEARNING OBJECTIVES

1) Differentiate inflammatory and degenerative arthropathies based on the anatomic location of findings. 2) Identify radiographic findings in arthropathies and list their differential diagnoses. 3) Classify MRI findings in inflammatory and degenerative arthropathies.

RC704B Pitfalls of Inflammatory Arthritis Imaging

Participants
Connie Y. Chang, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

cychang@mgh.harvard.edu

LEARNING OBJECTIVES

1) To know the differential diagnosis for inflammatory arthritis in large and small joints. 2) To analyze the distinguishing clinical and imaging features of the inflammatory arthritis pitfalls. 3) To apply this knowledge to formulating recommendations for next steps (imaging, clinical tests).

RC704C Imaging of Spondyloarthritis

Participants
Robert G. Lambert, MBBCh, Edmonton, AB (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

rlambert@ualberta.ca

LEARNING OBJECTIVES

1) Describe the imaging findings commonly seen in spondylarthritis with a focus on MRI. 2) Distinguish the patterns of disease that occur in spondyloarthritis from degeneration. 3) Identify pitfalls in interpreting imaging studies obtained in spondylarthritis.

RC704D Implementing Cartilage Mapping in Clinical Practice

Participants
Carl S. Winalski, MD, Rocky River, OH (*Presenter*) Institutional service agreement, Medical Metrics, Inc Institutional service

agreement, BioClinica, Inc Institutional service agreement, PAREXEL International Corporation Institutional service agreement, CartiHeal Ltd Shareholder, Pfizer Inc Spouse, Shareholder, General Electric Company

For information about this presentation, contact:

winalsc@ccf.org

RC704E Advanced Techniques in Osteoarthritis Imaging

Participants
Shadpour Demehri, MD, Baltimore, MD (*Presenter*) Research support, General Electric Company; Research Grant, Carestream Health, Inc; Consultant, Toshiba Corporation

For information about this presentation, contact:

sdemehr1@jhmi.edu

LEARNING OBJECTIVES

1) To evaluate advanced imaging based biomarkers for diagnosis and risk assessment for OA outcomes. 2)To list the MRI-based anatomical imaging techniques for cartilage imaging. 3) To introduce novel CT imaging techniques for OA imaging and their potential role in routine clinical practice.

Printed on: 10/29/20

RC705

What's in the Pipeline for Neuro MRI?

Thursday, Dec. 5 4:30PM - 6:00PM Room: E451B

MR NR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Michael M. Zeineh, PhD, MD, Stanford, CA (*Moderator*) Research funded, General Electric Company;

For information about this presentation, contact:

mzeineh@stanford.edu

LEARNING OBJECTIVES

1) Develop a framework for task-based fMRI for language mapping. 2) Assess what resting state fMRI can accomplish as an alternative. 3) Define clinical applications of quantitative susceptibility mapping (QSM). 4) Identify real-world clinical applications of advanced diffusion imaging beyond DWI and DTI. 5) Identify patient selection and training considerations for fMRI. 6) Develop guidelines for paradigm and sequence decisions. 7) Describe quality control aspects of data processing. 8) Assess activation in key eloquent brain regions. 9) Specify the relevant information concisely. 10) Explain how information about intrinsic brain networks are generated from resting state fMRI. 11) Define common analysis methods for resting state fMRI data. 12) Describe pitfalls in the processing, analysis, and interpretation of resting state fMRI data. 13) Identify potential clinical applications of resting state fMRI. 14) Describe the benefits of using 7T field strength for imaging susceptibility. 15) Explain the challenges associated with quantification of susceptibility. 16) Assess the benefits of using quantitative susceptibility imaging methods in neurodegenerative disease. 17) Identify which brain regions most commonly experience changes in susceptibility due to neurodegenerative diseases. 18) Examine the role of iron deposition in predicting symptom severity, disease burden, and cognitive impairment. 19) Describe how the diffusion MRI signal is sensitive to brain cellular features. 20) Define the concepts of diffusion tensor imaging (DTI) and tractography. 21) Identify the benefits of higher order methods and how to implement them in clinic. 22) Assess how specificity to cellular pathology is attained through biophysical modeling. 23) Compare popular biophysical models (WMTI, NODDI) and their use in clinical applications.

Sub-Events

RC705A Task-based Language fMRI in 20 Minutes

Participants
Michael M. Zeineh, PhD, MD, Stanford, CA (*Presenter*) Research funded, General Electric Company;

For information about this presentation, contact:

mzeineh@stanford.edu

LEARNING OBJECTIVES

1) Identify patient selection and training considerations for fMRI. 2) Develop guidelines for paradigm and sequence decisions. 3) Describe quality control aspects of data processing. 4) Assess activation in key eloquent brain regions. 5) Specify the relevant information concisely.

RC705B Resting State fMRI in 20 Minutes

Participants
Haris I. Sair, MD, Baltimore, MD (*Presenter*) Research Grant, Tocagen

LEARNING OBJECTIVES

1) Explain how information about intrinsic brain networks are generated from resting state fMRI. 2) Define common analysis methods for resting state fMRI data. 3) Describe pitfalls in the processing, analysis, and interpretation of resting state fMRI data. 4) Identify potential clinical applications of resting state fMRI.

RC705C 7T Susceptibility and Neurodegenerative Disorders

Participants
Janine M. Lupo, PhD, San Francisco, CA (*Presenter*) Grant, General Electric Company

LEARNING OBJECTIVES

1) Describe the benefits of using 7T field strength for imaging susceptibility. 2) Explain the challenges associated with quantification of susceptibility. 3) Assess the benefits of using quantitative susceptibility imaging methods in neurodegenerative disease. 4) Identify which brain regions most commonly experience changes in susceptibility due to neurodegenerative diseases. 5) Examine the role of iron deposition in predicting symptom severity, disease burden, and cognitive impairment.

RC705D Clinical Applications of Advanced Diffusion MRI

Participants
Els Fieremans, PhD, New York, NY (*Presenter*) Scientific Advisory Board, Microstructure Imaging, Inc; Stockholder, Microstructure Imaging, Inc; Royalties, General Electric Company

For information about this presentation, contact:

Els.Fieremans@nyulangone.org

LEARNING OBJECTIVES

1) Describe how the diffusion MRI signal is sensitive to brain cellular features. 2) Define the concepts of diffusion tensor imaging (DTI) and tractography. 3) Identify the benefits of higher order methods and how to implement them in clinic. 4) Assess how specificity to cellular pathology is attained through biophysical modeling. 5) Compare popular biophysical models (WMTI, NODDI) and their use in clinical applications.

Printed on: 10/29/20

RC706

Essentials of Orbital Imaging

Thursday, Dec. 5 4:30PM - 6:00PM Room: E353C

HN NR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Sub-Events

RC706A Orbital and Ocular Anatomy and Trauma

Participants
Kristine M. Mosier, DMD, PhD, Indianapolis, IN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify relevant ocular and orbital anatomy important to classification or staging in the trauma setting. 2) Classify ocular and orbital trauma. 3) Identify emergent and non-emergent findings and what the emergency physician or ophthalmologist/oculoplastics surgeon needs to know.

RC706B Orbital and Ocular Inflammation

Participants
Mary Beth E. Cunnane, MD, Boston, MA (*Presenter*) Nothing to Disclose

RC706C Orbital and Ocular Tumors

Participants
Ashok Srinivasan, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

ashoks@med.umich.edu

LEARNING OBJECTIVES

1) To discuss the differential diagnosis of orbital and ocular tumors with emphasis on clinical presentation and imaging features.

RC706D The Radiology of Vision Loss and Diplopia

Participants
Ilona M. Schmalfuss, MD, Gainesville, FL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the location and course of cranial nerves 2, 3, 4 and 6 and their relation to pertinent adjacent anatomical structures. 2) Analyze CT or MRI studies to determine the most likely diagnosis causing the neuropathy of cranial nerves 2, 3, 4 and 6.

RC707

Advances in Imaging of Small Incidental Renal Masses (Including Cancers): Implications for Management

Thursday, Dec. 5 4:30PM - 6:00PM Room: E353B

GU OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Nicole M. Hindman, MD, New York, NY (*Presenter*) Nothing to Disclose
Matthew S. Davenport, MD, Ann Arbor, MI (*Presenter*) Royalties, Wolters Kluwer nv
Nicola Schieda, MD, Ottawa, ON (*Presenter*) Nothing to Disclose
Stuart G. Silverman, MD, Brookline, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

sgsilverman@partners.org

Nicole.Hindman@nyulangone.org

LEARNING OBJECTIVES

1) Recommend appropriate management for the incidental renal mass using the latest guidelines. 2) Generate a comprehensive evaluation of indeterminate renal masses using a novel structured report. 3) Predict malignant subtypes of renal cancers (and differentiate from benign masses) using new developments in CT and MRI. 4) Manage small renal masses, including select renal cancers, with active surveillance based on imaging and biopsy.

RC708

Emergency Imaging of 'At Risk' Populations

Thursday, Dec. 5 4:30PM - 6:00PM Room: N227B

ER PD

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Koenraad H. Nieboer, MD, Jette, Belgium (*Moderator*) Speakers Bureau, General Electric Company

Sub-Events

RC708A Imaging of Nonaccidental Trauma in Children

Participants
Steven L. Blumer, MD, MBA, Wilmington, DE (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

sblumermd@gmail.com

LEARNING OBJECTIVES

1) To review the incidence of Nonaccidental Trauma in the pediatric population. 2) To review the suggested imaging workup of children with suspected Nonaccidental Trauma. 3) To review the major imaging findings of Nonaccidental Trauma on imaging studies.

RC708B Making the Invisible Visible: Bringing Intimate Partner Violence in Focus

Participants
Bharti Khurana, MD, Brookline, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

bkhurana@bwh.harvard.edu

LEARNING OBJECTIVES

1) Review the high prevalence of Intimate Partner Violence (IPV) and the barriers linked to underreporting. 2) Understand the key role that radiologist can play in the identification of IPV victims and contribute to multi-dimensional clinical support tool. 3) Recognize the common injury patterns and imaging utilization in IPV victims. 4) Become aware of AI integration in developing multidimensional clinical support tool for IPV detection.

RC708C Imaging of Geriatric Trauma

Participants
Koenraad H. Nieboer, MD, Jette, Belgium (*Presenter*) Speakers Bureau, General Electric Company

For information about this presentation, contact:

koenraad.nieboer@uzbrussel.be

LEARNING OBJECTIVES

1) Decide whether it is advisable to administer contrast media in elderly patients with an unknown renal function during a polytrauma CT scan. 2) Recognizing typical trauma mechanisms in the elderly. 3) Have knowledge of advanced CT techniques for optimal imaging for trauma in the elderly.

RC709

LI-RADS Update (Interactive Session)

Thursday, Dec. 5 4:30PM - 6:00PM Room: S406A

GI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Special Information

This is an interactive session. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

Sub-Events

RC709A Major LI-RADS Features

Participants
Kathryn J. Fowler, MD, San Diego, CA (*Presenter*) Consultant, 12 Sigma Technologies; Researcher, Nuance Communications, Inc; Contractor, Midamerica Transplant Services; ;

For information about this presentation, contact:

k1fowler@ucsd.edu

LEARNING OBJECTIVES

1) Review the LI-RADS major features of HCC. 2) Understand the operational definitions of major features. 3) Understand the unequivocal requirement of major features and interplay of major features and LR-M features.

ABSTRACT

NA

RC709B Ancillary LI-RADS Features

Participants
Victoria Chernyak, MD,MS, Bronx, NY (*Presenter*) Consultant, Bayer AG

For information about this presentation, contact:

vichka17@hotmail.com

LEARNING OBJECTIVES

1) To learn the appearance, biological rationale and scientific evidence supporting use of ancillary features (AFs) in LI-RADS categorization. 2) To know and correctly use the rules for application of the AFs in LI-RADS v2018. 3) To apply the knowledge of AFs and their applications for various practice cases.

RC709C LI-RADS Treatment Response

Participants
Richard Kinh Gian Do, MD,PhD, New York, NY (*Presenter*) Consultant, Bayer AG; Author, Reed Elsevier; Spouse, Author, Wolters Kluwer nv; Spouse, Data Monitoring Committee, Alk Abello

LEARNING OBJECTIVES

1) Identify differences and similarities between locoregional therapies for HCC. 2) Compare response criteria for HCC. 3) Apply the LI-RADS Treatment Response Algorithm.

ABSTRACT

HCC treatment response to locoregional therapy is assessed routinely by diagnostic radiologists. However, assessment of treatment response is complicated by the proliferation of response criteria and guidelines in recent years. Differences between locoregional therapies, from radiofrequency ablation for solitary masses to transarterial radioembolization of entire lobes, further complicate standardization of response assessment. This lecture will provide an overview of commonly used locoregional therapies for HCC and compare existing response criteria, such as Response Evaluation in Solid Tumors (RECIST) and modified RECIST. These provide context for the recent development of the LI-RADS Treatment Response Algorithm, which will be illustrated in selected cases.

RC709D Challenging LI-RADS Topics

Participants
Mustafa R. Bashir, MD, Cary, NC (*Presenter*) Research Grant, Siemens AG; Research Grant, NGM Biopharmaceuticals, Inc; Research Grant, Madrigal Pharmaceuticals, Inc; Research Grant, Metacrine, Inc; Research Grant, Pinnacle Clinical Research; Research Grant, ProSciento Inc; Research Grant, Carmot Therapeutics; Research Grant, 1Globe Health Institute; Research Consultant, ICON plc;

LEARNING OBJECTIVES

1) Review challenging topics in 2017 CT/MRI LI-RADS, including hepatobiliary agents, LR-M criteria, and the patient populations in

which LI-RADS is/is not applicable.

ABSTRACT

2017 CT/MRI LI-RADS provides guidelines for diagnosis of hepatocellular carcinoma and risk stratification of hepatocellular nodules that are not clearly malignant. However, the assessment of patients who may or may not be at elevated risk for developing hepatocellular carcinoma is more nuanced and requires an understanding of a number of additional concepts. This discussion will focus on the use of hepatobiliary contrast agents, the diagnosis of non-hepatoceillular malignancy, and patient populations in which LI-RADS should or should not be applied.

Printed on: 10/29/20

RC710

Second and Third Trimester Obstetrical Ultrasound

Thursday, Dec. 5 4:30PM - 6:00PM Room: S103CD

GU OB US

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

LEARNING OBJECTIVES

1) Understand how measurements can be used in obstetrical ultrasound. 2) Know which measurements should be used routinely in obstetrical ultrasound. 3) Know how to determine gestational age and estimate fetal weight. 4) To diagnose placenta previa. 5) To diagnose vasa previa. 6) To diagnose morbidly adherent placenta. 6) Identify chorionicity and amnionicity in multiple gestations. 7) Detect complications of monochorionic placentation. 8 Identify those cases that need referral for prenatal intervention.

Sub-Events

RC710A OB Measurements

Participants
Peter M. Doubilet, MD, PhD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

pdoubilet@gmail.com

LEARNING OBJECTIVES

1) Understand how measurements can be used in obstetrical ultrasound. 2) Know which measurements should be used routinely in obstetrical ultrasound. 3) Know how to determine gestational age and estimate fetal weight.

Active Handout:Peter Michael Doubilet

http://abstract.rsna.org/uploads/2019/18000732/Active RC710A.pdf

RC710B Pregnancy Support Structures: Placenta and Umbilical Cord

Participants
Paula J. Woodward, MD, Salt Lake City, UT (*Presenter*) Editor, Reed Elsevier

LEARNING OBJECTIVES

1) Distinguish low-lying placenta from placenta previa. 2) Confidently diagnose vasa previa. 3) Recognize findings in placenta accreta spectrum and their clinical implication.

ABSTRACT

The placenta and umbilical cord are quite literally the lifeline for the developing fetus. Abnormalities in either can adversely affect the pregnancy and pose a significant risk of morbidity or mortality to either the fetus or mother at the time of delivery.

RC710C Multiple Gestations

Participants
Anne M. Kennedy, MD, Salt Lake City, UT (*Presenter*) Author with royalties, Reed Elsevier

For information about this presentation, contact:

anne.kennedy@hsc.utah.edu

LEARNING OBJECTIVES

1) Identify chorionicity and amnionicity in multiple gestations. 2) Detect complications of monochorionic placentation. 3) Identify those cases that need referral for prenatal intervention.

Active Handout:Anne M. Kennedy

http://abstract.rsna.org/uploads/2019/18000734/Active RC710C.pdf

RC711

Advances and Updates in SPECT/CT

Thursday, Dec. 5 4:30PM - 6:00PM Room: S504CD

CT NM

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Sub-Events

RC711A SPECT/CT in Infection and Inflammation

Participants
Christopher J. Palestro, MD, New Hyde Park, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Interpret SPECT/CT performed for suspected inflammation/infection to determine their precise location and extent. 2) Compare available radiopharmaceuticals and imaging modalities for specific clinical indications in the assessment of inflammation and infection. 3) Recognize and avoid pitfalls in interpretation of SPECT/CT studies performed for inflammation and infection.

RC711B SPECT/CT Oncology and Endocrinology

Participants
Esma A. Akin, MD, Washington, DC (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

eakin@mfa.gwu.edu

LEARNING OBJECTIVES

1) To describe indications of using SPECT-CT imaging in endocrine and neuroendocrine tumors. 2) Observe case examples of common and uncommon presentations of these disease entities in daily clinical practice.

RC711C SPECT/CT Technology: State of the Art

Participants
Timothy Turkington, PhD, Durham, NC (*Presenter*) Consultant, Data Spectrum Corporation

LEARNING OBJECTIVES

1) To be able to provide a basic description of SPECT imaging. 2) To be able to describe at least two factors that limit SPECT imaging and how new technologies are helping to mitigate those factors.

RC712

CTA for TAVR and Other Aortic Valve Replacements

Thursday, Dec. 5 4:30PM - 6:00PM Room: E352

CA CT VA

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Karen G. Ordovas, MD, Seattle, WA (*Moderator*) Advisor, Arterys Inc;
Jean Jeudy JR, MD, Baltimore, MD (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

jjeudy@som.umaryland.edu

Sub-Events

RC712A Pre-TAVR CT Imaging Protocols

Participants
Dominique C. DaBreo, BMedSc,FRCPC, Kingston, ON (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Develop optimal protocols for performance of CT angiograms for pre-TAVR planning. 2) Describe ways to approach pre-TAVR CT scans in the challenging, such as in the setting of arrhythmias or renal dysfunction.

RC712B CTA for Sizing Transcatheter Heart Valves

Participants
Karen G. Ordovas, MD, Seattle, WA (*Presenter*) Advisor, Arterys Inc;

RC712C Aortic Valve Assessment in the Post-TAVR Patient

Participants
Jean Jeudy JR, MD, Baltimore, MD (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

jjeudy@som.umaryland.edu

RC712D CT for the Evaluation of Surgical Bioprostheses

Participants
Dominika Sucha, MD,PhD, Utrecht, Netherlands (*Presenter*) Nothing to Disclose

RC713

Read Cases with Experts

Thursday, Dec. 5 4:30PM - 6:00PM Room: E351

GU OB PD

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Sub-Events

RC713A Fetal Neuro Cases

Participants
Beth M. Kline-Fath, MD, Cincinnati, OH (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

beth.kline-fath@cchmc.org

LEARNING OBJECTIVES

1) To reinforce discriminating between normal and abnormal development. 2) To present pathologies with regard to the supratentorial and infratentorial brain to familiarize the audience with common and rare entities that are relevant to clinical practice. 3) To review a patterned approach and critical thinking skills necessary for correct diagnosis.

ABSTRACT

Cases of central nervous system fetal pathology will be presented. The fetal brain changes dramatically during gestation.

RC713B Fetal Lung Cases

Participants
Amy R. Mehollin-Ray, MD, Pearland, TX (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

armeholl@texaschildrens.org

LEARNING OBJECTIVES

Review fetal imaging cases that highlight a variety of pathologies which occur in the fetal chest. Apply an organized approach to evaluating and diagnosing fetal lung malformations. Recognize complications and improve awareness of fetal and postnatal therapies.

RC713C Fetal GI Cases

Participants
Teresa Victoria, MD,PhD, Philadelphia, PA (*Presenter*) Nothing to Disclose

RC714

Morbidity and Mortality

Thursday, Dec. 5 4:30PM - 6:00PM Room: S502AB

IR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Eric J. Hohenwalter, MD, Milwaukee, WI (*Moderator*) Consultant, BTG International Ltd
Brian S. Funaki, MD, Riverside, IL (*Moderator*) Speaker, Canon Medical Systems Corporation

Sub-Events

RC714A Oncologic M&M

Participants
Eric J. Hohenwalter, MD, Milwaukee, WI (*Presenter*) Consultant, BTG International Ltd

LEARNING OBJECTIVES

1) To explain common errors leading to M&M in non-vascular intervention. 2) To develop a contingency plan for complications which occur in non vascular intervention.

RC714B Memorable M&M Cases

Participants
Alan H. Matsumoto, MD, Charlottesvle, VA (*Presenter*) Grant, W. L. Gore & Associates, Inc; Grant, Medtronic plc; Grant, Cook Group Incorporated; Grant, Insightec Ltd; Research Grant, IBM Corporation; Data Safety Monitoring Board, W. L. Gore & Associates, Inc; Data Safety Monitoring Board, Endologix, Inc; Data Safety Monitoring Board, Boston Scientific Corporation; Data Safety Monitoring Board, Penumbra, Inc; Data Safety Monitoring Board, Proteon Therapeutics, Inc; Stockholder, BrightWater Medical; Scientific Advisory Board, Boston Scientific Corporation; Advisory Board, Vascular Medcure; Advisory Board, Proteon Therapeutics, Inc; Advisory Board, BrightWater Medical; Advisory Board, Tenex Medical; Stock options, Tenex Medical; Stockholder, Volcano Medical;

LEARNING OBJECTIVES

1) Understand how errors in judgment can contribute to complications. 2) Understand how perception failures can contribute to complications. 3) Understand how to recognize serious complications. 4) Understand how to manage complications in IR.

RC714C Vascular M&M

Participants
John A. Kaufman, MD, Portland, OR (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

kaufmajo@ohsu.edu

LEARNING OBJECTIVES

1) Identify arterial and venous vascular complications. 2) Describe management of the complications. 3) Discuss strategies to avoid complications.

RC714D Nonvascular M&M

Participants
Brian S. Funaki, MD, Riverside, IL (*Presenter*) Speaker, Canon Medical Systems Corporation

LEARNING OBJECTIVES

1) To list common errors which lead to complications in non-vascular interventions.

RC715

New Science: A Bridge to Breast Cancer Screening

Thursday, Dec. 5 4:30PM - 6:00PM Room: S102CD

BR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Elizabeth S. Burnside, MD,MPH, Madison, WI (*Moderator*) Research Grant, Hologic, Inc

For information about this presentation, contact:

zuleyml@upmc.edu

LEARNING OBJECTIVES

1) Understand that new evidence dispels persistent myths and reasserts the effectiveness of mammography screening. 2) Appreciate that we can address current challenges for breast cancer screening acceptance by decreasing harms and advancing novel solutions. 3) Recognize that using social determinants to drive efficient delivery and decrease disparities has the potential to improve breast cancer screening, save lives, and elevate program effectiveness.

Sub-Events

RC715A New Science

Participants
Robert A. Smith, PhD, Atlanta, GA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

robert.smith@cancer.org

RC715B Screening Perspective: Current and Future Issues

Participants
Mark A. Helvie, MD, Ann Arbor, MI (*Presenter*) Institutional Grant, General Electric Company; Institutional Grant, IBM Corporation

LEARNING OBJECTIVES

1) Review current challenges for breast cancer screening acceptance. 2) Describe methods to decrease screening adverse risks (harms). 3) To consider future directions for screening.

RC715C Healthcare Delivery, Social Determinant, and Disparities

Participants
Elizabeth S. Burnside, MD,MPH, Madison, WI (*Presenter*) Research Grant, Hologic, Inc

LEARNING OBJECTIVES

1) Understand why the delivery of breast cancer screening services is generally more important than technology available. 2) Appreciate that disparities in breast cancer screening not only miss opportunities to save lives but also cast doubt on technical and program effectiveness. 3) Recognize that risk factors and social determinants have the potential to improve delivery, save lives, and elevate program effectiveness.

RC716

Patient and Physician Communication in the Digital Era (Sponsored by the RSNA Public Information Committee)

Thursday, Dec. 5 4:30PM - 6:00PM Room: N229

LM

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Susan D. John, MD, Houston, TX (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

laurabancroftmd@gmail.com

LEARNING OBJECTIVES

1) Create patient friendly reports. 2) Use available technology to improve communication and create patient-friendly radiology reports. 3) Leverage enterprise IT to improve radiology communication and collaboration.

ABSTRACT

In transitioning to a value-based practice, it is imperative that radiologists learn to interact efficiently and effectively with patients and their referring clinicians. Patients are becoming increasingly involved in their healthcare and want informative radiology reports they can understand, as well as readily available information online about providers and services. In this course, attendees will learn how to harness the growing number of digital tools to improve their interactions with referring clinicians and patients.

Sub-Events

RC716A Innovations in Radiology Reporting

Participants
Tarik K. Alkasab, MD,PhD, Boston, MA (*Presenter*) Consultant, Nuance Communications, Inc

RC716B Websites and Social Media for Physicians and Patients

Participants
Arvind Vijayasarathi, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

Arvind.Vijayasarathi@gmail.com

LEARNING OBJECTIVES

1) Define key features of a successful practice website. 2) Identify publicly available online resources containing relevant patient-focused information. 3) Compare the unique attributes of social media platforms such as Facebook, Instagram and Twitter. 4) Recognize limitations of online and social media communication. 5) Develop a comprehensive strategy to communicate with patients in the digital world.

RC716C Communicating with Physicians Near and Far

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

LEARNING OBJECTIVES

1) Describe challenges in referring physician communication in the current digital radiology environment. 2) Explore novel strategies for referring physician communication leveraging informatics solutions. 3) Recognize the impact on radiology practices and health systems of implementing such solutions.

RC717

Emerging Technology: PET/MRI Update 2019

Thursday, Dec. 5 4:30PM - 6:00PM Room: S505AB

MR NM

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Rathan M. Subramaniam, MD,PhD, Dunedin, New Zealand (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

rathan.subramaniam@utsouthwestern.edu

LEARNING OBJECTIVES

1) To discuss opportunities of PET/MRI in clinical practice and research. 2) To discuss challenges of PET/MRI in clinical practice and research.

Sub-Events

RC717A PET/MRI Update 2019: Clinical Practice Implementation - Pearls

Participants
Geoffrey B. Johnson, MD,PhD, Rochester, MN (*Presenter*) Research Grant, General Electric Company Research Grant, Pfizer Inc

RC717B PET/MRI Update 2019: Clinical Applications - Brain and Head and Neck

Participants
Alexander Drzezga, MD, Cologne, Germany (*Presenter*) Research support, Siemens AG; Speakers Bureau, Siemens AG; Stockholder, Siemens AG; Research support, General Electric Company; Consultant, General Electric Company; Research support, Life Molecular Imaging; Speakers Bureau, sanofi-aventis Group; Speakers Bureau, General Electric Company; Research support, Eli Lilly and Company;

LEARNING OBJECTIVES

1) Review relevant clinical applications for PET/MR in the diagnostic work-up of disorders of the brain. 2) Review strengths of PET/MR for disorders of the head and neck. 3) Understand the value of different currently available tracers for neuroimaging and oncological applications. 4) Review challenges and limitations of PET/MR in brain/head & neck and expected future developments.

RC717C PET/MRI Update 2019: Clinical Applications - Body

Participants
Spencer C. Behr, MD, San Francisco, CA (*Presenter*) Research Grant, General Electric Company; Consultant, Navidea Biopharmaceuticals, Inc; Grant, Navidea Biopharmaceuticals, Inc

LEARNING OBJECTIVES

1) Review common current applications for abdominopelvic oncologic PET/MRI, including hepatic malignancies, rectal cancer, and cervical cancer. 2) Understand the role of novel tracers in prostate cancer (PSMA PET) and neuroendocrine tumors (somatostatin receptor PET). The presentation will focus on prostate cancer as an application. 3) Present the current limitations and future advances in PET/MRI that will help increase the clinical acceptance and applicability of body PET/MRI.

RC717D PET/MRI Update 2019: Clinical Applications - Cardiac

Participants
Pamela K. Woodard, MD, Saint Louis, MO (*Presenter*) Researcher, Siemens AG; Research Grant, F. Hoffmann-La Roche Ltd; Consultant, Medtronic plc; ; ; ; ; ;

For information about this presentation, contact:

Woodardp@wustl.edu

LEARNING OBJECTIVES

1) Individuals attending this session will understand clinical cardiac PET/MR imaging applications; applications will include a) myocardial perfusion and viability, b) inflammation, c) nonischemic cardiomyopathy, and d) tumor assessment.

RC717E PET/MRI Update 2019: Clinical Applications - Pediatrics

Participants
Lisa J. States, MD, Plymouth Mtng, PA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

States@email.chop.edu

LEARNING OBJECTIVES

1) Suggest optimal protocols for pediatric PET/MRI. 2) List indications for pediatric PET/MRI in oncologic and non-oncologic applications. 3) Understand the challenges of these studies in children.

RC717F PET/MRI Update 2019: Physics

Participants
Georges El Fakhri, PhD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the challenges and opportunities afforded by simultaneous PET/MR. 2) Understand the role of PET/MR in imaging myocardial membrane potential.

Printed on: 10/29/20

RC718

Interactive Game: Pearls and Tips in Oncologic Image Interpretation (Interactive Session)

Thursday, Dec. 5 4:30PM - 6:00PM Room: S404AB

OI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Yuliya Lakhman, MD, New York, NY (*Moderator*) Nothing to Disclose

Special Information

This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

Sub-Events

RC718A Head and Neck

Participants
Birgit B. Ertl-Wagner, MD, Toronto, ON (*Presenter*) Spouse, Stockholder, Siemens AG; Author, Springer Nature;

For information about this presentation, contact:

BirgitBetina.Ertl-Wagner@sickkids.ca

LEARNING OBJECTIVES

1) Appreciate the importance of the location, imaging features and potential nodal involvement of head and neck tumors for diagnostic decision-making and prognostication. 2) Describe important imaging signs to differentiate tumors of the skull base differentiate common benign and malignant disorders of the head and neck based on their imaging presentation.

RC718B Chest

Participants
Katherine A. Kaproth-Joslin, MD, PhD, Rochester, NY (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

Katherine_kaproth-joslin@urmc.rochester.edu

LEARNING OBJECTIVES

1) To better understand what the ordering clinician is looking for on imaging, both pre and post treatment. 2) Review the latest version of lung cancer TNM staging. 3) Understand the pearls and pitfalls of oncologic imaging in the chest, including tricks to identify recurrent disease post treatment, unique properties of certain lung cancers, and mimics of disease progression.

RC718C Abdomen

Participants
Khaled M. Elsayes, MD, Pearland, TX (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

kmelsayes@mdanderson.org

LEARNING OBJECTIVES

1) Describe most commonly encountered imaging pitfalls, pseudolesions and misdiagnoses that can be encountered on imaging the liver. 2) Discuss relevant technical background. pathophysiology and hemodynamics of these pitfalls. 3) Correlate imaging features of these masses with clinical and pathologic findings. 4) Provide useful pearls and clues to reach a specific diagnosis.

ABSTRACT

There is a wide range of common pitfalls and pseudo-lesions encountered in liver imaging, which can lead to incorrect diagnoses mainly because many radiologists are not completely familiar with anatomical, morphological, physiological, hemodynamic and biological principles. This leads to common misinterpretations which would further results in wrong management with potentially negative outcome. In this exhibit, we will discuss the spectrum of these pathologies and provide clues to correct diagnoses

RC718D Female Pelvis

Participants
Helen C. Addley, MRCP, FRCR, Cambridge, United Kingdom (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

helenclareaddley@hotmail.co.uk

LEARNING OBJECTIVES

1) Highlight common pearls and pitfalls in gynae-oncology imaging. 2) Review post-treatment appearances of the female pelvis. 3) Discuss the most frequent pitfalls in gynae-oncology image interpretation from tumor board of cancer center.

Printed on: 10/29/20

RC721

Innovations in MR and CT Perfusion

Thursday, Dec. 5 4:30PM - 6:00PM Room: S103AB

CT MR PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Roland Bammer, PhD, Parkville, Australia (*Coordinator*) Founder, iSchemaView, Inc; Director, iSchemaView, Inc; Stockholder, iSchemaView, Inc; Founder,HobbitView, Inc; Director,HobbitView, Inc; Stockholder, HobbitView, Inc

LEARNING OBJECTIVES

1) A survivors guide for perfusion methodology. 2) Practical considerations of perfusion imaging and leakage measurements in tumors. 3) How to use and interpret perfusion imaging in cerebro-vascular disease.

Sub-Events

RC721A MR and CT Perfusion and Pharmacokinetic Imaging

Participants
Roland Bammer, PhD, Parkville, Australia (*Presenter*) Founder, iSchemaView, Inc; Director, iSchemaView, Inc; Stockholder, iSchemaView, Inc; Founder,HobbitView, Inc; Director,HobbitView, Inc; Stockholder, HobbitView, Inc

RC721B Evidence-Based Best Acquisition Protocols for DSC-MRI in Brain Tumors

Participants
Jerrold L. Boxerman, MD, PhD, Providence, RI (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

jboxerman@lifespan.org

LEARNING OBJECTIVES

1) Explain the DSC-MRI contrast mechanism and vessel size dependence of gradient-echo and spin-echo signal changes. 2) Identify the major protocol decisions for single-echo, gadolinium-based DSC-MRI. 3) Describe techniques for reducing contrast agent leakage effects in DSC-MRI. 4) Recommend an evidence-based best-practice protocol for DSC-MRI applications in neuro-oncology and clinical trials.

RC721C Perfusion Imaging in Cerebrovascular Disease

Participants
Shalini A. Amukotuwa, BMedSc,MBBS, Melbourne, Australia (*Presenter*) Spouse, Founder, iSchemaview

RC722

Functional MR Imaging for Normal Tissue Response Assessment in Radiotherapy

Thursday, Dec. 5 4:30PM - 6:00PM Room: S503AB

BQ MR PH RO

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Kristy K. Brock, PhD, Houston, TX (*Moderator*) License agreement, RaySearch Laboratories AB; Grant support, RaySearch Laboratories AB; Research support, Mirada Medical Ltd; ;

Sub-Events

RC722A State of the Art in Functional MR Imaging for Normal Tissue Assessment

Participants
Kiaran P. McGee, PhD, Rochester, MN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify underlying biological processes associated with functional magnetic resonance imaging techniques. 2) List most commonly used functional imaging techniques in magnetic resonance imaging. 3) Explain the physics of various functional magnetic resonance imaging technique described in the presentation.

RC722B Clinical Need for Functional MR Imaging for Normal Tissue Assessment in Radiation Therapy

Participants
Clifton D. Fuller, MD,PhD, Houston, TX (*Presenter*) Research Consultant, Elekta AB Research Grant, Elekta AB Speaker, Elekta AB

For information about this presentation, contact:

cdfuller@mdanderson.org

LEARNING OBJECTIVES

Discuss the relevant needs for normal tissue imaging after radiotherapy, using head and neck radiotherapy as a use case.Define opportunities for enhanced normal tissue imaging procedures for post-therapy toxicity and monitoring.

RC722C Technical Challenges in the Integration of Functional MR Imaging for Normal Tissue Assessment into Radiotherapy

Participants
Martha M. Matuszak, PhD, Ann Arbor, MI (*Presenter*) Research funded, Varian Medical Systems, Inc; Consultant, Varian Medical Systems, Inc

LEARNING OBJECTIVES

1) Discuss the challenges in incorporating functional MR into treatment planning.

RC723

CT Radiation Dose Reduction: Techniques and Clinical Implementation

Thursday, Dec. 5 4:30PM - 6:00PM Room: S504AB

CT PH SQ

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Lifeng Yu, PhD, Rochester, MN (*Coordinator*) Nothing to Disclose

For information about this presentation, contact:

yu.lifeng@mayo.edu

LEARNING OBJECTIVES

1) Review techniques that are currently available for radiation dose reduction. 2) Understand general dose management and optimization strategies and how they are implemented in adult CT. 3) Understand strategies to optimize scanning protocols in pediatric CT.

ABSTRACT

This course will provide an overview of techniques and clincial implementations of radiation dose reduction in CT.

Sub-Events

RC723A Overview of Technology for Radiation Dose Reduction

Participants
Joseph W. Stayman, PhD, Baltimore, MD (*Presenter*) Research Grant, Canon Medical Systems Corporation; Research Grant, Carestream Health, Inc; Research Grant, Elekta AB; Research Grant, Fischer Medical; Research Grant, Medtronic plc; Research collaboration, Koninklijke Philips NV; Research collaboration, Varex Imaging Corporation; Research Grant, Siemens AG; Research Grant, General Electric Company;

LEARNING OBJECTIVES

1) Identify targets for radiation dose reductions in x-ray CT. 2) Gain an understanding of dose reduction strategies based on innovations in hardware design and development. 3) Gain an understanding of dose reduction strategies based on data processing chain improvements including iterative reconstruction methods. 4) Understand some of the trade-offs in dose reduction as well as limitations on dose reduction.

RC723B Dose Optimization Strategy and Clinical Implementation in Adult CT

Participants
Lifeng Yu, PhD, Rochester, MN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Introduce dose management and optimization strategies in adult CT. 2) Describe how dose reduction techniques are clinical implemented in adult CT, including neuro, chest, abdominal, cardiovascular, and MSK.

RC723C Dose Reduction and Protocol Optimization in Pediatric CT

Participants
Robert MacDougall, PhD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the important of clinical indication on CT protocol design. 2) Describe the different commercial implementations of kV and mA modulation algorithms and understand methods of standardizing image quality across platforms. 3) Understand the effect of reconstruction algorithms on acquisition parameter selection in pediatric CT.

RC724

Revisiting Radiology's Titans

Thursday, Dec. 5 4:30PM - 6:00PM Room: N228

OT

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

Participants
Richard B. Gunderman, MD, PhD, Indianapolis, IN (*Moderator*) Nothing to Disclose
N. Reed Dunnick, MD, Ann Arbor, MI (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

laurabancroftmd@gmail.com

LEARNING OBJECTIVES

1) Learn about Godfrey Hounsfield's early years and how it led to his developing a CT scanner. 2) Understand how the success of the Beatles helped to support Hounsfield's work. 3) Appreciate how the world of medical imaging was changed by the CT scanner.

Sub-Events

RC724A Marie Curie

Participants
Richard B. Gunderman, MD, PhD, Indianapolis, IN (*Presenter*) Nothing to Disclose

RC724B Godsfrey Hounsfield

Participants
N. Reed Dunnick, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose

RC724C Paul Laterbur

Participants
Richard B. Gunderman, MD, PhD, Indianapolis, IN (*Presenter*) Nothing to Disclose

RC725

Radiomics: Oncologic Applications

Thursday, Dec. 5 4:30PM - 6:00PM Room: N226

BQ PH

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Sandy Napel, PhD, Stanford, CA (*Coordinator*) Medical Advisory Board, Fovia, Inc; Scientific Advisor, EchoPixel, Inc; Scientific Advisor, RADLogics, Inc

LEARNING OBJECTIVES

1) Provide an overview of imaging genomics fields (radiogenomics and radiomics). 2) Survey progress made to date in imaging genomics of breast and liver cancer. 3) Understand and appreciate the context for 'real world' applications of imaging genomics in breast and hepatic malignancies. 4) Apply radiomics and imaging genomics in brain tumors. 5) Describe the use of MRI as a biomarker for underlying genomic composition. 6) Define role of MRI in personalized medicine for target discovery of therapeutic targets. 7) Explain the use of MRI in drug development and clinical trials. 8) Assess the research available in imaging genomics. 9) Describe the integration of radiomics and imaging genomics into big data platforms.

Sub-Events

RC725A Breast Cancer with PET-CT

Participants
Richard L. Wahl, MD, Saint Louis, MO (*Presenter*) Research Consultant, Nihon Medi-Physics Co, Ltd Contract, WhiteRabbit.AI Inc

For information about this presentation, contact:

rwahl@wustl.edu

RC725B Radiogenomics of Hepatic Malignancies

Participants
Neema Jamshidi, MD, PhD, Santa Monica, CA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

njamshidi@mednet.ucla.edu

LEARNING OBJECTIVES

1) Provide an overview of imaging genomics fields (radiogenomics and radiomics). 2) Survey progress made to date in imaging genomics of liver cancer. 3) Understand and appreciate the context for 'real world' applications of imaging genomics in hepatic malignancies.

RC725C Brain Cancer: Radiomics, Radiogenomics, and Big Data

Participants
Rivka R. Colen, MD, Houston, TX (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

rrcolen@gmail.com

LEARNING OBJECTIVES

1) Define the field of radiomics and imaging genomics. 2) Apply radiomics and imaging genomics in brain tumors. 3) Describe the use of MRI as a biomarker for underlying genomic composition. 4) Define role of MRI in personalized medicine for target discovery of therapeutic targets. 5) Explain the use of MRI in drug development and clinical trials. 6) Assess the research available in imaging genomics. 7) Describe the integration of radiomics and imaging genomics into big data platforms.

ABSTRACT

This objective of this course is to introduce the recently emerged field of radiomics and imaging genomics (radiogenomics) in brain tumors, specifically glioblastoma (GBM) and brain metastasis. Emphasis will be on radiomics with regards to the high-dimensional, high-throughput feature extraction of imaging features from medical images, specifically MRI; the second emphasis will be on the use of imaging in relation to underlying tumor genomics, how to use MRI as a biomarker, surrogate and correlate of tumor genomics as well as the use of MRI as a genomic target discovery tool and its application in therapeutic discovery and drug development. The role of radiomics and imaging genomics in the era of big data and how we can leverage the imaging-omic data will also be discussed.

RC727

Beyond the Podium: Tips for Better Teaching and Testing from Trainees through CME

Thursday, Dec. 5 4:30PM - 6:00PM Room: S501ABC

ED HP

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
David J. Disantis, MD, Jacksonville, FL (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

djdisantis@gmail.com

Sub-Events

RC727A Keep it Brain-friendly: Creating Presentations That Stick

Participants
Andres R. Ayoob, MD, Lexington, KY (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

andres.ayoob@uky.edu

LEARNING OBJECTIVES

1) Explain the components of cognitive load. 2) Apply evidence-based principles to reduce cognitive load in multimedia presentations. 3) Employ evidence-based presentation techniques that foster learning.

RC727B Keep it Practical: Educational Exhibits and Journal CME That They'll Appreciate

Participants
Meghan G. Lubner, MD, Madison, WI (*Presenter*) Grant, Koninklijke Philips NV; Grant, Johnson & Johnson;

For information about this presentation, contact:

mlubner@uwhealth.org

LEARNING OBJECTIVES

1) Review a step-by-step approach to creating an educational exhibit. 2) Discuss a few tips for creating meaningful content and visual appeal. 3) Review the process for parlaying an educational exhibit into a manuscript with CME.

RC727C Keep it Honest: Writing Good Questions Doesn't Have to Be Hard

Participants
David J. Disantis, MD, Jacksonville, FL (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

djdisantis@gmail.com

LEARNING OBJECTIVES

1) Describe the components of a properly constructed question. 2) Recognize the most common errors in question writing, and understand how to avoid them.

ABSTRACT

Question writing flaws remain common in radiology's leading pubilcatons. This presentation presents the 'anatomy' of a good test question, with tips for avoiding the most common mistakes.

RC729

Rectal MRI (Interactive Session)

Thursday, Dec. 5 4:30PM - 6:00PM Room: S105AB

GI MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Sub-Events

RC729A Surgeon Point of View

Participants
Scott Strong, Chicago, IL (*Presenter*) Consultant, Johnson & Johnson; Instructor, Intuitive

For information about this presentation, contact:

scott.strong@nm.org

LEARNING OBJECTIVES

1) Understand the operative options for radical resection of rectal cancer. 2) Describe the imaging features important to planning radical resection of rectal cancer. 3) Realize the implications of changes in imaging features following neoadjuvant therapy.

RC729B MRI Protocol

Participants
Mukesh G. Harisinghani, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

MHARISINGHANI@MGH.HARVARD.EDU

LEARNING OBJECTIVES

1) Provide an overview of MR protocol for rectal cancer staging. 2) Provide pointers on sequence optimization.

RC729C MRI Staging

Participants
Regina G. Beets-Tan, MD, PhD, New York, NY (*Presenter*) Nothing to Disclose

RC729D Response to Neoadjuvant Therapy

Participants
Kartik S. Jhaveri, MD, Mississauga, ON (*Presenter*) Research Grant, General Electric Company; Research Grant, Bayer AG; Speaker, Siemens AG; Speaker, Bayer AG

LEARNING OBJECTIVES

1) Discuss role of MRI in assessing neoadjuvant treatment response in rectal cancer. 2) Review MRI assessment of treatment response. 3) Highlight limitations and pitfalls.

RC729E Case Review

Participants
Mukesh G. Harisinghani, MD, Boston, MA (*Presenter*) Nothing to Disclose
Regina G. Beets-Tan, MD, PhD, New York, NY (*Presenter*) Nothing to Disclose
Kartik S. Jhaveri, MD, Mississauga, ON (*Presenter*) Research Grant, General Electric Company; Research Grant, Bayer AG; Speaker, Siemens AG; Speaker, Bayer AG

For information about this presentation, contact:

MHARISINGHANI@MGH.HARVARD.EDU

LEARNING OBJECTIVES

1) Provide overview of MR imaging in rectal cancer staging. 2) Highlight important technical pointers for accurate staging.

RC731

Image-guided Biopsy of the Spine (Hands-on)

Thursday, Dec. 5 4:30PM - 6:00PM Room: E263

MK NR IR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Michele H. Johnson, MD, New Haven, CT (*Moderator*) Scientific Advisory Board, iSchemaView, Inc; Medical Advisory Board, iSchemaView, Inc

LEARNING OBJECTIVES

1) Discuss and demonstrate spine biopsy techniques including CT and fluoroscopic approaches, anatomic landmarks, needle selection, special technical considerations for dealing with soft tissue masses, and fluid accumulations, lytic and blastic lesions, and hypervascular conditions. 2) Hands on exposure will be provided in order to familiarize participants with the vast number of biopsy devices that are clinically available. 3) Training models will also be used in order to teach technical skills with respect to approach and technique. 4) Advantages and disadvantages of various biopsy devices and techniques, and improve their understanding of how to maximize the reliability and safety of these spine biopsy procedures.

Sub-Events

RC731A Pre- and Post Biopsy Assessment

Participants
Richard Silbergleit, MD, Royal Oak, MI (*Presenter*) Consultant, Relievant Medsystems, Inc

LEARNING OBJECTIVES

1) Be familiar with all required aspects of the pre-biopsy work-up, including medications, laboratory values, and review of relevant prior imaging. 2) Be familiar with solutions to address complications or other unexpected events which may arise during the course of spine biopsy. 3) Be comfortable in performing the post procedure assessment of the patient after spinal biopsy.

RC731B Equipment Used for Image-guided Biopsies of the Spine

Participants
Michele H. Johnson, MD, New Haven, CT (*Presenter*) Scientific Advisory Board, iSchemaView, Inc; Medical Advisory Board, iSchemaView, Inc

LEARNING OBJECTIVES

1) Demonstrate the types of needles used for spine biopsy. 2) Selecting the proper types of needles used for spine biopsy. 3) Case demonstration of the proper use of single or coaxial needle sets for spine biopsy and the advantages or disadvantages of each.

RC731C Thoracic and Lumbar Biopsies

Participants
John L. Go, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the anatomy of the thoracic and lumbar spine relevant to spine biopsy. 2) Describe the approaches used to approach various anatomical regions within the thoracic and lumbar spine. 3) Provide case examples of various approaches used to biopsy the thoracic and lumbar spine.

RC731D Cervical Spine Biopsies

Participants
A. Orlando Ortiz, MD, MBA, Bronx, NY (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

ortizo@nychhc.org

LEARNING OBJECTIVES

1) Demonstrate the various approaches used to biopsy lesions of the cervical spine. 2) Determine the selection of the proper needles to use to biopsy the spine. 3) Provide case examples of cervical biopsies and the thought process used to perform these procedures.

ABSTRACT

Cervical spine biopsies can be challenging procedures to perform, hence they tend to be performed by a limited number of proceduralists. C-spine biopsy is often performed to evaluate potential neoplastic or infectious processes of the cervical spine. The key to performing these procedures effectively and safely is in appropriate patient selection, careful image analysis in order to

properly position the patient and choose an approach, identification of critical structures (such as the carotid artery) and neck spaces that should be avoided, and use of coaxial biopsy techniques. The procedure can be safely performed with CT and/or CT fluoroscopy. Specimen sampling principles and specimen handling are also discussed they can help to optimize this procedure.

RC731E Disc Biopsy and Aspiration

Participants
Amish H. Doshi, MD, New York, NY (*Presenter*) Speaker, Merit Medical Systems, Inc

LEARNING OBJECTIVES

1) To review the indications for spinal biopsies in the setting of discitis and osteomyelitis of the spine. 2) The various techniques and imaging modalities for these biopsies will be reviewed. 3) Sample collection and analysis as well as typical diagnostic yield will also be reviewed.

ABSTRACT

The lecture will focus on the indications for imaging guided biopsy in the setting of discitis/osteomyelitis and describe a variety of CT and Fluoroscopic guided techniques in obtaining aspirate and tissue sample. Additionally, the lecture will review of the various types of needles used in the procedures and in what setting specific needles should be used. A brief review of current literature on yield of imaging guided biopsy will also be discussed.

Printed on: 10/29/20

RC732

Emotional Intelligence, Empathy, and Resilience

Thursday, Dec. 5 4:30PM - 6:00PM Room: E353A

LM

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Alexander M. Norbash, MD, San Diego, CA (*Moderator*) Scientific Advisor, Penumbra, Inc; Scientific Advisor, IBM Corporation; Scientific Advisor, General Electric Company; Stockholder, Boston Imaging Core Lab, LLC; ; ; ; ;

Sub-Events

RC732A Taming the Lion: Technique for Upset Patients, Referrals, and Colleagues

Participants
Perry S. Gerard, MD, Woodmere, NY (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

perry.gerard@wmchealth.org

LEARNING OBJECTIVES

1) To understand the importance of dealing effectively with different types of individuals encountered on a daily basis. 2) Understand that upset individuals in the department can lead to loss of referrals and consults, poor interactions with patients and referring physicians and ultimately loss of department revenue. 3) Develop the skills for early detection and methods to deal with upset patients, families and referring physicians. 4) Develop skills of engagement, preventing escalation of conflicts, methods of communication and conflict resolution. 5) Understand and develop skills of service recovery and methods of building relationships in the workplace. 6) Understand the importance of emotional intelligence (EQ) and how it allows individuals to work through conflicts by empathizing with individuals and allowing calm in the work environment. 7) Provide training of staff in emotional intelligence and conflict resolutions.

ABSTRACT

N/A

RC732B Building our Empathy Muscles

Participants
Cheri L. Canon, MD, Birmingham, AL (*Presenter*) Royalties, The McGraw-Hill Companies; Consultant, Bracco Group

For information about this presentation, contact:

ccanon@uabmc.edu

LEARNING OBJECTIVES

1) Define emotional intelligence. 2) List strategies to increase empathy. 3) Understand role of empathy in physician wellness.

RC732C Social and Emotional Intelligence Training for Resident Education

Participants
Jessica B. Robbins, MD, Madison, WI (*Presenter*) Nothing to Disclose

RC732D Q&A

RC750

MR Imaging-guided Breast Biopsy (Hands-on)

Thursday, Dec. 5 4:30PM - 6:00PM Room: E260

BR MR

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Roberta M. Strigel, MD, Madison, WI (*Presenter*) Research support, General Electric Company
Rosalind P. Candelaria, MD, Houston, TX (*Presenter*) Nothing to Disclose
Brian Johnston, MD, Queen Creek, AZ (*Presenter*) Nothing to Disclose
Jennifer R. Kohr, MD, Seattle, WA (*Presenter*) Nothing to Disclose
Diana L. Lam, MD, Seattle, WA (*Presenter*) Nothing to Disclose
Santo Maimone IV, MD, Jacksonville Beach, FL (*Presenter*) Research Consultant, GRAIL Inc
Cecilia L. Mercado, MD, New York, NY (*Presenter*) Nothing to Disclose
Jessica H. Porembka, MD, Dallas, TX (*Presenter*) Nothing to Disclose
Gaiane M. Rauch, MD, PhD, Houston, TX (*Presenter*) Nothing to Disclose
Jeffrey S. Reiner, MD, New York , NY (*Presenter*) Nothing to Disclose
Raman Verma, MD, Ottawa, ON (*Presenter*) Nothing to Disclose
Ryan W. Woods, MD, MPH, Madison, WI (*Presenter*) Nothing to Disclose
Bethany L. Niell, MD,PhD, Tampa, FL (*Presenter*) Nothing to Disclose
Beatriu Reig, MD, New York, NY (*Presenter*) Nothing to Disclose
Anand K. Narayan, MD,PhD, Boston, MA (*Presenter*) Nothing to Disclose
Eren D. Yeh, MD, Belmont, MA (*Presenter*) Consultant, Statlife SAS
Debbie L. Bennett, MD, Saint Louis, MO (*Presenter*) Advisory Board, Devicor Medical Products, Inc; Speaker, Hologic, Inc
Dana Ataya, MD, Tampa, FL (*Presenter*) Nothing to Disclose
Richard S. Ha, MD, New York, NY (*Presenter*) Nothing to Disclose
Erin I. Neuschler, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Denise M. Thigpen, MD, Washington, DC (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

gmrauch@mdanderson.org

jessica.porembka@utsouthwestern.edu

rstrigel@uwhealth.org

rcandelaria@mdanderson.org

Debbie.bennett@health.slu.edu

LEARNING OBJECTIVES

1) Explain why MR-guided breast biopsy is needed for patient care. 2) Identify relative and absolute contraindications to MR-guided breast biopsy. 3) Describe criteria for MR-guided breast biopsy patient selection. 4) Debate risks and benefits of pre-biopsy targeted ultrasound for suspicious MRI findings. 5) Understand the basic MR-guided biopsy procedure, protocol and requirements for appropriate coil, needle and approach selection. 6) Manage patients before, during and after MR-guided breast biopsy. 7) Define the benefits and limitations of MR-guided vacuum assisted breast biopsy. 8) Apply positioning and other techniques to challenging combinations of lesion location and patient anatomy for successful MR-guided biopsy.

ABSTRACT

This course is intended to provide basic didactic instruction and hands-on experience for MR-guided breast biopsy. Because of the established role of breast MRI in the evaluation of breast cancer through screening and staging, there is a proven need for MR-guided biopsy of the abnormalities that can only be identified on MRI. This course will be devoted to the understanding and identification of: 1) appropriate patient selection 2) optimal positioning for biopsy 3) target selection and confirmation 4) various biopsy technologies and techniques 5) potential problems and pitfalls and 6) radiology/pathology concordance. Participants will spend 30 minutes in didactic instruction followed by 60 minutes practicing MR-guided biopsy using provided phantoms. Various combinations of full size state-of-the-art breast MRI coils, biopsy localization equipment and needles from multiple different vendors will be available for hands-on practice. Some stations will have monitors loaded with targeting software. Expert breast imagers from around the world will be at each of 10 stations to provide live coaching, tips, techniques and advice.

RC752

Breast Elastography (Hands-on)

Thursday, Dec. 5 4:30PM - 6:00PM Room: E264

BR US

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

FDA Discussions may include off-label uses.

Participants

Richard G. Barr, MD, PhD, Campbell, OH (*Presenter*) Consultant, Siemens AG; Consultant, Koninklijke Philips NV; Research Grant, Siemens AG; Research Grant, SuperSonic Imagine; Speakers Bureau, Koninklijke Philips NV; Research Grant, Bracco Group; Speakers Bureau, Siemens AG; Consultant, Canon Medical Systems Corporation; Research Grant, Esaote SpA; Research Grant, BK Ultrasound; Research Grant, Hitachi, Ltd
Stamatia V. Destounis, MD, Scottsville, NY (*Presenter*) Advisory Committee, Hologic, Inc; Medical Advisory Board, iCad, Inc
Rajas N. Chaubal, MBBS,MD, Thane, India (*Presenter*) Nothing to Disclose
Nitin G. Chaubal, MD, MBBS, Thane, India (*Presenter*) Nothing to Disclose
Chander Lulla, MD,MBBS, Mumbai, India (*Presenter*) Nothing to Disclose
Maija Radzina, MD,PhD, Riga, Latvia (*Presenter*) Speaker, Canon Medical Systems Corporation
Vito Cantisani, MD, Roma, Italy (*Presenter*) Speaker, Canon Medical Systems Corporation; Speaker, Bracco Group; Speaker, Samsung Electronics Co, Ltd;
Paula B. Gordon, MD, Vancouver, BC (*Presenter*) Stockholder, OncoGenex Pharmaceuticals, Inc ; Stockholder, Volpara Health Technologies Limited; Scientific Advisory Board, Real Imaging Ltd; Scientific Advisory Board, DenseBreast-info, Inc; Scientific Advisor, Dense Breasts Canada
Tanya W. Moseley, MD, Houston, TX (*Presenter*) Consultant, Hologic, Inc
Catherine W. Piccoli, MD, Voorhees, NJ (*Presenter*) Stockholder, Qualgenix LLC
Gary J. Whitman, MD, Houston, TX (*Presenter*) Nothing to Disclose
Anna I. Holbrook, MD, Atlanta, GA (*Presenter*) Nothing to Disclose
Rachna Dutta, MD, Cleveland, OH (*Presenter*) Nothing to Disclose
Daniele Fresilli, Roma, Italy (*Presenter*) Nothing to Disclose
Giuseppe Schillizzi, Roma, Italy (*Presenter*) Nothing to Disclose
Michael Golatta, MD,PhD, Heidelberg, Germany (*Presenter*) Research Consultant, Siemens AG; Research Grant, Siemens AG
Daniela Elia, Roma, Italy (*Presenter*) Nothing to Disclose
Giorgia Polti, Rome, Italy (*Presenter*) Nothing to Disclose
Eleonora Polito, Rome, Italy (*Presenter*) Nothing to Disclose
Yana Solskaya, MD, Riga, Latvia (*Presenter*) Nothing to Disclose
Olga Guiban, Rome, Italy (*Presenter*) Nothing to Disclose
Patrizia Pacini, Rome, Italy (*Presenter*) Nothing to Disclose
Laurie R. Margolies, MD, New York, NY (*Presenter*) Research Consultant, FUJIFILM Holdings Corporation; Research Consultant, Imago Corporation
Jung Min Chang, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Norran H. Said, MD, FRCR, Cairo, Egypt (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

riaclinic@gmail.com

mradzina@gmail.com

vito.cantisani@uniroma1.it

yana.solskaya@gmail.com

rdutta@metrohealth.org

laurie.margolies@mountsinai.org

norranhussein@yahoo.com

imchangjm@gmail.com

tstephens@mdanderson.org

LEARNING OBJECTIVES

1) To explain the difference between strain and shear wave elastography. 2) To review how to characterize breast lesions as benign or malignant on elastography. 3) To demonstrate how to perform both strain and shear wave elastography for breast imaging.

RC753

Introduction to Medical 3D Printing

Thursday, Dec. 5 4:30PM - 6:00PM Room: S406B

IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
William J. Weadock, MD, Ann Arbor, MI (*Moderator*) Owner, Weadock Software, LLC
Adnan M. Sheikh, MD, Ottawa, ON (*Moderator*) Speaker, Siemens AG

For information about this presentation, contact:

weadock@umich.edu

Sub-Events

RC753A Introduction to Medical 3D Printing

Participants
William J. Weadock, MD, Ann Arbor, MI (*Presenter*) Owner, Weadock Software, LLC

RC753B Orthopedic Applications

Participants
Adnan M. Sheikh, MD, Ottawa, ON (*Presenter*) Speaker, Siemens AG

For information about this presentation, contact:

asheikh@toh.ca

LEARNING OBJECTIVES

1) To become familiar with 3D printing technologies. used in orthopaedics. 2) Review common 3D printing applications in orthopaedics.

RC753C Cardiac Applications

Participants
Justin R. Ryan, PhD, San Diego, CA (*Presenter*) Nothing to Disclose

RC753D Vascular Applications

Participants
Ciprian N. Ionita, PhD, Buffalo, NY (*Presenter*) Grant, Canon Medical Systems Corporation;

For information about this presentation, contact:

cnionita@buffalo.edu

LEARNING OBJECTIVES

1) Teach the steps required to build hallow patient specific vascular phantoms which could be used for flow and endovascular simulations. 2) Demonstrate how 3D printed phantoms could be used for diagnostic imaging software validation. 3) Demonstrate the benefit of using 3D printed cardiovascular phantoms to test endovascular devices. 4) Demonstrate the benefit of the 3D printed cardiovascular phantoms for pre-treatment simulations in high risk surgery patients.

ABSTRACT

Patient specific vascular phantoms manufactured using 3D printing can be a valuable tool for device testing, software validation and endovascular treatment planning. Previous phantoms were made from one material and they were a simplification of the patient anatomy. They used to model one artery, rarely included complex vascular trees and the arterial wall mechanical properties were ignored. In addition, inclusion of pathologies such as atherosclerotic plaques or surrounding anatomical structures was practically inexistent. These basic vascular models could be used to evaluate endovascular devices, validate software or simulate interventions but their simplicity could misguide the user about true clinical situations. Advancements in multi-material 3D printing allow development of phantoms replicating complex vascular systems and vascular disease which can mimic mechanical properties of the vessels and physiological aspects of the blood flow. In this presentation we will present how to design complex vascular tree phantoms which includes significant distal vasculature and vascular lesions such as atherosclerotic plaques and aneurysms.Distal arteries can include branching down to 400 microns. We will show various applications of the phantoms to study device behavior and software validation. For diagnostic software validation, we will demonstrate how such phantoms could be used for validation of a CT-FFR software. In the second part of the lecture we will present the use of the patient specific vascular phantoms for treatment planning of vascular diseases such as mitral valve replacement, intracranial aneurysm treatment, thrombectomy and abdominal aortic aneurysms with the Fenestrated Endo Vascular Aortic Repair device. We will show how significant surgery outcome

improvement in twelve patients undergoing pre-treatment simulation using patient specific phantoms.

RC753E Craniomaxillofacial Applications

Participants
Jonathan M. Morris, MD, Rochester, MN (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

morris.jonathan@mayo.edu

LEARNING OBJECTIVES

1) Understand the basics technologies of 3D printing. 2) Describe how 3D printing is used in the field of craniomaxillofacial surgery. 3) Demonstrate the value of point of care manufacturing using 3D printing. 4) Discuss Sterilization techniques and 3D printing of biocompatible goods. 5) Detail why the radiologist should be at the center of this field.

Printed on: 10/29/20

RC754

Patient-centric Radiology: How to Do It

Thursday, Dec. 5 4:30PM - 6:00PM Room: S403B

IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Olga R. Brook, MD, Boston, MA (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

obrook@bidmc.harvard.edu

LEARNING OBJECTIVES

1) To learn about implementation of patient-centered radiology into your practice - translating your reports into patient's language, having your phone number in the report, using open reports, leveraging informatics, improving customer service.

Sub-Events

RC754A Translating Radiology Report to Patient's Language

Participants
Arun Krishnaraj, MD, MPH, Charlottesville, VA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

arunk@virginia.edu

LEARNING OBJECTIVES

1) Understand the barriers to creating reports whose primary audience is patients. 2) Generate reports that are accessible to patients without a background in healthcare. 3) Assess the benefits of serving an often overlooked stakeholder.

ABSTRACT

The final product of a radiologist's work is the creation and dissemination of the radiology report. However, patients, who are the direct beneficiary of the output and decision making that occurs because of the content of the report, are rarely considered customers by the radiologists and their needs are often overlooked. This can lead to frustration on behalf of patients and a lack of shared decision making. To address this shortcoming, the session will discuss the barriers to creating radiology reports tailored to patients, tips for creating effective patient centereed reports, and the positive impact patient centered reports can have on the patient expereince.

RC754B Using Informatics to Transform Radiology to Patient-centered Practice

Participants
Seth J. Berkowitz, MD, Boston, MA (*Presenter*) Nothing to Disclose

RC754C Improving Customer Service in Radiology

Participants
Alex Towbin, MD, Cincinnati, OH (*Presenter*) Author, Reed Elsevier; Grant, Guerbet SA; Grant, Cystic Fibrosis Foundation; Consultant, Reed Elsevier; Advisory Board, IBM Corporation; Advisory Board, KLAS Enterprises LLC;

For information about this presentation, contact:

alexander.towbin@cchmc.org

LEARNING OBJECTIVES

1) List the five dimensions of Service Quality. 2) Describe examples of a quality improvement project that focuses on each of the five dimensions of service quality.

ABSTRACT

Radiology is a service-oriented specialty. The purpose of this lecture is to introduce the five dimensions of service quality. Examples of customer service initiatives will be provided to illustrate each of the service quality dimensions.

RC754D Radiologists' Experience with Open Radiology Reports

Participants
Olga R. Brook, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

obrook@bidmc.harvard.edu

LEARNING OBJECTIVES

1) To learn about impact of open radiology reports on radiologist workflow in a large academic institution where open reports has been in practice for more than 10 years.

RC754E My Experience with Providing Direct Phone Line in Radiology Report

Participants
Jennifer L. Kemp, MD, Denver, CO (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

jkemp@divrad.com

LEARNING OBJECTIVES

1) List the benefits of including radiologist contact information at the bottom of reports. 2) List potential obstacles to including radiologist contact information at the bottom of reports. 3) Develop a similar program of including contact information for radiologists in their own practices.

Printed on: 10/29/20

RCA55

Intro to Statistics with R (Hands-on)

Thursday, Dec. 5 4:30PM - 6:00PM Room: S401AB

IN RS

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants

James E. Schmitt, MD, PhD, Havertown, PA (*Moderator*) Nothing to Disclose
James E. Schmitt, MD, PhD, Havertown, PA (*Presenter*) Nothing to Disclose
Nathan M. Cross, MD, MS, Seattle, WA (*Presenter*) Consultant, Koninklijke Philips NV
David Gutman, MD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Install and launch the R software package. Understand how to search for and download external packages to extend R's functionality. 2) Load data from external files such as txt, csv, and xlsx. 3) Perform basic mathematical operations and utilize data structures to manipulate data. 4) Use loops to perform more complex operations over the data, including true/false logic. 5) Understand the basics of creating plots and histograms. 6) Perform common statistical tests including correlation, Chi-square, and ANOVA.

Printed on: 10/29/20

RCC55

Deep Learning-An Imaging Roadmap

Thursday, Dec. 5 4:30PM - 6:00PM Room: E450A

AI IN

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

FDA Discussions may include off-label uses.

Participants
Paula M. Jacobs, PhD, Bethesda, MD (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

Paula.Jacobs@nih.gov

LEARNING OBJECTIVES

1) Understand the framework of 'Deep Learning', Machine Learning, and Neural Net computer algorithms. 2) Comprehend what aspects of radiology practice are most amenable to machine learning deployment. 3) Understand the academic, commercial and clinical perspectives on how the field will likely develop and how NCI's Cancer Imaging Archive (TCIA) can accelerate development of this new technology.

ABSTRACT

Deep Learning,' an independent self-learning computational environment that uses multilayered computational neural nets, has generated considerable excitement (as well as concerns and misperceptions) in medical imaging. Deep learning computational techniques, such as convolutional neural networks (CNNs) generate multiple layer feature classifiers that extract disease relevant features from entire regions of medical images without the need for localization or pre-segmentation of lesions. Although CNNs require training on very large image datasets that encompass particular disease expressions, they can be diagnostically effective since no human input of segmentation features such as size, shape, margin sharpness, texture, and kinetics are required. But their immediate and future applicability as tools for unsupervised medical decision-making are, as yet, not well understood by most clinical radiologists. This overview session of Deep Learning will provide a clearer picture by presenters who are active in that field and who can clarify how the unique characteristics of Deep Learning could impact clinical radiology. It will address how radiologists can contribute to, and benefit from, this new technology. Topics of this multi-speaker session will cover: 1) the general principles of deep learning computational schemas and their mechanisms of handling image inputs and outputs. 2) new technology including hardware shifts in microprocessors from CPU's to GPU devices that offer significant computational advantages 3) how to ensure that Deep Learning results are consistently clinically relevant and meaningful including nodal element tuning and provability so as to assure medical care consistency and reproducibility. 4) how to develop and leverage datasets for deep learning on archives such as the NIH The Cancer Imaging Archive (TCIA) including requirements for input image dataset magnitude and completeness of disease spectrum representation. 5) how to embed essential non-imaging data needed as inputs, (e.g. EHR, outcome, cross-disciplinary metadata, and the data pre-processing required to make DICOM ready for Deep Learning. The presentations will be at a level understandable and relevant to the RSNA radiologist audience.

Sub-Events

RCC55A Computer Science Deep Learning Research by the Academic Community

Participants
Fred W. Prior, PhD, Little Rock, AR (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

FWPrior@uams.edu

LEARNING OBJECTIVES

1) Understand the basic concepts of Machine Learning and Deep Learning and how they differ. 2) Gain insights into how these techniques are being used in quantitative imaging (Radiomic) research.

RCC55B Commercial Development and Deployment of Deep Learning Technology

Participants
Abdul Hamid Halabi, Santa Clara, CA (*Presenter*) Developer, NVIDIA Corporation; Spouse, Employee, Covenant Pathology

RCC55C Radiology Clinician Perspectives

Participants
Andrea G. Rockall, FRCR,MRCP, London, United Kingdom (*Presenter*) Speaker and Chairman, Guerbet SA

LEARNING OBJECTIVES

1) Understand the differences between an algorithm that works in the lab and one that works in clinical practice. 2) Identify common weaknesses in study design that can lead to better apparent performance than might be realized in practice. 3) Recognize challenges in practical workflow that might impede clinical adoption of some tools.