Ultrasound

Participants
Christina Gkali, MD, Athens, Greece (*Presenter*) Nothing to Disclose
Athanasios N. Chalazonitis, MD, MPH, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Eleni Feida, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Andromachi Zourla, MD, PhD, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Constantine Dimitrakakis, MD, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Alexandra Tsigginou, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Aris Giannos, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To review an appropriate breast Strain and A.R.F.I. (Acoustic Radiation Force Impulse) elastography examination protocol.2. To present technical factors which influence the elastographic evaluation of breast lesions.3. To present lesion characteristics that affect the elastographic evaluation of them.4. To provide a special tips chart in order to avoid misdiagnosis.

TABLE OF CONTENTS/OUTLINE

Both benign and malignant breast lesions were examined in our Radiology Department with ultrasound elastography imaging in more than 100 consenting patients. All cases were paired with cytological or/and histological confirmation.In our educational exhibit we will present a dedicated Strain (elasticity score and strain ratio) and A.R.F.I. (Virtual Touch Tissue Imaging/VTI and Virtual Touch Tissue Quantification/VTQ) elastography examination protocol for benign and malignant breast lesions. We will also analyze in details technical factors and lesion characteristics which can influence the elastographic evaluation. Finally, a special tips chart will be presented as an examination tool to avoid misdiagnosis due to elastography pitfalls.A great variety of different sample cases will help the participant to understand the spectrum of breast elastography pitfalls and guide him, or her on how to avoid them.

Contrast-enhanced Ultrasound for Assessment of Axillary Lymph Node Status in Breast Cancer: Why and How to Do It

All Day Location: BR Community, Learning Center

FDA Discussions may include off-label uses.

Participants
Takayoshi Uematsu, MD, PhD, Nagaizumi, Japan (*Presenter*) Nothing to Disclose
Kazuaki Nakashima, MD, Nagasaki, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The major teaching points of this exhibit are: 1. Contrast-enhanced US is useful in the detection and confirmation of axillary lymph node metastasis in breast cancer. 2. The presence of a perfusion defect of lymph nodes and the fast wash in of arterial flow in the defect area using reinjection are confirmative signs of metastasis.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Illustrate the normal anatomy of axillary lymph node 3. Sonazoid-enhanced US techniques for assessment of axillary lymph node status 3. Illustrative cases with pathological findings 4. Discussion 6. Summary

Detection of 2D and 3D Mammography Occult Cancers with ABUS Technology

All Day Location: BR Community, Learning Center

Participants
Christina C. Clemow, DO, Rocky River, OH (*Presenter*) Nothing to Disclose
Rachna Dutta, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Katie Davis, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. ABUS is proven to identify occult cancers missed on 2D mammography2. Recent experience at our institution provides evidence that ABUS can detect cancer not visible on 3D tomosynthesis studies in dense breasts. A review of Medline/Pubmed yielded no published reports of ABUS detected cancers not seen on 3D tomosynthesis in patients with dense breasts. 3. ABUS may allow for earlier cancer detection, changing treatment course, and should therefore be considered as a supplemental screening tool in patients with dense breasts

TABLE OF CONTENTS/OUTLINE

Discuss dense breasts as an independent risk factor for developing breast cancer.Review secondary screening options for dense breasts.Review standard screening mammography protocol and decision factors leading to the offering of secondary screening exams to patients with dense breasts.Pictorial case presentation showcasing our initial experience with ABUS and the detection of mammographically occult malignancies on both 2D and 3D tomosynthesis.Case presentation of ABUS detected malignancies with correlation of imaging features on handheld diagnostic ultrasound and biopsy with rad-path correlation.Discuss ABUS as a secondary screening tool for dense breasts and the implication of early detection of small cancers and improved treatment course.

BR132-ED-X

Comparison of Contrast-Enhanced Ultrasound (CEUS) and MRI in Evaluating Invasive Breast Cancer - What We've Learned So Far

All Day Location: BR Community, Learning Center

FDA Discussions may include off-label uses.

Participants
Mollie A. Rashid, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Sandy C. Lee, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Arman Danielian, MS, Glendale, CA (*Abstract Co-Author*) Nothing to Disclose
Edward G. Grant, MD, Los Angeles, CA (*Abstract Co-Author*) Research Grant, General Electric Company ; Medical Advisory Board, Nuance Communications, Inc
Bhushan Desai, MBBS, MS, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Mary W. Yamashita, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Linda Hovanessian-Larsen, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To understand the basic principles and techniques of contrast enhanced ultrasound (CEUS) and investigate its role in imaging breast cancer2. Provide illustrative examples of CEUS compared to MRI in patients with newly diagnosed invasive carcinoma3. To compare and contrast qualitative and quantitative parameters of these tumors on CEUS with established parameters on MRI 4. Correlate the findings of CEUS and MRI to histopathology and receptor status5. Include case examples of nonenhancing breast cancer subtypes on CEUS and their corresponding MRI findings, and possible explanations for these findings

TABLE OF CONTENTS/OUTLINE

A. Background and significance of CEUSB. Literature reviewC. Review of limitations of current modalitiesD. Show case examples of patients at our institution that have biopsy proven invasive breast carcinoma with an initial CEUS and MRI prior to treatmentE. Correlate imaging findings with histopathology/receptor status F. Provide preliminary data comparing tumor size, percent necrosis, and enhancement patterns between CEUS and MRIG. Provide illustrative examples of nonenhancing invasive cancer subtypes on CEUS and their corresponding MRI findingsH. Discuss our institution's initial and subsequent modifications in technique for CEUS exams I. Discuss the future of CEUS and applications in breast cancer imaging

Not Just Shades of Grey - A Review of the ACR BI-RADS Ultrasound Lexicon

All Day Location: BR Community, Learning Center

Participants
Rosalind P. Candelaria, MD, Houston, TX (*Presenter*) Nothing to Disclose
Beatriz E. Adrada, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Monica L. Huang, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Lumarie Santiago, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Xuan-Loc Nguyen, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Bruno D. Fornage, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Ultrasound is a breast cancer screening and diagnostic tool. The most suspicious ultrasound features will determine the BI-RADS assessment category. Ultrasound diagnostic accuracy relies on the correlation of sonographic findings with other imaging findings (e.g., mammogram and MRI) and with the clinical examination. Appropriate use of the lexicon descriptors and BI-RADS assessment categories helps guide management and facilitate communication with clinicians.

TABLE OF CONTENTS/OUTLINE

Background history of BI-RADS Illustrative examples of terminology a. Examples of tissue composition b. Examples of masses c. Examples of calcifications d. Examples of associated features e. Examples of special cases Assignment of BI-RADS assessment categories and appropriate follow up Literature review of interobserver variability and positive predictive value of descriptors Self-assessment with interactive cases Review of key teaching points References

Contrast-enhanced Ultrasonography (CEUS) of Breast Cancer Metastatic Axillary Lymph Nodes. Imaging-pathology Correlations and Potential Pitfalls

All Day Location: BR Community, Learning Center

Participants
Tomoyuki Ohta, Tokyo, Japan (*Presenter*) Nothing to Disclose
Makiko Nishioka, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Norio Nakata, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose
Kunihiko Fukuda, MD, Tokyo, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

(1) To review CEUS image of breast cancer metastatic axillary lymph nodes. (2) To demonstrate basic findings suggestive of metastasis and imaging-pathology correlation. (3) To discuss potential pitfalls of CEUS of breast cancer metastatic axillary lymph nodes.

Reading Between the Lines: Sonographic Evaluation for Breast Implant Rupture

All Day Location: BR Community, Learning Center

Awards
Certificate of Merit

Participants
Ramapriya Ganti, MD, Dallas, TX (*Presenter*) Nothing to Disclose
Pooja Sharma, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Jody C. Hayes, MD, Southlake, TX (*Abstract Co-Author*) Nothing to Disclose
Stephen J. Seiler, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Review the proper ultrasound technique for implant evaluation Describe the most common ultrasound features signifying implant rupture Highlight imaging findings that may mimic rupture

TABLE OF CONTENTS/OUTLINE

• Ultrasound Techniques: Optimizing image quality Split screen imaging, with comparison to the contralateral implant• Implant Characteristics: Implant Type: saline, silicone, dual-lumen, expander-type Implant Location: prepectoral, retropectoral Capsule-Shell Complex Anatomy Contour Abnormalities: radial fold, bulge, herniation• Saline Implants: Injection Ports Saline Rupture• Silicone Implants: Intracapsular Rupture Signs: stepladder, subcapsular line, loss of trilaminar lining Intracapsular Rupture Mimics: reverberation artifact, radial folds, cohesive implants, fibrous capsular calcifications Extracapsular Rupture Signs: snowstorm/echogenic noise, silicone granulomas, extension along fascial planes, silicone-laden lymphadenopathy• Peri-Implant Effusions: Evaluation and management of peri-implant effusions by ultrasound• Diagnostic Uncertainty: Recommendations for inconclusive sonographic evaluations

Real-time MRI Navigated Ultrasound for Preoperative Tumor Staging in Breast Cancer Patients: Technique and Clinical Implementation

All Day Location: BR Community, Learning Center

Awards
Certificate of Merit

Participants
Ah Young Park, MD, Ansan , Korea, Republic Of (*Presenter*) Nothing to Disclose
Bo Kyoung Seo, MD, PhD, Ansan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyu Ran Cho, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ok Hee Woo, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Hoon Cha, MD, Ansan City, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Real-time MRI navigated ultrasound is an image fusion technique to display the results of both MRI and ultrasound on the same monitor. This system is a promising technique to improve lesion detection and analysis, to maximize advantages of each imaging modality, and to compensate disadvantages of each US and MRI. The purpose of this educational exhibit is to illustrate technical principles of the real-time MRI navigated ultrasound and to demonstrate clinical implementation of the system in evaluation of tumor extent, nodal status, and multiplicity in breast cancer patients.

TABLE OF CONTENTS/OUTLINE

1) Introduction 2) Significance of second-look ultrasound examination for breast lesions initially detected with MRI in breast cancer patients 3)Technical principles and equipment setting up of real-time MRI navigated ultrasound 4) Clinical implementation of real-time MRI navigated ultrasound: Tumor extent, lymph node status, and multiplicity 5) Prospect of real-time MRI navigated ultrasound in tumor staging 6) Discussion

Pictorial Review: Contrast Enhanced Ultrasound in Evaluating Breast Cancer Patients Receiving Neoadjuvant Chemotherapy

All Day Location: BR Community, Learning Center

FDA Discussions may include off-label uses.

Participants
Sandy C. Lee, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Brenna A. Chalmers, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Arman Danielian, MS, Glendale, CA (*Abstract Co-Author*) Nothing to Disclose
Edward G. Grant, MD, Los Angeles, CA (*Abstract Co-Author*) Research Grant, General Electric Company ; Medical Advisory Board, Nuance Communications, Inc
Bhushan Desai, MBBS, MS, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Mary W. Yamashita, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Linda Hovanessian-Larsen, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To understand the basics of contrast enhanced ultrasound (CEUS) and investigate its role in imaging breast cancer patients receiving neoadjuvant chemotherapy (NAC)2. To demonstrate the imaging findings, qualitative and quantitative parameters on CEUS for biopsy-proven invasive carcinoma at: (1) baseline before initiating NAC, (2) 3 weeks after starting NAC, and (3) after completion of NAC prior to surgical treatment3. Provide illustrative examples of CEUS and compare them to contrast enhanced breast MRI (CE-MRI)4. Discuss the future of CEUS and possible applications in patients undergoing NAC

TABLE OF CONTENTS/OUTLINE

A. Background/significance of NAC and the current role of MRIB. Explain the technique/basics of CEUSC. Provide clinical presentation, imaging findings (tumor size, percent necrosis, enhancement characteristics and enhancement quantitative parameters), and histopathology for 15 patients that have biopsy proven invasive breast cancer who receive NAC with an emphasis on CEUS studies. CEUS is performed at baseline, after starting NAC, and after completion of NAC prior to surgeryD. Correlation of the CEUS and CE-MRI imaging findings with final histopathology after surgery will be presented. Examples of complete and partial pathologic response will be illustratedE. Discuss the future of CEUS and possible applications in patients undergoing NAC

The Utility of Ultrasound MicroPure Imaging in Breast Grouped Microcalcifications: Imaging Principle and Clinical Application

All Day Location: BR Community, Learning Center

Participants
Ah Young Park, MD, Ansan , Korea, Republic Of (*Presenter*) Nothing to Disclose
Bo Kyoung Seo, MD, PhD, Ansan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyu Ran Cho, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ok Hee Woo, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Young Sik Kim, Ansan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The MicroPure imaging is an innovative ultrasound technique to aid the detection of microcalcifications. This system has a special filter to enhance bright echoes with background suppression and to improve visualization of microcalcifications. Grouped microcalcifications, which is defined as five or more calcifications within 1cm of each other, is the smallest distribution subtype of calcifications on mammography. Grouped microcalcifications are not easily detectable on ultrasound, therefore, mammography-guided procedure is suggested for suspicious microcalcifications. The MicroPure imaging allows performing ultrasound-guided procedure of microcalcifications, that is beneficial to radiation exposure, time, and medical cost. The purpose of this educational exhibit is to demonstrate the imaging principle of the MicroPure imaging and clinical application in grouped microcalcifications with pathological correlation.

TABLE OF CONTENTS/OUTLINE

1) Introduction 2) Definition and significance of grouped microcalcifications in the breast 3) Limitations of conventional ultrasound technique to detect breast microcalcifications 4) Imaging principle of MicroPure imaging 5) Clinical application of MicroPure imaging in grouped microcalcifications with pathological correlation: Benign vs. malignancy 6) Advantages and pitfalls of MicroPure imaging 7) Discussion

Ultrasound Elastography in the Differential Diagnosis of Benign and Malignant Breast Lesions. Personal Experience and Update of the Literature on the Use of Strain-US Elastography (SUE) and Shear Wave.

All Day Location: BR Community, Learning Center

Participants
Vito Cantisani, MD, Roma, Italy (*Presenter*) Speaker, Toshiba Corporation; Speaker, Bracco Group; Speaker, Samsung Electronics Co, Ltd;
Nicola Di Leo, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Carlo De Felice, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Rossella Occhiato, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Laura Ballesio, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Carlo Catalano, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Ferdinando D'Ambrosio, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Valentina Cipolla, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Mattia Di Segni, MD, Roma, Italy (*Abstract Co-Author*) Nothing to Disclose
Francesco Flammia, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Description of elastographic features of breast typical and atypical lesions, with pathology confirmation compared with BIRADS-US classification. 2. Explanation of technical issues of various US elastography methods and their application in the breast. 3. Review of epidemiology, clinical presentation, state of the art work up, differential diagnosis and treatment options.

TABLE OF CONTENTS/OUTLINE

Diagnostic features of breast lesions. State of the art imaging and literature review, including BIRADS classification and EFSUMB and WFUMB guidelines. US techniques available for breast lesion evaluation and their use in the diagnosis and their limits: qualitative elastography with Ueno score, semi-quantitative strain ratio measurements and shear wave elasticity and velocity measurements. Tips and tricks for better results. Breast lesions features at US strain and shear wave elastography provided by image review of representative cases from our cohort of 88 patients in correlation with histopathology will be showed. Discussion on differential diagnosis and the role of the two imaging modalities. Conclusion: USE and Shear wave elastography are accurate and feasible ultrasound additional tool. Both of them may be used to increase accuracy of US in breast lesion differentiation, but necessary training is warranted for its prompt use.

Ultrasonography-based Thyroidal and Perithyroidal Anatomy and its Clinical Significance

All Day Location: VI Community, Learning Center

Awards
Certificate of Merit

Participants
Eun Ju Ha, Suwon, Korea, Republic Of (*Presenter*) Nothing to Disclose
Jung Hwan Baek, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

For a safe and effective US-guided procedure such as ethanol-, radiofrequency-, laser- ablation, selective nerve block, and core needle biopsy, knowledge of neck anatomy, particularly that of the nerves, vessels, and other critical structures, is essential.Teaching point 1. To elucidate US-based thyroidal and perithyroidal anatomy, as well as its clinical significance.Teaching point 2. To provide prevention techniques for complications during the US-guided procedures.

TABLE OF CONTENTS/OUTLINE

1. Nervous system 1-1. Vagus nerve 1-2. Superior and inferior laryngeal nerves 1-2-1. Recurrent and non-recurrent inferior laryngeal nerve 1-2-2. Superior laryngeal nerve 1-3. Cervical sympathetic ganglion 1-4. Cervical plexus and brachial plexus 1-5. Spinal accessory nerve 1-6. Phrenic nerve 1-7. Traumatic neuroma2. Muscular sturcture 2-1. Anterior neck muscles 2-2. Lateral neck muscles 2-3. Posterior neck muscles3. Vascular structure 3-1. Superior and inferior thyroid artery 3-2. Common carotid artery and internal jugular vein 3-3. Superior, middle, and inferior thyroid veins 3-4. Anterior jugular vein4. Bone and cartilage 4-1. Hyoid bone and vertebrae 4-2. Thyroid cartilage and cricoid cartilage5. Esophagus and trachea6. Prevention techniques

Organizing a Systematic Analysis to Detect and Manage Endovascular Aortic Aneurysm Repair and Complications by Ultrasound: A Comprehensive and Objective Review

All Day Location: VI Community, Learning Center

Participants
George C. Dantas, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
Carlos A. Ventura, PhD, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Marcelo B. Funari, MD, Ribeirao Pires, Brazil (*Abstract Co-Author*) Nothing to Disclose
Miguel J. Neto, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Marcos R. Queiroz, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Guilherme F. Mendes, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Thiago D. Saraiva, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Daniel C. Luz, MD, Brazil, Brazil (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is systematize an ultrasound examination after Endovascular Aortic Aneurysm Repair (EVAR), using Duplex Scan, CEUS and Image fusion techniques to detect and evaluate complications.- Duplex scan is performed to determine aneurysm size, morphology of the endoprosthesis and visualize and evaluate blood flow in and out of the prosthesis (leak).- CEUS increases the sensitivity of ultrasound surveillance, due its ability in detects low flow velocity and recognize endoleaks with delayed enhacement. Contrast image is viewed on a split image screen with the grayscale image adjacent.- We do it with 1mL of Sonovue® followed by 5mL of normal saline flush. Where an endoleak was found, a more focused examination could be conducted with a further 1mL bolus agent contrast.- In case of patients have a previous CTA, image fusion techniques combining CEUS and CTA can be performed in a split image screen using appropriate software.- Image fusion improves spatial orientation, facilitating the characterization of complications post-EVAR, especially endoleaks.

TABLE OF CONTENTS/OUTLINE

Introduction Complications after EVAR Ultrasound advantages and limitations Systematization of examination Conclusion

Challenges in Ultrasound Imaging of Carotid Artery Stenosis

All Day Location: VI Community, Learning Center

Participants
Faezeh Razjouyan, MS, Washington, DC (*Presenter*) Nothing to Disclose
Osvaldo Mercado, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Bonnie C. Davis, MD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Andre J. Duerinckx, MD, PhD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Han Y. Kim, MD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Kamyar Sartip, MD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Jean Sebastien Rowe, BS, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Noreen Islam, MPH, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Brittany Bryant, BS, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Weonpo Yarl, MS, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Sanchez J. Colo, MBA, Pharm D, Lanham, MD (*Abstract Co-Author*) Nothing to Disclose
Isaac Dodd, Cheverly, MD (*Abstract Co-Author*) Nothing to Disclose
Jonathan Nakata, BS, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Motahar Basam, BA, Silver Spring, MD (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

At the end of this presentation, participants will be able to: Apply new insights from a summary of the world literature on the use of ultrasound in evaluating normal carotid anatomy with gray-scale, color and duplex Doppler techniques. Describe the potential for human errors and technical artifacts and/or mistakes when acquiring or interpreting carotid ultrasound examinations. Recognize technical limitations that can result in errors in interpretation. Recognize the need for further research in the flow hemodynamics of the carotid artery. Discuss the importance of quality assessment in the accuracy of diagnosing carotid stenosis.

TABLE OF CONTENTS/OUTLINE

Review and summarize the world literature on various imaging modalities used for carotid imaging. Illustrate specific human errors and technical artifacts such as: satisfaction of search, machine tracing of Doppler velocity flow patterns and others. Assess the need for more research and understanding of how to apply hemodynamic principles validated in the carotid bifurcation to other portions of the carotid anatomy. Review limitations of carotid imaging due to color Doppler artifacts. Review recommendations to obtain consistency in reporting carotid sonograms for both structure and content.

Ultrasound Assessment of Chronic Mesenteric Ischemia

All Day Location: VI Community, Learning Center

Awards
Cum Laude

Participants
Abbas Momin, MD, New Haven, CT (*Presenter*) Nothing to Disclose
John S. Pellerito, MD, Manhasset, NY (*Abstract Co-Author*) Nothing to Disclose
Margarita V. Revzin, MD, Wilton, CT (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

To familiarize the radiologist with application of ultrasound in assessment of chronic mesenteric ischemia (CMI). This will aid in improving radiologists ability to correctly diagnose this disease and minimize the rate of misdiagnosis and misinterpretation.

TABLE OF CONTENTS/OUTLINE

1. The natural history of CMI, and factors that differentiate it from acute mesenteric ischemia.2. Review of the anatomy and physiology of splanchnic vessels and their collateral circulation.3. Review ultrasound protocols for evaluation of splanchnic arteries with emphasis on utilization of different approaches and modes, and optimization of parameters to improve mesenteric artery assessment.4. Diagnostic criteria for CMI will be summarized with detailed discussion of secondary signs of stenosis. Different examples of two and three vessel stenoses and chronic superior mesenteric artery occlusion with retrograde reconstitution will be provided. 5. Pitfalls in evaluation will be discussed including median arcuate ligament syndrome, nutcracker syndrome, low and high output states, arrhythmia, acute superior mesenteric artery thrombosis, celiac axis dissection and pseudoaneurysm formation, and spontaneous superior mesenteric artery dissection.6. Current management of CMI will be discussed.7. A discussion of follow-up assessment after arterial stenting.

Ultrasound-Guided Intervention Enhanced: How to Improve Success Rate and Avoid Complication with the Use of Ultrasound Contrast Agent

All Day Location: VI Community, Learning Center

FDA Discussions may include off-label uses.

Awards
Cum Laude

Participants
Dean Y. Huang, FRCR, London, United Kingdom (*Presenter*) Nothing to Disclose
Mohammad Daneshi, MBBS, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Gibran Yusuf, MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Raymond Ramnarine, MBBS, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Maria E. Sellars, MD, FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Paul S. Sidhu, MRCP, FRCR, London, United Kingdom (*Abstract Co-Author*) Speaker, Bracco Group; Speaker, General Electric
Company

TEACHING POINTS

Ultrasonography is a proven technology in intervention. Ultrasound contrast agent (UCA) improves its imaging to the level of other enhanced modalities. However, to justify its use in interventional procedures, it is useful to attain clarity about where its use could potentially improve outcome. The aim of the exhibit is to familiarise learners with the evolving application of UCA in US-guided procedures, and to illustrate how use of UCA could improve success rate and reduce complications.

TABLE OF CONTENTS/OUTLINE

To provide illustration of a spectrum of routinely performed US-guided procedures where use of UCA could be rewarding: A. Drainage: For targeting septated intra-hepatic, pelvic and sub-capsular renal abscess. B.'US tubograms' for precise information on drain position and extent of collection. C. Biopsy: For visualization of vascular tissue within necrotic lesions, and avascular scar in native and transplant renal biopsy. D. Nephrostomy: For calyceal and needle visualization. E. 'US nephrostograms': for drain position and imaging of ureteric stricture, urinoma or rare ureteroenteric fistula. F. Tumor ablation: For tumor visualization and response monitoring. G. Macro-vascular imaging: For detection and management of complications such as extravasation and pseudo-aneurysm at puncture site and in dialysis fistula intervention.

Ultrasound Immersion Week: An Innovative Approach of Instruction for Medical Students in Ultrasound

All Day Location: VI Community, Learning Center

Participants
Varun Rachakonda, MD, Houston, TX (*Presenter*) Nothing to Disclose
Roshon Amin, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Manickam Kumaravel, MD, FRCR, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

At the end of this exhibit, the readers would learn: A method of creating an intensive ultrasound curriculum by designing a program 'Ultrasound Immersion Week' aimed specifically at medical students A method for measuring effectiveness of the program Application of this methodology for various audiences in different institutions

TABLE OF CONTENTS/OUTLINE

Overview of ultrasound training for medical students. Current status and gaps in instruction. Presention of our curriculum for 2nd year medical students curriculum in ultrasound at our institution including instrumentation, anatomy, and ultrasound guided interventional procedures using phantoms Program overview of Ultrasound Immersion Week including teaching methodology, curriculum, pre- and post- Immersion Week assessments of skills and knowledge Medical student ultrasound competition Medical student and resident satisfaction surveys Discussion of how to replicate this experience at other institutions Training radiology resident volunteers to teach medical students basic ultrasound techniques/principles Ultrasound machines, human models, and phantom models Creation of low-cost homemade phantom models to demonstrate ultrasound guided interventional procedures

AAPM/RSNA Physics Tutorial for Residents: US

Saturday, Nov. 28 12:00PM - 2:00PM Location: E351

US **PH**

AMA PRA Category 1 Credits ™: 2.00
ARRT Category A+ Credits: 2.00

Participants
Thaddeus A. Wilson, PhD, Memphis, TN (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Provide an overview of MRI/Ultrasound technology, recent advances and trends for the future. 2) Make the session attractive to both the clinician, clinician educator, medical physicist and other associated radiological fields. 3) First session hour will be spent reviewing the concepts of the modality. 4) Second session hour will be spent discussing artifacts of the modality.

Sub-Events

SPPH01A   Update in Ultrasound

Participants
Kai E. Thomenius, PhD, Niskayuna, NY (*Presenter*) Stockholder, General Electric Company; Research Consultant, Endra, Inc

LEARNING OBJECTIVES

View learning objectives on main course title.

SPPH01B   Primer and Clinical Significance of Artifacts in Ultrasound

Participants
David M. Paushter, MD, Chicago, IL, (dpaushter@uchicago.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the basic principles of ultrasound imaging and Doppler. 2) Apply these principles to identify the causative factors producing common artifacts in ultrasound. 3) Recognize artifacts encountered in clinical practice. 4) Identify methods to prevent or minimize artifacts in clinical practice.

ABSTRACT

Medical ultrasound including imaging and Doppler requires an understanding of basic principles of sound formation, propogation and display. Artifacts are common in ultrasound, and it is critical to: a) avoid production of artifacts when possible, b) recognize artifacts during imaging and c) control or eliminate artificacts that may interfere with image interpretation. Topics to be covered in this session will focus on equipment malfunction or design, operator error, violation of assumptions and physical principles as causative factors in artifact production. Included will be review and presentation of select examples of artifacts related to ultrasound basic principles, including:Ultrasound imagingResolution, beam width,refraction, reverberation, comet tail, ringdown, multipath, side and grating lobes, speed error, range ambiguity and mirror image produced in ultrasound imaging.Doppler/Duplex SonographyGain, scale, Doppler angle, aliasing/range ambiguity, mirroring, wall filter, color assignment, color bleeding, twinkle artifact, tissue vibratio and mirroring. ,

URL

Active Handout:David M. Paushter

http://abstract.rsna.org/uploads/2015/15001982/SPPH01B.pdf

Ultrasound Sunday Case of the Day

Sunday, Nov. 29 8:00AM - 11:59PM Location: Case of Day, Learning Center

US

AMA PRA Category 1 Credit ™: .50

Participants
Nirvikar Dahiya, MD, Phoenix, AZ (*Presenter*) Nothing to Disclose
Jason M. Wagner, MD, Oklahoma City, OK (*Abstract Co-Author*) Nothing to Disclose
Melanie P. Caserta, MD, Jacksonville, FL (*Abstract Co-Author*) Nothing to Disclose
Aya Kamaya, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Maryellen R. Sun, MD, Boston, MA (*Abstract Co-Author*) Research Grant, Glaxo SmithKline plc
Sean Duguay, MD, Oklahoma City, OK (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) Participants will learn to list the sonographic appearances of common and uncommon diseases. 2) Participants will learn to describe the differentiating features between similar diseases via a case based format. 3) Participants will learn to discuss the pathophysiology of diseases that are responsible for the sonographic appearance.

Genitourinary (New Technologies for Imaging the Genitourinary Tract)

Sunday, Nov. 29 10:45AM - 12:15PM Location: E351

`GU` `BQ` `MR` `US`

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

`FDA` Discussions may include off-label uses.

Participants
Julia R. Fielding, MD, Chapel Hill, NC (*Moderator*) Nothing to Disclose
Erick M. Remer, MD, Cleveland, OH (*Moderator*) Nothing to Disclose

Sub-Events

SSA09-01 Simultaneous Conventional Dynamic MR Urography and High Temporal Resolution Perfusion MRI of Bladder Tumors Using a Novel Free-Breathing Golden-Angle Radial Compressed-Sensing Sequence

Sunday, Nov. 29 10:45AM - 10:55AM Location: E351

Participants
Nainesh Parikh, MD, New York, NY (*Presenter*) Nothing to Disclose
Justin M. Ream, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Hoi Cheung Zhang, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Kai Tobias Block, PhD, New York, NY (*Abstract Co-Author*) Royalties, Siemens AG;
Hersh Chandarana, MD, New York, NY (*Abstract Co-Author*) Equipment support, Siemens AG; Software support, Siemens AG;
Consultant, Bayer, AG;
Andrew B. Rosenkrantz, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the feasibility of simultaneous conventional dynamic MR urography (MRU) and high temporal resolution perfusion MRI of bladder tumors using a novel free-breathing golden-angle radial acquisition scheme with compressed sensing reconstruction

METHOD AND MATERIALS

22 patients with bladder lesions underwent MRU using the GRASP (Golden-angle RAdial Sparse Parallel) technique. Following contrast injection, GRASP was performed of the abdomen and pelvis during free breathing (voxel size 1.4x1.4x3.0 mm, 1,000 radial spokes, acquisition time 3:44 min). Two dynamic data-sets were retrospectively reconstructed from this single acquisition by combining a distinct number of spokes into each dynamic frame: 110 spokes per frame to provide a resolution of approximately 30 seconds, serving as conventional MRU for clinical interpretation, and 8 spokes per frame to provide 2 second resolution images for quantitative perfusion. Using the 2 second resolution images, ROIs were placed within the bladder lesion and normal bladder wall for all patients, an arterial input function was generated from the femoral artery, and the GKM perfusion model was applied.

RESULTS

Follow-up cystoscopy and biopsy demonstrated 16 bladder tumors (13 stage≥T2, 3 stage≤T1) and 6 benign lesions. All lesions were well visualized using the conventional 25 second clinical dynamic images. Based on the 2 second resolution images, Ktrans was significantly higher in bladder tumors (0.38±0.24) than in either normal bladder wall (0.12±8, p<0.001) or in benign bladder lesions (0.15±0.04, p=0.033). The ratio between Ktrans of the lesion and of normal bladder wall in each patient was nearly double in tumors than in benign lesions (4.3±3.4 vs. 2.2±1.6), and Ktrans was nearly double in stage≥T2 tumors than in stage≤T1 tumors (0.44±0.24 vs. 0.24±0.24), although these did not approach significance (p=0.180-0.209), likely related to small sample size.

CONCLUSION

GRASP DCE-MRI provides simultaneous conventional dynamic MRU and high temporal resolution perfusion MRI of bladder tumors. Quantitative evaluation of bladder lesions based on the 2 second temporal resolution reconstructions showed associations with pathologic findings in our preliminary cohort.

CLINICAL RELEVANCE/APPLICATION

The novel GRASP sequence allows quantitative perfusion evaluation of bladder lesions within the context of a clinical MRU examination using a single contrast injection and without additional scan time.

SSA09-02 Magnetic Resonance Fingerprinting in Diagnosis of Prostate Cancer: Initial Experience

Sunday, Nov. 29 10:55AM - 11:05AM Location: E351

Participants
Shivani Pahwa, MD, Clevelnad, OH (*Presenter*) Nothing to Disclose
Chaitra A. Badve, MD, MBBS, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Yun Jiang, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Alice Yu, BS, MS, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Mark D. Schluchter, PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Mark A. Griswold, PhD, Cleveland, OH (*Abstract Co-Author*) Research support, Siemens AG Royalties, Siemens AG Royalties, General Electric Company Royalties, Bruker Corporation Contract, Siemens AG
Lee E. Ponsky, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Vikas Gulani, MD, PhD, Ann Arbor, MI (*Abstract Co-Author*) Research support, Siemens AG

PURPOSE

To describe initial experience in detecting prostate cancer (PCa) using quantitative MRI parameters—T1 and T2 relaxation times

To describe initial experience in detecting prostate cancer (PCa) using quantitative MRI parameters - T1 and T2 relaxation times derived from magnetic resonance fingerprinting (MRF-FISP), in combination with conventional ADC maps.

METHOD AND MATERIALS

63 patients with clinical suspicion of prostate cancer were imaged on 3T Siemens Skyra /Verio scanners. MRF has been shown to measure T1 and T2 relaxation times with high accuracy and precision2. In addition tothe standard multiparametric MRI exam, MRF-FISP was acquired (slice thickness: 6 mm, in-plane resolution:1×1 mm2,FOV:400 mm, TR:11-13 ms, flip angle:5-75 deg, duration:50s per slice).b-valuesfor DWI were0, 500, 1000 s/mm2.T1, T2 maps were generated from MRF-FISP dataand regions of interest (ROI)were drawn on T1, T2 and ADC maps in areas suspicious for cancer identified based on PIRADS score, and normal peripheral zone (NPZ). Matched pairs t-tests were used to compare T1, T2, ADC values in biopsy provenPCa and NPZ. Logistic regression model was applied to these parameters in differentiating PCa from NPZ. Receiver operating characteristic (ROC) analysis was performed for the parameters singly and in combination and area under the curve (AUC) was calculated

RESULTS

29 patients were diagnosed with cancer on transrectal biopsy. T1, T2, ADC values were significantly lower in cancer compared to NPZ ($p < 0.0001$). Mean T1, T2, ADC for prostate cancer were 1413 ± 60ms, 66 ± 3ms, $745 \pm 54 \times 10^{-6}$mm2/s, respectively. For NPZ, these values were 2058 ± 77ms, 165 ± 8ms, $1736 \pm 37 \times 10^{-6}$mm2/s.The AUC for T1, T2, ADC values in separating PCa from NPZ was 0.978, 0.982, 0.801, respectively. The combination of T2 and ADC produced the most complete separation between cancer and normal tissues, resulting in AUC of 0.995.

CONCLUSION

MRF-FISP is a novel relaxometry sequence that allows quantitative examination of prostate in a clinical setting. The T1 and T2 relaxation times so obtained, in combination with ADC values show promising results in detecting prostate cancer.

CLINICAL RELEVANCE/APPLICATION

Quantitative MR parameters can help identify prostate cancer non-invasively. This could have broad applications in diagnosis, guiding biopsy, and following treatment

SSA09-03   Contrast-enhanced Ultrasound for Renal Mass Characterization: Comparison of Low MI Time-intensity Curves and Destruction Reperfusion Techniques

Sunday, Nov. 29 11:05AM - 11:15AM Location: E351

Participants
Wui K. Chong, MD, Chapel Hill, NC (*Presenter*) Nothing to Disclose
Emily Chang, MD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Sandeep Kasoji, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Paul Dayton, PhD, Chapel Hill, NC (*Abstract Co-Author*) Co-founder, SonoVol LLC; Board Member, SonoVol LLC
Ersan Altun, MD, Istanbul, Turkey (*Abstract Co-Author*) Nothing to Disclose
Julia R. Fielding, MD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose
Kevin O. Herman, MD, Raleigh, NC (*Abstract Co-Author*) Nothing to Disclose
W K. Rathmell, Chapel Hill, NC (*Abstract Co-Author*) Research support, GlaxoSmithKline plc
Lee Mullin, PhD, Chapel Hill, NC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate contrast enhanced US (CEUS) for renal mass characterization in chronic renal insufficiency (CRI), comparing nondestructive (low MI) and destruction-reperfusion techniques.

METHOD AND MATERIALS

Prospective study comparing 48 subjects: 24 with normal function and renal masses scheduled for excision; 24 with CRI and indeterminate renal lesions on non-contrast US/CT.CEUS was performed on an Acuson Sequoia with CPS software. Perflutren (Definity) 1.3ml was administered IV. Lesions were imaged at a low MI of 0.2. A 3 minute videoclip was recorded. Time Intensity curves (TICs) of the lesion and adjacent parenchyma were generated. After 30 minutes, a 2nd dose of Definity was given and a Destruction Reperfusion (DR) sequence performed on the same lesion. DR was performed under an IND exemption from the FDA. Bubble destruction was performed at an MI of 0.9. Reperfusion images were obtained using Motion Stabilized Persistence software (Siemens). A color-coded parametric map quantifying arrival time was generated in which Green=faster arrival, Red=slower, Black=no contrast. (Arrow=Bosniak IV mass).Reference standard was pathology, contrast CT/MR or absence of change on follow up imaging for benign lesions. Two blinded readers reviewed the low MI images and classified the lesions using Bosniak criteria.

RESULTS

Lesion size ranged from 1.7-7.6cm (mean 3.5cm). Histopathology of resected masses showed no cavitation or cellular injury from high MI of DR. DR arrival times correlated with low MI TIC parameters. Sensitivity for distinguishing Bosniak I/II/IIF from III and higher was: Reader 1-96%, Reader 2-100%. Specificity was 78% and 63%. Specificity is lower because CEUS detects smaller amounts of contrast than CT/MR, leading to 'overstaging' with standard Bosniak. Reduced time to peak and arrival time ($p < 0.05$) was seen in the parenchyma of CRI subjects compared to parenchyma of those with normal renal function.

CONCLUSION

CEUS can characterize renal lesions, but Bosniak criteria must be modified because US is more sensitive to slight enhancement. DR does not cause tissue injury, correlates with low MI findings, and takes less time. The parenchyma in CRI showed reduced/ delayed contrast uptake, suggesting CEUS may also be useful for renal functional imaging.

CLINICAL RELEVANCE/APPLICATION

CEUS can evaluate indeterminate renal lesions and renal function in CRI, a population where CT and MR contrast are contraindicated.

SSA09-04   ARFI Evaluation of Small (<4 cm) Renal Masses. A Preliminary Study

Sunday, Nov. 29 11:15AM - 11:25AM Location: E351

Participants
Costanza Bruno, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose
Alessandra Bucci, MD, Verona, Italy (*Presenter*) Nothing to Disclose
Matteo Brunelli, PhD, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose
Salvatore Minniti, MD, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose
Chiara Dalla Serra, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose
Roberto Pozzi Mucelli, Verona, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate if ARFI can be a reliable technique in distinguish ccRCCS from other solid and fluid-containing small renal masses.

METHOD AND MATERIALS

31 small (<4 cm) renal masses (27 were solid - 17/27 ccRCCs, 3/27 papillary RCCs, 2/27 chromophobe RCCs, 4 oncocytomas and 1 angiomyolipoma - and 4 were cysts) were prospectively evaluated using US and ARFI. Each lesion was assigned an ARFI value obtained from the average of 12 measurements.All the solid masses underwent resection; all the cystic lesions were Bosniak 2, so were evaluated with follow up.The difference existing between the two groups was evaluated by means of Student's t test.A cut off value was determined to distinguish between ccRCCs and other lesions and sensibility, specificity, PPV, NPV and accuracy were determined.

RESULTS

ccRCCs are characterized by an higher ARFI value and - when compared with all the other lesions - the difference existing between the two groups was statistically significant (p<0.001). Considering a cut off value of 1.95 m/sec sensibility, specificity, PPV, NPV and accuracy were respectively 94.1%, 78.6%, 84.2%, 91.7% and 87.1%.

CONCLUSION

ccRCC is characterized by an higher ARFI value which can be used to distinguish it from other solid and fluid containing masses.

CLINICAL RELEVANCE/APPLICATION

ARFI can be an useful tool in the evaluation of small renal masses, helping distinguish cc RCCs from other lesions.

SSA09-05   **Fusion Imaging of (Contrast-enhanced) Ultrasound with CT or MRI for Kidney Lesions**

Sunday, Nov. 29 11:25AM - 11:35AM Location: E351

Participants
Thomas Auer, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Tobias De Zordo, MD, Innsbruck, Austria (*Presenter*) Nothing to Disclose
Daniel Junker, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Isabel M. Heidegger, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Werner R. Jaschke, MD, PhD, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Friedrich H. Aigner, MD, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of the study was to evaluate the feasibility of fusion imaging (FI) of (contrast-enhanced) ultrasound (CEUS) with CT/MRI in localization of sonographically challenging kidney lesions and usefulness for assessment of indeterminate kidney lesions

METHOD AND MATERIALS

From March 2013 to January 2014, 30 consecutive patients were included in this retrospective studyAll patients presented with previously in CT/MRI detected indeterminate kidney lesions that were either not detectable or hard to distinguish in conventional gray-scale ultrasoundIn these patients additional FI was performed by fusion of ultrasound with CT/MRI datasets. In 26 (86.7%) of these patients FI and CEUS was simultaneously conducted

RESULTS

FI could be performed in all of the 30 patientsFI-indication: In 18 of 30 patients (60%) FI was performed because a lesion of interest could not clearly be allocated due to multiple and directly adjacent similar lesions within one kidney. In 12 of 30 patients (40%) the kidney lesions were solitary or at least isolated but could not be detected with gray-scale US alone.CEUS-indication: Insufficient CT protocol (without NECT) and a not-water-isodens lesion (>20 HU) in 8 (30.8%) patients borderline CE in CT (10HU-20HU) in 11 (42.3%) patients non-conclusive CT/MRI studies in 5 (19.2%) patients CEUS for follow-up in 2 (7.7%) patients.Combined FI-CEUS: FI-CEUS could clearly differentiate between a surgical and non-surgical finding in 24 (80%) of 30 patients In 2 (6.7%) of 30 patients with conducted FI-CEUS lesions remained indeterminateFinal dignosis: Histology revealed a surgical lesion in 6 (20%) patients, while in 18 (60%) patients a non-surgical lesion such as BII/BIIF cysts, abscess formations, cicatricial tissue and a pseudotumor could be found. FI-CEUS didn't determine a final diagnosis in 2 patients (6.7%) In one elderly patient (3.3%) FI was conducted without CEUS because only size control of was demanded In 3 (10%) patients kidney lesions were not confidently detected with FI due to general US limitations

CONCLUSION

Our data suggest that FI of the kidney is a feasible examination regarding the localization and further assessment of indeterminate kidney lesions.

CLINICAL RELEVANCE/APPLICATION

The combination of FI with a synchronous CEUS examination can clarify indeterminate renal CT or MRI findings, reduce radiation exposure and is cost effective.

SSA09-06   **Optimal Energy for Kidney Parenchymal Visualization in Monoenergetic Images Generated from Dual Energy CT**

Participants
Jason DiPoce, MD, Jerusalem, Israel (*Presenter*) Nothing to Disclose
Zimam Romman, Haifa, Israel (*Abstract Co-Author*) Employee, Koninklijke Philips NV
Jacob Sosna, MD, Jerusalem, Israel (*Abstract Co-Author*) Consultant, ActiViews Ltd Research Grant, Koninklijke Philips NV

PURPOSE

To evaluate image quality of kidney parenchyma in a spectrum of CT monoenergy levels and to select the optimal Monoenergy levels for visualization.

METHOD AND MATERIALS

IRB approval was obtained. 30-corticomedullary phase, IV contrast-enhanced CT abdomen scans (18 males, 12 females, mean age of 50 years) were evaluated. In each scan, kidney parenchyma (60 regions) was assessed. The scans were obtained from a 64-slice spectral detector CT prototype (Philips Healthcare, Cleveland, OH, USA) at 120 kVp with an average of 150 mAs. For each scan, simultaneous conventional polyenergetic and monoenergetic image datasets at 50, 60, 70, 100, and 140 keV were reconstructed. Two experienced radiologists analyzed subjectively in consensus visualization of the kidney parenchyma and selected the optimal visualization dataset based on the conspicuity of the cortex and medulla and compared to the conventional images. Objective kidney signal-to-noise ratio (SNR) in the optimal monoenergy images was measured and compared to data from the conventional CT images.

RESULTS

Optimal image quality for kidney visualization was subjectively selected with 60 - 70 keV monoenergy images and was judged to be better than the conventional dataset. The kidney SNR values in optimal monoenergy were highly significantly different (p<0.01) from conventional CT images. Average SNR was 10.9 and 16.3 in the conventional and optimal monoenergy respectively.

CONCLUSION

Optimal visualization of the kidney parenchyma on dual energy CT images is achieved with monoenergy image reconstruction at 60 - 70 keV based on both subjective and objective assessments and seems to improve image quality compared to conventional images.

CLINICAL RELEVANCE/APPLICATION

Optimal image quality in monoenergy images may be supplemental to conventional polyenergetic images and potentially increase the diagnostic yield.

Honored Educators

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

Jason DiPoce, MD - 2013 Honored Educator
Jacob Sosna, MD - 2012 Honored Educator

SSA09-07   The Use of New Tissue Strain Analytics Measurement in Testicular Lesions

Participants
Dirk-Andre Clevert, MD, Munich, Germany (*Presenter*) Speaker, Siemens AG; Speaker, Koninklijke Philips NV; Speaker, Bracco Group;
Matthias Trottmann, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Julian Marcon, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Melvin D'Anastasi, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Alexander Karl, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Maximilian F. Reiser, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Virtual touch tissue imaging quantification (VTIQ) is a newly developed technique for the sonographic quantification of tissue elasticity. It has been used in the assessment of breast lesions. The purpose of this study was to determine the diagnostic performance of VTIQ in unclear testicular lesions.

METHOD AND MATERIALS

Twenty patients with known testicular pathology underwent conventional B-mode sonography with additional VTIQ of the testicular lesions using a Siemens Acuson S2000™ and S3000™ (Siemens Medical Solutions, Mountain View, CA, USA) system. Tissue mechanical properties were interpreted and compared in the VTIQ examination. The pathologic diagnosis was established after surgery or in the follow up examination in highly suspicious of benign lesions.

RESULTS

Over 36 months, 22 focal testicular lesions (median lesion size, 18 mm; range, 4-36 mm in 20 patients (median age, 43 years; range, 22-81 years) were examined. Lesions were hyperechoic (n = 1), hypoechoic (n = 14), isoechoic (n = 1), mixed echogenicity (n = 3) or anechoic (n = 3). Histological examination showed one benign lesion (6.25 %) with a mean size of 7 mm and 15 malignant lesions (93.75 %) with a mean size of 20 mm. The value of the shear wave velocity in normal testis tissue showed a mean shear wave velocity of 1.17 m/s. No value of the shear wave velocity could the measured in cystic lesions. The rest of the benign lesions showed a mean shear wave velocity of 2.37 m/s. The value of the shear wave velocity in germ cell tumours showed a mean shear wave velocity of 1.94 m/s and for seminoma it showed a mean shear wave velocity of 2.42 m/s.

CONCLUSION

VTIQ is a reliable new method for measuring qualitative and quantitative stiffness of testis lesions and tissue. The qualitative shear-

wave elastography features were highly reproducible and showed good diagnostic performance in unclear testicular lesions. The VTIQ technique is a useful in assessing small testicular nodules and pseudo lesions.

CLINICAL RELEVANCE/APPLICATION

VTIQ is a reliable user independent new method for measuring qualitative and quantitative stiffness of different testis lesions and tissue. The VTIQ technique allows to distinguished different testis lesions and pseudo lesions.

SSA09-08   One-stop-shot MRI for Infertility Evaluation: Comparison with US and CT-HSG

Sunday, Nov. 29 11:55AM - 12:05PM Location: E351

Participants
Javier Vallejos, MD, MBA, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose
Jimena B. Carpio, MD, Buenos Aires, Argentina (*Presenter*) Nothing to Disclose
Ezequiel Salas, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Carlos Capunay, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Mariano Baronio, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Patricia M. Carrascosa, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Research Consultant, General Electric Company
Lorena I. Sarati, Vicente Lopez, Argentina (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Demonstrate the utility of MRI-HSG in the diagnosis of infertility, can through this method show uterine, tubal, ovarian and pelvic causes.

METHOD AND MATERIALS

14 patients between 31 and 41 year-old diagnosed with infertility were studied. We performed a transvaginal ultrasound, virtual CT-HSG and MRI- HSG at the same day. MRI protocol include high-resolution T2 sequences, fat-suppressed T1, diffusion weighted imaging and contrast dynamic sequence (3D time-resolved imaging of contrast kinetics [TRICKS]). A contrast dilution of saline, iodine and gadolinium was instilled. Antral follicle counts, endometrial cavity findings, uterine wall pathology, tubal patency, and pelvic cavity findings were assessed with modalities.

RESULTS

In all cases it was observed more ovarian follicles on MRI-HSG than in US. In 65% of patients, Fallopian tubes were visualized completely with MRI-HSG, whereas in the remaining 35% only look at its distal portion. In all cases was demonstrated tubal patency with free peritoneal spillage. In 45% of patients, MRI-HSG showed endoluminal lesions, likes polyps and miomas, that were corroborated with CT-HSG. In 14% of patients, MRI-HSG detected endometrial implants in pelvic cavity that could not be corroborated by the other methods.

CONCLUSION

MRI-HSG allows a comprehensive evaluation for infertility diagnosis, with visualization and quantification of antral follicles, endometrial cavity, uterine wall and fallopian tubes as well as pelvic cavity findings such as endometrial implants.

CLINICAL RELEVANCE/APPLICATION

MRI techniques could be combined with HSG procedure in order to enables a one-step-shot imaging for evaluation of female infertility with the advantages of causing less pain and avoidance of exposure to ionizing radiation.

SSA09-09   4D Ultrasound Cistoscopy with Fly through in the Evaluation of Urinary Bladder Tumors Preliminary Experience

Sunday, Nov. 29 12:05PM - 12:15PM Location: E351

Participants
Vito Cantisani, MD, Roma, Italy (*Abstract Co-Author*) Speaker, Toshiba Corporation; Speaker, Bracco Group; Speaker, Samsung Electronics Co, Ltd;
Nicola Di Leo, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Valerio Forte, MD, Rome, Italy (*Presenter*) Nothing to Disclose
Flavio Malpassini, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Mauro Ciccariello, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Francesco Flammia, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Francesco M. Drudi, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Carlo Catalano, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Federica Flammia, Roma, Italy (*Abstract Co-Author*) Nothing to Disclose
Giuseppe Schillizzi, Roma, Italy (*Abstract Co-Author*) Nothing to Disclose
Ferdinando D'Ambrosio, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the feasibility and diagnostic efficacy 4D Ultrasound cystoscopy with Fly through as compared with trasditional cystoscopy in evaluating Urinary Bladder tumors.

METHOD AND MATERIALS

30 consecutive patients with previous detected urinary bladder lesions at cystoscopy were prospectively evaluated with 2D baseline US, and 4D Ultrasound with fly through (US virtual navigation system) by an expert radiologist blinded to cystoscopy results. The two imaging modalities were compared with cystoscopy and surgical results (N=8 patients) in order to assess the sensitivity and specificity in tumor detection and characterization. The diagnostic performance of 2D features and 4D ultrasound were estimated and compared using ROC curve analysis.

RESULTS

24/33 and 31/33 urinary bladder lesions were detected by 2 D US and 4 D Ultrasound respectively. The latter was also able to

identify two additional lesions not previously detected at traditional cystoscopy. The US features of the lesions were consistent with the one provided at cystoscopy with not significant differences in term of characterization.Conclusion: Our preliminary results shows that 4 D ultrasound cystoscopy with fly through is more accurate than baseline 2D ultrasound to detect and characterize urinary bladder lesions with results comparable with traditional cystoscopy.

CONCLUSION

Our preliminary results shows that 4 D ultrasound cystoscopy with fly through is more accurate than baseline 2D ultrasound to detect and characterize urinary bladder lesions with results comparable with traditional cystoscopy.

CLINICAL RELEVANCE/APPLICATION

New ultrasound software such as 4 D ultrasound cystoscopy with fly through may help us to follow-up patients treated conservatively for urinary bladder lesions.

Physics (Mammography/Ultrasound)

Sunday, Nov. 29 10:45AM - 12:15PM Location: S404AB

`BR` `DM` `US` `PH`

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

`FDA` Discussions may include off-label uses.

Participants
Andrew Karellas, PhD, Worcester, MA (*Moderator*) Research collaboration, Koning Corporation
Ernest J. Feleppa, PhD, New York, NY (*Moderator*) Research collaboration, General Electric Company; Research collaboration, SonaCare Medical, LLC

Sub-Events

SSA20-01 Realistic Simulation of X-ray Phase-contrast Imaging at a Human Scale

Sunday, Nov. 29 10:45AM - 10:55AM Location: S404AB

Participants
Yongjin Sung, Boston, MA (*Presenter*) Nothing to Disclose
William P. Segars, PhD, Durham, NC (*Abstract Co-Author*) Nothing to Disclose
Adam Pan, Cambridge, MA (*Abstract Co-Author*) Nothing to Disclose
Rajiv Gupta, PhD, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

X-ray phase-contrast imaging (XPCI) can dramatically improve soft tissue contrast in medical imaging. Despite worldwide efforts to develop novel XPCI systems, a numerical framework to rigorously predict the performance of a clinical XPCI system at a human scale is not yet available.

METHOD AND MATERIALS

We have developed a novel method of propagating the X-rays through a human-scale 3-D object [1]. Specifically, we have adopted the wave equation simplified with the first-order Rytov approximation, which allows us to quickly and accurately generate simulated amplitude and phase images that an XPCI detector would see. For our numerical phantom, we have adopted the XCAT model as defined with non-uniform rational B-splines (NURBS) [2]. Existing methods using the XCAT rely on ray tracing or Monte-Carlo simulation, which produce inaccurate XPCI simulations. Using our wave-based approach, we can accurately simulate the phase-contrast signal from the NURBS phantom.

RESULTS

Using the developed method, we have generated a projection image of a human chest for the grating-based method, the most popular XPCI method (Figure 1b). Compared to the attenuation image (Figure 1a), there is higher contrast between soft-tissue structures on the phase-contrast image. For example, all the structures obscured by the diaphragmatic silhouette are much better appreciated in the phase image. Similarly, the intra-vertebral disks are seen with greater clarity in phase-contrast than in attenuation. The phase-contrast image also demonstrates the bronchial tree (including the primary, secondary, and tertiary branches) better than the attenuation image.

CONCLUSION

Combining the NURBS-based XCAT phantom and our wave propagation simulator, we could simulate various XPCI methods at a full adult human scale, for the first time with the best of our knowledge.

CLINICAL RELEVANCE/APPLICATION

There is currently no XPCI system that can image a human torso. Our numerical tool can be used to predict and compare the performance of new XPCI systems on various disease entities in a clinical scenario.

SSA20-03 Comparison of Detection Performance between 2D Digital Mammography and Breast Tomosynthesis Using a Structured Physical Phantom

Sunday, Nov. 29 11:05AM - 11:15AM Location: S404AB

Participants
Lesley Cockmartin, Leuven, Belgium (*Presenter*) Nothing to Disclose
Nicholas Marshall, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Guozhi Zhang, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Kim Lemmens, MSc, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Eman Shaheen, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Hilde Bosmans, PhD, Leuven, Belgium (*Abstract Co-Author*) Co-founder, Qaelum NV Research Grant, Siemens AG

PURPOSE

To propose and apply a phantom for performance comparison between digital mammography (DM) and breast tomosynthesis (BT).

METHOD AND MATERIALS

The phantom consists of a 48 mm thick breast-shaped acrylic container, filled with water and acrylic spheres of different diameters. Three-dimensionally printed spiculated (diameter range: 3.8-9.7 mm) and non-spiculated (1.6-6.2 mm) masses as well as

microcalcifications (90-250 μm) were inserted as targets. The phantom was imaged ten times in both DM and BT mode on four systems: Siemens Inspiration, Hologic Selenia Dimensions, GE SenoClaire 3D and Fuji Amulet Innovality under automatic exposure control. Five readers evaluated target detectability in a four-alternative forced-choice study. The percentage of correct responses (PC) was assessed based on 10 trials of each reader for each object type, size and imaging modality. Additionally, detection threshold diameters at 62.5% PC were assessed via fitting of the psychometric curve.

RESULTS

For microcalcifications, average PC was comparable for the four systems in DM and BT mode, ranging from 78% to 84% for DM and from 64% to 82% for BT. Threshold diameters for microcalcification detection for the four systems ranged between 111 and 118 μm in DM and between 113 and 158 μm in BT. For masses, PC values were higher in BT compared to DM. In DM, they ranged from 60% to 75% for spiculated and from 31% to 45% for non-spiculated masses. For BT, detection of spiculated masses was the highest (94% to 99%) and remained high for non-spiculated masses (65% to 85%). For spiculated masses threshold diameters were between 4.6 and 6.3 mm for DM and between 1.7 and 2.6 mm for BT. Threshold diameters for non-spiculated masses lay outside the range available in the phantom in DM mode while for BT threshold diameters were found between 1.8 and 3.1 mm.

CONCLUSION

The phantom was able to show detectability differences between DM and BT for four commercial systems. These results are comparable to published clinical findings: BT performed better for the detection of masses, while both modalities were equivalent for the detection of microcalcifications.

CLINICAL RELEVANCE/APPLICATION

The proposed phantom enables the detection performance evaluation of BT against DM during acceptance testing, routine quality control or image quality benchmarking of BT systems.

SSA20-04   VHF-Induced Thermoacoustic Imaging Using a Clinical Ultrasound Transducer Array

Sunday, Nov. 29 11:15AM - 11:25AM Location: S404AB

Participants
Sarah K. Patch, PhD, Milwaukee, WI (*Presenter*) Nothing to Disclose
William See, MD, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To demonstrate that a clinical ultrasound transducer array can detect VHF-induced thermoacoustic pulses with sufficient bandwidth for quantitative whole organ imaging. This is an important step because thermoacoustic signal strength is directly proportional to SAR, which is lower in the VHF regime than in microwave or optical regimes.

METHOD AND MATERIALS

A 96-channel transducer array (P4-1) providing 3 cm coverage was incorporated into a benchtop thermoacoustic imaging system for imaging fresh surgical specimens. Thermoacoustic signal was generated by 700 ns irradiation pulses with 11 kV/m electric field strength. Data was acquired simultaneously in step-and-shoot mode by the array and a 2.25 MHz focused single-element transducer. In-plane resolution and contrast were measured by imaging an 80-micron wire and a homogeneous cylindrical phantom.Several fresh human prostates were imaged immediately after surgery. Two sets of sinograms were acquired, separated by a 2 cm translation along the tomographic axis. The P4-1 data was reconstructed over a 6 x 6 x 5 cm^3 volume. Rudimentary comparison to histology was performed.

RESULTS

As expected, the larger single element transducer was more sensitive and required 8-fold less signal averaging than the P4-1 array. Although nominal bandwidths of the P4-1 array and 2.25 MHz transducer are comparable, the single element transducer was more sensitive to low frequencies and provided better contrast, whereas the higher frequency P4-1 array provided better resolution. Full width at half maximum in the P4-1 and single element images of the 80-micron wire at isocenter were smaller and greater than 1 mm, respectively. CNR in the single element and P4-1 images of the cylindrical phantom were greater than 5 and less than 1/5, respectively. A weighted average of the two images provides better image quality than either individually.Volumetric reconstruction of the multi-channel P4-1 data visualizes anatomic features that are rarely seen in ultrasound, CT, or MRI.

CONCLUSION

VHF-induced thermoacoustic pulses can be detected by clinical ultrasound arrays. Quantitative imaging can be achieved using transducers and electronics with sensitivity to kHz frequencies.

CLINICAL RELEVANCE/APPLICATION

VHF-induced thermoacoustics requires propagating powerful EM pulses, similar to B1 excitation pulses used in MRI, but without the need for a costly superconducting magnet.

SSA20-05   Intra-Operative Cerebral Angio-Sonography with Ultrasound Contrast Agents

Sunday, Nov. 29 11:25AM - 11:35AM Location: S404AB

Participants
Francesco Prada, MD, Milan, Italy (*Presenter*) Nothing to Disclose
Massimiliano Del Bene, Legnano, Italy (*Abstract Co-Author*) Nothing to Disclose
Luigi Solbiati, MD, Busto Arsizio, Italy (*Abstract Co-Author*) Nothing to Disclose
Giovanni Mauri, MD, San Donato Milanese, Italy (*Abstract Co-Author*) Consultant, Esaote SpA
Luca Maria Sconfienza, MD, PhD, San Donato Milanese, Italy (*Abstract Co-Author*) Nothing to Disclose
Francesco DiMeco, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose

Background

Intra-operative vessels visualization is highly desirable in neurosurgery, especially when the target is related or close to main

vessels, such as in skull base and vascular surgery. Contrast enhanced ultrasound (CEUS) is an imaging technique that allows visualization of tissue perfusion and vascularization, through the infusion of purely intravascular ultrasound contrast agents (UCA).

Evaluation

After cerebral scanning with B-mode ultrasound (US) CEUS is performed: UCA are injected and insonated with low mechanical index US. UCA specific harmonic signal is transduced using contrast specific algorithm, to obtain real-time angio-sonography (ASG).

Discussion

UCA depicts flow entity and direction in the target vessels, through the visual qualitative detection of movement, velocity and number of MB. Through the UCA dynamics it is possible to study all the vascular districts simultaneously, both arterial and venous, without the necessity to set gain or pulse repetition frequency as in Doppler imaging that however permits to quantify the flow; 3 phases of enhancement are notable: arterial, parenchymal and venous. ASG, being an echotomographic examination, provides a representation of the vessels within the surgical fields, not only on the surface, as showed by microscopic fluorescence, but also of those deeply seated and still embedded within the surgical field, allowing to visualize them in depth and follow their entire course simply tilting the probe.

Conclusion

Real time intra-operative ASG is a rapid, reliable, repeatable method for vessels visualization and evaluation of tissue perfusion.

SSA20-06　A New AEC Set-up Achieves Constant Lesion Detectability for Different Breast Thicknesses in Digital Mammography

Sunday, Nov. 29 11:35AM - 11:45AM Location: S404AB

Participants
Elena Salvagnini, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Chantal Van Ongeval, MD, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Nicholas Marshall, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Lesley Cockmartin, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Koen Michielsen, MSc, Leuven, Belgium (*Abstract Co-Author*) Research Grant, Siemens AG
Andre Van Steen, MD, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Lara Struelens, Mol, Belgium (*Abstract Co-Author*) Nothing to Disclose
Hilde Bosmans, PhD, Leuven, Belgium (*Presenter*) Co-founder, Qaelum NV Research Grant, Siemens AG

PURPOSE

To investigate detectability of simulated lesions in real mammograms for different breast thicknesses and 2 set-ups for automatic exposure control (AEC).

METHOD AND MATERIALS

520 screening mammograms, acquired under standard AEC mode, were selected and divided into 4 thickness groups(T-groups), T1≤29mm, T2=30-49mm, T3=50-69mm, T4≥70mm. Each group contained 130 cranio-caudal lesion-free images. BIRADS density scores and Volpara density maps were available for each image. Simulated lesions of microcalcification clusters and masses were inserted into half of the images. A specific lesion template was inserted into one image of each T-group having the same BIRADS score and local Volpara value in order to separate the influence of thickness from the background. A new AEC set-up, designed to give constant theoretical object detectability as a function of thickness rather than constant detector pixel value. Modified AEC was then implemented for breast thicknesses above 30 mm resulting in an average dose increase of 60%. New patient data were collected and lesion insertion was repeated for the new dataset. Four radiologists performed a free search study on both datasets. JAFROC analysis was then applied. The alternative free-response receiver operating characteristic (AFROC) areas were calculated for each T-group.

RESULTS

For standard AEC mode: AFROC area decreases from 0.802 to 0.553 with increasing thickness for groups T1 to T3 while the area for T4 (0.565) was found almost equal to T3 (0.553). All p-values were smaller than 0.05 except for the T3-T4 pair. Detection differences between T3 and T4 were not significantly different, while the decreasing trend from T1 to T3 is significant. For the modified AEC mode: the AFROC area for T1 was equal to 0.802, while for T2, T3 and T4 it was equal to respectively 0.650, 0.652 and 0.652. No significant differences were found for these T-groups (p-values>0.05) while T1 remained significantly different from all others T-groups.

CONCLUSION

A significant decrease in lesion detection for increasing breast thickness is seen when the standard AEC mode is used. The modified AEC mode instead provided constant lesion detection for breast thicknesses above 30mm.

CLINICAL RELEVANCE/APPLICATION

This study quantifies the influence of breast thickness on lesion detectability and proposes a new AEC set-up with improved detectability for digital mammographic systems.

SSA20-07　X-ray Attenuation of Normal and Cancerous Breast Tissue Measured with Photon-counting Spectral Imaging

Sunday, Nov. 29 11:45AM - 11:55AM Location: S404AB

Participants
Erik Fredenberg, MSc, PhD, Stockholm, Sweden (*Presenter*) Employee, Koninklijke Philips NV
David R. Dance, PhD, Guildford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Kenneth C. Young, PhD, Guildford, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Paula Willsher, Cambridge, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Fleur Kilburn-Toppin, MBBCHIR, MA, Cambridge, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Matthew G. Wallis, MD, Cambridge, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

Elin Moa, MS, Solna, Sweden (*Abstract Co-Author*) Employee, Koninklijke Philips NV

PURPOSE

Spectral imaging is emerging as a promising method to extract quantitative information from x-ray images, applied in mammography to improve lesion visibility, discriminate between lesion types, and measure breast density. Common for the development of these applications is that prior knowledge of tissue x-ray attenuation is required, but the sources of such information are sparse. Moreover, attenuation is often measured on formalin-fixed tissue specimens, but the effect of such fixation on the obtained attenuation values is largely unknown. The purpose of this study is to measure the attenuation of fresh and fixed samples of normal and cancerous breast tissue.

METHOD AND MATERIALS

7 samples of adipose breast tissue, 3 samples of glandular tissue and 8 samples of tumor tissue in the thickness range 3-12mm were imaged on a photon-counting spectral mammography system before and after formalin fixation. The energy dependent x-ray attenuation was measured in terms of equivalent thicknesses of aluminum (Al) and poly-methyl methacrylate (PMMA) for 10mm of tissue.

RESULTS

Figure 1 shows the equivalent Al and PMMA thicknesses (mean +-1 standard deviation of individual samples): -0.110+-0.022mm Al, 8.60+-0.13mm PMMA for fresh adipose tissue, 0.268+-0.040mm Al, 8.44+-0.26mm PMMA for glandular tissue, 0.312+-0.024mm Al, 8.55+-0.17mm PMMA for tumor tissue. The difference between fixed and fresh tissue were -0.007mm Al, 0.01mm PMMA for adipose tissue, -0.041mm Al, 0.22mm PMMA for glandular tissue, and -0.039mm Al, 0.07mm PMMA for tumor tissue.

CONCLUSION

There was a measurable difference in attenuation between fresh and fixed tissue that was consistent for all investigated tissue types. There was a relatively large difference between glandular and tumor tissue, but the number of samples is still too limited to show significance. The equivalent PMMA thicknesses were slightly higher than values derived from published data (Hammerstein 1979, Johns and Yaffe 1987), but the Al thicknesses agreed well values derived from Johns and Yaffe.

CLINICAL RELEVANCE/APPLICATION

Accurate data on tissue attenuation is crucial for the development and implementation of spectral imaging techniques, which can potentially improve sensitivity and specificity of mammography.

SSA20-08 Dedicated High-Resolution Breast CT Allows Imaging Micro-Calcifications down to 130 μm at Screening Mammography Dose Levels

Sunday, Nov. 29 11:55AM - 12:05PM Location: S404AB

Participants
Willi A. Kalender, PhD, Erlangen, Germany (*Presenter*) Consultant, Siemens AG Consultant, Bayer AG Founder, CT Imaging GmbH Scientific Advisor, CT Imaging GmbH CEO, CT Imaging GmbH
Daniel Kolditz, PhD, Erlangen, Germany (*Abstract Co-Author*) Employee, CT Imaging GmbH
Ann-Christin Roessler, MSc, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Evelyn Wenkel, MD, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Ruediger Schultz-Wendtland, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Peter Fasching, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Computed tomography of the breast (BCT) has been a topic of interest for about two decades. It was proposed and evaluated in different designs by a number of groups as a potential alternative method for breast imaging. So far efforts have shown success with respect to soft tissue imaging but suffer from limited spatial resolution. We designed and evaluated a BCT scanner aiming for three-dimensional (3D) spatial resolution of better that 100 μm to provide means for improved assessment of 3D micro-calcification clusters.

METHOD AND MATERIALS

The concept of the scanner is built on fast spiral CT using directly converting cadmium telluride detector technology with 100 μm pixel pitch; it was evaluated and confirmed previously by simulations. Here we assessed spatial resolution on a prototype setup by measuring the modulation transfer function (MTF) using a 10 μm diameter tungsten wire. High precision Ruby beads immersed in a plastic breast-mimicking setup and 10 surgically resected breast specimens were measured in direct comparison to full field digital mammography (FFDM). The same 60 kV scan protocol was used for all BCT measurements; standard clinical settings were used for FFDM imaging. Micro-CT at 30 μm resolution was employed as reference standard for judging the specimen results.

RESULTS

BCT exposures were kept at a level corresponding to below 6 mGy average glandular dose related to exposure of a tissue-equivalent cylinder of 14 cm diameter. Spatial resolution characterized by the MTF's 10% value was measured as 64 lp/cm. Ruby beads were clearly visible in BCT exams down to 130 μm, the smallest size available; FFDM revealed beads down to 160 μm. Specimen examinations confirmed these results qualitatively. For specimens, BCT showed micro-calcifications down to 100 μm; it was vastly superior in separating structures in different layers by virtue of its slice imaging nature.

CONCLUSION

High-resolution BCT allows improving the assessment of 3D micro-calcification clusters and avoids erroneous superimposition effects, which may pretend fictitious lesions in projection imaging.

CLINICAL RELEVANCE/APPLICATION

Breast CT offering high resolution in all three dimensions shall enable improved analysis and diagnostics of micro-calcifications.

SSA20-09 Performance Evaluation of Microcalcification Detection in a Multi-contrast Breast X-ray Imaging System

Participants
John W. Garrett, MS, Madison, WI (*Presenter*) Nothing to Disclose
Yongshuai Ge, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Ke Li, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Ran Zhang, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Guang-Hong Chen, PhD, Madison, WI (*Abstract Co-Author*) Research funded, General Electric Company; Research funded, Siemens
AG

PURPOSE

The breast anatomical background noise power spectrum (NPS) and quantum NPS jointly impact the final detection performance of an x-ray breast imaging system. For a grating-based multi-contrast breast imaging system, it has recently been discovered that differential phase contrast (DPC) and dark-field (DF) contrast images have fundamentally different anatomical background NPS and quantum NPS. These dramatic differences should result in fundamentally different imaging performance, particularly in the context of microcalcification detection. The purpose of this study was to evaluate the diagnostic performance of the three-contrast mechanisms for the breast microcalcification detection task.

METHOD AND MATERIALS

To evaluate imaging performance, a quantitative model observer performance analysis framework was used in this study. To model the microcalcification detection task for each contrast mechanism, a microcalcification signal was segmented from absorption, DPC, and DF images of a cadaver breast specimen. Two-component (quantum + anatomical) NPS were directly measured from multi-contrast images of cadaver breasts. A generalized model observer was used to combine the task functions and NPS to quantify the microcalcification detectability indices for a range of radiation exposure levels (5-100%) and calcification sizes (diameter = 0.25-2.5 mm).

RESULTS

For the 1 mm calcification, the highest diagnostic performance corresponded to DPC imaging (7.4), with DF the next highest (3.8), and absorption the lowest (3.2). However, absorption imaging also showed the most relaxed dependence on radiation exposure level among the three modalities due to the larger portion of low frequency content in its anatomical noise. Among the calcifications with different sizes, DPC showed a peak in detectability at 1.25 mm and DF showed a peak at 0.75 mm, while absorption imaging had no such peak in the range explored.

CONCLUSION

The microcalcification detection performance in multi-contrast breast imaging is strongly influenced by both anatomical noise and radiation dose level. The results presented here offer new insight into how each individual modality can be optimized to maximize the likelihood of detecting early breast cancers.

CLINICAL RELEVANCE/APPLICATION

Understanding how additional information from DPC and DF imaging may aid in breast cancer is a crucial step in designing next generation multi-contrast breast imaging systems.

Breast Sunday Poster Discussions

Sunday, Nov. 29 1:00PM - 1:30PM Location: BR Community, Learning Center

BR

AMA PRA Category 1 Credit ™: .50

Participants
Elizabeth McDonald, MD, PhD, Philadelphia, PA (*Moderator*) Nothing to Disclose

Sub-Events

BR223-SD-SUB1   Upgrade Rate of Radial Scar on Core Needle Biopsies Performed for Calcifications

Station #1

Participants
Miriam Hulkower, MD, Bronx, NY (*Presenter*) Nothing to Disclose
Evan Himchak, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Beatriu Reig, MD, MPH, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Susan Fineberg, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Tova C. Koenigsberg, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Radial scars and radial/complex sclerosing lesions (RSL) of the breast are benign lesions of the breast that may present with mammographic findings or may be incidentally identified on core needle biopsy. Due to the concern for undersampling of an associated malignancy, patients with RSL on core biopsy usually undergo excisional biopsy. However, there is a wide range of upgrade rates (0 to 40%) reported in the literature. We seek to determine the upgrade rate after core biopsy performed for calcifications alone, in order to identify a possible group of patients with RSL who may not require excisional surgery.

METHOD AND MATERIALS

We searched the institutional clinical pathologic database for breast core biopsy results using the words "radial scar," "radial sclerosing lesion," or "complex sclerosing lesion" from 2003 through 2014. Radial scar was required to be the highest grade lesion diagnosed on the image-guided core needle biopsy specimen; the case was excluded if there was evidence of malignancy or atypia. Reports of the diagnostic mammograms indicating the need for biopsy were reviewed and only cases of calcifications were included. If a mass, nodule, asymmetry or architectural distortion were the cause for biopsy, the case was excluded. Method and length of follow-up were recorded for each patient.

RESULTS

40 lesions in 40 patients met criteria for inclusion. 26 patients underwent surgical excision and 14 patients had imaging or clinical follow up. All patients underwent stereotactic core needle biopsy for suspicious calcifications identified on mammography. There were no cases of upgrade to high grade lesions, no findings of carcinoma in situ or invasive ductal carcinoma on excision, and no cases of progression on follow up mammograms.

CONCLUSION

The cancer upgrade rate was 0% in this study of biopsies performed for calcifications. As calcifications are not typical imaging features of RSL, any RSL identified histologically were likely incidental and not related to the target imaging finding. Our results suggest that these incidental RSL may not require excision.

CLINICAL RELEVANCE/APPLICATION

Core needle biopsies performed for calcifications alone yielding radial scar as the highest grade lesion can be considered benign, without the need for surgical excision.

BR224-SD-SUB2   Differentiation of Benign and Metastatic Axillary Lymph Nodes: Added Value of MR Computer-Aided Evaluation in Patients with Breast Cancer

Station #2

Participants
Seong Jong Yun, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Yu Mee Sohn, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Woo Jin Yang, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hee Young Choi, MD, Seoul, Korea, Democratic People's Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jehong Yoon, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine qualitative and quantitative threshold of the MR (magnetic resonance)-CAE (computer-aided evaluation) parameters to differentiate between benign and metastatic ALNs (axillary lymph nodes) and to investigate the added value of the MR-CAE.

METHOD AND MATERIALS

From July 2011 to June 2014, 124 patients (age range, 35-80 years; mean age, 59.8 ± 11.1 years) who underwent conventional MR and MR-CAE for preoperative assessment of tumor extent and ALNs were included. The MR-CAE were evaluated with regard to qualitative (visualization on color map, kinetic curve type) and quantitative parameters (initial enhancement ratio, delayed phase enhancement ratio, and peak enhancement). Two radiologists (board-certified radiologist dedicated to breast imaging with 7-years of experience and 4th grade senior resident) independently interpreted MR images for the presence of metastatic ALNs by using

conventional MR images alone and in combination with MR-CAE data. Diagnostic performance and threshold using receiver operating characteristic (ROC) curve were analyzed.

RESULTS

Among 124 patients, 34 (26.4%) had positive results of ALNM (axillary lymph node metastasis) and 90 (73.6%) showed negative results on final pathologic report. The frequencies of visualization on color map (p=0.007) and kinetic curve type (p<0.001) were significantly different between ALNM group and no ALNM group. Mean values (%) of persistent, plateau, and washout ratios differed significantly (all p<0.001) between positive ALNM and negative ALNM groups. Of these significant parameters, the washout ratio >49% showed the greatest diagnostic accuracy (area under the curve, 0.909). With conventional MR imaging alone, sensitivity, specificity, and accuracy were 70.6%, 70.0%, and 70.2%, respectively. With conventional MR imaging and washout ratio on MR-CAE combined, sensitivity, specificity, and accuracy were 84.9%, 92.8%, and 90.2%, respectively.

CONCLUSION

The addition of MR-CAE data to conventional MR imaging can be helpful to improve diagnostic accuracy in the differentiation of benign ALNs from metastatic ALNs by measuring washout ratio.

CLINICAL RELEVANCE/APPLICATION

The MR-CAE can predict ALN status in patients with breast cancer, for avoiding unnecessary treatment steps.

BR225-SD-SUB3 Sonographic Features of Benign and Malignant Axillary Nodes Post Neoadjuvant Chemotherapy

Station #3

Participants
Kyungmin Shin, MD, Houston, TX (*Presenter*) Nothing to Disclose
Olena O. Weaver, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Abigail S. Caudle, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Henry M. Kuerer, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Wei Wei, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Wei T. Yang, MD, Houston, TX (*Abstract Co-Author*) Researcher, Hologic, Inc

PURPOSE

To determine the sonographic features of benign and malignant axillary nodes post neoadjuvant chemotherapy in patients with biopsy proven cN1 breast cancer.

METHOD AND MATERIALS

Patients with biopsy proven cN1 primary breast malignancy receiving neoadjuvant chemotherapy at a single institution between January 2011 and December 2014 were included in this study. Sonographic features of the biopsy proven clipped axillary lymph nodes were retrospectively reviewed and documented pre and post neoadjuvant treatment. Changes in the sonographic features of the clipped axillary lymph nodes were correlated with the final histopathology. Statistical analyses of the shape, cortical thickness, presence or absence of the fatty hilum, and cortical echogenicity of the lymph nodes prior to and after neoadjuvant treatment (consistent with methods) were performed using the univariate logistic regression model.

RESULTS

A total of 165 patients with a median age of 49 years (range, 23-84 years) were included in the study. Of these, 75 patients (45%) showed complete pathologic response and 90 (55%) persistent metastatic disease on histopathology at the time of final surgery. The analysis demonstrated that irregular shape of the lymph node post neoadjuvant therapy was associated with lower probability of having complete response compared to the lymph nodes with oval shape (odds ratio=0.17, p=0.004). Also, resolution/normalization of cortical thickening was associated with higher likelihood of having complete response compared to the lymph nodes with persistent cortical thickening (OR=4.95, p=0.0001). In addition, increase in lymph node volume or cortical thickness was associated with less change of having complete pathologic response (OR=0.99, p=0.007). Other sonographic findings such as the presence of absence of the fatty hilum did not show statistically significant correlation with having complete pathologic response.

CONCLUSION

Sonographic factors that may help predict axillary nodal response to therapy include shape, normalization of cortical thickness and lymph node volume, while hilar status was not helpful in the evaluation of response.

CLINICAL RELEVANCE/APPLICATION

The ability to distinguish benign from malignant nodes post neoadjuvant treatment with sonography may help to develop more individualized and less invasive surgical approaches to the axillae.

BR226-SD-SUB4 Accuracy of Index Tumor Measurement on CESM When Compared to Pathologic Tumor Size and Its Implications on Breast Cancer Staging

Station #4

Participants
Chandni Bhimani, DO, Camden, NJ (*Presenter*) Nothing to Disclose
Pauline Germaine, DO, Camden, NJ (*Abstract Co-Author*) Nothing to Disclose
Allison S. Gittens, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Robyn G. Roth, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Lydia Liao, MD, PhD, Voorhees, NJ (*Abstract Co-Author*) Consultant, General Electric Company; Consultant, Devicor Medical Products, Inc
Luna Li, MD, PhD, Voorhees, NJ (*Abstract Co-Author*) Nothing to Disclose
Elizabeth Tinney, RRA, Cape May Court House, NJ (*Abstract Co-Author*) Nothing to Disclose
Kristin Brill, MD, Camden, NJ (*Abstract Co-Author*) Nothing to Disclose
Todd L. Siegal, MD, Camden, NJ (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Correlate accuracy of index breast cancer measurements on contrast-enhanced spectral mammography (CESM) based on abnormal area of enhancement to final assessment of size at the time of pathologic evaluation following tumor excision (i.e. lumpectomy or mastectomy).

METHOD AND MATERIALS

A retrospective database search of 1568 CESM cases performed at our institution between December of 2013 and April of 2015 revealed 220 cases of biopsy proven malignancy. Electronic medical records of these patients were accessed to obtain the final pathology including tumor size at the time of excision. Reported measurements in radiology and pathology databases were recorded and compared.

RESULTS

Out of 220 CESM diagnosed malignancies, 202 patients underwent surgery at our institution. Fifty patients underwent preoperative chemotherapy, resulting in exclusion from final analysis. Additional 53 patients with biopsy-proven DCIS were also excluded from the final analysis, as diagnosis of malignancy was based on microcalcification assessment on digital mammography, rather than abnormal enhancement on CESM. Final cohort of 99 patients consisted of single site and multifocal involvement with ductal and lobular carcinoma of various sizes and tumor grades.A strong correlation exists between the size of enhancement on CESM and final tumor measurement at the time of pathology evaluation, particularly for a single mass. This correlation improves with increase in tumor size and grade. Correlation decreased in cases of multifocal involvement and infiltrative morphology, particularly infiltrative lobular carcinoma.

CONCLUSION

CESM combines benefits of digital mammography with assessment of lesion vascularity following intravenous contrast administration. Based on prior research, CESM has an excellent correlation with MRI, the current gold standard, in tumor visualization and characterization, providing important information of tumor assessment, staging and preoperative planning. This study further supports the important role CESM plays in breast cancer evaluation and serves as a reliable indicator of tumor size.

CLINICAL RELEVANCE/APPLICATION

Index tumor measurement on CESM is a reliable indicator of final tumor assessment at the time of pathology evaluation, providing extremely valuable information in tumor staging and preoperative planning.

BR111-ED-SUB5   Strengths and Shortcomings of Digital Breast Tomosynthesis: Review of Cancers Detected as well as those "Missed" in a Population-based Screening Program

Station #5

Awards
Magna Cum Laude
Identified for RadioGraphics

Participants
Katrina Korhonen, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Susan Weinstein, MD, Philadelphia, PA (*Abstract Co-Author*) Consultant, Siemens AG
Elizabeth McDonald, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Samantha P. Zuckerman, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Emily F. Conant, MD, Philadelphia, PA (*Abstract Co-Author*) Speaker, Hologic, Inc; Scientific Advisory Board, Hologic, Inc; Consultant, Siemens AG

TEACHING POINTS

This exhibit will: Review cases of screen detected cancers seen only or better with digital breast tomosynthesis (DBT) compared to digital mammography alone (DM) in a population based screening program. Define false negative and interval cancers and demonstrate examples from 3 years of screening an entire population with combination DBT (over 33,000 patients). Explore reasons why cancers were missed or not detected at DBT screening and suggest opportunities for improvement.

TABLE OF CONTENTS/OUTLINE

1. Review of DBT versus DM cancer conspicuity from 3 years and over 33,000 cases of DBT screening Case-based review of subtle or DBT-only detected cancers2. Review rates and trends of false negative and interval cancers using follow-up data from network and state-wide cancer registries Case-based review of false negative and interval cancer cases with review of possible reasons for lack of detection, including asymptomatic patients whose cancers were detected by other modalities such as US or MRI3. Review of possible causes for false negatives or diagnostic error in DBT screening Failure to detect Satisfaction of search Breast complexity or obscuration Excluded from view Not visible on modality (detected by MR or US) Failure to characterize Call-back mis-categorized as benign Stable lesion

BR184-ED-SUB6   Don't Quit Too Soon! Troubleshooting to Overcome Technical Challenges in Image-guided Breast Biopsy

Station #6

Awards
Identified for RadioGraphics

Participants
Allyson L. Chesebro, MD, Boston, MA (*Presenter*) Nothing to Disclose
Sona A. Chikarmane, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Julie A. Ritner, MD, West Roxbury, MA (*Abstract Co-Author*) Nothing to Disclose
Robyn L. Birdwell, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Catherine S. Giess, MD, Wellesley, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. Discuss patient and lesion factors which pose technical challenges to successful stereotactic-, US-, and MRI-guided breast biopsy2. Present strategies and procedural modifications used to perform successful stereotactic-, US-, or MRI-guided breast biopsy and wire localization for challenging breast lesions or challenging clinical scenarios3. Discuss techniques for ensuring correlation between mammographic and US, mammographic and MRI, and US and MRI findings

TABLE OF CONTENTS/OUTLINE

1. Discuss patient factors (psychosocial, physical, co-morbidity) that pose technical challenges to image-guide core needle biopsy 2. Discuss lesion factors (type, multiplicity, conspicuity, location within the breast or axilla) that pose technical challenges to image-guided core needle biopsy and wire localization3. Present potential solutions and strategies to overcome patient and lesion challenges using a multi-modality case-based approach4. Present some of the challenges of multi-modality image correlation (mammography-US, mammography-MRI, US-MRI) and possible solutions to ensure successful and accurate image-guided core needle biopsy

Honored Educators

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

Catherine S. Giess, MD - 2015 Honored Educator
Robyn L. Birdwell, MD - 2015 Honored Educator

Gynecologic Ultrasound (An Interactive Session)

Sunday, Nov. 29 2:00PM - 3:30PM Location: E353B

`GU` `OB` `US`

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

Participants

Sub-Events

RC110A   Uterus and Endometrium

Participants
Ruth B. Goldstein, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Be able to state the acceptable standards for endometrial assessment in women with abnormal vaginal bleeding. 2) Be able to recognize a uterine abnormality in a postmenopausal woman that warrants further evaluation including tissue sampling or MRI. 3) Be able to recognize and diagnose adenomyosis.

Active Handout:Ruth Beth Goldstein

http://abstract.rsna.org/uploads/2015/15001988/RC110A.pdf

RC110B   Ovarian Masses

Participants
Phyllis Glanc, MD, Toronto, ON (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Evaluate critical ultrasound features of adnexal masses that permit stratification into benign, indeterminate or suspicious for malignancy. 2) Incorporate the role of guidelines, consensus statements, risk prediction algorithms and serum biomarkers. 3) Consider the role of alternate imaging modalities such as MRI, CT, PET-CT. 4) Utilize appropriate management strategies.

ABSTRACT

There remains a gap between the state of the knowledge and translation into practice for the diagnosis and management of adnexal masses. Pelvic ultrasound remains the primary imaging modality in the greater majority of cases. Most ovarian masses can be correctly classified on the basis of their ultrasound characteristics, nonetheless many masses that are 'almost certainly benign' or even 'indeterminate' come to prompt surgical exploration, which is not always apprpriate or without its potential risks.. This session will explore further these characteristic findings but also will evaluate the role of serial ultrasound, additional modalities such as MR or CT, serum biomarkers, strategies such as IOTA simple rules and optimization of referral patterns.

Active Handout:Phyllis Glanc

http://abstract.rsna.org/uploads/2015/15001989/RC110B.pdf

RC110C   Endometriosis

Participants
Luciana P. Chamie, MD, PhD, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define clinical and epidemiological aspects of endometriosis. 2) Define the importance of imaging mapping for endometriosis before clinical counseling. 3) Apply the most appropriate technique to investigate endometriosis. 4) Define the bowel preparation required for the transvaginal ultrasound to investigate endometriosis. 5) Apply the imaging algorithm to map deeply infiltrative endometriosis. 6) Assess the ultrasonographic findings of deeply infiltrative endometriosis in the most common sites such as bladder, vesicouterine pouch, retrocervical space, vagina, ureters, appendix and rectosigmoid colon. 7) Assess the ultrasonographic findings of ovarian endometriomas and differentiate them from functional cysts.

ABSTRACT

Endometriosis is a very common gynecological disease affecting millions of women in their reproductive life, often causing pelvic pain and infertility. Clinical history and physical examination may suggest endometriosis, but imaging mapping is necessary to identify the disease and mandatory for clinical couseling and surgical planning. Transvaginal ultrasound after bowel preparation is the best imaging modality as the first-line technique to evaluate patients suspected of endometriosis. The bowel preparation is relatively simple and include the day before and the day of the examination. This method is highly accurate to identify intestinal endometriosis and to determine which layers of the bowel wall are affected. In addition, it provides better assessment of small peritoneal lesions of the retrocervical space, vagina and bladder. Pelvic adhesions can also be evaluated during the exam.

URL

http://chamie.com.br/download

Active Handout:Luciana Pardini Chamie

Breast Imaging: Fundamentals of Interpretation

Sunday, Nov. 29 2:00PM - 3:30PM Location: S406A

BR **DM** **US**

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

Participants

Sub-Events

RC115A ACR Accreditation

Participants
Brett T. Parkinson, MD, Salt Lake Cty, UT (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the history and current relevance of Breast Imaging Accreditation. 2) Be familiar with the scoring standards for breast imaging accreditation, including reasons for failure. 3) Learn about electronic submission of mammography images for accreditation. 4) Appreciate the importance of attaining Breast Imaging Centers of Excellence status.

RC115B Mammography: A Practical Approach to Breast Lesions

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

LEARNING OBJECTIVES

1) The participants should be able to develop a practical common sense approach to the detection and subsequent evaluation of breast lesions. The participant should be able develop an approach focused on the use of prior films, additional spot compression views and ultrasound in establishing the significance of screen detected lesions and the evaluation of patients presenting with clinical signs and symptoms.

ABSTRACT

A basic, practical and common sense approach in the detection and evaluation of potential breast lessons is presented. As a starting point the need to sit back and review the images globally for potential technical issues that may limit or preclude interpretation, breast size asymmetry, parenchymal asymmetry (focal, global or developing) and the presence of diffuse changes will be discussed. After the images are accessed globally, the active search for the presence of potential masses, calcifications and distortion will be discussed. The importance of using prior films, additional spot compression views, physical examination and ultrasound before making management decisions will be emphasized all towards the goal of minimizing potential delays in the diagnosis of early breast cancers.

RC115C Breast Ultrasound

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

LEARNING OBJECTIVES

1) Participants should have greater confidence in performing and interpreting breast ultrasound exams, with an understanding of knobology and post-processing to produce optimal images, and to make use of Doppler to assess breast masses. A brief explanation of elastography will be included. 2) Participants will also gain understanding of the challenges of mammographic-sonographic correlation, and an approach for when correlation is uncertain.

ABSTRACT

Breast ultrasound is an indispensable adjunct to mammography. Using BIRADS criteria, ultrasound can provide critical information that can lead to the earlier diagnosis of cancer, but also allow a definitive benign diagnosis and eliminate the need for invasive procedures. This requires optimal imaging.This course will cover the fundamentals of breast ultrasound including:Equipment selection, set-up and optimization, including the proper use of focal zones, compounding and harmonics, Doppler and elastography.Lesion characterization using BIRADS descriptors will be discussed for simple and complicated cysts, and criteria for distinguishing benign from malignant solid masses.Mamographic/sonographic correlation is key, when the indication for the examination is investigation of a mass seen at screening mammography. This is fairly straightforward when the mass is large and solitary, but more challenging when it is small and/or there are multiple masses. The ultrasound finding has to correspond to the location of the mammographic mass as well as the character of the mass.

RC117

MR-Guided High Intensity Focused Ultrasound (HIFU)

Sunday, Nov. 29 2:00PM - 3:30PM Location: S504CD

`MR` `US` `IR`

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

`FDA` Discussions may include off-label uses.

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

Sub-Events

RC117A   Neurologic Applications of MR-guided HIFU

Participants
Max Wintermark, MD, Lausanne, Switzerland, (max.wintermark@gmail.com) (*Presenter*) Advisory Board, General Electric Company;

LEARNING OBJECTIVES

1) To understand the neuro applications of HIFU. 2) To understand the challenges of applying HIFU for neuro applications. 3) To review the ongoing trials of neuro applications of HIFU.

ABSTRACT

MR guided focused ultrasound is a new, minimally invasive method of targeted tissue thermal ablation that may be of use to treat central neuropathic pain, essential tremor, Parkinson tremor, and brain tumors. The system has also been used to temporarily disrupt the blood-brain barrier to allow targeted drug delivery to brain tumors. We will discuss current and potential neuro applications of this exciting technology.

RC117B   Gynecologic Applications of MR-guided HIFU

Participants
Young-Sun Kim, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Explain pros and cons of MR-guided HIFU in the treatment of uterine fibroids and adenomyosis as compared to other therapeutic modalities 2) Assess important factors in screening MR exams of MR-guided HIFU therapy of uterine fibroids 3) Explain treatment strategy of MR-guided HIFU therapy of uterine fibroids to improve therapeutic outcomes 4) Describe the current limitations of MR-guided HIFU of uterine fibroids and explain how to overcome limitations

ABSTRACT

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

Handout:Young-Sun Kim

http://abstract.rsna.org/uploads/2015/13012024/RSNA2015_KimYS - handout.pptx

RC117C   Body Applications of MR-guided HIFU

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

LEARNING OBJECTIVES

1) To become familiar with the basic physical principles of HIFU and the potential of MR guidance. 2) To approach selection criteria in MRI screening examinations for accurate indications and identify contraindications and non-suitable patients. 3) To appreciate current results and potential therapy regimens. 4) To understand recent technical developments and their potential.

ABSTRACT

The concept of ideal tumor surgery is to remove the neoplastic tissue without damaging adjacent normal structures. High-intensity focused ultrasound (HIFU) was developed in the 1940s as a viable thermaltissue ablation approach. In clinical practice, HIFU has been applied to treat a variety of solid benign and malignant lesions, including pancreas, liver, prostate, and breast carcinomas, soft tissue sarcomas, and uterine fibroids. More recently, magnetic resonance guidance has been applied for treatment monitoring during focused ultrasound procedures (magnetic resonance-guided focused ultrasound, MRgFUS). Intraoperative magnetic resonance imaging provides the best possible tumor extension and dynamic control of energy deposition using real-time magnetic

resonance imaging thermometry. The fundamental principles and clinical indications of the MRgFUS technique will be introduced; different treatmentoptions and personal outcomes will be discussed.

RC117D   Palliation of Painful Metastases to Bone

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

LEARNING OBJECTIVES

1) Therapeutic options for palliation of painful metastases to bone. 2) Patient selection for MR guided focused ultrasound palliation of painful bone metastases. 3) Results of Phase III pivotal study of ExAblate MR guided focused ultrasound for palliation of painful bone metastases. 4) Technical aspects of successful patient treatment. 5) Immediate post-treatment imaging-based assessment of results. 6) Future applications of MR guided focused ultrasound for the management of osseous metastatic disease.

ABSTRACT

Cancer patients commonly have metastases to bone; as the survival of cancer patients is prolonged by more effective therapies, the prevalence of patients with metastases to bone is also increasing. Bone metastases are often painful, and often diminish the quality of life. Radiation therapy (RT) is the standard of care for the treatment of bone metastases, but a significant subset of patients do not respond to RT. MR guided focused ultrasound non-invasively achieves localized tissue ablation and provides a proven method of pain relief in patients who do not respond to radiation therapy. MR imaging provides a combination of tumor targeting, real-time monitoring during treatment, and immediate verification of successful treatment. The results of the pivotal Phase III trial that led to FDA approval of the ExAblate MR guided focused ultrasound device for the palliation of painful metastases to bone will be reviewed. In particular, patient selection, the technical aspects of successful patient treatment, and post-treatment assessment of results will be described. Concepts for future development of this technology with regard to the management of osseous metastatic disease will also be presented.

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

Sunday, Nov. 29 2:00PM - 3:30PM Location: E264

US **IR**

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

Participants
Stephen C. O'Connor, MD, Springfield, MA (*Moderator*) Nothing to Disclose
Alda F. Cossi, MD, Boston, MA (*Presenter*) Nothing to Disclose
Neil T. Specht, MD, Trumbull, CT (*Presenter*) Nothing to Disclose
Mark L. Lukens, MD, Greensboro, NC (*Presenter*) Nothing to Disclose
Michael A. Mahlon, DO, Tacoma, WA (*Presenter*) Nothing to Disclose
Manish N. Patel, DO, Cincinnati, OH, (manish.patel@cchmc.org) (*Presenter*) Nothing to Disclose
Hollins P. Clark, MD, MS, Winston Salem, NC (*Presenter*) Nothing to Disclose
Mark J. Hogan, MD, Columbus, OH (*Presenter*) Nothing to Disclose
Carmen Gallego, MD, Madrid, Spain, (cgallego@salud.madrid.org) (*Presenter*) Nothing to Disclose
Mabel Garcia-Hidalgo Alonso, MD, Madrid, Spain (*Presenter*) Nothing to Disclose
John D. Lane, MD, Bayside, WI (*Presenter*) Nothing to Disclose
William W. Mayo-Smith, MD, Boston, MA (*Presenter*) Author with royalties, Reed Elsevier; Author with royalties, Cambridge University Press
Humberto G. Rosas, MD, Madison, WI (*Presenter*) Nothing to Disclose
Kristin M. Dittmar, MD, Columbus, OH (*Presenter*) Nothing to Disclose
Nicholas A. Zumberge, MD, Columbus, OH (*Presenter*) Stockholder, Abbvie Inc; Stockholder, Cerner Corporation; Stockholder, Dexcom, Inc; Stockholder, Exact Sciences Corporation; Stockholder, Gilead Sciences, Inc; Stockholder, Merck & Co, Inc; Stockholder, Northwest Biotherapeutics Inc
Veronica J. Rooks, MD, Honolulu, HI (*Presenter*) Nothing to Disclose
James W. Murakami, MD, Columbus, OH (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

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

ABSTRACT

Ultrasound Monday Case of the Day

Monday, Nov. 30 7:00AM - 11:59PM Location: Case of Day, Learning Center

US

AMA PRA Category 1 Credit ™: .50

Participants
Nirvikar Dahiya, MD, Phoenix, AZ (*Presenter*) Nothing to Disclose
Jason M. Wagner, MD, Oklahoma City, OK (*Abstract Co-Author*) Nothing to Disclose
Melanie P. Caserta, MD, Jacksonville, FL (*Abstract Co-Author*) Nothing to Disclose
Aya Kamaya, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Maryellen R. Sun, MD, Boston, MA (*Abstract Co-Author*) Research Grant, Glaxo SmithKline plc
Maitray D. Patel, MD, Phoenix, AZ (*Abstract Co-Author*) Nothing to Disclose
Scott W. Young, MD, Scottsdale, AZ (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) Participants will learn to list the sonographic appearances of common and uncommon diseases. 2) Participants will learn to describe the differentiating features between similar diseases via a case based format. 3) Participants will learn to discuss the pathophysiology of diseases that are responsible for the sonographic appearance.

Molecular Imaging Symposium: Basics of Molecular Imaging

Monday, Nov. 30 8:30AM - 10:00AM Location: S405AB

BQ **MI** **MR** **US**

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

FDA Discussions may include off-label uses.

Participants
Jan Grimm, MD, PhD, New York, NY (*Moderator*) Nothing to Disclose
Zaver M. Bhujwalla, PhD, Baltimore, MD (*Moderator*) Nothing to Disclose

Sub-Events

MSMI21A   MI Using Radioactive Tracers

Participants
Jan Grimm, MD, PhD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) In this course, we will discuss the various radio tracers and their applications in Molecular Imaging studies. Participants will understand in which situations to use which radio tracers, what to consider when developing the imaging construct and what controls to obtain for nuclear imaging studies. Examples will contain imaging with small molecules, with antibodies and nanoparticles as well as with cells in order to provide the participants with examples how o correctly perform their imaging studies. Most of the examples will be from the oncology field but their underlying principles are universally applicable to other areas as well.

ABSTRACT

Nuclear Imaging is currently the only true "molecular" imaging method utilized in clinic. It offers quantitative imaging of biological processes in vivo. Therefore, it is not surprising that it is also highly frequented in preclinical imaging applications since it is currently the only true quantitative imaging method. Multiple agents have been developed, predominantly for PET imaging but also for SPECT imaging.In this talk, we will discuss the application of radio tracers to molecular imaging and what to consider. Common pitfalls and mistakes as well as required measures to avoid these will be discussed. We will discuss various examples of imaging constructs, ranging from small molecules to antibodies, nanoparticles and even cells. In addition, the imaging modalities will also briefly discussed, including PET, SPECT and Cherenkov imaging.

MSMI21B   Molecular MRI and MRS

Participants
Zaver M. Bhujwalla, PhD, Baltimore, MD, (zbhujwa1@jhmi.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

To define the role of MRI and MRS in molecular and functional imaging and cover specific applications in disease processes. The primary focus will be advances in novel theranostic approaches for precision medicine.

ABSTRACT

With an array of functional imaging capabilities, magnetic resonance imaging (MRI) and spectroscopy (MRS) techniques are valuable in obtaining functional information, but the sensitivity of detection is limited to the 0.1-1 mM range for contrast agents and metabolites, respectively. Nevertheless, MRI and MRS are finding important applications in providing wide-ranging capabilities to tackle key questions in cancer and other diseases with a 'molecular-functional' approach. An overview of these capabilities and examples of MR molecular and functional imaging applications will be presented with a focus on theranostic imaging for precision medicine.

MSMI21C   Nanoparticles

Participants
Heike E. Daldrup-Link, MD, Palo Alto, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand important safety aspects of USPIO. 2) To recognize the value of immediately clinically applicable iron oxide nanoparticles for tumor MR imaging applications. 3) To learn about clinically relevant new developments of theranostic USPIO.

ABSTRACT

Nanoparticles Nanoscale materials can be employed to develop novel platforms for understanding, diagnosing, and treating diseases. Integrating nanomedicine with novel multi-modality imaging technologies spurs the development of new personalized diagnostic tests and theranostic (combined diagnostic and therapeutic) procedures. This presentation will provide an overview over the safety, diagnostic applications and theranostic developments of clinically applicable ultrasmall superparamagnetic iron oxide nanoparticles (USPIO). USPIO which are currently used for clinical applications include ferumoxytol (Feraheme), an FDA-approved iron supplement, and ferumoxtran-10 (Combidex/Sinerem), which is currently undergoing renewed clinical trials in Europe. Safety considerations for these agents will be discussed. Both compounds provide long lasting blood pool enhancement, which can be used for MR angiographies and tissue perfusion studies. Subsequently, USPIO are slowly phagocytosed by macrophages in the reticuloendothelial system (RES), which can be used to improve MRI detection of tumors in liver, spleen, lymph nodes and bone

marrow. A slow phagocytosis by macrophages in inflammations and high grade tumors can be used to grade the severity of the disease process and monitor new immune-modulating therapies. Novel developments include synthesis of multi-functional nanoparticles, which can be detected with two or more imaging modalities, as well as clinically applicable approaches for in vivo tracking of stem cell therapies. Since USPIO are not associated with any risk of nephrogenic sclerosis, they can be used as alternative contrast agents to gadolinium chelates in patients with renal insufficiency or in patients in whom creatinine lab values are not available. Ongoing pre-clinical developments include the development of improved, targeted and activatable nanoparticle formulations, which can further improve sensitivity, specificity and theranostic imaging capabilities.

MSMI21D   Contrast Ultrasound

Participants
Steven B. Feinstein, MD, Chicago, IL (*Presenter*) Research support, General Electric Company; Consultant, General Electric Company; Investor, SonoGene LLC;

LEARNING OBJECTIVES

1) Inform: Clinical utility and safety of contrast enhanced ultrasound (CEUS) imaging. 2) Educate: Current diagnostic and therapeutic approaches. 3) Introduce: Newer concepts for combined diagnostic and therapeutic applications.

MSMI21E   Quantitative Imaging Biomarkers

Participants
Richard L. Wahl, MD, Saint Louis, MO (*Presenter*) Research Consultant, Nihon Medi-Physics Co, Ltd;

LEARNING OBJECTIVES

1) Identify at least one method of assessing anatomic tumor response quantitatively. 2) Identify at least one method of assessing metabolic tumor response using FDG PET quantitative. 3) Identify an MRI quantitative metric which is associated with cellularity of biological processes.

ABSTRACT

Radiology initially developed as an analog imaging method in which non quantitative data were interpreted in a 'qualitative and subjective' manner. This approach has worked well, but modern imaging also is digital, quantitative and has the opportunity for more quantitative and objective interpretations. This lecture will focus on a few areas in which quantitative imaging is augmenting qualitative image assessments to lead to more precise interpretation of images. Examples of such an approach can include measuremental of tumor 'metabolic' activity using formalisms such as PERCIST 1.0; methods of assessment of tumor size and volumes using the RECIST 1.1 and emerging formalisms and metrics of tumor heterogeneity, density, receptor density, diffusion, vascular permeability and elasticity using techniques incuding PET/SPECT, MRI, CT and ultrasound. With quantitative imaging, the opportunity to move from qualitative methods to precise in vivo quantitative pheontyping is a real one, with a quantitative 'phenome' complementing other 'omics' such as genomics. However, the quality of quantitation may vary and close attention to technical methodologies and process are required to have reliable and accurate quantitation. The RSNA QIBA effort will be briefly reviewed as one approach to achieve precise quantiative phenotyping. Examples of the use of quantitative phenotyping to inform patient management will be discussed.

Honored Educators

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

Richard L. Wahl, MD - 2013 Honored Educator

Abdominal Doppler (An Interactive Session)

Monday, Nov. 30 8:30AM - 10:00AM Location: E353C

`GI` `US`

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

Participants

Sub-Events

RC210A   Imaging and Doppler of Portal Hypertension

Participants
Myron A. Pozniak, MD, Madison, WI, (mpozniak@uwhealth.org) (*Presenter*) Stockholder, Cellectar Biosciences, Inc; Support, General Electric Company

LEARNING OBJECTIVES

1) Understand the normal anatomy, anatomic variants of the hepatic vasculature. 2) Identify the normal Doppler flow profiles of the hepatic vasculature. 3) Understand the hemodynamic principles of portal hypertension and how they impact the Doppler waveforms of the hepatic arteries, portal veins and hepatic veins. 4) Understand the role of ultrasound in the evaluation of variceal pathways.

RC210B   Doppler Evaluation of Mesenteric Vessels

Participants
John S. Pellerito, MD, Manhasset, NY, (johnp@nshs.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify applications for Doppler evaluation of the mesenteric arteries and veins. 2) Develop techniques to detect and interpret mesenteric flow abnormalities. 3) Explain criteria for the interpretation of significant mesenteric arterial disease.

ABSTRACT

RC210C   Renal Doppler: Vessels and Beyond

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

LEARNING OBJECTIVES

1) Understand the technical parameters and diagnostic criteria of color and spectral Doppler interrogation of the renal arteries, veins and parenchyma. 2) Learn and apply new information regarding Doppler ultrasound applications including vascular disease, stone disease, renal masses and renal parenchymal disease. 3) Appreciate the value of renal Doppler and its role vs other vascular imaging with CT or MRI.

ABSTRACT

Renal Doppler: Vessels and BeyondThis lecture will explore the use of Doppler ultrasound in the assessment of the kidney and its vascular supply. Doppler technique will be reviewed with particular attention to artifacts and pitfalls which may enhance or detract from diagnostic efficacy. The role of ultrasound imaging in assessment of acute as well as chronic renal dysfunction will be elucidated. The performance of Doppler ultrasound will be highlighted regarding vascular stenosis and occlusion, parenchymal perfusion, and diagnosis of renal masses and stones. Doppler techniques to avoid false negative and false positive studies will be emphasized. Controversial parameters will be stressed, in particular the use of absolute velocities versus ratios in the diagnosis of renal artery stenosis, especially in renal transplants. Surgical emergencies will be highlighted, and the role of correlative imaging with CT, MR and/or angiography will be addressed.

Active Handout:Deborah J. Rubens

http://abstract.rsna.org/uploads/2015/15001995/Active RC210C.pdf

Breast Series: Hot Topics in Breast Imaging

Monday, Nov. 30 8:30AM - 12:00PM Location: Arie Crown Theater

| BR | DM | MR | US |

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

Participants

Wendie A. Berg, MD, PhD, Pittsburgh, PA, (wendieberg@gmail.com) (*Moderator*) Consultant, SuperSonic Imagine; Departmental Research Grant, General Electric Company ; Departmental Research Grant, Hologic, Inc; Equipment support, Gamma Medica, Inc; Equipment support, General Electric Company; Equipment support, Hologic Inc; ;
Sarah M. Friedewald, MD, Chicago, IL (*Moderator*) Consultant, Hologic, Inc; Research Grant, Hologic, Inc
Elizabeth A. Morris, MD, New York, NY (*Moderator*) Nothing to Disclose

Sub-Events

RC215-01   Tomosynthesis

Monday, Nov. 30 8:30AM - 8:50AM Location: Arie Crown Theater

Participants
Liane E. Philpotts, MD, New Haven, CT (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Assess the increasing body of literature concerning digital breast tomosynthesis. 2) Describe its use in both the screening and diagnostic mammography environments. 3) Evaluate the benefits of tomosynthesis and understand how it is dramatically changing the whole practice of breast imaging.

ABSTRACT

Tomosynthesis is revolutionizing breast imaging. The evidence to date reveals consistent reductions in false positives and increases in invasive cancer detection in screening mammography. This should have a profound effect on shifting the balance of benefits and harms of screening mammography. In addition, tomosynthesis has a dramatic effect on diagnostic mammography, resulting in expedited imaging, fewer patients requiring follow up, and increases in the positive predictive value of biopsy recommendations. Interpretation time and learning curve are considerations in utilizing tomosynthesis. Correct utilization requires careful interpretation of images and careful correlation with multi-modality imaging, particularly ultrasound. Downstream effects of tomosynthesis lead to dramatic changes in workflow. Cost analyses point to cost savings with tomosynthesis.

RC215-02   Three Consecutive Years of Screening with Digital Breast Tomosynthesis: Are the Outcomes Sustainable?

Monday, Nov. 30 8:50AM - 9:00AM Location: Arie Crown Theater

Participants
Emily F. Conant, MD, Philadelphia, PA (*Presenter*) Speaker, Hologic, Inc; Scientific Advisory Board, Hologic, Inc; Consultant, Siemens AG
Andrew Oustimov, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Lauren Pantalone, BS, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Susan Weinstein, MD, Philadelphia, PA (*Abstract Co-Author*) Consultant, Siemens AG
Elizabeth McDonald, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Marie Synnestvedt, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Mitchell D. Schnall, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Studies have shown improved screening outcomes when digital breast tomosynthesis (DBT) is combined with digital mammography (DM) compared to screening with DM alone. However, questions exist regarding the sustainability of outcomes over consecutive years. Are the improved DBT outcomes due to prevalence rather than incidence screening? What impact is there on interval cancer rates? We investigate these issues by comparing outcomes from 3 years of consecutive DBT screening of our entire clinic population. Cancer registry data is used to determine interval cancer rates.

METHOD AND MATERIALS

We have screened over 33,000 patients with DBT after complete conversion in 9/2011. Recall rates, cancer detection rates, PPVs, biopsy rates and interval cancer rates within 1 year will be compared over the 3 year period with prior DM rates. A positive screen is defined as recall prompting a biopsy recommendation (cat. 4, 5). Patients assigned to short-term follow-up (cat. 3) are considered negative screens. Network cancer registry data through 12/2014 is used to determine interval cancer rate (defined as symptomatic cancers presenting at <1 year).

RESULTS

The reduction in recall from the baseline DM rate of 10.4% remained statistically significant over 3 DBT years (p<0.001, <0.001 and 0.003, respectively) however, showed a non-significant trend upward from DBT yr 1 to 3 (8.8, 9.0 and 9.2%). Cancer detection rates/1000 screened continued to increase from baseline DM rate of 4.6 to 5.5, 5.8 and 6.1 for DBT yr 1 to 3, but the trend was non-significant (p=0.108). The biopsy rate remained relatively stable, however, PPV1, 2 and 3 showed continued increases over time, with the trend in PPV1 statistically significant (p=0.025). The interval cancer rate decreased from 0.9/1000 screened for DM to 0.5 for DBT yr 1 and 0.1 for DBT yr 2. There is not adequate follow-up to calculate interval cancer rate for DBT yr 3.

CONCLUSION

Our data shows that not only are DBT screening outcomes sustainable, there are continued trends of increased cancer detection and PPVs over time. There was also a decrease in interval cancer rate with DBT within 1 year of screening suggesting that DBT detects more, clinically significant interval cancers.

CLINICAL RELEVANCE/APPLICATION

Consecutive years of screening with DBT demonstrate sustainable and even continually improving outcomes as measured by increased cancer detection and a trend of decreasing interval cancers.

Honored Educators

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

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

RC215-03 Screen-detected and Interval Cancers before, During, and after Implementation of Digital Breast Tomosynthesis in a Population-based Mammography Screening Program

Monday, Nov. 30 9:00AM - 9:10AM Location: Arie Crown Theater

Participants
Per Skaane, MD, PhD, Oslo, Norway (*Presenter*) Equipment support, Hologic, Inc; Consultant, Hologic, Inc; Support, Hologic, Inc
Sofie Sebuodegard, Oslo, Norway (*Abstract Co-Author*) Nothing to Disclose
David Gur, PhD, Pittsburgh, PA (*Abstract Co-Author*) Nothing to Disclose
Randi Gullien, RT, Oslo, Norway (*Abstract Co-Author*) Support, Hologic Inc; Travel support, Hologic, Inc
Solveig S. Hofvind, Oslo, Norway (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To analyze cancer detection and interval cancer rates before, during, and after implementation of digital breast tomosynthesis (DBT) in organized breast cancer screening.

METHOD AND MATERIALS

The prospective screening trial including DBT was approved by the Ethical Committee. All participating women signed a written consent. The screening program includes women 50-69 years invited biannually to two-view full-field digital mammography (FFDM) screening. Image interpretation is carried out in batch reading mode with independent double reading using a 5-point rating scale for probability of cancer, with consensus/arbitration decision for all positive scores before final decision to recall. Incident screening exams (prior exams performed 2 years earlier) of the first years of four subsequent screening rounds in 2007 (FFDM), 2009 (FFDM), 2011 (FFDM plus DBT), and 2013 (FFDM only) were analyzed. Prevalent screen exams were excluded from analysis. Interval cancers of incident screened women in 2007, 2009, and 2011 were recorded based on a two-year follow-up period. Attendance as well as cancer detection rates (invasive cancers and DCIS), and interval cancer rates were compared using t-test with 95% confidence intervals (CI).

RESULTS

The number of women in the study population was 10.755, 11.069, 8.269, and 8.580 in 2007, 2009, 2011, and 2013, respectively. The numbers and rates (per 1.000 screen exams) of screen-detected cancers were 67 and 6.2 (95% CI 4.7-7.7), 52 and 4.7 (95% CI 3.4-6.0), 81 and 9.7 (95 CI 7.6-11.8), and 41 and 4.8 (95% CI 3.3-6.2) in 2007, 2009, 2011, and 2013. The numbers and rates (per 1.000 screen exams) of interval cancers were 22 and 2.1 (95% CI 1.2-2.9), 32 and 2.9 (95% CI 1.9-3.9), 17 and 2.1 (95% CI 1.1-3.0) for women screened in 2007, 2009, and 2011, respectively.

CONCLUSION

Implementation of digital breast tomosynthesis increases the cancer detection rate in mammographic screening. The interval cancer rate remained stable.

CLINICAL RELEVANCE/APPLICATION

Tomosynthesis increases cancer detection rate in organized mammographic screening. Further studies are needed for evaluating the interval cancer rates.

RC215-04 Missed Breast Cancer by Digital Mammography and Tomosynthesis

Monday, Nov. 30 9:10AM - 9:20AM Location: Arie Crown Theater

Participants
Miguel A. Pinochet, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Eleonora Horvath, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Monica P. Rochels, MD, Santiago , Chile (*Presenter*) Nothing to Disclose
Claudio S. Silva Fuente-Alba, MD, MSc, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Marcela Uchida, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Maria Paz Duran Caro, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Heriberto Wenzel, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Eduardo Soto, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Maria Cecilia P. Galleguillos, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Maria E. Droguett, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Full-field digital mammography (FFDM) plus digital breast tomosynthesis (DBT) have shown to improve the sensitivity of breast cancer detection in screening programs. The purpose of this study was to analyze the imaging and histopathological characteristics of the breast cancers missed by FFDM and DBT.

METHOD AND MATERIALS

IRB approved, retrospective review of 223 consecutive breast cancers evaluated by FFDM plus DBT and Ultrasound (US) examination between 2013 and 2014. Variables assessed were: age, breast density (ACR 1-4), tumor size, location in the parenchyma, presence of microcalcifications, detailed morphological features in different imaging methods, histopathological tumor type and molecular subtype. Qualitative variables were described by percentage distribution, median and range.

RESULTS

Detection-rate of FFDM and DBT were: 83.0% and 90.5% respectively, with a substantial interreader agreement (k=0.67±0.06). In total we found 38 cancers (17%) undetectable in FFDM. Of these, 17 (7.5%) were recognized by DBT as a focal distortion or spiculated mass; 14 of them in dense breast (ACR 3-4). Finally 21 cancers (9.5%) among 20 women (median age: 53 years; range 41-64 years) were occult also in DBT, all identified by US. Breast density according to ACR 2, 3 and 4 was 10%, 65%, and 25% respectively. Median tumor size was 8.5 mm (range 4-35 mm). All cancers had an intraparenchymatous location, were microlobulated, without microcalcifications nor distortion. Two cases were DCIS and 19 infiltrating (14 ductal and 5 lobular). Thirteen were luminal A, 4 luminal B and 2 HER2 positive subtypes.

CONCLUSION

DBT improved the detection-rate of the FFDM, depicting more cancers that appeared as distortions or spiculated masses in dense breast tissue.However, the DBT also has limitations: it is not able to recognize 9.5 % of all breast cancers, mainly those small, infiltrating, non-calcified, non-spiculated, within dense parenchyma. Complementary breast US allows their earlier detection.

CLINICAL RELEVANCE/APPLICATION

We describe the imaging characteristics of those cancers that remain occult in FFDM and in DBT.

Active Handout:Monica Patricia Rochels

http://abstract.rsna.org/uploads/2015/15008044/RC215-04.pdf

RC215-05   Performance Measures When Interpreting FFDM Examinations with Increasing Experience with DBT Based Screening in a Mixed FFDM/DBT Practice

Monday, Nov. 30 9:20AM - 9:30AM Location: Arie Crown Theater

Participants
David Gur, PhD, Pittsburgh, PA (*Presenter*) Nothing to Disclose
Margarita L. Zuley, MD, Pittsburgh, PA (*Abstract Co-Author*) Research Grant, Hologic, Inc;
Jules H. Sumkin, DO, Pittsburgh, PA (*Abstract Co-Author*) Scientific Advisory Board, Hologic, Inc

PURPOSE

To assess radiologists' recall and cancer detection rates when interpreting full field digital mammography (FFDM) examinations as experience with digital breast tomosynthesis (DBT) increased in a mixed FFDM and DBT practice.

METHOD AND MATERIALS

Using MQSA and pathology reporting data, we reviewed FFDM recall and cancer detection rates for 12 radiologists in a mixed FFDM and DBT practice before they interpreted DBT and then after they each interpreted 500 DBT screening examinations, and for 5 radiologists after interpreting 1000 DBT examinations. All diagnostic recommendations were obtained from our radiology databases and outcome measures were verified by pathology. Individual and pooled data were assessed at a two sided significance level of p<0.05.

RESULTS

A total of 41,871 FFDM examinations were reviewed and analyzed pre DBT and 38,664 and 18,395 FFDM examinations were reviewed and analyzed post 500 and 1000 interpretations of DBT examinations, respectively. We observed no significant changes (p>0.05) in recall rates for FFDM as experience with DBT increased from virtually none to 500 DBT interpretations and later to over 1000 DBT interpretations. Average recall rates for FFDM were 11.4%, 11.6% and 11.3%, respectively, with no individual demonstrating a significant change or a relative rank order change on a relative scale (p>0.05). We observed no significant changes in cancer detection rates (CDRs) with increased experience with DBT from virtually none to 500 DBT interpretations and later to over 1000 DBT interpretations. Group CDRs were 4.7, 5.0, and 4.7 per 1000 FFDM screening examinations during the three periods, respectively (p>0.05). Pooled data group changes in recall rates had concordant trend changes in CDRs, albeit the trends were not statistically significant (p>0.05).

CONCLUSION

Despite expectations for improved performance, in particular in terms of recall rates, when interpreting FFDM examinations as experience with DBT increases in a mixed FFDM/DBT practice, radiologists reporting patterns and cancer detection rates did not change significantly.

CLINICAL RELEVANCE/APPLICATION

In a mixed FFDM/DBT practice, radiologists reporting patterns and cancer detection rates when interpreting FFDM examinations did not change significantly as experience with DBT increased.

RC215-06   Integrated Interpretation of Digital Breast Tomosynthesis and Ultrasound in Asymptomatic Women with Dense Breasts

Monday, Nov. 30 9:30AM - 9:40AM Location: Arie Crown Theater

Participants
Jung Min Chang, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Won Hwa Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Woo Kyung Moon, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the diagnostic performances of combined digital mammography (DM) and digital breast tomosynthesis (DBT) versus combined DM and breast ultrasound (US) in asymptomatic women with dense breasts, and to evaluate the performance of an integrated interpretation of DBT and US.

METHOD AND MATERIALS

This study was approved by our Institutional Review Board and all patients provided informed consent. 196 pairs of DBT and US images from asymptomatic women with dense breasts (median age, 51 years; range, 21-77), who underwent screening examinations comprised our study population. Two independent prospective reading sessions of DBT and US with information of DM were performed in parallel by 12 radiologists blinded to the other examinations, and the integration of the results from both examination was performed by 2 expert breast radiologists in consensus, downgrading BI-RADS 3 lesions on US to BI-RADS 2 if DBT showed benign findings (BI-RADS categories 1 to 3). Sensitivity, specificity, negative predictive value (NPV), and positive predictive value (PPV) for recall of DBT, US, and their integrated results were compared using McNemar test, and Fisher's exact test.

RESULTS

Among 196 women, 27 lesions were assessed as showing suspicious findings on DBT, and 60 on US. Five cancers (mean invasive tumor size, 1.9cm; range 0-2.8cm) were detected on both DBT and US. Sensitivities and NPVs were 100% for both DBT and US. Specificity and PPVs for recall were 96.9% and 18.5% for DBT and 90.6% and 8.3% for US. The specificity for DBT was significantly higher than that of US (P=0.008). Integrated results downgrading BI-RADS 3 lesions on US to BI-RADS 2 if DBT showed benign findings yielded a significant reduction in the recall rate (30.6% vs. 12.2%, P=0.0004) without sensitivity loss.

CONCLUSION

For asymptomatic women with dense breasts, DBT combined with DM showed higher specificity than US combined with DM, and the integration of DBT information to US, resulted in decreased recall rates without loss in sensitivity.

CLINICAL RELEVANCE/APPLICATION

DBT is a beneficial method in evaluating dense breasts on DM, and integrated reading of DBT and US may induce reduction of short-term follow-up without change in sensitivity.

RC215-07   Whole Breast Ultrasound

Monday, Nov. 30 9:40AM - 10:00AM Location: Arie Crown Theater

Participants
Regina J. Hooley, MD, New Haven, CT (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the indications for whole breast ultrasound. 2) Be familiar with the advantages and disadvantages of automated and handheld whole breast ultrasound. 3) Review optimal technique and strategies to improve specificity of whole breast ultrasound.

ABSTRACT

Technological advances and improvements in scan resolution have led to increased utility of whole breast ultrasound. Whole breast ultrasound is more widely accepted as a supplemental screening tool in women with dense breasts and a negative mammogram, but may also be used to evaluate disease extent in women with a new diagnosis of breast cancer. Whole breast ultrasound may be performed using a traditional handheld technique or using an automated scanner, which is less operator dependent. Careful attention to scanning technique is essential to produce high quality images, as well as to improve overall sensitivity and specificity.

ActiveHandout:Regina J. Hooley

http://abstract.rsna.org/uploads/2015/15002285/ActiveRC21.pdf

RC215-08   Update on Technologist-performed, Screening Breast Ultrasound in Women with Dense Tissue 5 Years after CT Public Act No. 09-41: How Are We Doing Now?

Monday, Nov. 30 10:00AM - 10:10AM Location: Arie Crown Theater

Participants
Liane E. Philpotts, MD, New Haven, CT (*Presenter*) Nothing to Disclose
Madhavi Raghu, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Melissa A. Durand, MD, New Haven, CT (*Abstract Co-Author*) Research Grant, Hologic, Inc
Laura J. Horvath, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Reni S. Butler, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Paul H. Levesque, MD, Madison, CT (*Abstract Co-Author*) Nothing to Disclose
Regina J. Hooley, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Much experience has been gained during 5 years of performing screening whole breast ultrasound (US) on women with dense tissue. The purpose of this study was to assess current outcomes of these exams and compare to results obtained in our first year.

METHOD AND MATERIALS

A HIPAA-compliant, retrospective review of the breast imaging database (PenRad, MN) was performed to identify all screening ultrasound exams performed at a satellite office of a tertiary academic cancer hospital, during a 5 month period (10/1/14-2/28/15). All screening US exams were performed by dedicated breast technologists using hand-held scanning and with on-site dedicated breast radiologists available. Only cases reported as normal and dense on recent screening mammogram were included. Patients undergoing diagnostic mammography or follow up ultrasounds were not included. The BIRADS final assessment, positive predictive value (PPV3) and cancer detection rate (CRD) was determined and compared to results obtained in our practice in the first year of performing screening ultrasound (10/1/09 - 9/30/10).

RESULTS

756 supplemental screening US were performed during the time period, of which 708 (94%) were reported as normal (BIRADS 1,2). 40 cases (5%) were reported as BIRADS 3. Only eight biopsies were recommended (BIRADS 4,5 1%) of which 2 were malignant (both invasive ductal carcinoma), PPV3=25%. This yield a cancer detection rate of 2.6 per 1000 (2/756). In comparison to our first year results, there has been significant changes with and increase in the rate of BIRADS 1,2 (75% vs 94%, p<0.0001), a decrease in the rate of BIRADS 3 (20% vs 5%, p<0.0001), fewer biopsies recommended BIRADS 4,5 (5% vs 1%, p<0.0001), and an improvement in the PPV3(6.5% vs 25%, p<0.0001) with maintained CDR (3.2 vs 2.6 per 1000).

CONCLUSION

There has been a large shift in the outcome of supplemental screening ultrasound performed during 5 years with significantly fewer false positives and a higher PPV with maintained CDR, resulting in greatly improved performance of this exam.

CLINICAL RELEVANCE/APPLICATION

With experience, the performance and outcome of supplemental screening ultrasound is greatly improved.

RC215-09   Radiologists' Specificity in Reading Automated Breast Ultrasound (ABUS) Can Be Improved by Computer Aided Arbitration

Monday, Nov. 30 10:10AM - 10:20AM Location: Arie Crown Theater

Participants
Jan Van Zelst, Nijmegen, Netherlands (*Presenter*) Nothing to Disclose
Tao Tan, Nijmegen, Netherlands (*Abstract Co-Author*) Research Grant, QView Medical, Inc
Andre R. Grivegnee, MD, Linkebeek, Belgium (*Abstract Co-Author*) Nothing to Disclose
Mathijn D. De Jong, MD, 's-Hertogenbosch, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Nico Karssemeijer, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Shareholder, Matakina Technology Limited; Consultant, QView Medical, Inc; Shareholder, QView Medical, Inc; Director, ScreenPoint Medical BV; Shareholder, ScreenPoint Medical BV;
Ritse M. Mann, MD, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Speakers Bureau, Bayer AG

PURPOSE

Screening for breast cancer with supplemental Automated Breast Ultrasound (ABUS) increases the amount of unnecessary recalls for benign lesions that otherwise would not have been observed. We investigated the effect of using Computer Aided Detection (CADe) software as independent arbiter on radiologists' findings on the sensitivity and specificity of ABUS for breast screening.

METHOD AND MATERIALS

The IRB waived the need for informed consent for this study. Randomly selected views from ABUS scans (Siemens, ABVS) of 89 women were included. 19 women had malignancies, 30 had benign lesions and 40 women had no abnormalities. Three dedicated breast radiologists and a 4th year resident with experience in reading ABUS participated in this multi-reader-multi-case (MRMC) study. They read all 89 cases without aid from CADe and were instructed to mark and report their findings using a 0-100 likelihood-of-malignancy scale. The CADe program (Qview Medical Inc, Los Altos, Ca.) also analyzed the 89 cases independent from the radiologists, providing suspicious region candidates for each case.The locations of the findings of the radiologists were compared to the locations of the CADe software findings. Radiologist's findings were considered suspicious only when the marked lesions matched to the candidates of CADe. Radiologists' findings that were not marked by CADe were regarded as benign.MRMC ROC analysis was used to compare the area under the ROC curve (AUC) of the normal unaided readings to the AUC of the readings after computer aided arbitration.

RESULTS

The AUC improved significantly from 0.77 to 0.88 after arbitration, using the CADe software (p = 0.01). Furthermore, the partial AUC in the range of 90-100% specificity also improves significantly from 0.05 to 0.065 (p=0.04). The radiologists' findings that were subsequently overruled by the CADe program were mostly true benign lesions or artefacts. None were malignant.

CONCLUSION

Using CADe software for computer aided arbitration has the potential to improve the specificity of breast radiologists screening with ABUS.

CLINICAL RELEVANCE/APPLICATION

CADe arbitration may help to identify unnecessary referrals for non-malignant lesions that can be reevaluated by second readers and potentially increase specificity without losing sensitivity.

RC215-10   Supplemental Automated Breast Ultrasound Screening in BRCA Gene Mutation Carriers; Is There Any Value?

Monday, Nov. 30 10:20AM - 10:30AM Location: Arie Crown Theater

Participants
Jan Van Zelst, Nijmegen, Netherlands (*Presenter*) Nothing to Disclose
Gwendolyn Woldringh, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Roel D. Mus, MD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Peter Bult, MD, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Matthieu Rutten, MD, Hertogenbosch, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Ritse M. Mann, MD, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Speakers Bureau, Bayer AG
Nicoline Hoogerbrugge, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Nico Karssemeijer, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Shareholder, Matakina Technology Limited; Consultant, QView Medical, Inc; Shareholder, QView Medical, Inc; Director, ScreenPoint Medical BV; Shareholder, ScreenPoint Medical BV;

PURPOSE

Intensive yearly breast cancer screening programs for BRCA carriers with MRI and mammography (XM) detect many cancers at an

early stage. However, BRCA carriers still present with interval cancers. In this prospective study we investigated whether automated breast ultrasound (ABUS) leads to earlier or additional detection of breast cancer.

METHOD AND MATERIALS

This study was approved by a local IRB and is HIPAA compliant. 295 female BRCA gene mutation carriers signed informed consent for this study. They were offered 5 round of screening in two years. A team of 4 dedicated breast radiologists read all examinations. We analyzed sensitivity, specificity and positive predictive value (PPV) of all three modalities. Furthermore, we retrospectively reevaluated prior ABUS scans of cancer patients and the ABUS scans of ultrasound negative cases in this cohort.

RESULTS

Out of 295 BRCA gene mutation carriers, 16 women were diagnosed with a screening-detected breast cancer. In six women, pure DCIS with no invasive component was found. None of the DCIS, not prospectively or in retrospect, was found on ABUS. In ten women, invasive breast cancer (IBC) was detected. Seven of these IBCs were found on ABUS. No additional cancers were found with ABUS. For six out of ten IBCs a prior ABUS scan was available. In retrospect, two IBCs (33,3%) were retrospectively visible on the ABUS scan six months earlier and one of these was detected but classified as BI-RADS 2. Also two interval IBCs (12.5%) occurred in between screening rounds and one of these cancer was also detected six months earlier but classified as BI-RADS 2. For XM, MRI, and ABUS sensitivity was 0.50, 0.88 and 0.44, specificity 0.97, 0.95 and 0.95 and PPV 0.32, 0.28 and 0.09, respectively

CONCLUSION

In our BRCA screening program, MRI and XM together detect most of the cancers. In this study, adding ABUS did not increase cancer detection. In retrospect, some cancers were seen earlier, but regarded benign due to a benign appearance, which is common in the BRCA population.

CLINICAL RELEVANCE/APPLICATION

High interval cancer rates in the BRCA carrier population justifies intensifying the yearly screening regimen of MRI and XM, however at this point adding ABUS does not seem to offer a solution.

RC215-11   Supplemental Screening US in Combination with Elastography and Color Doppler US: Interim Results of a Prospective Multicenter Study

Monday, Nov. 30 10:30AM - 10:40AM Location: Arie Crown Theater

Participants
Su Hyun Lee, MD,PhD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Sung Ui Shin, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
A Jung Chu, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Min Sun Bae, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Woo Kyung Moon, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To validate the added value of elastography and color Doppler ultrasonography (US) for supplemental screening US in a multicenter study.

METHOD AND MATERIALS

This study was conducted with institutional review board approval, and written informed consent was obtained. From November 2013 to December 2014, 1,241 women (mean age, 46 yrs) with breast masses (mean size, 1.0cm) detected on supplemental screening US and assessed as BI-RADS category 3 or higher were prospectively recruited from 10 tertiary care centers. After identifying the mass of interest on B-mode US, elastography (strain elastography in 4 sites; shear-wave elastography in 6 sites) and color Doppler US were performed. Investigators assessed the likelihood of malignancy as a percentage at the time of enrollment using the four data sets: B-mode US alone, B-mode US with elastography, B-mode US with color Doppler US, and B-mode US with elastography and color Doppler US. Reference standard of biopsy or at least 1 year of follow-up was completed in 1,050 women (84.6%) and included in the interim analysis.

RESULTS

71 of 1,050 breast masses (6.8%) were malignant. The areas under the receiver operating characteristics curve (AUC) of B-mode US increased from 0.878 to 0.922 (P=.039) and 0.911 (P=.157) when elastography or color Doppler US was added, respectively. When both elastography and color Doppler US were added to B-mode US, the highest AUC (0.957) was achieved (P<.001). The majority of breast masses in our cohort (91.5%, [961/1050]) was assessed as BI-RADS category 3 or 4A on B-mode US and included 25 malignancies (9 DCIS, 16 invasive carcinoma). None of invasive cancers but only one DCIS showed negative findings on both elastography and color Doppler US. If the BI-RADS category 3 or 4A masses with negative findings on both elastography and color Doppler US were managed with 1-year follow-up, a considerable number of benign biopsies (84.0%, [539/642]) and unnecessary short-term follow-up (85.7%, [252/294]) can be reduced yielding higher PPV (27%, [70/258]) compared to that of B-mode US alone (6.8%, [71/1050]).

CONCLUSION

Combined use of elastography and color Doppler US can increase the PPV of supplemental screening US for breast cancer detection.

CLINICAL RELEVANCE/APPLICATION

Combined use of elastography and color Doppler US can reduce a considerable number of unnecessary biopsies or short-term follow-up induced by supplemental screening breast US.

Breast MRI: Screening and Diagnostic Use

Monday, Nov. 30 10:50AM - 11:10AM Location: Arie Crown Theater

Participants
Christiane K. Kuhl, MD, Bonn, Germany (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To list shortcomings of mammographic screening for breast cancer. 2) To define the term 'overdiagnosis' and distinguish it from 'false positive diagnoses'. 3) To list the current indications for screening with Breast MRI. 4) To describe pathophysiological processes that determine diagnosis of breast cancer in MRI vs. in mammography. 5) To list the advantages and limitations of non-mammographic screening.

RC215-13 **Prospective Abbreviated MRI (AB-MR) Exam in a Screening Cohort Compared with Conventional Breast MRI**

Monday, Nov. 30 11:10AM - 11:20AM Location: Arie Crown Theater

Participants
Claudia R. Seuss, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Yiming Gao, MD, New York, NY (*Presenter*) Nothing to Disclose
Amy N. Melsaether, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Hildegard B. Toth, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Linda Moy, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate an AB-MR in women at intermediate and high-risk (HR) for breast cancer.

METHOD AND MATERIALS

An IRB approved study was performed on 86 asymptomatic women who underwent 114 breast MRI exams from 12/2011 - 12/2013. All women were at risk for breast cancer, had dense breasts, had surgery and/or follow up imaging. The breast MRI was performed on a 3T magnet with an acquisition time of 10 minutes. A single reader prospectively interpreted the AB-MR by reviewing the first post-contrast scan, T2 scan and prior studies. Comparison was made to the original diagnostic interpretation. Also, two additional readers retrospectively review the AB-MR exams. Final BIRADS assessment and confidence score was assessed for each lesion.

RESULTS

Of 86 women, 17 (19.8%) at HR, of which 11 (12.8%) were BRCA carriers, and 58 (67.4%) were at intermediate risk. Mean age was 46 years, range 29-76 years. Mean lesion size was 0.7cm (range 0.3 - 4cm). Sensitivity was 100%; 8 cancers (3 DCIS and five invasive cancer) were identified by the readers. All four cancers in BRCA carriers were identified by all readers. Using the abridged protocol, the specificity was 71% and an additional 14 findings were identified prospectively. The specificity for the retrospective review was 59 - 76%. Kappa score showed good interobserver agreement among the 3 readers. Mild to moderate BPE (p=0.02) small lesion size (< 0.6cm) (p=0.03) and absence of high signal T2 correlate (p=0.01) were significantly correlated with decreased confidence by all 3 readers. Of the 114 exams, 78 (68.4%) were originally assessed as BIRADS 1 or 2, 9 (7.9%) as BIRADS 3, 27 (23.7%) as BIRADS 4 or 5. Among the 3 readers, there was a statistically increase rate of BIRADS 3 assessments - 9.1 -17.6% (p=0.04) but not for BIRADS 4 assessments 19.2 -26.3% (p=.76).

CONCLUSION

An abridged breast MRI in a screening population had a high sensitivity but moderate specificity.

CLINICAL RELEVANCE/APPLICATION

An AB-MR screening exam can detected all the breast cancers but at the expense of a higher rate of follow up imaging.

RC215-14 **Efficacy of Annual MRI for High-risk Breast Cancer Screening**

Monday, Nov. 30 11:20AM - 11:30AM Location: Arie Crown Theater

Participants
Sarah Stamler, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Janice S. Sung, MD, New York, NY (*Presenter*) Nothing to Disclose
Jennifer B. Kaplan, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Tammy Huang, MD, Short Hills, NJ (*Abstract Co-Author*) Nothing to Disclose
Carol H. Lee, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
D. David Dershaw, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Elizabeth A. Morris, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Christopher E. Comstock, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the need for annual MRI in high-risk screening.

METHOD AND MATERIALS

IRB approved retrospective review was performed to identify breast cancers detected on screening breast MRI between January 2005-December 2010. Medical records were reviewed for risk factors (family history, personal history, BRCA status, prior high risk lesion) and tumor histopathology. The time intervals between the MRI on which the cancer was detected and the patient's baseline and most recent prior screening MRI were determined.

RESULTS

18,065 screening MRIs in 7,517 women were performed during the study period. 170 cancers were detected in 167 women (2.2%).

63/170 (37%) cancers were detected on baseline MRI. Of 107 (63%) cancers detected on a subsequent MRI, 81 (75%) were invasive, mean size= 0.7 cm, 9/107 (8%) node positive. 82/107 (77%) had a negative screening MRI within 1.3 years prior to the MRI on which the cancer was detected. Cancers were found at 1 year follow up (<1.5 years) in 17 (16%), at 2 years (1.5-2.5) in 25 (23%), and 65 (61%) on additional years of follow up. Results were independent of risk factors.

CONCLUSION

Annual MRI effective detects node negative, subcentimeter invasive cancers in a high-risk population. These cancers were not seen on MRI 1 year earlier suggesting the need for annual screening in this population.

CLINICAL RELEVANCE/APPLICATION

Annual MRI is the most appropriate screening interval for high-risk women, detecting node negative subcentimeter invasive cancers.

RC215-15 Longitudinal Results of a Breast MRI Screening Program for Patients at High and Intermediate Risk: Does BRCA Status Matter?

Monday, Nov. 30 11:30AM - 11:40AM Location: Arie Crown Theater

Participants
Suzan Vreemann, MSc, Nijmegen, Netherlands (*Presenter*) Nothing to Disclose
Albert Gubern-Merida, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Susanne Lardenoije, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Bram Platel, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Nico Karssemeijer, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Shareholder, Matakina Technology Limited; Consultant, QView Medical, Inc; Shareholder, QView Medical, Inc; Director, ScreenPoint Medical BV; Shareholder, ScreenPoint Medical BV;
Ritse M. Mann, MD, PhD, Nijmegen, Netherlands (*Abstract Co-Author*) Speakers Bureau, Bayer AG

PURPOSE

Breast cancer screening in women at elevated risk is performed with yearly MRI and mammography. This includes women with BRCA mutations and women at elevated risk for other causes (mainly family history). The purpose of this study was to assess differences between BRCA mutation carriers and non-BRCA patients in a longitudinal MRI screening program in terms of recall rate, positive predictive value, and detection.

METHOD AND MATERIALS

An IRB approved, retrospective review of patient files from women screened with breast MRI between 2003 and 2013 was performed at our academic center. We analysed 9.504 screening MR examinations in 2843 women (age: 45 ± 12.09 years), including 761 BRCA patients, and 2082 non-BRCA patients. Recall rate (RR), positive predictive value (PPV), and cancer detection rate (CDR) were evaluated for first round examinations and follow-up examinations separately. BRCA patients were compared with non-BRCA patients. Chi-square tests were used to determine statistical significance.

RESULTS

The RR for BRCA patients in the first round of screening was 86.07 per 1000 examinations and 52.58 per 1000 examinations in non-BRCA patients (p<0.001). The PPV for BRCA patients in the first round of screening was found to be 0.44, compared to 0.50 in non-BRCA patients (p=0.013). The CDR was 38.25 per 1000 examinations for BRCA patients and 26.53 per 1000 examinations for non-BRCA patients (p<0.001). In follow up, the RR was found to be 24.92 per 1000 examinations for BRCA patients and 22.81 per 1000 examinations for non-BRCA patients (p<0.001). The PPV was 0.46 for BRCA patients and 0.21 for non-BRCA patients (p<0.001). CDR was 11.42 per 1000 examinations for BRCA patients and 4.86 per 1000 examinations for non-BRCA patients (p<0.001).

CONCLUSION

RR and CDR are high for all patients in the first round. RR and CDR significantly decreased in follow-up rounds (p<0.001). PPV remained at an acceptable level for both patient groups, and remains particularly high in BRCA carriers. RR, PPV, and CDR differed significantly between BRCA and non-BRCA patients in both first and follow up rounds.

CLINICAL RELEVANCE/APPLICATION

These results underline that MRI is an excellent tool for screening high risk patients. Cancer detection is very high in the first round in all patients, but remains high only in BRCA carriers in follow up rounds.

RC215-16 Ultrafast Dynamic Contrast Enhanced (DCE) MRI of the Whole Breasts: A Novel Imaging Technique for Breast Cancer Detection with Super High Temporal Resolution- Comparison of MIP Images between Ultrafast MRI and Regular DCE MRI

Monday, Nov. 30 11:40AM - 11:50AM Location: Arie Crown Theater

Participants
Hiroyuki Abe, MD, Chicago, IL (*Presenter*) Consultant, Seno Medical Instruments, Inc
Naoko Mori, MD, PhD, Sendai, Japan (*Abstract Co-Author*) Nothing to Disclose
Keiko Tsuchiya, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Kirti M. Kulkarni, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Deepa Sheth, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
David V. Schacht, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Federico Pineda, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Gregory S. Karczmar, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Milica Medved, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate whether DCE ultrafast MRI (UFMRI) is equal or superior to regular DCE MRI in terms of cancer detection using maximum intensity projection (MIP) images.

METHOD AND MATERIALS

The acquisition protocol of UFMRI consisted of 5 pre and 8 post-contrast bilateral, fat-suppressed ultrafast acquisitions of whole breasts, with temporal resolution of 7 sec for 3T (spatial resolution: 1.5 x 1.5 x 3 mm), or 9 sec for 1.5T (spatial resolution: 1.5 x 1.5 x 3.75 mm); followed by four high spatial resolution acquisitions (spatial resolution: 0.8 x 0.8 x 0.8 mm) with temporal resolution of 75 sec for 3T or followed by five acquisitions (spatial resolution: 1.0 x 1.0 x 1.0 mm) with temporal resolution of 65 sec for 1.5T. Two radiologists compared MIP images of regular MRI (first phase) and UFMRI (first to eighth phase) of 16 patients with breast cancer, to see if tumors are detectable with MIP images of each acquisition method. In total 30 known cancers were evaluated.

RESULTS

All 30 masses (100%) were detected on MIP images of the UFMRI, while 22 masses (73%) were detected on the MIP image of the regular MRI. Among the 22 masses detected on both, 3 masses were subtle on the regular MIP, but clearly seen on the UFMRI MIP. Eight masses were not visible on regular MRI due to strong parenchymal enhancement (6 masses), misregistration artifacts (1 mass), and overwrap with large vessels (1 mass).

CONCLUSION

UFMRI could represent a better method than regular MRI for the detection of breast cancer with MIP images.

CLINICAL RELEVANCE/APPLICATION

Enhancing lesions are clearly visualized with UFMRI due to the lack of interference from background parenchymal enhancement. MIP images of UFMRI may be useful as a new screening MRI protocol which would shorten the performance and interpretation time without lowering the sensitivity and therefore decrease costs.

RC215-17 Abbreviated MRI (AB-MR) of the Breast - Do We Need a Second Post-Contrast Scan?

Monday, Nov. 30 11:50AM - 12:00PM Location: Arie Crown Theater

Participants
Amy N. Melsaether, MD, New York, NY (*Presenter*) Nothing to Disclose
Yiming Gao, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Claudia R. Seuss, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Laura Heacock, MS, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Linda Moy, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

AB-MR exam has a high sensitivity for the detection of breast cancers. However, for AB-MR to be an effective screening tool, it should maintain a high sensitivity and specificity. The purpose of this study was to assess the diagnostic accuracy of an AB-MR using one and two post-contrast scans in a screening cohort.

METHOD AND MATERIALS

An IRB approved retrospective review of 145 women with 205 findings who underwent a breast MRI at 3T was performed by two readers. Women with dense breasts who were at risk for breast cancer were included. 61 (42%) women were newly diagnosed with breast cancer and 84 (58%) were asymptomatic high-risk women. The scan time for the 3 T1-scans was 4 minutes; the scan time for the T2-sequence was 4 minutes. Prior to this study, each reader interpreted 400 AB-MR exams. Final BIRADS assessment and confidence score was assessed for each lesion. Comparison was made to the original diagnostic interpretation.

RESULTS

73 (97%) of 76 invasive cancers and all 61 known cancers, especially those presenting as masses were detected on the first post-contrast scan. However, the second post-contrast scans allowed improved characterization of foci and NME but not for masses (p<0.03). Of interest, about 10 (50%) of 20 DCIS were better seen on the second post contrast scan. Seven of 10 lesions were low or intermediate grade DCIS. With a single post contrast data set, 15 (10.3%) incidental NME not reported on the full breast MRI protocol was noted and recommended for additional imaging, follow-up or biopsy. The second post-contrast scan was as such able to downgrade a BIRADS 3 assessment in 9 (60%) lesions to a BIRADS 2 diagnosis assessment, none of which were malignant at follow-up. One interval cancer, low grade DCIS, was missed by both readers on the abbreviated two post-contrast data set protocol.

CONCLUSION

In an intermediate risk population with dense breasts, a second post-contrast scan both increased cancer detection and improved characterization of benign lesions, which led to a decrease in BI-RADS 3 assessments.

CLINICAL RELEVANCE/APPLICATION

Two post-contrast scans may be sufficient for an AB-MR exam to have a high sensitivity and specificity.

Master Class in Musculoskeletal Ultrasound (Hands-on)

Monday, Nov. 30 8:30AM - 10:00AM Location: E258

`MK` `US`

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

Participants

Marnix T. van Holsbeeck, MD, Detroit, MI (*Presenter*) Consultant, General Electric Company Consultant, Koninklijke Philips NV Stockholder, Koninklijke Philips NV Stockholder, General Electric Company Grant, Siemens AG Grant, General Electric Company
Catherine J. Brandon, MD, Ann Arbor, MI (*Presenter*) Stock options, VuCOMP, Inc
Michael A. Dipietro, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Alberto S. Tagliafico, MD, Genova, Italy (*Presenter*) Nothing to Disclose
Joseph H. Introcaso, MD, Neenah, WI (*Presenter*) Nothing to Disclose
Humberto G. Rosas, MD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize and identify pitfalls of scanning that lead to false positive or false negative musculoskeletal ultrasound results. 2) Perform skills for scanning difficult patients. 3) Follow rigorous protocols for the examination of different anatomic regions. 4) Position patients for more complicated musculoskeletal ultrasound examinations. 5) Recognize and integrate the importance of tissue movement in judging the functionality of the extremities.

ABSTRACT

In this Musculoskeletal Ultrasound Master class, an opportunity will be given to participants to start a written dialogue in advance to RSNA 2012. The electronically submitted questions will be sorted by instructors and organized per topic. A select number of recurrent themes in these questions will be prepared for dialogue on stage. When the questions focus on a particular scanning skill, the authors of the questions will be invited on the examination platform to show problems they encounter in their practice. By using a step-by step approach in solving the scanning issues, all who are present should benefit from the technical interactions on stage. Cameras will project scanning details on large screens. The seating in the master class will guarantee close proximity for an enriching interaction between audience and stage. At the end of the master class, the audience will be broken up in smaller groups for a more personal interaction with the instructors with the intent of improving scanning skills on an individual level.

Active Handout:Marnix T. van Holsbeeck

http://abstract.rsna.org/uploads/2015/12020755/RC231.pdf

US-guided Interventional Breast Procedures (Hands-on)

Monday, Nov. 30 8:30AM - 10:00AM Location: E264

BR　**IR**　**US**

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

Participants

Jocelyn A. Rapelyea, MD, Washington, DC (*Moderator*) Consultant, General Electric Company
Margaret M. Szabunio, MD, Lexington, KY (*Presenter*) Nothing to Disclose
Shambhavi Venkataraman, MD, Boston, MA (*Presenter*) Nothing to Disclose
Angelique C. Floerke, MD, Washington, DC (*Presenter*) Consultant, CareFusion Corporation
Rachel F. Brem, MD, Washington, DC (*Presenter*) Board of Directors, iCAD, Inc Board of Directors, Dilon Technologies LLC Stock options, iCAD, Inc Stockholder, Dilon Technologies LLC Consultant, U-Systems, Inc Consultant, Dilon Technologies LLC Consultant, Dune Medical Devices Ltd
Karen S. Johnson, MD, Durham, NC, (karen.johnson2@dm.duke.edu) (*Presenter*) Research Consultant, Siemens AG
Nicole S. Lewis, MD, Washington, DC (*Presenter*) Nothing to Disclose
Kathleen R. Gundry, MD, Atlanta, GA (*Presenter*) Nothing to Disclose
Michael N. Linver, MD, Albuquerque, NM (*Presenter*) Scientific Advisory Board, Hologic, Inc; Scientific Advisory Board, Real Imaging Ltd

LEARNING OBJECTIVES

1) Describe the equipment needed for ultrasound guided interventional breast procedures. 2) Review the basic principles of ultrasound guidance and performance of minimally invasive breast procedures. 3) Practice hands-on technique for ultrasound guided breast interventional procedures.

ABSTRACT

This course is intended to familiarize the participant with equipment and techniques in the application of US guided breast biopsy and needle localization. Participants will have both basic didactic instruction and hands-on opportunity to practice biopsy techniques on tissue models with sonographic guidance. The course will focus on the understanding and identification of: 1) optimal positioning for biopsy 2) imaging of adequate sampling confirmation 3) various biopsy technologies and techniques 4) potential problems and pitfalls

Neuroradiology/Head and Neck (Thyroid and Parathyroid Imaging)

Monday, Nov. 30 10:30AM - 12:00PM Location: N229

`HN` `NR` `US`

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

`FDA` Discussions may include off-label uses.

Participants
Laurie A. Loevner, MD, Gladwyne, PA (*Moderator*) Stockholder, General Electric Company; Stockholder, Pfizer Inc; Stockholder, Merck & Co, Inc; Stockholder, Johnson & Johnson; Stockholder, Amgen Inc; Stockholder, GlaxoSmithKline plc
Mark E. Mullins, MD, PhD, Atlanta, GA (*Moderator*) Nothing to Disclose

Sub-Events

SSC09-01   The Role of Core-Needle Biopsy as a First-line Diagnostic Tool for Initially Detected Thyroid Nodules

Monday, Nov. 30 10:30AM - 10:40AM Location: N229

Participants
Chong Hyun Suh, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Jung Hwan Baek, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jeong Hyun Lee, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Young Jun Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jae Kyun Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the role of core-needle biopsy (CNB) as a first-line diagnostic tool for initially detected thyroid nodules.

METHOD AND MATERIALS

This observational study was approved by the institutional review board and informed consent was obtained from all patients. From October 2008 to December 2011, we evaluated 632 initially detected thyroid nodules from 632 consecutive patients who underwent CNB. CNB readings were categorized into the same six categories of the Bethesda System. Final malignant results were diagnosed after surgery or CNB. Final benign results were diagnosed by surgery, twice of benign biopsy results, or benign cytology with a stable size at one year follow-up. The incidences of non-diagnostic, inconclusive results, diagnostic performance, unnecessary surgery, and complications were evaluated. Subgroup analysis according to nodule size was performed. The risk factors of inconclusive results were evaluated by multivariate logistic regression analysis.

RESULTS

CNB achieved 1.3% of non-diagnostic and 5.9% of inconclusive results. The diagnostic accuracy, sensitivity, specificity, positive predictive value and negative predictive value for diagnosis of malignancy were 97.6%, 90.5%, 100%, 100% and 92.7%, respectively. The unnecessary surgery was 0.6% and complication rate was 0.2%. Subgroup analysis showed that diagnostic performance was not significant according to nodule size. There were no independent risk factors associated with inconclusive results.

CONCLUSION

Our study demonstrated that CNB achieved low non-diagnostic, inconclusive results and high diagnostic accuracy for patients with initially detected thyroid nodules. CNB also minimize unnecessary surgery. Therefore, CNB seems to be a promising diagnostic tool for patients with initially detected thyroid nodules.

CLINICAL RELEVANCE/APPLICATION

CNB can be an alternative to FNA for patients with initially detected thyroid nodules to minimize non-diagnostic, inconclusive results and unnecessary surgery. CNB seems to be a promising diagnostic tool for patients with initially detected thyroid nodules.

SSC09-02   Optimal Follow-up Interval and Follow-up Management of Initial Non-diagnostic Thyroid Nodules 10 mm or Larger in Size

Monday, Nov. 30 10:40AM - 10:50AM Location: N229

Participants
Hee Jung Moon, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jieun Koh, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Eun-Kyung Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jin Young Kwak, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jung Hyun Yoon, MD, Seongnam, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the optimal follow-up interval in initial non-diagnostic thyroid nodules 10 mm or larger on ultrasonography-guided fine needle aspiration (US-FNA).

METHOD AND MATERIALS

This retrospective study was approved by the Institutional Review Board, and informed consent was waived. A total 228 nodules were classified into the 3, 6, and 12 months groups according to when the first follow-up US was performed or the length of the

US-FNA intervals, within 3 months, from 3 to 9 months, and 9 months after initial US-FNA. Nodules were classified according to size change. US features were reassessed using the Thyroid Imaging Reporting and Data System (TI RADS). Malignancy detection rate, malignancy risk, and clinico-pathological characteristics were compared among 3, 6, and 12 months groups and according to size change.

RESULTS

Seven (3.1%) were malignant. Malignancy detection rates, extrathyroidal extension and lymph node metastasis were not significantly different among the three groups. 13 (5.7%) of 228 showed increased size at least 10.7 months after initial US-FNA. One (7.7%) of the 13 was minimally invasive follicular carcinoma without lymph node metastasis found at 63.2 months. Of 177 without change, six papillary thyroid carcinomas less than 20 mm (3.4%) were found at a mean 10.4 months. The malignancy risks of 177 nodules with TI RADS category 3, 4a, 4b, and 4c were 1.7% , 0%, 3.3%, and 21.4%. None of the 38 nodules with decreased size were malignant. and 9 months after initial US-FNA.

CONCLUSION

The follow-up of initial non-diagnostic thyroid nodules 10 mm or larger in size can be performed around 12 months with US. The decision to perform repeat US-FNA can be made based on initial and follow-up US features.

CLINICAL RELEVANCE/APPLICATION

dealing with non-diagnostic thyroid nodues) 'The follow-up of initial non-diagnostic thyroid nodules 10 mm or larger in size can be performed around 12 months with US'

SSC09-03 Radiofrequency Ablation: New Perspectives in the Treatment of Malignant and Benign Thyroid Diseases

Monday, Nov. 30 10:50AM - 11:00AM Location: N229

Participants
Rosa Cervelli, Pisa, Italy (*Presenter*) Nothing to Disclose
Salvatore Mazzeo, MD, Pisa, Italy (*Abstract Co-Author*) Nothing to Disclose
Valentina Battaglia JR, MD, Pisa, Italy (*Abstract Co-Author*) Nothing to Disclose
Carla Cappelli, MD,PhD, Pisa, Italy (*Abstract Co-Author*) Nothing to Disclose
Benedetta Pontillo Contillo, Pisa, Italy (*Abstract Co-Author*) Nothing to Disclose
Luigi De Napoli, Pisa, Italy (*Abstract Co-Author*) Nothing to Disclose
Carlo Bartolozzi, MD, Pisa, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Aim of this study was to evaluate the safety and the efficacy of ultrasound-guided percutaneous RFA in the treatment of benign thyroid nodules, and in selected cases of recurrent thyroid cancers (RTC).

METHOD AND MATERIALS

This study included 40 patients: 30/40 affected by nodular goiter contraindicated to surgery; 10/40 affected by RTC and excluded from surgery/ radiometabolic therapy. Pre treatment diagnostic protocol included a CT and US examinations performed within 1month, in order to evaluate lesions' volumes.All RFA procedures were performed under US guidance by using a 18-gauge electrode, with a single 1-cm active, internally cooled, tip.Response to therapy was evaluated by means of contrast enhanced ultrasound in benign goiters (follow-up ranging from 6 to 18 months) and by means of CT in RTCs (follow-up ranging from 3 to 12 months).Mean Volume Reduction Rate (MVRR) was evaluated in respect to the pre-treatment lesions' volumes.

RESULTS

RFA was well tolerated by all patients: significant complication (permanent, laryngeal nerve lesion) was observed only in one patientsMVRR in goiters at 6, 12 and 18 months resulted to be 71,9±13,3%, 75,8±14,3% and 83,0±6,5% respectively; RCTs' MRVV at 3, 6 and 12 months were 57,2±27,5%, 82,4±13,0%, and 75,4±6,6% respectively.

CONCLUSION

All multinodular goiters showed excellent volume reduction; all patients presented a reduction of the compression symptoms.The neoplastic lesions demonstrated a good therapeutic response with slowing of disease progression.

CLINICAL RELEVANCE/APPLICATION

RFA is a reliable alternative to surgery in patients affected by benign goiter; moreover RFA might be considered as a valid approach for the debulking of RTC in non surgical cases.

SSC09-04 Sonographic and Demographical Features Associated with BRAF and RAS Mutations in the Follicular Variant of Papillary Thyroid Carcinoma

Monday, Nov. 30 11:00AM - 11:10AM Location: N229

Participants
Luzeng Chen, Boston, MA (*Presenter*) Nothing to Disclose
Manish Dhyani, MBBS, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Anthony E. Samir, MD, Boston, MA (*Abstract Co-Author*) Consultant, Pfizer Inc; Consultant, General Electric Company; Consultant, PAREXEL International Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Siemens AG; Research Grant, Toshiba Corporation; Research Grant, General Electric Company; Research Grant, Samsung Electronics Co, Ltd; Research Grant, Analogic Corporation; Research support, SuperSonic Imagine; Research support, Hitachi, Ltd

PURPOSE

The follicular variant of Papillary thyroid carcinoma (FVPTC) is the second common subtype of Papillary thyroid carcinoma. FVPTC harbors two common genetic mutations; BRAF and RAS, and nodules with BRAF mutations are more aggressive. The purpose of the study was to identify demographic and US features that might be useful for differentiating BRAF and RAS positive FVPTC's.

METHOD AND MATERIALS

The data of 61 patients with > 1 cm FVPTCs diagnosed between November 2000 and April 2011 were reviewed retrospectively. The patients were divided by mutation status into 3 groups: (1) BRAF positive group, (2) RAS positive group and (3) mutation negative group. Two radiologists with more than 10 years of thyroid sonography experience reviewed the sonographic characteristics of the FVPTC nodule while blinded to the results of the genetic analysis. Ultrasound features and patient demographics were compared.

RESULTS

The BRAF mutation was detected in 16 (26.2%) patients. The RAS mutation was detected in 25 (41%) patients. Patients with RAS positive FVPTC were significantly younger than patients in the BRAF mutation group (p=0.022) and the no mutation group (p=0.034). The nodule longest dimension of the BRAF group was smaller than the RAS group (p=0.036) and no mutation group (p=0.002). An indistinct nodule border was more common in the BRAF group than in the RAS group in both radiology assessments (p=0.002, p=0.002 respectively, Kappa value 0.610, p=0.000). An indistinct nodule border was more common in the BRAF group than in the no mutation group too (p=0.030, p=0.030 respectively, Kappa value 0.468 p=0.005). One of the two Radiologists found the BRAF group to appear spiculated more commonly than the other groups (BRAF group (6/16) vs. the RAS group (0/25) p=0.002; BRAF group (6/16) vs. no mutation group(0/20) p=0.004), and one of the two Radiologists found echogenicity to be significantly lower in the BRAF group (BRAF group vs. RAS group p=0.000; BRAF group vs. no mutation group p=0.007). No significant differences were found between gender, tall/wide, halo sign, heterogeneity, calcification in nodule, or vessel in and around the nodule.

CONCLUSION

An indistinct sonographic boundary is associated with the BRAF mutation, and larger nodule size is associated with the RAS mutation in FVPTCs.

CLINICAL RELEVANCE/APPLICATION

Demography and ultrasound features may be helpful to differentiate BRAF and RAS positive in FVPTC.

SSC09-05 Role of Screening Thyroid Ultrasonography in Healthy Population and Imaging Analysis of Screening-detected Thyroid Cancer

Monday, Nov. 30 11:10AM - 11:20AM Location: N229

Participants
Jeongin Yoo, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Sung Hee Park, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Objective : To evaluate the role of screening ultrasonography (US) in healthy population and analyze the US features of screening-detected thyroid cancer (SDTC).

METHOD AND MATERIALS

A total of 1845 persons participated in the study among 1923 healthy population who underwent screening thyroid US from March through August 2012 at our screening center; those who were lost to follow up (n=60) and those who underwent the previous operation on thyroid (n=18) were excluded. We evaluated detection rate of thyroid cancer and the average cost for detecting each cancer patient. (Presumed cost: $100 for thyroid US and $150 for fine-needle aspiration). We also analyzed the US features of screening-detected thyroid cancer.

RESULTS

Among 1845 participants 973 had benign disease (52.74 %, 63 by FNA and 910 with no change in 2 year-follow-up); 29 had thyroid cancer (1.57 %, 27 proven by FNA and 2 by surgery); 28 had PTC and 1 had follicular carcinoma. The cancer patients were predominantly women (69.0 %) and the mean age was 50.9±9.825. Imaging features that significantly differentiated malignant nodules from benign nodules were solid composition (100 % in malignant nodules), hypoechogenicity (100 %), taller than wide axis (82.8 %) and indistinct margin (86.2 %). Among 18 patients who underwent thyroidectomy, 14 (77.8 %) had pathologic tumor staging of T1 and 12 (85.71 %) had nodal staging of N0. The estimated average cost for detecting each cancer patient was $6,838.

CONCLUSION

Screening thyroid US enables detection of early stage thyroid cancer in asymptomatic healthy population. The majority of screening-detected thyroid cancer was micropapillary carcinoma and showed solid and hypoechoic nodule on US.

CLINICAL RELEVANCE/APPLICATION

The majority of screening-detected thyroid cancer was micropapillary carcinoma. Screening thyroid US enables detection of early stage thyroid cancer in asymptomatic healthy population.

SSC09-06 Malignant Thyroid Nodule with Chronic Lymphocytic Thyroiditis: The Value of Core-Needle Biopsy

Monday, Nov. 30 11:20AM - 11:30AM Location: N229

Participants
Eunchae Lee, MD, Seongnam-Si, Korea, Republic Of (*Presenter*) Nothing to Disclose
Yeo Koon Kim, Seongnam-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Eun Ju Chun, MD, PhD, Seongnam-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sang Il Choi, MD, Seongnam-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The detection and diagnosis of thyroid cancer can be more difficult in patients with chronic lymphocytic thyroiditis (CLT). The aim of this study is to compare the diagnostic accuracy of fine-needle aspiration biopsy (FNAB) and core-needle biopsy (CNB) for malignant thyroid nodule in CLT patients.

METHOD AND MATERIALS

Institutional review board approved and waived informed consent for this retrospective study. From January 2010 to April 2014, 1815 CLT patients (183 men, 1632 women; mean age, 53.6 years; age range, 11-87 years) who underwent ultrasound-guided FNAB (FNAB group, 993 nodules in 970 patients; 90 men, 880 women; mean age, 55.5 years; age range, 18-87 years) or CNB (CNB group, 912 nodules in 845 patients; 93 men, 752 women; mean age, 52.1 years; age range, 11-86 years) for thyroid nodule were included. Final diagnosis with surgical resection was obtained for 353 nodules. Chi-square test was used to compare the inconclusive results from both groups. Diagnostic accuracy, sensitivity, specificity, positive predictive value, and negative predictive value for the diagnosis of thyroid cancer were calculated on the basis of binomial probabilities.

RESULTS

The rate of inconclusive results (nondiagnostic specimen or atypia of unknown significance) were significantly lower in CNB group (FNAB group, n=306 (30.8%); CNB group, n=33 (3.6%); p<0.001).With correlation to final surgical pathology, the sensitivity and negative predictive value of FNAB were lower than CNB (49.5%, 18.9% vs. 83.5%, 63.6%)

CONCLUSION

Inconclusive results were significantly lower with CNB. CNB showed better diagnostic accuracy for thyroid cancer in patients with CLT.

CLINICAL RELEVANCE/APPLICATION

CNB can reduce the rate of inconclusive result in patients with CLT.

SSC09-07 Three-Dimensional Sonography more Accurately Localizes Preoperative Parathyroid Adenomas than Conventional 2D Sonography and Sestamibi

Monday, Nov. 30 11:30AM - 11:40AM Location: N229

Participants
Susan J. Frank, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Adam Goldman-Yassen, MD,MS, Bronx, NY (*Presenter*) Nothing to Disclose
Tova C. Koenigsberg, MD, Bronx, NY (*Abstract Co-Author*) Nothing to Disclose
Mordecai Koenigsberg, MD, Flushing, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Single parathyroid adenomas are the most common etiology of primary hyperthyroidism. If a single, enlarged parathyroid gland can be accurately identified before surgery, unilateral surgical dissection can be attempted, which has a lower morbidity than four-gland exploration. Two-dimensional ultrasound (2D US) and sestamibi scans are routinely used to evaluate patients with suspected primary hyperparathyroidism. Three-dimensional ultrasound (3D US) provides the surgeon with a coronal view, similar to a surgical perspective, and evaluates the typical vascularity of abnormal parathyroid glands. We compared the preoperative imaging of patients who underwent parathyroidectomy for primary hyperparathyroidism to determine the improvement of 3D US over 2D ultrasound and sestamibi for preoperative gland localization.

METHOD AND MATERIALS

We conducted a retrospective review of patients that underwent parathyroid surgery at our institution. We reviewed operative notes and pathology reports to identify final localization of abnormal parathyroid glands based on pathology and decrease in parathyroid hormone by 50% after gland excision in the OR. We evaluated preoperative ultrasound and sestamibi scan reports for gland localization.

RESULTS

118 patients underwent surgery for primary hyperthyroidism and underwent both preoperative ultrasound and sestamibi examinations at our institution between 2010 and 2014, 37 using 3D US. 3D US correctly identified the side of the abnormal parathyroid adenoma in 95% of cases (CI 81%-99%), compared with 57% of 2D US (CI 45%-68%), and the precise site of the abnormal gland in 81% of cases (CI 64%-92%), compared with 52% for 2D US (CI 40%-63%). Sestamibi scans correctly lateralized 82% of cases in our cohort (CI 73%-88%). 3D US and sestamibi concordantly lateralized the abnormal parathyroid in 92% of cases (CI 72%-96%), compared with 49% in 2D US cases (CI 38%-61%).

CONCLUSION

3D US is more sensitive than 2D US for correctly identifying the side and precise location of abnormal parathyroid glands in patients with primary hyperparathyroidism. 3D sonography may help provide more accurate gland localization before parathyroid surgery.

CLINICAL RELEVANCE/APPLICATION

Accurate localization of abnormal parathyroid glands before parathyroidectomy can reduce surgical morbidity and complications.

SSC09-08 Most Thyroid Cancers Lack Intranodular Vascularity on Color Doppler

Monday, Nov. 30 11:40AM - 11:50AM Location: N229

Participants
Grace C. Yang, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Karen O. Fried, MD, New York, NY (*Presenter*) Nothing to Disclose

PURPOSE

'Intranodular hypervascularity' has been reported to be associated with thyroid cancers in radiology literature. The aim of this study is to test this assumption with detailed pathology follow-up.

METHOD AND MATERIALS

Over a period of 8 years, 149 ultrasound-guided thyroid fine needle aspiration biopsies had both ultrasound images and histology

slides for review. Color Doppler images were reviewed and intranodular vascularity was graded from 0 to 3+ (0:no color). Recuts from index nodule were reviewed and divided into malignant and benign categories and tumor subtype recorded.

RESULTS

There were 99 thyroid cancers (size: 0.6-7 cm, mean 2.1, medium 1.8), and 50 benign nodules (size 0.4-9 cm, mean 3.06, medium 2.9),. The malignant nodules from 22 males and 77 females included 78 papillary carcinomas (PTC), 6 medullary carcinomas (MTC), 6 Hürthle cell carcinomas (HTC), 5 follicular carcinomas (FTC), and 4 poorly differentiated thyroid carcinomas (PDTC). Benign nodules from 11 males and 39 females included 32 follicular adenoma/adenomatoid nodules (FA), 13 Hürthle cell adenoma/adenomatoid nodules (HA) and 5 hyalinizing trabecular adenomas (HHA). As shown in Table 1, there were 58 (93.5%) cancers (50 PTC, 5 MTC, 2 PDTC, 1 FTC) and 4 (6.5%) benign nodules (3 HA, 1 FA) with no intranodular vascularity; 15 (88.2%) cancers (9 PTC, 1 MTC, 4 HTC, 1 PDTC) and 2 (11.8%) benign nodules (2 HA) had 1+ intranodular vascularity; 14 (93.3%) cancers (10 PTC, 2 HTC, 2 FTC) and 1 (0.7%) benign nodules (1 HA) had 2+ intranodular vascularity; 12 (21.8%) cancers (9 PTC, 2 FTC, 1 PDTC) and 43 (78.2%) benign nodules (31 FA, 7 HA, 5 HHA) had 3+ intranodular vascularity.

CONCLUSION

Most thyroid cancers have no intranodular vascularity and most hypervascular thyroid nodules are benign. This finding is not surprising, since most thyroid cancers are PTC, which is a tumor rich in lymphatic vessels. Follicular tumors are rich in blood vessels, but FTC is much less common than PTC..

CLINICAL RELEVANCE/APPLICATION

'Absence of intranodular vascularity' is recommended as one of the suspicoius features of thyroid ultrasound that include 'hypoechoic', 'taller than wide', 'blurred margins' and 'microcalcifications'

SSC09-09   Role Played by Elasticity Imaging in the Evaluation of the Thyroid Nodule

Monday, Nov. 30 11:50AM - 12:00PM Location: N229

Participants
Francisco J. Campoy-Balbontin, MD, PhD, Seville, Spain (*Presenter*) Nothing to Disclose
Carmen Jurado-Gomez, MD, Bellavista, Spain (*Abstract Co-Author*) Nothing to Disclose
Jose-Carlos Perez-Tejada, MD,PhD, Sevilla, Spain (*Abstract Co-Author*) Nothing to Disclose
Carmen Almeida, BMedSc, Seville, Spain (*Abstract Co-Author*) Nothing to Disclose
Rafael Aznar Mendez, Sevilla, Spain (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate conventional ultrasonography (US) including color doppler and elasticity imaging (EI) in thyroid nodule malignancy prediction.

METHOD AND MATERIALS

This prospective study included 399 patients (mean age, 51.9 years; range 13-83 years), 294 women (86.7%) and 45 men (13.3%). In 426 nodules (N) US, doppler color, EI and fine needle acquisition (FNA) were performed. The cytological results were classified according to the Bethesda System. No-apt sample and atypia or follicular proliferation of uncertain origin, were excluded (60N). 339 nodules in 335 patients were studied, divided in a non-surgical group (benign or T2, 292N) and a surgical group (follicular neoplasm-T4, 33N; suspicious for papillary carcinoma-T5, 9N; and Papillary carcinoma-T6, 5N). Comparison among US, vascularization, EI and cytology was performed, by using the χ2 tests and the non-parametric Mann-Whitney U test, for categorical variables (statistical significance <0.05). Multivariate logistic regression analysis was performed to assess the independent variables for surgical group prediction.

RESULTS

Findings associated to surgical nodules are heterogeneity (24/51%; odds ratio (OR):2.584), very hypoecoic (4/8.5%; OR:5.195), Hypoecoic (24/51.1%; OR:4.160), increased vascularization (12/27.9%; OR:3.233), infiltrative margin (8/17%; OR:6.450), irregular border (5/10.6%; OR:4.211), hard in EI (19/40.4%; OR:2.073). Findings linked to benignity are to be isoechoic (197/67.5%) and spongiform (153/52.4%). In the multivariate regression analysis only very hypoechoic and hypoechoic are independent criteria related for the surgical group (p<0.05), whereas spongiform is the only independent criteria associated to benignity.

CONCLUSION

EI could help in combination with the other US features to choose the nodule to perform FNA, but it does not seem to be independent criteria to indicate FNA

CLINICAL RELEVANCE/APPLICATION

EI properly used is a helpful tool, to be considered always in combination with US features, to indicate FNA.

Ultrasound Tuesday Case of the Day

Tuesday, Dec. 1 7:00AM - 11:59PM Location: Case of Day, Learning Center

US

AMA PRA Category 1 Credit ™: .50

Participants
Nirvikar Dahiya, MD, Phoenix, AZ (*Presenter*) Nothing to Disclose
Jason M. Wagner, MD, Oklahoma City, OK (*Abstract Co-Author*) Nothing to Disclose
Melanie P. Caserta, MD, Jacksonville, FL (*Abstract Co-Author*) Nothing to Disclose
Aya Kamaya, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Maryellen R. Sun, MD, Boston, MA (*Abstract Co-Author*) Research Grant, Glaxo SmithKline plc
Hee Sun Park, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) Participants will learn to list the sonographic appearances of common and uncommon diseases. 2) Participants will learn to describe the differentiating features between similar diseases via a case based format. 3) Participants will learn to discuss the pathophysiology of diseases that are responsible for the sonographic appearance.

Musculoskeletal Series: Ultrasound

Tuesday, Dec. 1 8:30AM - 12:00PM Location: E450A

`MK` `US`

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

Participants
Marnix T. van Holsbeeck, MD, Detroit, MI, (marnix@rad.hfh.edu) (*Moderator*) Consultant, General Electric Company Consultant, Koninklijke Philips NV Stockholder, Koninklijke Philips NV Stockholder, General Electric Company Grant, Siemens AG Grant, General Electric Company
Jon A. Jacobson, MD, Ann Arbor, MI, (jjacobsn@umich.edu) (*Moderator*) Consultant, BioClinica, Inc; Royalties, Reed Elsevier; ; ;

LEARNING OBJECTIVES

1) The 'Ultrasound' Series Course will review musculoskeletal sonography through live instruction by expert refresher course instructors, interspersed with scientific presentations.

Sub-Events

RC304-01   Elbow Ultrasound (Demonstration)

Tuesday, Dec. 1 8:30AM - 9:00AM Location: E450A

Participants
Jon A. Jacobson, MD, Ann Arbor, MI (*Presenter*) Consultant, BioClinica, Inc; Royalties, Reed Elsevier; ; ;

LEARNING OBJECTIVES

View learning objectives under main course title.

Honored Educators

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

Jon A. Jacobson, MD - 2012 Honored Educator

RC304-02   Ultrasound of the Distal Biceps Brachii Tendon Using Four Approaches: Reproducibility and Reader Preference

Tuesday, Dec. 1 9:00AM - 9:10AM Location: E450A

Participants
Shefali P. Kothary, MD, New York, NY (*Presenter*) Nothing to Disclose
Theodore T. Miller, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Gabrielle P. Konin, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Ogonna K. Nwawka, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Yoshimi Endo, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Gregory R. Saboeiro, MD, New York, NY (*Abstract Co-Author*) Research funded, Terumo Corporation Speakers Bureau, Bioventus LLC

PURPOSE

To determine which sonographic appearance of the distal biceps tendon is preferred by readers and if images obtained by two different operators are reproducible.

METHOD AND MATERIALS

An IRB approved, HIPAA compliant prospective study was performed evaluating the distal biceps brachii tendon in 40 elbows in 20 volunteers. The subjects had no history of biceps injury or abnormality, and were without antecubital pain. There were 8 males and 12 females, ages 24 to 67 years (mean age of 37) with a body mass index (BMI) of 18.3 to 31.1 (mean BMI of 24.7). Distal biceps brachii tendons of each subject were scanned in long axis using a 6-15 MHz linear transducer on a GE Logic 9 by two experienced musculoskeletal radiologists independently (operator A and B) using four different approaches: anterior, lateral, medial, and posterior. Five musculoskeletal radiologists independently reviewed the static images, and ranked the 4 approaches based on overall combination of echogenicity of the tendon, visualized length, and visualization of the insertion.

RESULTS

The appearance of the distal tendon obtained via the medial approach was preferred by readers in 78.5% (314/400) of cases (74.5% performed by operator A and 82.5% performed by operator B). The anterior approach was preferred by readers in 19.25% (77/400) of cases (24.0% by operator A and 14.5% by operator B). The lateral approach was preferred in 2.25% (9/400) of cases (1.5% by operator A and 3% by operator B), and the posterior approach was never preferred.

CONCLUSION

The appearance of the distal biceps brachii tendon using the medial approach is preferred by readers and is reproducible between different operators.

CLINICAL RELEVANCE/APPLICATION

When sonographically evaluating the elbow for suspected pathology of the distal biceps tendon, the medial approach should be the primary method of visualization, supplemented by the other approaches if necessary.

RC304-03 Shear Wave Elastography (SWE) Improves Treatment Monitoring of Patients with Tendinopathies

Tuesday, Dec. 1 9:10AM - 9:20AM Location: E450A

Participants
Timm Dirrichs, Aachen, Germany (*Presenter*) Nothing to Disclose
Christiane K. Kuhl, MD, Bonn, Germany (*Abstract Co-Author*) Nothing to Disclose
Valentin Quack, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose
Simone Schrading, MD, Aachen, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

It has been shown that SWE is useful for the evaluation of tendoninopathies. Purpose of this prospective clinical study was to analyze the correlation between clinical symptoms and tendon stiffness in patients undergoing treatment of tendinopathies. Aim is to establish SWE as tool for monitoring tendon healing under therapy.

METHOD AND MATERIALS

Prospective study in 35 patients with 47 symptomatic tendons (17 achilles, 15 patellar tendons and 15 humeral epicondylitis) who underwent a standardized multi-modality US protocol consisting of B-mode US, power Doppler (PD-US), and SWE, using a high-resolution linear 15 MHz probe (Aixplorer, Supersonic). All patients underwent this multi-modality US protocol three times: prior to any therapy, after 4 week of therapy and after 6 months of therapy. At each visit, patients were seen by an orthopedic surgeon who ranked the patients' clinical symptoms by standardized orthopedic scores (VISA-A, VISA-P, DASH). Clinical scores of symptom severity were correlated with ultrasound findings by using the Spearman correlation.

RESULTS

Clinical scores revealed symptom relief in 46.8% (22/47) of patients after 4 weeks and in 68.0% (32/47) after 6 months. A change of structural tendon abnormalities as observable by B-mode US was detectable in one single patient after 4 weeks (1/22; 4.5%,) as well as after 6 months (1/32; 3.1%). A decrease in neovascularization as observed by PD-US was detectable in 9 patients after 4 weeks (9/22; 40.9%) and in 13 patients after 6 months (13/32; 39.4%). An increase in tendon stiffness as determined by SWE was found in 18 patients after 4 weeks (18/22; 81.8%) and in 28 patients after 6 months (28/32; 90.6%). At quantitative analysis, the 32 patients whose clinical symptoms improved exhibited an increase of mean SWE values by 23 kPa (from 41.7 to 64.2 kPa) after 4 weeks and by 64 kPa (from 41.7 to 105.5 kPa) after 6 months. Clinical scores correlated poorly with findings at B-mode ($r = 0.24$), moderately with findings at PD-US ($r = 0.59$), and perfectly with findings made at SWE($r = 0.80$.)

CONCLUSION

Shear wave elastography correlates better with clinical symptoms and seems to display tendon healing better and earlier than B-mode and Power Doppler.

CLINICAL RELEVANCE/APPLICATION

Shear wave elastography appears to be useful to guide treatment and to develop new treatment approaches in patients with tendinopathies.

RC304-04 Delayed Onset Muscle Soreness (DOMS) after Eccentric Resistance Training of the Elbow Flexor Muscles: Temporal Evolution of MRI, Diffusion Tensor Imaging and Ultrasound Shear-Wave Elastography Findings

Tuesday, Dec. 1 9:20AM - 9:30AM Location: E450A

Participants
Christoph A. Agten, MD, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Florian M. Buck, MD, Langnau am Albis, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Linda Dyer, Zurich, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Christian W. Pfirrmann, MD, MBA, Forch, Switzerland (*Abstract Co-Author*) Advisory Board, Siemens AG; Consultant, Medtronic, Inc
Andrea Rosskopf, MD, Zurich, Switzerland (*Presenter*) Nothing to Disclose

PURPOSE

To evaluate the appearance of DOMS over time using fluid-sensitive and diffusion-weighted MRI sequences, diffusion-tensor imaging(DTI) and ultrasound(US) shear-wave elastography in healthy volunteers.

METHOD AND MATERIALS

Five men (m;mean age 39.6±4.6 years) and 5 women (w;30.6±13.5 years) underwent unilateral eccentric resistance training of the elbow flexor muscles consisting of 3 sets (12 repetitions each) of individually adapted maximal weights. 1.5T-MRI was done before and after (15 min;1,3, and 7 days) the training, including fluid-sensitive sequences, diffusion-weighted-sequences, and DTI of the distal upper arm. Evaluated MRI parameters were: visible muscle edema (vME; mild, moderate, severe), cross-sectional muscle area (CSMA), muscle diffusion restriction (ADC:10-6mm²/sec), fractional anisotropy(FA). US shear-wave elastography of the brachial muscle was performed before and after(15min; 0.5,1,2,3 and 7 days) the training. Subjective DOMS-evaluation parameters were assessed:pain (scale 0-10), tension feeling, extension deficit.

RESULTS

In men mean vME was moderate and peaked 3 days post training, for women mean vME was mild and peaked 2 days post training. CSMA was highest 3 days post-training in men(+9%) and women(+11%). Maximum mean ADC value was found after 3 days in men(1809; before training:1530) and women(1742; before:1476). Mean FA dropped from 361(m) and 389(w) to a minimum of 252 and 321 respectively after 3 days.US-elastography revealed an increase of mean shear wave velocity values(MSWV) after training in men(before training:3.0 m/s±0.3; peak 15min post:4.0 m/s±0.9) and in women(before:2.8± 0.4;peak 1 day post:3.2 m/s±0.4). In men a significant positive correlation was found between ADC of M. brachialis and MSWV($r=0.92$,$p=0.028$) and a significant negative correlation between maximal FA of flexor muscles and pain ($r=-0.99$;$p<0.001$) was seen. Maximal pain level(m:3±1,w:4±3)

and maximal extension deficit was achieved after 2 days. Tension feeling started 15min post-training and normalized after 7 days.

CONCLUSION

Muscles changes can be detected 15 minutes after eccentric resistance training using diffusion-MRI and US shear-wave elastography. FA correlates negatively with subjective pain symptoms in men. ADC shows changes earlier than fluid-sensitive-MR sequences.

CLINICAL RELEVANCE/APPLICATION

ADC and US-elastography are recommended when looking for very early muscle changes after eccentric muscle exercise.

RC304-05   Ultrasound of the Post-arthroplastic Hip

Tuesday, Dec. 1 9:30AM - 9:40AM Location: E450A

Participants
David Robinson, BSC, Hampton East, Australia (*Presenter*) Nothing to Disclose
Steven Lee, FRANZCR, Windsor, Australia (*Abstract Co-Author*) Nothing to Disclose
Paul Marks, FRANZCR, Box Hill, Australia (*Abstract Co-Author*) Nothing to Disclose
Michal Schneider, PhD, Clayton, Australia (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Ultrasound has been recommended as an imaging modality in the follow-up of hip replacement surgery. However, no descriptions of typical ultrasound appearances of the major pathologies that may afflict the hip replacement have been published to date. We set out to characterize ultrasound findings of the post-arthroplastic hip.

METHOD AND MATERIALS

Patients presenting to the department for routine follow-up imaging of their hip prosthesis were consecutively recruited. Ultrasound imaging was performed of the anterior and posterior prosthesis and of the iliopsoas bursa and tendon.

RESULTS

Fifty two patients were prospectively recruited with a mean (±SD) age of 60.4 (±12) years. Twelve patients had bilateral hip prostheses, giving 64 hips for analysis. There were 45 Birmingham hip resurfacings (BHR), ten MITCH, five Articular Surface Replacement (ASR), three Total Hip Replacements (THR) and one ADEPT hip resurfacing. Mean age of the prosthesis in situ was 8.2 years. Ultrasound was able to reliably image the soft tissues of all hips. The average (±SD) maximal antero-posterior (AP) synovial thickness was 6.5 (± 7) millimeters and the AP Iliopsoas tendon measurement was 4.8 (± 0.94) millimeters. Forty four hips presented with normal ultrasonic appearances. There were 15 iliopsoas bursal effusions ranging from mild (a trace of fluid surrounding the ilipsoas tendon), to very large (fluid-filled masses anterosuperior to the prosthesis). Four hips showed enlargement of the prosthesis-to-bone "step" possibly indicating the process of osteolytic femoral neck thinning. One hip demonstrated mild synovial thickening at the anterior recess.

CONCLUSION

Ultrasound is able to detect and evaluate a range of soft tissue pathologies about the post-prosthetic hip, such as fluid or effusion of the iliopsoas bursa, iliopsoas tendon thickening and heterogeneity, synovial thickening of the anterior and posterior hip joint recesses. Ultrasound imaging has an important role to play in the follow-up of the post-prosthetic hip

CLINICAL RELEVANCE/APPLICATION

Ultrasound of the post-prosthetic hip can demonstrate abnormalities during follow up and may serve as a useful tool in the management of patients with hip replacements.

RC304-06   Hip Ultrasound (Demonstration)

Tuesday, Dec. 1 9:40AM - 10:10AM Location: E450A

Participants
Marnix T. van Holsbeeck, MD, Detroit, MI, (marnix@rad.hfh.edu) (*Presenter*) Consultant, General Electric Company Consultant, Koninklijke Philips NV Stockholder, Koninklijke Philips NV Stockholder, General Electric Company Grant, Siemens AG Grant, General Electric Company
Kathy Quenneville, BS, RT, Commerce Township, MI, (kathyq@rad.hfh.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Demonstrate the osseous landmarks that guide the diagnostic work up of an adult hip. 2) Practice a step by step approach in the evaluation of anterior hip pain. 3) Rationalize the individual steps for the hip dynamic examination.

RC304-07   Ankle and Foot Ultrasound (Demonstration)

Tuesday, Dec. 1 10:20AM - 10:50AM Location: E450A

Participants
Andrew J. Grainger, MRCP, FRCR, Leeds, United Kingdom (*Presenter*) Speaker, General Electric Company; Equipment support, Siemens AG;

LEARNING OBJECTIVES

View learning objectives under main course title.

RC304-08   Semi-Quantitative Sonoelastography of Inflammatory Myopathies: Comparison with Clinical Examination, Magnetic Resonance (MR) Imaging, and Pathologic Finding

Tuesday, Dec. 1 10:50AM - 11:00AM Location: E450A

Participants

Yoonah Song, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Seunghun Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Dae Hyun Yoo, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sung Guk Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate real-time sonoelastography (SEL) in patients with inflammatory myopathies compared to clinical examination, MR imaging, and pathologic finding.

METHOD AND MATERIALS

The study was approved by the institutional review board, and informed consent was waived. Seventeen lesions of 16 consecutive patients with inflammatory myopathies (5 men, 11 women; mean age, 41 years; range, 11-67 years) were assessed with real-time SEL using Hitachi EUB-7500 ultrasound (US) system and software for elastography. Elastogram was obtained using freehand manipulation, compressing areas which were correlated with active inflammation on MR imaging. Using dedicated software for color information from the elastographic images, the relative strains for target muscle and reference muscle were measured. All lesions were underwent an US-guided percutaneous biopsy. The US and MR images were analyzed in conjunction with clinical symptom and biochemical data.

RESULTS

The strain ratio of target muscle was higher than adjacent muscle (mean 3.14; range, 0.95-5.93). There was no significant agreement between the strain ratios of the color parameters and the biochemical data. Sixteen of 17 specimens (94.1%) were confirmed by inflammatory myopathies. One lesion (5.9%) shows well preserved muscle fiber with few lymphocytes infiltration.

CONCLUSION

Muscle hardness as semi-quantitative measured by SEL, was increased in cases of inflammatory myopathies. The correlation between strain ratio from the elastographic images and the pathologic data suggest that SEL could be an important tool not only in the diagnosis but also in the management of the patients with inflammatory myopathies.

CLINICAL RELEVANCE/APPLICATION

High strain ratio could add knowledge regarding early development of inflammatory myopathy, which might have an impact on guidance before US-guided procedure to improve success rate for biopsy.

RC304-09 Real-time Sonoelastography Evaluation of the Achilles Tendon Following Ultrasound-guided Platelet-rich Plasma Injection for Refractory Achilles Tendinopathy

Tuesday, Dec. 1 11:00AM - 11:10AM Location: E450A

Participants

Chin Chin Ooi, MMedSc,BSC, Singapore, Singapore (*Presenter*) Nothing to Disclose
Michal Schneider, PhD, Clayton, Australia (*Abstract Co-Author*) Nothing to Disclose
Peter Malliaras, Melbourne, Australia (*Abstract Co-Author*) Nothing to Disclose
David Connell, Melbourne, Australia (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the clinical feasibility of sonoelastography (SE) in depicting changes in Achilles tendon stiffness following platelet-rich plasma (PRP) injection for Achilles tendinopathy, and to correlate SE findings with clinical outcome at 12 months post-injection.

METHOD AND MATERIALS

Between January 2013 and January 2014, consecutive patients with unilateral refractory Achilles tendinopathy were enrolled. B-mode ultrasound (US), color Doppler (CD) and SE were performed at baseline, 4-6 weeks, 6 months and 12 months post treatment. The strain ratio (strain value between Achilles tendon and Kager's fat) during SE, and the proportion of tendons with intratendinous hypoehogenicities and neovascularities were documented. Clinical outcomes were assessed by the Victorian Institute of Sport Assessment-Achilles (VISA-A) questionnaire at all time points and correlated with the sonographic findings.

RESULTS

Forty-five Achilles tendons from 45 patients (33 males, 12 females, mean age 51, mean symptom duration 15.3 months) were examined. The clinical VISA-A improved significantly from 38.4 (±14.1) at baseline, 77.2 (±12.5) at 6 months (p <0.001) to 81.2 (±10.8) at 12 months (p <0.001). The mean strain ratio values were 2.16 (±1.42) at baseline, 2.03 (±0.67) at 4-6 weeks, 1.81 (±0.62) at 6 months and 1.19 (±0.34) at 12 months with a significant reduction observed at 6 months (p =0.006) and 12 months (p <0.001). The proportion of tendons with neovascularities were significantly reduced at 6 months (p <0.001) and 12 months (p <0.001) whereas a significant change in the distribution of tendons with hypoechogenicities was only observed at 12 months in comparison to baseline (p <0.001). At 12 months evaluation, none of the tendons regained a normal echotexture despite improvement in VISA-A. Strain ratio demonstrated a significant moderate correlation with VISA-A (r =-0.610, p <0.001) while B-mode and CD US did not show a significant correlation (r =-0.041, p =0.817, and r =-0.116, p =0.514).

CONCLUSION

The treated Achilles tendons showed progressive stiffening, along with improvement in clinical findings up to one year follow-up. SE using strain ratio could be a promising supplementary tool for monitoring the progress of Achilles tendon healing after treatment.

CLINICAL RELEVANCE/APPLICATION

The supplementation of SE to conventional US may improve the specificity in routine monitoring of Achilles tendon healing and provide more objective data for safer return to activities.

RC304-10 Comparison of Ultrasound Guided Collagenase Clostridium Histolyticum Injections and Blinded Injections for the Treatment of Dupuytren's Contracture

Participants
Eva Llopis, MD, Valencia, Spain (*Presenter*) Nothing to Disclose
Luis Aguilella, MD, Alzira, Spain (*Abstract Co-Author*) Nothing to Disclose
Rosana Perez, MD, Alzira, Spain (*Abstract Co-Author*) Nothing to Disclose
Victoria Higueras, MD, Alzira, Spain (*Abstract Co-Author*) Nothing to Disclose
Elena Belloch, Alzira, Spain (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Collagenase clostridium histolyticum (collagenasa) injections have been proven an effective, safe treatment for Dupuytren disease, an alternative to fasciectomy. Our objective was to analyze the additional value of US guided injections and to study the correlation of US and MR for the diagnosis of Dupuytren disease

RESULTS

All patients were male but 2; average age 66,5yo; 5th finger was the most frequently affected, (group A 50% and B 60.41%) pretendinous cord was the most frequent 71% and52% (group A/B) followed by lateral cord 13% and 28.6% (group A/B). US appearance is variable (combined 45%, hyperechogenic36%, hypoechogenic18%), mean distance from skin1,8mm, average size of the cord 3,9mm (1,6-5,5mm). On T1Wi MR is mainly low SI (36%) or combined 45%. Complete extension (<5% contraction) was achieved in 36.97% and 57,14% (group A/B), the percentage of correction was 70% and 76 (group A /B), p=0.095, being statistically significant for PIP, 54%/76% (group A/B), p=0.020. VAS in 68% and 76% (group A/B), failure in 32% and 23% (group A/B).No nerve damage or tendon rupture occurred. Skin complications 32% and 23,8% (group A/B).

CONCLUSION

US guidance offers better results and slightly decrease of skin complications than blind collagenase injection being a good alternative to fasciectomy, although not statiscally significant. More significant results are seen on lateral cords on PIP contractions, where US is recommended. MR and US can identify collagenous and cellular components, thus potentially improving effectiveness, however US is more variable.

CLINICAL RELEVANCE/APPLICATION

US has added value in targeting Dupuytren cords for injection of collagenase with better outcome and lower rate of complications especially for lateral cords on PIP contractions

RC304-11   Ultrasound-Guided Treatment of Refractory Chronic Plantar Fasciopathy: A Randomized Controlled Pilot Study of Platelet-Rich Plasma versus Corticosteroid Injection

Participants
Kenneth S. Lee, MD, Madison, WI (*Presenter*) Research Consultant, SuperSonic Imagine; Consultant, Echometrix, LLC; Royalties, Reed Elsevier
John J. Wilson, MD, MS, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Sarah Kohn, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Elizabeth Plovanich, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Jeffrey Swick, MD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Ray Vanderby, PhD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate if ultrasound(US)-guided platelet-rich plasma(PRP) injection is effective for treating moderate to severe refractory chronic plantar fasciopathy(PF) compared to standard of care corticosteroid(SOC) injection.

METHOD AND MATERIALS

Inclusion criteria were met,which required unilateral PF,failed conservative therapy,and VAS pain level of at least 5 of 10 for at least 6 months duration. 44 consecutive subjects were randomized into two groups, PRP and SOC.Subjects received either a single injection of autologous PRP or a single injection of triamcinolone 40 mg at week 0. VAS pain levels,validated clinical surveys(FAAM/SANE),and US changes of PF thickness,hypoechogenicity(grade 0 -3),and hyperemia(grade 0-3) were obtained at week 0(pre-injection),week 16 and 32. Analysis of covariance was used for statistical analysis. Statistical significance was determined at p-value<0.05.

RESULTS

21 PRP subjects (mean age 47.8 yrs; range 30-64), M:F(4:17) and 23 SOC subjects (mean age 49.2 yrs; range 30-64), M:F(7:16) completed the 32-week study from March 2011-July 2014. No loss to follow-up.Baseline VAS pain levels were not significant(6.93 in PRP vs 6.63 in SOC;p=0.4). At week 16 and 32,both groups showed improvement in VAS pain levels compared to baseline,but PRP showed greater improvement than SOC over time(6.93 to 2.64 to 1.7;p=0.00).SOC pain level improved initially at week 16 but rebounded by week 32(3.28 to 4.77; p=0.002).FAAM scores improved for both groups(p<0.001)but the PRP group improved by 12.6 more points by week 32(p=0.02).SANE scores showed improving trend over time consistently favoring PRP(p=0.006).132 US exams performed.Baseline US changes were not significant except for hypoechogenicity(2.80 in PRP vs 1.79 in SOC;p<0.002).PF thickness decreased(mean of 0.33 mm;p<0.001) in both groups but no difference between groups(p=0.74).PRP showed greater echotexture improvement than SOC over time(decrease of 0.42/visit, SD 0.13 in PRP vs 0.004/visit in SOC;p=0.003).Hyperemia did not change over time (0.86 for PRP vs 0.81 for SOC,p = 0.80).There were no complications.

CONCLUSION

US-guided PRP injection may be an effective treatment option for refractory chronic PF compared to corticosteroid injection. Larger multi-armed studies are now needed to establish a new standard of care treatment algorithm.

CLINICAL RELEVANCE/APPLICATION

PRP is more effective than corticosteroid injection for the long-term treatment of refractory chronic plantar fasciopathy

FR is more effective than corticosteroid injection for the long-term treatment of refractory chronic plantar fasciopathy.

RC304-12 Ultrasound-guided Interventions

Tuesday, Dec. 1 11:30AM - 12:00PM Location: E450A

Participants
Kenneth S. Lee, MD, Madison, WI (*Presenter*) Research Consultant, SuperSonic Imagine; Consultant, Echometrix, LLC; Royalties, Reed Elsevier

LEARNING OBJECTIVES

View learning objectives under main course title.

Pitfalls in Abdominal Imaging

Tuesday, Dec. 1 8:30AM - 10:00AM Location: E353C

`GI` `CT` `MR` `US`

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

Participants

Sub-Events

RC309A   Pitfalls in Bowel Imaging

Participants
David H. Kim, MD, Madison, WI (*Presenter*) Consultant, Viatronix, Inc; Co-founder, VirtuoCTC, LLC; Medical Advisory Board, Digital ArtForms, Inc; Stockholder, Cellectar Biosciences, Inc

LEARNING OBJECTIVES

1) List the advantages/disadvantages of positive and negative oral contrast 2) Recognize common pitfalls that mimic disease 3) Devise practical approaches to manage common bowel imaging scenarios

RC309B   Atypical Liver Lesions

Participants
Rendon C. Nelson, MD, Durham, NC, (rendon.nelson@duke.edu) (*Presenter*) Consultant, General Electric Company Consultant, Nemoto Kyorindo Co, Ltd Consultant, VoxelMetrix, LLC Research support, Bracco Group Research support, Becton, Dickinson and Company Speakers Bureau, Siemens AG Royalties, Wolters Kluwer nv

LEARNING OBJECTIVES

1) To understand the typical imaging appearance of various focal liver lesions on CT and MR and how they can present in an atypical fashion (i.e. the imaging spectrum).

ABSTRACT

Active Handout:Rendon C. Nelson

http://abstract.rsna.org/uploads/2015/14000560/Active RC309B.pdf

RC309C   Pitfalls in Hepatic Doppler Sonography

Participants
Jonathan B. Kruskal, MD, PhD, Boston, MA, (jkruskal@bidmc.harvard.edu) (*Presenter*) Author, UpToDate, Inc

LEARNING OBJECTIVES

1) Discuss the common technical pitfalls that occur when performing the liver Doppler examination, and how these can be mitigated. 2) Discuss the perceptual and interpretive errors that occur when performing the liver Doppler examination, and how these can be minimized. 3) Describe the clinical impact of technical and interpretive errors.

ABSTRACT

Honored Educators

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

Jonathan B. Kruskal, MD, PhD - 2012 Honored Educator

RC309D   Pearls and Pitfalls in Pancreatic Diseases

Participants
Khaled M. Elsayes, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe most commonly encountered imaging pitfalls of the pacreas. 2) Describe relevant technical background. pathophysiology and hemodynamics of these pitfalls. 3) Discuss tips to avoid erroneous diagnosis and pearls to reach correct diagnosis.

ABSTRACT

There is a wide range of common pitfalls in pancreas imaging, which can lead to frequent incorrect diagnoses mainly because many radiologists are not completely familiar with anatomical, morphological, physiological, hemodynamic and biological principles as well as deficiency of modern clinical and radiological knowledge. This leads to common misinterpretations which would further results in

wrong management with potentially negative outcome. In this course, we will review important typical features of common pancreatic pathologies and mimics of these pathologies that may require different treatment and improved prognosis.

RC310

First Trimester Ultrasound (An Interactive Session)

Tuesday, Dec. 1 8:30AM - 10:00AM Location: S402AB

`GU` `OB` `US`

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

Participants

Active Handout:Carol Beer Benson

http://abstract.rsna.org/uploads/2015/15001996/Active RC310.pdf

Sub-Events

RC310A   Ectopic Pregnancy

Participants
Anne M. Kennedy, MD, Salt Lake City, UT (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Diagnose tubal ectopic. 2) Differentiate Cesarean scar implantation from a normal, low-lying pregnancy. 3) Recognize the more unusual sites of ectopic pregnancy (cervical, interstitial, abdominal). 4) Understand the indications for expectant vs. medical vs. surgical management .

ABSTRACT

Ectopic pregnancy can be a life-threatening condition for young, healthy women. The availability of senstive urine pregnancy tests means that we are seeing patients at a time when It may be very difficult to see any sonographic findings of pregnancy. The session will review and illustrate examples of the recommended descriptive terms 'pregnancy of unknown location',' probable ectopic' and 'definite ectopic' both of which refer to tubal ectopics.We will also review the appearance of heterotopic pregnancy and non-tubal ectopics including Cesarean scar implantation, interstitial and cervical implantation, and abdominal and ovarian ectopic with demonstration of the role of color Doppler, 3D ultrasound and other imaging modalities.Modern management of ectopic pregnacy has become much less aggressive, in part because the diagnosis is made so much earlier. The indications for the various treatment options will be outlined with illustrative case of local injection as well as intraoperative photos during laparoscopy.

Active Handout:Anne M. Kennedy

http://abstract.rsna.org/uploads/2015/15001997/RC310A.pdf

RC310B   Diagnosis of Miscarriage

Participants
Peter M. Doubilet, MD, PhD, Boston, MA, (pdoubilet@partners.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Know the sonographic criteria for definite miscarriage and probable miscarriage in the early first trimester. 2) Understand that any saclike intrauterine structure (rounded edges, no yolk sac or embryo) in a woman with a positive pregnancy test is highly likely to be a gestational sac. 3) Understand that nonvisualization of an intrauterine gestational sac in a woman with hCG above the 'discriminatory' level (2000 mIU/ml) does not exclude the possibility of a normal pregnancy.

ABSTRACT

This lecture will cover the diagnosis of early first trimester miscarriage in two settings: (i) ultrasound demonstrates no intrauterine gestational sac ('pregnancy of unknown location'); (ii) ultrasound demonstrates an intrauterine gestational sac but no embryo or heartbeat. In the first of these settings, the role of the quantitative hCG level will be discussed, including whether a single measurement can be used to rule out a normal intrauterine pregnancy. In the second setting, the currently accepted criteria for definite miscarriage and for probable miscarriage will be presented. The lecture will also address findings that indicate a high likelihood of impending pregnancy failure when an embryo with heartbeat is seen on ultrasound.

Active Handout:Peter Michael Doubilet

http://abstract.rsna.org/uploads/2015/15001998/RC310B Early1stTriMiscarriage--RSNA2015.pdf

RC310C   Mid-late First Trimester

Participants
Carol B. Benson, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the importance of evaluating the developing fetal head during the late first trimester for early detection of large neural tube defects. 2) Incorporate measurement of the nuchal translucency into their assessment of the fetuses of gestational age 11-14 weeks. 3) Recognize sonographic abnormalities of the ventral wall to distinguish normal physiologic bowel herniation from defects including omphalocele and gastroschisis.

ABSTRACT

This lecture will discuss the sonographic appearance of fetal anatomy in the latter part of the third trimester in order to help participants recognize abnormalities of the fetus at this early gestational age. While many anomalies cannot be detected until later in pregnancy, the discussion will focus on those anomalies that can be detected in the first trimester. Specific topics covered will be central nervous system anomalies, including anencephaly, encephalocele and holoprosencephaly, ventral wall defects including omphalocele and gastroschisis, bladder outlet obstruction, and skeletal anomalies including skeletal dysplasias. Detection of anomalies early in gestation, before the second trimester, permits time to assess the fetus for other anomalies, syndromes, and aneuploidy.

Characterization of Complex and Sonographically Indeterminate Adnexal Masses (An Interactive Session)

Tuesday, Dec. 1 8:30AM - 10:00AM Location: E353B

GU **MR** **US**

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

Participants

Sub-Events

RC329A Overview of the Clinical Indications for Using MRI

Participants
Andrea G. Rockall, MRCP, FRCR, London, United Kingdom (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To be familiar with the typical clinical presentation of adnexal masses. 2) To understand the role role of ultrasound in the initial evaluation and diagnosis of adnexal masses. 3) To know the current indications for MRI in the characterisation of adnexal masses.

ABSTRACT

Clinical presentation of adnexal masses can be due to symptoms (such as acute or chronic pelvic pain or sepsis) or may be incidental. Ultrasound is the initial investigation in almost every case, although CT may be used initially in patients presenting with an acute abdomen. Ultrasound features that can differentiate benign from malignant adnexal masses are well defined and over 80% of cases can be confidently characterised on the basis of ultrasound findings. However, when the nature of a mass is indeterminate on ultrasound, MRI can be useful in further characterisation of the mass. This can be particularly useful in cases where fertility preservation is of paramount importance or where the risks of surgery are high due to other co-morbidities. This lecture will include a full discussion of the current indications for MRI in characterisation of adnexal masses.

RC329B Review of Scoring System for Complex and Sonographically Indeterminate Adnexal Masses (The RULES)

Participants
Isabelle Thomassin-Naggara, MD, Paris, France (*Presenter*) Speakers Bureau, General Electric Company; Research Consultant, Olea Medical

LEARNING OBJECTIVES

1) To learn how to optimise the MRI protocol and how to improve the characterisation of indeterminate complex adnexal masses. 2) To understand the added value of functional sequences (DCE MRI and DWI) in diagnosing adnexal masses. 3) To present a novel diagnostic score named ADNEX MR score for classified adnexal masses using MR imaging according to their positive predictive value.

ABSTRACT

For complex adnexal masses, MR imaging add to conventional criteria of malignancy common to all imaging modalities (bilaterality, tumor diameter larger than 4 cm, predominantly solid mass, cystic tumor with vegetations, and secondary malignant features, such as ascites, peritoneal involvement, and enlarged lymph nodes) specific features based on the characterization of the solid tissue (including vegetation, thickened irregular septa and solid portion) of the adnexal tumor. Using ADNEX MR-SCORING system for adnexal masses, areas under the curve for diagnosis of malignancy is high both for experienced and junior reader (AUCR1/R2=0.980/0.961). A score is 4 or greater is associated with malignancy with a sensitivity of 93.5% (58/62) and specificity of 96.6% (258/267). A score is 4 or greater is associated with malignancy with a sensitivity of 93.5% (58/62) and specificity of 96.6% (258/267), the risk of malignancy is high, and the patient should be referred to a cancer center. When the diagnostic score is 3 or less, the association with malignancy is minimal and the patient may benefit from more imaging follow-up or conservative treatment. Finally, if the diagnostic score is 2, the mass has a very low risk to be malignant (<2%). This new MR diagnosis classification will be detailed with interactive clinical cases during this session

RC329C Interactive Cases

Participants
Elizabeth A. Sadowski, MD, Madison, WI (*Presenter*) Nothing to Disclose
Isabelle Thomassin-Naggara, MD, Paris, France (*Presenter*) Speakers Bureau, General Electric Company; Research Consultant, Olea Medical

LEARNING OBJECTIVES

1) Develop a method for classifying adnexal masses on MRI by assessing their signal characteristics and enhancement patterns. 2) Assess the risk of ovarian cancer based on the MRI appearance of an adnexal lesion and clinical information. 3) Emphasize the role of MRI in the evaluation of adnexal lesions.

ABSTRACT

ABSTRACT There is a spectrum of ovarian neoplasms ranging from benign to malignant. Identifying the MR imaging features suggestive of benign versus worrisome lesions can help appropriately triage adnexal lesions into follow up versus surgical consultation. The purpose of the interactive session is to review the imaging features of benign and worrisome adnexal lesions on MRI and to discuss the appropriate follow up in each case.

Carotid and Renal Doppler (Hands-on)

Tuesday, Dec. 1 8:30AM - 10:00AM Location: E264

GU **VA** **US**

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

FDA Discussions may include off-label uses.

Participants

Gowthaman Gunabushanam, MD, New Haven, CT, (gowthaman.gunabushanam@yale.edu) (*Moderator*) Editor, WebMD Health Corp ;
Gowthaman Gunabushanam, MD, New Haven, CT, (gowthaman.gunabushanam@yale.edu) (*Presenter*) Editor, WebMD Health Corp ;
Mark E. Lockhart, MD, Birmingham, AL, (mlockhart@uabmc.edu) (*Presenter*) Nothing to Disclose
Shweta Bhatt, MD, MBBS, Rochester, NY (*Presenter*) Nothing to Disclose
Wui K. Chong, MD, Chapel Hill, NC, (wk_chong@med.unc.edu) (*Presenter*) Nothing to Disclose
Corinne Deurdulian, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Vikram S. Dogra, MD, Rochester, NY (*Presenter*) Editor, Reed Elsevier
Edward G. Grant, MD, Los Angeles, CA (*Presenter*) Research Grant, General Electric Company ; Medical Advisory Board, Nuance Communications, Inc
Ulrike M. Hamper, MD, MBA, Baltimore, MD (*Presenter*) Nothing to Disclose
Felix A. Hester, Helena, AL (*Presenter*) Nothing to Disclose
Michelle L. Robbin, MD, Birmingham, AL, (mrobbin@uabmc.edu) (*Presenter*) Consultant, Koninklijke Philips NV;
Leslie M. Scoutt, MD, New Haven, CT (*Presenter*) Consultant, Koninklijke Philips NV
Ravinder Sidhu, MD, Rochester, NY, (ravinder_sidhu@urmc.rochester.edu) (*Presenter*) Nothing to Disclose
Sadhna Verma, MD, Cincinnati, OH (*Presenter*) Nothing to Disclose
Margarita V. Revzin, MD, Wilton, CT, (margarita.revzin@yale.edu) (*Presenter*) Nothing to Disclose
Davida Jones-Manns, Hampstead, MD (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

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

ABSTRACT

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

Honored Educators

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

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

Essentials of Musculoskeletal Imaging

Tuesday, Dec. 1 1:30PM - 3:00PM Location: S100AB

MK   MR   US

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

Participants

Sub-Events

MSES33A   Introduction to Musculoskeletal Ultrasound

Participants
Maha Torabi, MD, Winston Salem, NC, (mtorabi@wakehealth.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) List the indications, benefits, and limitations of musculoskeletal ultrasound. 2) Demonstrate proper transducer manipulation and system optimization to produce diagnostic images. 3) Recognize common pathology of the musculoskeletal system as seen at ultrasound.

ABSTRACT

Active Handout:Maha Torabi

http://abstract.rsna.org/uploads/2015/15001838/Active MSES33A.pdf

MSES33B   MRI of Injuries in the High Performance Athlete

Participants
William B. Morrison, MD, Philadelphia, PA (*Presenter*) Consultant, General Electric Company Consultant, AprioMed AB Patent agreement, AprioMed AB Consultant, Zimmer Holdings, Inc

LEARNING OBJECTIVES

1) Recognize patterns of injury in high performance athletes using MRI. 2) Be able to relate pathology to common injuries in the general population. 3) Realize implications of injury in females and adolescent athletes.

MSES33C   Return to Play: Imaging the Athlete

Participants
Bethany U. Casagranda, DO, Pittsburgh, PA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Define Return to Play. 2) Discuss social pressures and controversial dogma surrounding Return to Play. 3) Recognize imaging findings of common sports related injuries. 4) Discuss the radiologist's role in diagnosis of pathology and communication with referring physicians.

ABSTRACT

Athletes of all levels are encumbered by injury and the social stresses of returning to play (RTP). RTP is a broad topic describing the time it takes an athlete to return to their sport after sustaining an injury. This discussion will encompass various levels of play, several sports and position-specific injuries. The focus will be on common injuries as well as controversial topics. Overall, emphasis is on imaging and the role of the radiologist caring for athletes.

Pediatric Series: Abdomen

Tuesday, Dec. 1 3:00PM - 6:00PM Location: S102AB

`GI` `MR` `US` `PD`

AMA PRA Category 1 Credits ™: 3.25
ARRT Category A+ Credits: 3.50

`FDA` Discussions may include off-label uses.

Participants
Brian D. Coley, MD, Cincinnati, OH (*Moderator*) Editor with royalties, Reed Elsevier
Oscar M. Navarro, MD, Toronto, ON, (oscar.navarro@sickkids.ca) (*Moderator*) Nothing to Disclose
Ethan A. Smith, MD, Ann Arbor, MI (*Moderator*) Nothing to Disclose
Jeanne S. Chow, MD, Boston, MA (*Moderator*) Nothing to Disclose

Sub-Events

RC413-01 Sonography of Neonatal Necrotizing Enterocolitis

Tuesday, Dec. 1 3:00PM - 3:20PM Location: S102AB

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

LEARNING OBJECTIVES

1) Identify the limitations of abdominal radiographs in necrotizing enterocolitis. 2) Describe sonographic findings in necrotizing enterocolitis. 3) Define the role of sonography in necrotizing enterocolitis.

ABSTRACT

Necrotizing enterocolitis (NEC) is a relatively common disease affecting neonates, especially preterm infants, but can also be seen in term neonates. Despite the progress in neonatal medicine, it remains associated with significant morbidity and mortality, with reported death rates up to 20-30%.Traditionally, neonatal NEC has been imaged with abdominal radiographs, and in fact radiographic findings are part of the Bell staging clinical criteria. Radiographic assessment mainly relies in the evaluation of the bowel gas pattern and in the detection of extraluminal gas. However, most of the radiographic findings are indirect signs of bowel involvement in NEC or its complications and are not always present even in severe cases.Sonography, which can be done by the bedside and without the need of radiation, has the advantage that allows direct visualization of the bowel wall and can assess for the presence of pneumatosis, changes in wall echogenicity, wall thickening, wall thinning, peristalsis and even wall perfusion, including hyperemia and decrease or absent vascularity, all of which can be signs of NEC. Sonography also allows direct visualization of the peritoneal cavity and may detect complex free fluid and localized fluid collections, more often associated with complicated NEC. Furthermore, sonography may also detect portal venous gas and pneumoperitoneum, the latter indicative of bowel perforation. Therefore, sonography may provide information not available on radiographs and aid in the diagnosis of NEC and detection of complications. For example, sonography may allow diagnosis of bowel necrosis before perforation occurs and pneumoperitoneum becomes evident on abdominal radiographs thus facilitating early intervention.In summary, sonography has at least a complementary role to radiographs and its use may affect management of patients with neonatal NEC and possibly their outcome.

RC413-02 Development of a Near Infra-Red (NIR) Plenoptic Imaging System for Detecting Necrotizing Enterocolitis (NEC)

Tuesday, Dec. 1 3:20PM - 3:30PM Location: S102AB

Participants
Rohan Bhavane, PhD, Houston, TX (*Presenter*) Stockholder, Sensulin, LLC
Zbigniew Starosolski, PhD, Houston, TX (*Abstract Co-Author*) Stockholder, Alzeca Biosciences, LLC
Barbara Stoll, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Alex Kaay, BS, Santa Barbara, CA (*Abstract Co-Author*) Nothing to Disclose
Douglas Burrin, PhD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Ananth Annapragada, PhD, Houston, TX (*Abstract Co-Author*) Stockholder, Marval Pharma Ltd Stockholder, Alzeca Biosciences LLC Stockholder, Sensulin LLC Stockholder, Abbott Laboratories Stockholder, Johnson & Johnson

PURPOSE

An early detection of necrotizing enterocolitis (NEC) in premature infants is key in order to reduce morbidity and mortality. Imaging of premature infants is challenging, since transportation outside the NICU and sedation are both unadvisable. We therefore designed a near infra-red (NIR) plenoptic camera system to image premature infants, and a novel liposomal nanoparticle that localizes to NEC lesions upon intravenous injection. This study tested the visualization of NEC lesions in a preterm piglet model.

METHOD AND MATERIALS

The NIR plenoptic camera assembly consists of 3 high-resolution camera CCD detectors mounted on a gantry with 1 axis of rotation with repeatable increment of 0.1 degree. This creates up to 1260 virtual cameras each with a resolution higher than 10 microns (Fig 1.A). Phantoms consisting of a tissue block with capillary tubes filled with the NIR dye - indocyanine green were utilized to fine tune the system for NIR signal detection.For the animal studies, pre term piglets (N=11) were delivered via C-section 2 weeks before reaching full term. The animals were maintained on total parenteral nutrition (TPN) for 2 days after which oral feeds were started.The animals were injected with liposomes containing a NIR dye, indocyanine green, after the oral feeding was commenced. The abdominal region of the animals was imaged at different time points to detect NIR signal.

RESULTS

NIR signal was detected from the location of gastro-intestinal (GI) tract. Animals that developed NEC showed stronger signal than those that did not go on to develop NEC. Figure 1.C shows representative images from a NEC positive and NEC negative animal.

CONCLUSION

The promising results from this preliminary study suggest that NIR optical imaging can aid in early detection of NEC.

CLINICAL RELEVANCE/APPLICATION

NEC is an inflammatory disease of the gastro-intestinal tract that affects pre-term infants. Early detection is critical to reducing mortality. This study reports an NIR imaging method that could be used for early detection of NEC. This technique eliminates the use of radiation, and is conducive to imaging within the NICU, and without the need for sedation.

RC413-03 Effectiveness of a Staged Ultrasound and Magnetic Resonance Imaging Protocol to Diagnose Pediatric Appendicitis

Tuesday, Dec. 1 3:30PM - 3:40PM Location: S102AB

Participants
Thaddeus W. Herliczek, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
David W. Swenson, MD, Brooklyn, CT (*Presenter*) Nothing to Disclose
Elizabeth H. Dibble, MD, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Claudia Cartagena, Providence, RI (*Abstract Co-Author*) Nothing to Disclose
Grayson L. Baird, MS, Providence, RI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this study was to establish the effectiveness of a staged ultrasound (US) and magnetic resonance imaging (MRI) algorithm for the diagnosis of pediatric appendicitis.

METHOD AND MATERIALS

A staged imaging algorithm using US and MRI in pediatric patients with suspected appendicitis was implemented at our institution on January 1, 2011, with US as the initial modality, followed by MRI when US findings were equivocal. A search of the radiology database revealed 2180 pediatric patients who underwent imaging for suspected appendicitis, 1,982 (90.9%) of whom where evaluated according to our established imaging algorithm. A review of the electronic medical record (EMR) of all patients was performed. All imaging reports were reviewed and classified as positive, negative or indeterminate/equivocal for appendicitis, and correlated with surgical and pathology reports.

RESULTS

The prevalence of appendicitis in our patient population was 20.5% (407/1982). Ultrasound alone was performed in 1905 patients (96.1%), yielding sensitivity of 98.7% and specificity of 97.1% for appendicitis. An additional 77 patients underwent MRI following equivocal US, yielding an overall staged imaging algorithm sensitivity of 98.2% and specificity of 97.1%. 0.35% of patients experienced false negative results under the staged protocol. The negative predictive value of the staged protocol was 99.5%.

CONCLUSION

A staged protocol of US and MRI for pediatric appendicitis is effective. Our study demonstrates a staged protocol of US and MRI has a sensitivity of 98.2% and specificity of 97.1% for appendicitis in pediatric patients.

CLINICAL RELEVANCE/APPLICATION

We believe staged protocol of US and MRI could supplant other imaging protocols for pediatric appendicitis. Additionally, staged US and MRI is an effective algorithm to assess pediatric appendicitis without the use of ionizing radiation.

RC413-04 Diagnostic Performance of Noncontrast MRI in Pediatric Appendicitis

Tuesday, Dec. 1 3:40PM - 3:50PM Location: S102AB

Participants
Gray R. Lyons, MD,PhD, New York, NY (*Presenter*) Nothing to Disclose
Pooja Renjen, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Ashley E. Giambrone, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Debra Beneck, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Arzu Kovanlikaya, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

MRI is increasingly employed as a diagnostic modality for suspected appendicitis in children. However, there is discrepancy as to which MRI sequences are sufficient for safe, timely, and accurate diagnosis. We hypothesized that diffusion weighted imaging (DWI) in conjunction with T2-weighted sequences are sufficient for diagnosis.

METHOD AND MATERIALS

All MRI examinations (n=112) performed at our institution for the evaluation of appendicitis in children were retrospectively collected for re-evaluation. Exams were re-read by blinded pediatric radiologists first as non-contrast exams, including T2-weighted and DWI sequences, then secondly as contrast exams, including T1-weighted contrast enhanced sequences. Samples were scored as positive, negative, or equivocal for appendicitis, or non-visualized appendix. Findings were compared to pathologic or clinical data in the medical record.

RESULTS

The sensitivity (with contrast: 1.0, without contrast: 1.0) and specificity (with: 1.0, without: 0.98) of the exams were not significantly different. However, the percentage of nondiagnostic scans was higher for noncontrast exams (with: 26.1%, without: 37.7%). To test the role of contrast in improving certainty of interpretation, nondiagnostic without contrast scans were re-read

with addition of contrast sequences. With addition of contrast sequences, the number of equivocal scans was reduced from 10 to 2 (80% RR, 9.1% AR) and the number of non-visualized appendix scans was reduced from 23 to 15 (35% RR, 9.1% AR).

CONCLUSION

In the evaluation of appendicitis in children, non-contrast MRI examinations provide similar sensitivity/specificity to contrast-enhanced examinations, however, the number of nondiagnostic studies is higher without contrast. We propose a scanning algorithm whereby an exam is initialized as a noncontrast study and reviewed by a radiologist for diagnostic quality prior to contrast administration, if necessary. With this approach, fewer children will receive intravenous contrast without deterioration in overall diagnostic quality.

CLINICAL RELEVANCE/APPLICATION

MRI diagnosis of acute appendicitis can be performed without contrast for most patients; injection of contrast can be reserved for only those patients with nondiagnostic noncontrast imaging.

RC413-05 Shear-wave Elastography for Evaluation of Clinically Significant Portal Hypertension and Hepatic Fibrosis in Children

Tuesday, Dec. 1 3:50PM - 4:00PM Location: S102AB

Participants
Hee Mang Yoon, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Young Ah Cho, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ah Young Jung, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jin Seong Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Chong Hyun Yoon, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the correlation among the liver stiffness (LS) measured by shear wave elastography (SWE), clinically significant portal hypertension (CSPH), and degree of hepatic fibrosis in children with liver diseases.

METHOD AND MATERIALS

We evaluated 38 consecutive pediatric patients (mean age, 9.7±4.6 years) who underwent ultrasound SWE and transjugular liver biopsy with hepatic venous pressure gradient (HVPG) measurement between June 2012 and March 2015. The patients had various liver diseases. Clinical and laboratory data were retrospectively collected. CSPH was defined as a HVPG ≥ 10 mmHg. Hepatic fibrosis was evaluated based on METAVIR classification of fibrosis. Linear regression analysis was performed to correlate LS with clinically significant PHT. Kruskal-Wallis test was conducted to correlation between LS and degree of hepatic fibrosis. Diagnostic performance of predicting clinically significant PHT and degree of hepatic fibrosis were assessed based on receiver operating characteristic (ROC) curve.

RESULTS

LS showed moderate to strong positive correlation with HVPG (r=0.603, p<0.001). On multivariate analysis, LS was a significant associated factor for diagnosis of CSPH (OR =1.275, p =0.009). The area of under the curve (AUC) for predicting CSPH was 0.839 (p<0.001) and the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for an LS cutoff value of 19.7 kPa were 77.8%, 93.1%, 77.8%, and 93.1%, respectively. There was a significant positive correlation between hepatic fibrosis and LS (p=0.007). The AUC for predicting advanced hepatic fibrosis (METAVIR stage, F3 or F4) was 0.845 (p<0.001) and the sensitivity, specificity, PPV and NPV of an LS cutoff value of 16.2 kPa were 78.6%, 87.5%, 78.6% and 87.5%, respectively.

CONCLUSION

LS exhibited significant correlation with HVPG and hepatic fibrosis. Cutoff values for predicting CSPH and advanced hepatic fibrosis were 19.7 kPa and 16.2 kPa , respectively.

CLINICAL RELEVANCE/APPLICATION

Measurement of LS using SWE can be used for noninvasive assessment and monitoring of CSPH and hepatic fibrosis in pediatric patients with various liver diseases.

RC413-06 US Elastography of Liver and Bowel in Children

Tuesday, Dec. 1 4:00PM - 4:20PM Location: S102AB

Participants
Jonathan R. Dillman, MD, Ann Arbor, MI, (jonathan.dillman@cchmc.org) (*Presenter*) Research support, Bracco Group; Research support, Siemens AG

LEARNING OBJECTIVES

1) Compare and contrast the different US elastography techniques that can be used in children. 2) Apply US elastography to the evaluation of the pediatric abdomen.

ABSTRACT

Multiple forms of ultrasound (US) elastography are available on state-of-the-art clinical ultrasound systems. In general, these techniques are based on either strain or shear wave imaging, and they can easily be performed in children. The basic physics behind each type of US elastography will be explained, and specific advantages and disadvantages will be discussed. Applications of US elastography in the evaluation of the pediatric abdomen will be presented, including assessment of the liver (e.g., for detection of parenchymal fibrosis) and bowel (e.g., for detecting fibrosis within segments of intestine affected by Crohn's disease). Recently published investigations related to US elastography in pediatric populations will be highlighted.

RC413-07 Pediatric Hepatobiliary Interventions

Participants
C. Matthew Hawkins, MD, Decatur, GA, (matt.hawkins@emory.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the spectrum of pediatric hepatobiliary disorders in which invasive imaging is required (using vascular and nonvascular interventional techniques). 2) To describe important hepatobiliary disorders where IR plays a central role in patient management (hepatic vascular malformations, vascular shunts, transplant issues). 3) To emphasize collaboration and communication between clinicians, diagnostic and interventional radiology in managing pediatric hepatobiliary disease.

RC413-08   Accuracy of Multi-echo Magnitude-based MRI Proton Density Fat Fraction to Estimate Longitudinal Change in Hepatic Steatosis in Children with Known or Suspected Non-alcoholic Fatty Liver Disease Using MRS as Reference

Tuesday, Dec. 1 5:00PM - 5:10PM Location: S102AB

Participants
Elhamy R. Heba, MBBCh, MD, San Diego, CA (*Presenter*) Nothing to Disclose
Kevin A. Zand, MD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Omid Yeganeh, MD, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Tanya Wolfson, MS, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Gavin Hamilton, PhD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Michael S. Middleton, MD, PhD, San Diego, CA (*Abstract Co-Author*) Consultant, Allergan, Inc Institutional research contract, Bayer AG Institutional research contract, sanofi-aventis Group Institutional research contract, Isis Pharmaceuticals, Inc Institutional research contract, Johnson & Johnson Institutional research contract, Synageva BioPharma Corporation Institutional research contract, Takeda Pharmaceutical Company Limited Stockholder, General Electric Company Stockholder, Pfizer Inc Institutional research contract, Pfizer Inc
Jeffrey B. Schwimmer, MD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Claude B. Sirlin, MD, San Diego, CA (*Abstract Co-Author*) Research Grant, General Electric Company; Speakers Bureau, Bayer AG; Consultant, Bayer AG ; ;

PURPOSE

To assess the accuracy of magnitude-based MRI (M-MRI) proton density fat fraction (PDFF) to estimate hepatic steatosis longitudinal change for two to six echoes in children with known or suspected non-alcoholic fatty liver disease (NAFLD), using magnetic resonance spectroscopy (MRS) as reference.

METHOD AND MATERIALS

This IRB-approved, HIPAA-compliant, single center, retrospective, longitudinal analysis included children with at least two MR visits between 2008 and 2011. Two-dimensional, spoiled gradient-echo unenhanced M-MRI was used to estimate hepatic PDFF. Low flip angle (10°) and repetition times of 120 to 270 ms were used to minimize T1 dependence. To correct for T2* decay, six nominally in- and out-of-phase echoes were obtained. Single-voxel MR spectra (STEAM) were analyzed by an experienced MR spectroscopist (8 cm3 voxel size, right lobe of liver away from artifact and vessels, long TR to avoid T1 dependence, five echoes to permit T2 correction, AMARES algorithm and jMRUI platform for analysis). Three circular regions of interest were placed on fifth-echo MR images on three consecutive slices co-localized to MRS voxel location, and propagated to images for the other echoes. M-MRI estimated PDFF was calculated for each visit from the first two to six echoes using a custom Matlab algorithm. M-MRI PDFF accuracy was assessed by Bland-Altman analysis and linear regression modeling of change in MRS PDFF vs. change in M-MRI PDFF, for each M-MRI method (two to six echoes).

RESULTS

Seventy-two children (158 MR examinations) were included in this analysis (50 M, 22 F; mean body mass index 33.6 ± 6.0 kg/m2; range 46.1 to 23.2 kg/m2). Regression analysis showed close agreement between change in M-MRI PDFF and change in MRS across all methods, with slope and intercept ranges for two to six echoes of 1.02 - 1.04 and 0.008 - 0.017%, respectively (close to the slope and intercept of the identity line), and R2 ranging from 0.93 to 0.95.

CONCLUSION

In comparison to MRS, M-MRI PDFF using two to six echoes provides an accurate estimate of hepatic steatosis change in children with known or suspected NAFLD.

CLINICAL RELEVANCE/APPLICATION

M-MRI PDFF may be used to evaluate hepatic steatosis changes in children since it shows strong agreement with MRS PDFF.

RC413-09   Superb Microvascular Imaging for the Detection of Parenchymal Perfusion in Undescended Testes in Young Children

Tuesday, Dec. 1 5:10PM - 5:20PM Location: S102AB

Participants
Mi-Jung Lee, MD, PhD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Yong Seung Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Myung-Joon Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hyun Joo Shin, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Superb Microvascular Imaging (SMI) is a novel, highly sensitive technique that can detect low velocity microvascular flow. The purpose of this study was to evaluate differences in perfusion of undescended testes (UDT) compared with normal testes in young children using this technique.

METHOD AND MATERIALS

We prospectively performed testicular ultrasonography including Power Doppler Imaging (PDI) and SMI in young children. The diagnosis of UDT or normal testes was determined according to physical examination by experienced pediatric urologists. Testicular size, volume, and microvascular flow for each testis were evaluated by both PDI and SMI. Microvascular flow was categorized into four grades: grade 0, no detectable intratesticular flow; grade 1, one or two focal areas of flow; grade 2, one linear or more than two focal areas of flow; and grade 3, more than one linear flow. Statistical analysis was performed to compare the differences between undescended and normal testes.

RESULTS

We imaged 40 testes from 20 boys (age, 2-29 months). Eleven boys had normal testes, seven had unilateral UDT, and two had bilateral UDT. The mean age was younger in boys with UDT (7.8 vs. 15.9 months, p < 0.001). Testis sizes and volumes were similar between the 29 normal and 11 UDT. However, SMI, but not PDI, detected differences in flow grades between the groups (p < 0.001). In univariate analysis, age (odds ratio [OR], 0.829; p = 0.012) and low grade flow on SMI (OR of grade 0, 51.886 with p < 0.001 and OR of grade 1, 14.29 with p = 0.017) were associated with UDT. These parameters were also significant in multivariate analysis (area under the curve, 0.892).

CONCLUSION

This study demonstrated decreased perfusion in the UDT in young children using SMI, which can be helpful for visualizing microcirculation and informing prognosis.

CLINICAL RELEVANCE/APPLICATION

Superb Microvascular Imaging (SMI) can demonstrate microcirculation that cannot be detected using conventional Doppler imaging in young children with undescended testes.

RC413-10   Assessment of Pediatric Hydronephrosis via Quantitative Ultrasound Imaging

Tuesday, Dec. 1 5:20PM - 5:30PM Location: S102AB

Participants
Juan Cerrolaza, PhD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Nora Lee, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Craig A. Peters, MD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Marius G. Linguraru, DPhil, MS, Washington, DC (*Presenter*) Nothing to Disclose

PURPOSE

To create new ultrasound (US) based quantitative imaging (QI) biomarkers of pediatric hydronephrosis (HN) to identify thresholds of safety for the hydronephrotic renal units where diuretic nuclear renography could be avoided.

METHOD AND MATERIALS

The retrospective dataset (IRB approved) consists of 50 patients (mean age 9.6 months; range 0-168 months) of variable severity (grade 1 to 4 according to the Society for Fetal Urology HN scale (SFU-HS)) with concurrent renal 2DUS imaging and diuretic renography (MAG-3). Mean differential uptake was: 49% (range 14-100%). Mean washout half time (T1/2) was: 37.3 min. (range 3 to >120 min.). Manual segmentation of renal parenchyma (RP) and collecting system (CS) was performed for calibration and algorithm development. 131 morphological parameters were computed (e.g. RP and CS size, curvature). Based on these parameters, machine learning techniques (support vector machines) were used to identify critical cases based on different T1/2 thresholds that would be clinically relevant at 20, 30 and 40 min. A best-fit model was derived for each threshold using optimal morphological parameters to categorize the renal units and receiver operating characteristic curve analysis was performed. For comparison similar thresholding was performed using the SFU-HS and the HN Index (HI).

RESULTS

For T1/2 thresholds of 20, 30 and 40 min. and at 100% sensitivity, the specificities were QI: 94, 70 and 74%, SFU-HS: 0, 39 and 33%, and HI: 52, 47, and 62%, respectively. Area under the curve values were QI: 0.98, 0.94 and 0.94, SFU-HS: 0.74, 0.78 and 0.88, and HI: 0.77, 0.78, and 0.80, respectively. The improvement obtained by the QI method was statistically significant (p < 0.05 in all the cases using McNemar's statistical test).

CONCLUSION

QI analysis of renal US allows to identify thresholds of clinically significant T1/2 with 100% sensitivity and clinically acceptable specificity. This technology can potentially and safely reduce the number of MAG-3 scans between 50 and 62%.

CLINICAL RELEVANCE/APPLICATION

QI analysis of renal US demonstrates higher diagnostic power than SFU-HS and HI, having the potential to provide robust assessment of HN non-invasively, minimizing the use of ionizing tests and reducing clinical cost.

RC413-11   Comparison of Contrast-enhanced Voiding Urosonography (ceVUS) in Infants and Children Using Optison to Conventional Fluoroscopic Voiding Cystourethrography (VCUG): Preliminary Results

Tuesday, Dec. 1 5:30PM - 5:40PM Location: S102AB

Participants
Carol E. Barnewolt, MD, Boston, MA (*Presenter*) Nothing to Disclose
Jeanne S. Chow, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Catherine Stamoulis, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Harriet J. Paltiel, MD, Boston, MA (*Abstract Co-Author*) Equipment support, Koninklijke Philips NV

PURPOSE

ceVUS is a radiation-free technique currently used in some European centers for diagnosis of vesicoureteral reflux (VUR) in children, but has not been adopted in the USA. There are no reports on the use of Optison, a second-generation US contrast agent available in the USA, for diagnosis of VUR. This study compares our early experience using Optison for ceVUS to conventional VCUG.

METHOD AND MATERIALS

We retrospectively reviewed 48 patients who underwent ceVUS with Optison immediately followed by VCUG for evaluation of fetal hydronephrosis (24), febrile UTI (16), solitary functioning kidney (5), urethral valves (2) and family history of VUR (1). 24 males and 24 females ranged in age from 2 days-10 years, median 5 months, (25th, 75th) quartiles (1.0, 11.5 months). Optison doses ranging from 0.125-1.25 cc were injected into 250 cc of saline and instilled via gravity through a urethral catheter into the bladder. Image clips of bladder, ureters and kidneys were obtained during bladder filling and voiding. Patients voided around the catheter and transperineal urethral images were obtained. A conventional VCUG was then performed. Studies were reviewed for presence of VUR. VUR grading for ceVUS was into the ureter (1), renal collecting system (2), upper tract dilation (3); for VCUG the International Grading system (I-V) was used.

RESULTS

No adverse events related to Optison occurred. Optimal visualization of the urethra, bladder and upper tracts during ceVUS was achieved with a contrast dose of 0.15 cc. Urethral images were obtained in 40/48 patients, with urethral anatomy well shown in all 40 (21M, 19F). Both studies were negative for VUR in 77/96 kidneys (80%), both positive in 7/96 (7%). In 12/96 (13%), ceVUS was positive and VCUG was negative. VUR by ceVUS was grade 1 (0), grade 2 (8), grade 3 (11). VUR by VCUG was grade I (0), grade II-III (2), grade IV-V (5). Compared to VCUG, ceVUS had a sensitivity for detection of VUR of 100% and specificity of 86%.

CONCLUSION

ceVUS with Optison was easily performed and well tolerated, with high sensitivity and relatively high specificity for diagnosis of VUR compared to VCUG, but without the need for ionizing radiation.

CLINICAL RELEVANCE/APPLICATION

The high-sensitivity, safety, and ease of performance of ceVUS using the US contrast agent Optison has the potential to largely replace conventional fluoroscopic VCUG for diagnosis of VUR which requires exposure to ionizing radiation. Further study is needed.

RC413-12   Pediatric Hypertension - The Radiologist's Role

Tuesday, Dec. 1 5:40PM - 6:00PM Location: S102AB

Participants
Ethan A. Smith, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Have a broad understanding of causes of hypertension in children. 2) Understand the basic pathophysiology behind renin mediated hypertension. 3) Be familiar with the different imaging modalities available to evaluate suspected renin-mediated hypertension and to understand the advantages and limitations of these modalities.

ABSTRACT

Unlike adults, hypertension in children is most commonly secondary to an underlying condition. Renovascular hypertension accounts for between 5-10% of cases of pediatric hypertension and presents clinically with significantly elevated blood pressure, usually refractory to multiple medications. Renovascular hypertension is also associated with a variety of genetic syndromes, including neurofibromatosis type 1 and Williams syndrome. In patients with clinically suspected renovascular hypertension, imaging is employed to confirm the diagnosis, to characterize the renovascular abnormality and to guide surgical or endovascular therapy. Ultrasound with Doppler is the most frequently used initial imaging test, but has historically been thought to be unreliable due to suboptimal sensitivity and specificity. Computed tomography angiography (CTA) and magnetic resonance angiography (MRA) are both useful in the evaluation of suspected renovascular hypertension in adults, but may be less useful in children due to the frequency of intra-renal vascular abnormalities in children which are difficult to resolve with non-invasive imaging. Catheter based digital subtraction agiography remains the gold standard imaging test because of its superior temporal and spatial resolution, allowing for excellent visualization of both extra-renal (aorta, main renal artery) and intra-renal vascular lesions. It is important for the diagnostic radiologist to understand the differences between pediatric and adult renovascular hypertension, and to understand the strengths and weaknesses of the different imaging modalities available, in order to help guide the treatment of these patients.

Gastrointestinal (Liver Fat and Fibrosis)

Tuesday, Dec. 1 3:00PM - 4:00PM Location: E350

`GI` `CT` `MR` `US`

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

Participants
Frank H. Miller, MD, Chicago, IL (*Moderator*) Nothing to Disclose
Donald G. Mitchell, MD, Philadelphia, PA (*Moderator*) Consultant, CMC Contrast AB

Sub-Events

SSJ09-01   MR Elastography of the Liver: Comparison of GRE and EPI Sequences

Tuesday, Dec. 1 3:00PM - 3:10PM Location: E350

Participants
Mathilde Wagner, MD,PhD, Paris, France (*Presenter*) Nothing to Disclose
Temel K. Yasar, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Cecilia Besa, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Jad M. Bou Ayache, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Octavia Bane, PhD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Maggie M. Fung, MEng, Bethesda, MD (*Abstract Co-Author*) Employee, General Electric Company
Bachir Taouli, MD, New York, NY (*Abstract Co-Author*) Consultant, Guerbet SA

PURPOSE

To compare 2D-GRE (gradient recalled echo) liver MR-Elastography (MRE) with 2D-SE-EPI (echoplanar imaging) MRE in terms of image quality (IQ) and liver stiffness (LS) measurements.

METHOD AND MATERIALS

36 patients with chronic liver disease or focal liver lesion (M/F:23/13, mean age 57.8 y) who underwent 3T liver MRI (MR750, GE) using 2D-GRE and 2D-SE-EPI liver MRE were enrolled in this single-center IRB approved study. Both sequences were acquired in the axial plane, with 4 slices (same location), 10 mm thickness, a 60Hz mechanical motion, similar FOV (2D-GRE: TR/TE 50/20, 256x80, 60 MEG frequency, ASSET 2 / SE EPI: TR/TE 1000/55.4, 80x80, 155Hz MEG frequency, ASSET 2). Scan time for EPI MRE was 4 sec and 14 sec for GRE MRE (for each slice). One radiologist placed ROIs in the liver parenchyma for measurements of LS (kPa). ROIs were drawn as large as possible, avoiding voxels with less than 95% confidence level on the confidence map, large vessels, parenchyma edge and fissures. IQ scores were assessed by a second radiologist using a four-point scale (0: no observable wave propagation/no confidence map; 3: excellent wave propagation in liver/confidence map covering more than 50% of liver slice). Mean LS values and IQ scores between EPI and GRE MRE were compared using Wilcoxon test. Reproducibility of LS between these two sequences was assessed with intraclass coefficient correlation (ICC), coefficient of variability (CV) and Bland-Altman limits of agreement (BALA).

RESULTS

In 4 patients, GRE MRE completely failed while there was no case of failure with EPI MRE. IQ scores were significantly higher using EPI versus GRE MRE(score 14.4 vs 8.6, P<0.0001). ROI size was significantly higher using EPI than GRE MRE (56.06 cm² vs. 14.47 cm², P<0.0001). LS measurements were not significantly different between the EPI and GRE MRE (3.41±1.36 kPa vs 3.42±1.56 kPa, P=0.51), were significantly correlated (ICC=0.908, P<0.0001) and showed a high reproducibility (mean CV=10.2% (0.2-28.2), bias=0.09±0.63 kPa (BALA[-1.15;1.32]).

CONCLUSION

IQ scores of EPI MRE were significantly higher than GRE MRE, with faster acquisition and equivalent measurements. Larger ROI in EPI MRE allows more comprehensive liver sampling.

CLINICAL RELEVANCE/APPLICATION

GRE MRE is the most common approach for LS assessment. EPI MRE performs superior in terms of IQ and liver coverage with less breath-holds. This approach might improve the performance of MRE.

SSJ09-02   Associations between Nonalcoholic Fatty Liver Disease (NAFLD) Histologic Features and Magnetic Resonance Elastography (MRE)-estimated Liver Stiffness in Adults without Fibrosis

Tuesday, Dec. 1 3:10PM - 3:20PM Location: E350

Participants
Alexandra A. Schlein, BS, San Diego, CA (*Presenter*) Nothing to Disclose
Chun Chieh K. Luo, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Kang Wang, PhD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Paul Manning, MSc, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Jonathan C. Hooker, BS, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Catherine A. Hooker, BS, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
William Haufe, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Tanya Wolfson, MS, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Anthony Gamst, PhD, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Kevin J. Glaser, Rochester, MN (*Abstract Co-Author*) Intellectual property, Magnetic Resonance Innovations, Inc; Stockholder, Resoundant, Inc

Meng Yin, Rochester, MN (*Abstract Co-Author*) The Mayo Clinic and MY have intellectual property rights and a financial interest in MRE technology.
Michael S. Middleton, MD, PhD, San Diego, CA (*Abstract Co-Author*) Consultant, Allergan, Inc Institutional research contract, Bayer AG Institutional research contract, sanofi-aventis Group Institutional research contract, Isis Pharmaceuticals, Inc Institutional research contract, Johnson & Johnson Institutional research contract, Synageva BioPharma Corporation Institutional research contract, Takeda Pharmaceutical Company Limited Stockholder, General Electric Company Stockholder, Pfizer Inc Institutional research contract, Pfizer Inc
Rohit Loomba, MD, MSc, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Claude B. Sirlin, MD, San Diego, CA (*Abstract Co-Author*) Research Grant, General Electric Company; Speakers Bureau, Bayer AG; Consultant, Bayer AG ; ;

PURPOSE

Magnetic resonance elastography (MRE) has been established as a noninvasive method of estimating liver stiffness and thereby inferring hepatic fibrosis. The purpose of this work is to assess whether the other hepatic pathologies that are observed in NAFLD; steatosis, inflammation, and ballooning, have independent, significant affects on MRE estimated stiffness, and to assess whether they are possible confounds of the stiffness estimation.

METHOD AND MATERIALS

In this IRB approved study, adults receiving standard-of-care liver biopsy for NAFLD were consented and underwent MRE at 3T within 180 days of biopsy. MRE was performed using three methods (2D at 60 Hz, 3D at 40 Hz, and 3D at 60 Hz), from which MRE-estimated liver stiffness values were calculated. Histologic features were scored based on NASH CRN criteria; subjects with histologically-determined fibrosis were excluded. Associations between liver stiffness and inflammation or ballooning were assessed using t-tests. The association between liver stiffness and steatosis was assessed using Spearman rank correlation analysis. Multivariate linear regression analysis was used to test MRE stiffness against histologic features adjusted for age, BMI, and ALT.

RESULTS

Sixty-four adults (30 M; mean age 49.5 yrs, range 18.5 to 75.8 yrs) were enrolled in this study. Multivariate linear regression analysis showed a negative correlation of steatosis with log of 3D MRE-estimated liver stiffness at 40 Hz (-0.064, p = 0.043) and 60 Hz (-0.068, p = 0.018). Univariate analyses of MRE-estimated liver stiffnesses for all three methods showed no association with inflammation (p = 0.08 to 0.11), ballooning (p = 0.51 to 0.63), or steatosis (rho = 0.29 to 0.39).

CONCLUSION

Hepatic steatosis has an independent, statistically significant association with the MR elastographic estimation of liver stiffness when BMI, ALT, and age are controlled for. Inflammation and ballooning do not have a statistically significant association with liver stiffness.

CLINICAL RELEVANCE/APPLICATION

This association between steatosis and liver stiffness is a possible confound in the MRE estimation of liver stiffness, and should be accounted for when MRE is used to estimate fibrosis in adult patients.

SSJ09-03   Noninvasive Hepatic Fibrosis Staging Using Magnetic Resonance Elastography: The Usefulness of the Bayesian Prediction Method

Tuesday, Dec. 1 3:20PM - 3:30PM Location: E350

Participants
Shintaro Ichikawa, MD, Chuo-Shi, Japan (*Presenter*) Nothing to Disclose
Utaroh Motosugi, MD, Yamanashi, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroyuki Morisaka, MD, Kofu, Japan (*Abstract Co-Author*) Nothing to Disclose
Katsuhiro Sano, MD, PhD, Chuo, Japan (*Abstract Co-Author*) Nothing to Disclose
Tomoaki Ichikawa, MD, PhD, Yamanashi, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroshi Onishi, MD, Yamanashi, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the usefulness of the Bayesian prediction method (BPM) for noninvasive hepatic fibrosis staging (HFS) using magnetic resonance elastography (MRE).

METHOD AND MATERIALS

Chronic liver disease patients (n = 309) were included and fibrosis staging and MRE was performed. Receiver operating characteristic analysis was used to determine the optimal cut-off stiffness value (cut-off method; COM) of MRE to distinguish between fibrosis stages. A uniform distribution was assumed for pre-MRE probability of stages using the BPM. The MRE stiffness value determined the post-MRE probability and confidence of HFS. The distinguishing ability of COM and BPM were compared in all patients (Bayesian-all) and in patients with strong confidence (≥ 90%) with BPM (Bayesian-strong).

RESULTS

The ability to distinguish between hepatic fibrosis stages was not significantly different between COM and Bayesian-all. In patients who had strong confidence with BPM, the sensitivity and negative predictive value (NPV) of Bayesian-strong for diagnosing ≥ F2, ≥ F3, and F4 were significantly higher than with COM (sensitivity: COM vs. Bayesian-all for ≥ F2, 94.5% vs. 99.1% (P = 0.0041); ≥ F3, 89.6% vs. 99.4% (P = 0.0001); F4, 89.3% vs. 100% (P = 0.0018); NPV: ≥ F2, 78.8% vs. 93.9% (P = 0.0059); ≥ F3, 85.0% vs. 98.7% (P < 0.0001); F4, 93.4% vs. 100% (P = 0.0009)). The specificity of Bayesian-strong for diagnosing F4 was significantly higher than that of COM (97.3% vs. 100% (P = 0.0428)).

CONCLUSION

BPM has better distinguishing ability than COM for HFS using MRE if the confidence is strong.

CLINICAL RELEVANCE/APPLICATION

A liver biopsy followed by histopathological assessment is a common approach for staging liver fibrosis. However, a biopsy can

cause several complications. Consequently, noninvasive methods have been developed for assessing hepatic fibrosis. Recent studies have indicated that MRE is a promising, highly reproducible tool with advanced diagnostic capacity for the non-invasive staging of hepatic fibrosis. Hepatic fibrosis can be assessed more correctly by using BPM.

SSJ09-04 Direct Comparison of 3 Elastrometry Devices (Fibroscan, Acoustic Radiation Force Impule, Supersonic Shearwave Imaging) for the Non-Invasive Diagnosis of Liver Fibrosis in Chronic Liver Diseases

Tuesday, Dec. 1 3:30PM - 3:40PM Location: E350

Participants
Victoire Cartier, MD, Angers, France (*Presenter*) Nothing to Disclose
Jerome Boursier, Angers, France (*Abstract Co-Author*) Nothing to Disclose
Jerome Lebigot, MD, Angers, France (*Abstract Co-Author*) Nothing to Disclose
Frederic Oberti, MD, PhD, Angers, France (*Abstract Co-Author*) Nothing to Disclose
Isabelle Fouchard-Hubert, Angers, France (*Abstract Co-Author*) Nothing to Disclose
Sandrine Bertrais, Angers, France (*Abstract Co-Author*) Nothing to Disclose
Paul Cales, MD, PhD, Angers, France (*Abstract Co-Author*) Research Consultant, Echosens SA
Christophe Aube, MD, PhD, Angers, France (*Abstract Co-Author*) Speaker, Bayer AG Support, General Electric Company

PURPOSE

Liver stiffness measurement using elastography allows for a non-invasive diagnosis of liver fibrosis with immediate results at bedside. We aimed to evaluate and compare the feasibility and the diagnostic accuracy Fibroscan (FS), Acoustic Radiation Force Impulse (ARFI), and Supersonic Shearwave Imaging (SSI) for the non-invasive diagnosis of liver fibrosis.

METHOD AND MATERIALS

192 patients with chronic liver disease, liver biopsy, FS, ARFI and SSI were included. Metavir F staging on biopsy was taken as the reference for liver fibrosis. Result for each elastographic device was the median of 10 valid measurements. Diagnostic cut-offs were calculated to maximize the sum of sensitivity + specificity.

RESULTS

Cause of chronic liver disease was NAFLD in 55.7% of cases, viral hepatitis: 16.1%, alcohol: 16.7%, and others: 11.5%. Fibrosis stage prevalence was: F0: 23.4%, F1: 37.0%, F2: 19.3%, F3: 13.5%, F4: 6.8%. Failure of liver stiffness measurement (no valid measurement) occurred in 18 patients (9.4%) with FS, no patients with ARFI, and 3 patients (1.6%) with SSI (p=0.001 between FS and SSI). Results for the 3 devices were available in 171 patients. Obuchowski indexes were: FS: 0.855±0.018, ARFI: 0.761±0.027, SSI: 0.789±0.025 (FS vs ARFI or SSI: p<=0.020). AUROC for significant fibrosis (Metavir F>=2) were: FS: 0.863±0.027, ARFI: 0.749±0.039, SSI: 0.781±0.036 (p=0.006; FS vs ARFI or SSI: p<=0.021). Diagnostic cut-offs for F>=2 were: FS: 8.0 kPa, ARFI: 1.29 m/s, SSI: 1.85 m/s. Using this cut-offs, diagnostic accuracy for F>=2 was: FS: 76.0%, ARFI: 70.2%, SSI: 77.2% (p=0.204). AUROC for cirrhosis were: FS: 0.941±0.027, ARFI: 0.895±0.048, SSI: 0.870±0.035 (p=0.011; FS vs SSI: p=0.010). Diagnostic cut-offs for cirrhosis were: FS: 16.6 kPa, ARFI: 1.87 m/s, SSI: 1.93 m/s. Using this cut-offs, diagnostic accuracy for cirrhosis was: FS: 90.6%, ARFI: 79.5%, SSI: 75.4% (p<0.001, FS vs others: p<=0.001).

CONCLUSION

ARFI and SSI have better feasibility and similar accuracy for the diagnosis of significant fibrosis than FS. However, FS has the best accuracy for the diagnosis of cirrhosis.

CLINICAL RELEVANCE/APPLICATION

Non-invasive diagnosis and evaluation of liver fibrosis in chronic liver diseases using acoustic based elastography.

SSJ09-05 Fibrosis in Nonalcoholic Fatty Liver Disease: Noninvasive Assessment Using CT Volumetry

Tuesday, Dec. 1 3:40PM - 3:50PM Location: E350

Participants
Nobuhiro Fujita, MD, PhD, Fukuoka, Japan (*Presenter*) Nothing to Disclose
Akihiro Nishie, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose
Yoshiki Asayama, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose
Kousei Ishigami, MD, Fukuoka City, Japan (*Abstract Co-Author*) Nothing to Disclose
Yasuhiro Ushijima, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose
Hiroshi Honda, MD, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose
Yukihisa Takayama, MD, Fukuoka, Japan (*Abstract Co-Author*) Research Grant, FUJIFILM Holdings Corporation
Daisuke Okamoto, MD, Fukuoka City, Japan (*Abstract Co-Author*) Nothing to Disclose
Koichiro Morita, Fukuoka, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To elucidate the morphological change in nonalcoholic fatty liver disease (NAFLD) with fibrosis stage using CT volumetry and to evaluate its diagnostic performance of CT volumetry for discriminating fibrosis stage in patients with NAFLD.

METHOD AND MATERIALS

A total of 38 patients with NAFLD (F0, 11; F1, 5; F2, 1; F3, 9; and F4, 12) who underwent contrast-enhanced CT were enrolled. On the basis of CT imaging, the volumes of total, left lateral segment, left medial segment, caudate lobe, and right lobe of the liver were calculated automatically and manually with a dedicated liver application. The relationship between the volume percentage of each area and fibrosis stage was analyzed using Spearman's rank correlation coefficient. Receiver operating characteristic (ROC) curve analysis was performed to determine the accuracy of CT volumetry for discriminating fibrosis stage.

RESULTS

The volume percentages of caudate lobe and left lateral segment significantly increased with fibrosis stage (r = 0.815, P < 0.001, and r = 0.465, P = 0.003, respectively). Contrarily, the volume percentage of the right lobe significantly decreased with fibrosis stage (r = -0.563, P < 0.001). The volume percentage of caudate lobe had the best diagnostic accuracy for staging fibrosis and

the area under the ROC curve values for discriminating fibrosis stage were as follows: ≥F1, 0.896; ≥F2, 0.929; ≥F3, 0.955; and ≥F4, 0.923. The best cut-off for advanced fibrosis (F3-F4) was 4.789% with sensitivity of 85.7% and specificity of 94.1%.

CONCLUSION

The volumes of caudate lobe and left lateral segment increase, and that of right lobe volume decreases with fibrosis stage in NAFLD. The volume percentage of caudate lobe calculated by CT volumetry is a useful diagnostic parameter for staging fibrosis in patients with NAFLD.

CLINICAL RELEVANCE/APPLICATION

CT volumetry is a powerful clinical tool to help diagnose fibrosis stage in NAFLD noninvasively. It may be useful in monitoring and making treatment decisions in patients with NAFLD.

SSJ09-06   Application of Ultrasound Texture Analysis For Detection of Liver Fibrosis

Tuesday, Dec. 1 3:50PM - 4:00PM Location: E350

Participants
David Podhaizer, MD, Boston, MA (*Presenter*) Nothing to Disclose
Hei Shun Yu, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Baojun Li, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Jorge A. Soto, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Stephan W. Anderson, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Avneesh Gupta, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the ability of ultrasound texture analysis to predict varying degrees of hepatic fibrosis in patients with known chronic liver disease.

METHOD AND MATERIALS

Following IRB approval, a retrospective chart review was performed on patients who underwent non-targeted ultrasound guided liver biopsies to include 29 patients with chronic liver disease (20 males, 9 females, mean age of 52 years old, range of 19 to 81 years old). For each patient, a single region of interested (ROI) was selected on two to three separate sonographic images that were obtained from the ultrasound guided liver biopsy examinations and the results were averaged. The ROIs were selected from the right lobe of the liver and excluded vessels and bile ducts. Texture analysis was performed on the ROIs using an in-house MATLAB-based program that extracted 45 texture features. Pearson product-moment correlation coefficients were calculated comparing texture features and degrees of hepatic fibrosis.

RESULTS

Of the 29 patients with chronic liver disease, the following Ishak fibrosis stages were represented, based on liver biopsy: Ishak 0, n=4; Ishak 1, n=4; Ishak 2, n=4; Ishak 3, n= 4; Ishak 4, n=4; Ishak 5, n=4; Ishak 6, n=5. Comparisons of the texture features with the degrees of hepatic fibrosis demonstrate strong correlations between Ishak fibrosis stage and Histogram texture features (r-values ranging up to -0.89), GLRL features (r-values ranging up to 0.80), Laws' features (r-values ranging up to 0.93), and GLGM features (r-values ranging up to -0.80). Weak correlation between texture features and degrees of fibrosis were demonstrated with 2-D features (r-values ranging up to 0.36) and GLCM features (r-values ranging up to -0.47).

CONCLUSION

Sonographic texture features demonstrate strong correlation with Ishak liver fibrosis scores. This suggests that texture analysis of ultrasound images has the potential to non-invasively predict varying degrees of hepatic fibrosis.

CLINICAL RELEVANCE/APPLICATION

Texture analysis can potentially be applied to ultrasound as a non-invasive method to diagnose and monitor progression of liver fibrosis.

Honored Educators

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

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

Genitourinary (Prostate Intervention)

Tuesday, Dec. 1 3:00PM - 4:00PM Location: E353C

`GU` `IR` `MR` `US`

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

`FDA` Discussions may include off-label uses.

Participants
Aytekin Oto, MD, Chicago, IL (*Moderator*) Research Grant, Koninklijke Philips NV; ; ;
Temel Tirkes, MD, Indianapolis, IN (*Moderator*) Nothing to Disclose

Sub-Events

SSJ10-01   MR-guided In-bore versus MRI/Ultrasound Fusion Plus TRUS-guided Prostate Biopsy: A Prospective Randomized Trial in Patients with Prior Negative Biopsies

Tuesday, Dec. 1 3:00PM - 3:10PM Location: E353C

Awards
Trainee Research Prize - Resident

Participants
Lars Schimmoeller, MD, Duesseldorf, Germany (*Presenter*) Nothing to Disclose
Michael Quentin, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Christian Arsov, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Dirk Blondin, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Robert Rabenalt, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Gerald Antoch, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Andreas Hiester, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Erhard Godehardt, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Helmut Erich Gabbert, D-40225 Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Peter Albers, MD, PhD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

This study prospectively compares the PCa detection rate (PCa-DR) of MR-guided in-bore biopsy (IB-GB) alone and MRI/ultrasound fusion-guided biopsy combined with a systematic TRUS-GB (FUS+TRUS-GB) in patients with at least one negative TRUS-GB and PSA level ≥4ng/ml.

METHOD AND MATERIALS

253 patients were included in this study. After multiparametric prostate MRI (T2WI, DWI, DCE-MRI) at 3T patients with any PI-RADS sum score ≥10 were prospectively randomized to IB-GB or FUS+TRUS-GB. Analysis of detection rates for PCa and significant PCa (Gleason score ≥7), highest Gleason score, number of biopsy cores to detect one (significant) PCa, positivity rate of biopsy cores, and tumor involvement per biopsy core were performed.

RESULTS

210 patients met all study requirements and were prospectively randomized, 106 patients receiving IB-GB and 104 patients FUS+TRUS-GB (age 65.3±7.1 vs. 66.7±6.8 years; median PSA 10.0 vs. 10.8 ng/ml, IQR 7.8-14.9 vs. 7.4-15.5 ng/ml). Mean number of cores was 5.61±0.80 vs. 17.38±1.17; p<0.001. PCa-DR for IB-GB was 36.8% (29.2% for significant PCa) and for FUS+TRUS-GB 39.4% (31.7%); p=0.776 and p=0.765. Mean highest Gleason score of 7.24±0.96 vs. 7.46±1.01; p=0.233. Positivity rate per biopsy core was 20.7% (123/595) vs. 11.6% (210/1,808); p<0.001. Number of biopsy cores needed to detect one PCa or one significant PCa was 15.3 vs. 44.1 and 19.2 vs. 54.8.

CONCLUSION

The combined biopsy approach did not significantly improve the overall PCa-DR compared to targeted IB-GB alone, but required significantly more cores. A prospective comparison of MR-targeted biopsy alone to systematic TRUS-GB is justified.

CLINICAL RELEVANCE/APPLICATION

We did not observe a difference between IB-GB and FUS+TRUS-GB to detect PCa.

SSJ10-02   Accuracy of Targeted Prostate Biopsy Using MR-ultrasound Fusion to Guide Biopsies Directed to Focal Lesions Suspicious for Malignancy: A Retrospective Study of 286 Patients

Tuesday, Dec. 1 3:10PM - 3:20PM Location: E353C

Participants
Guilherme C. Mariotti, MD, Jundiai, Brazil (*Presenter*) Nothing to Disclose
Tatiana Martins, MD, Belo Horizonte, Brazil (*Abstract Co-Author*) Nothing to Disclose
Marcos R. Queiroz, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Thais Mussi, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Rodrigo Gobbo, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Ronaldo H. Baroni, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Demonstrate an increase in the accuracy of targeted prostate biopsy using MR-ultrasound fusion to guide biopsies directed to focal

Demonstrate an increase in the accuracy of targeted prostate biopsy using MR-ultrasound fusion to guide biopsies directed to focal lesions suspicious for malignancy in a retrospective study of 286 patients.

METHOD AND MATERIALS

A single-institutional, IRB approved retrospective analysis of 286 patients in our database, which underwent targeted prostate biopsies using MR-ultrasound fusion from August 2013 to January 2015.We included all patients with suspected prostatic cancer based on clinical or laboratory findings (positive digital rectal examination or high PSA) submitted to multiparametric MRI and US-MRI fusion prostate biopsy.We excluded 7 patients with MRI-biopsy interval >= 6 months, 17 patients that underwent biopsy for staging of known cancer or active surveillance and 1 patient for whom clinical data was unavailable.

RESULTS

A total of 261 patients were included. Of these, 45 patients (17%) underwent previous negative transrectal US-guided biopsies. Table 1 summarizes demographic data of our casuistic.Pre-procedure MRI followed a Likert scale for suspition: Likert 1: 1 patient (0,4%); Likert 2: 18 patients (6,9%); Likert 3: 100 patients (38,3%); Likert 4: 75 patients (28,7%); Likert 5: 67 patients (25,7%).Overall positivity of the biopsies for tumors was 59% (154 cases), with 79% (123 cases) significant cancer (Gleason>=7), 19% (30 cases) non-significant cancer (Gleason 6) and 1 case of STUMP. Analyzing only the Likert 4 and 5 cases, in a total of 142 cases, the overall positivity was 76% (108 cases), with 90% (96 cases) significant cancer (Gleason>=7), 10% (11 cases) non-significant cancer (Gleason 6) and 1 leiomyoma. In our institution, the positivity of US-guided random biopsies, in a large sample of other patients in the same period (331 patients), was around 52%.

CONCLUSION

Our study demonstrates a significant improvement in the performance of prostate biopsy with US- MRI fusion compared to random US-guided biopsies, with potential clinical impact.

CLINICAL RELEVANCE/APPLICATION

Random prostate biopsies performed on a sextant-basis have a high incidence of false-negative results, and often diagnose microfocal lesions with low clinical significance. Targeted prostate biopsies using MR-ultrasound fusion have shown to detect clinically significant lesions and increase the accuracy of the procedure, with better clinical outcomes.

SSJ10-03   Targeted MR-guided Prostate Biopsy: Are Two Biopsy Cores per MRI Lesion Required?

Tuesday, Dec. 1 3:20PM - 3:30PM Location: E353C

Participants
Lars Schimmoeller, MD, Duesseldorf, Germany (*Presenter*) Nothing to Disclose
Michael Quentin, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Christian Arsov, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Frederic Dietzel, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Dirk Blondin, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Gerald Antoch, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Andreas Hiester, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Robert Rabenalt, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Peter Albers, MD, PhD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

This study evaluates the efficiency and potential benefit of taking two biopsy cores per MRI lesion when performing targeted MR-guided prostate biopsy.

METHOD AND MATERIALS

1545 biopsy cores of 774 intraprostatic lesions (two cores per lesion) in 290 patients (66.2±7.8 years; median PSA 8.2 ng/ml; IQR 6.0-12.0 ng/ml) were retrospectively evaluated regarding PCa detection, Gleason score, and tumor infiltration of the first (FBC) compared to the second biopsy core (SBC). All patients received previously a multiparametric (mp)-MRI (T2WI, DWI, DCE) of the prostate at 3T and all lesions were histologically verified by MR-guided in-bore biopsy.

RESULTS

491 biopsy cores were prostate cancer (PCa) positive, 239 of 774 (30.9%) FBC and 252 of 771 (32.7%) SBC (p=0.446). 61 FBC vs. 78 SBC detected significant PCa with a Gleason score ≥4+3=7 (25.5% vs. 31.0%; p=0.125). 687 SBC (89.1%) showed no histologic difference to the FBC. 74 SBC resulted in a higher tumor involvement per core when detecting the same Gleason sore (38.1%). In total 29.9% of the PCa lesions were Gleason-upgraded by SBC. 40 SBC detected PCA by negative FBC (5.2%). 43 SBC resulted in a Gleason upgrade (5.6%). 20 SBC showed a Gleason upgrade from a Gleason score 3+3=6 to ≥3+4=7 (2.6%) and 4 SBC to a Gleason score ≥4+3=7 (0.5%). 14 SBC showed a Gleason upgrade from 3+4=7 to ≥4+3=7 (1.8%).

CONCLUSION

The benefit of a second targeted biopsy core per suspicious MRI lesion is likely minor, especially regarding a significant Gleason upgrade. Therefore a further reduction of biopsy cores is feasible when performing a targeted MR-guided in-bore prostate biopsy.

CLINICAL RELEVANCE/APPLICATION

Provided a correct biopsy position was documented a second biopsy core per MRI lesion may be omitted for targeted MR-guided in-bore biopsy.

SSJ10-04   Prostate Cancer Aggressiveness: Correlation Between Multiparametric MRI and Molecular Stagging Using the CCP Score (Prolaris™ test)

Tuesday, Dec. 1 3:30PM - 3:40PM Location: E353C

Participants
Raphaele M. Renard-Penna, Paris, France (*Presenter*) Nothing to Disclose
Geraldine Cancel-Tassin, Paris, France (*Abstract Co-Author*) Nothing to Disclose

Eva M. Comperat, MD, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Justine Varinot, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Pierre Mozer, MD, PhD, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Morgan Roupret, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Marc O. Bitker, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Olivier Lucidarme, MD, Paris, France (*Abstract Co-Author*) Consultant, Bracco Group Consultant, F. Hoffmann-La Roche Ltd Consultant, Boehringer Ingelheim GmbH
Olivier Cussenot, Paris, France (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To correlate the ESUR-PI-RADS components as prognostic imaging biomarkers in localized prostate cancer to the Gleason score and the molecular CCP score (Prolaris™) .

METHOD AND MATERIALS

107 patients who had a multiparametric (mp) MRI before (RP) were selected. The largest lesion (index lesion) was measured on T2-MRI (Fig 1A) and ADC map and was classified with the ESUR-PI-RADS scoring system. A region of interest (ROI) was drown in the center of each target, on the ADC map . A single ADC ROI was correlated to histologically index proven lesion. The index lesions pointed out by mp MRI were matched on RP specimens and were run in Myriad's Research Laboratory in accordance with the Prolaris™ protocol in order to perform CCP score

RESULTS

For each index lesion the Pearson's correlations between, pretherapeutic CAPRA score, compoments of the ESUR-PIRADS score, including the maximal diameter (Tmax) and the topography of the index tumor were compared with the histo-pathological observations on the RP specimen.ESUR-PI RADS score and its components were tested with logistic regression model in oreder to assess their predictive value for Gleason's grade 4, CCP score value on the index lesion.On one hand, significant negative correlation was found between mean ADCs and diameter of the index lesion with Gleason's grade 4 ($p=0.0078$). The logistic regression model including Tmax (over 10mm) and ADC (under 800) predict with confidence Gleason'grade 4 in the index lesion (Fig 3). On the other hand, The Tmax or ADC size of the index lesion, remains unable to point out the aggressiveness of 7 tumours defined by CCP score. Among those, six were Gleason 6 (3+3) with a median Tmax of 8mm, and one of 8 mm was Gleason 7(3+4)

CONCLUSION

By mapping image features to gene expression data we were able to show that diffusion imaging and tumor size offer a potential for in vivo non invasive assessment of prognostic cancer aggressiveness.However CCP score related to high risk of lethal cancer did not, completely match with the mpMRI tumour map and Gleason score in 7% of patients. These results previosuly suggested by large scale genomic analysis suggest that the further management of early stages PCa could strongly beneficed of targeted biopsy with moelcular analysis

CLINICAL RELEVANCE/APPLICATION

This radio genomic correlation suggest that management of PCa could strongly benefit from both MRI targeted biopsy and subsequent molecular analysis.

SSJ10-05   Multi-parametric MRI (MpMRI) Findings after Focal Laser Ablation for Prostate Cancer (Pca)

Tuesday, Dec. 1 3:40PM - 3:50PM Location: E353C

Participants
Aytekin Oto, MD, Chicago, IL (*Presenter*) Research Grant, Koninklijke Philips NV; ; ;
Shiyang Wang, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Xiaobing Fan, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Stephen Thomas, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Ambereen Yousuf, MBBS, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Gregory S. Karczmar, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Tatjana Antic, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Scott Eggener, Chicago, IL (*Abstract Co-Author*) Research Grant, Visualase, Inc Speakers Bureau, Johnson & Johnson

PURPOSE

To describe the quantitative and qualitative MpMRI findings following focal laser ablation of Pca

METHOD AND MATERIALS

27 patients with 36 cancer foci on baseline MRI, underwent MRI guided focal laser ablation were prospectively followed with, immediate (36/36 sites), 3-month (36/36 sites) and 12-month (24/36 sites) post-procedure 3T MpMRI and TRUS guided biopsy at 12 months. Qualitative and quantitative MpMRI findings including size and appearance of ablation defect, ADC, K(trans) and Ve were recorded and compared between the follow-up studies and between patients with and without residual disease.

RESULTS

36 cancer foci were ablated in 27 patients. Ablation defect was clearly visible on 36/36, 11/36 and 0/24 sites on the immediate, 3-month and 12-month post-contrast DCE-MR images respectively, with a gradual decrease in size on 3 month MRI even in visible cases. Focal atrophy/scarring was noted at the site of ablation in 10/36 and 20/24 sites on 3-month and 12-month MRI. Mean K(trans) values were significantly lower on post-procedure MRI`s compared to baseline values ($p<0.05$). Mean ADC values on 3-month MRI were significantly higher than the baseline ADC values ($p<0.05$). There was not significant change in Ve ($p>0.05$). In 2/4 cases with residual cancer, focal early enhancement was noted on 12-month DCE-MR Images. Other than 1 case with residual cancer, no focal lesion (other than diffuse and ill-defined changes secondary to ablation) was noted at the ablation site on 12-month T2 and ADC images.

CONCLUSION

Immediate post-contrast MR images are helpful for identification of the ablation defect. Quantitative MR parameters such as ADC and K (trans) change significantly following ablation. Early focal enhancement on DCE-MR Images at the ablation zone at 12-month

MRI is a suspicious finding for residual tumor.

CLINICAL RELEVANCE/APPLICATION

Follow-up MR images can be obtained at 12 months after laser ablation and early focal enhancement at the ablation zone can be considered suspicious for residual cancer.

Honored Educators

SSJ10-06   **Primary and Secondary Prostate Biopsy Settings: Differences When Performing Targeted MR-guided Biopsies**

Tuesday, Dec. 1 3:50PM - 4:00PM Location: E353C

Participants
Frederic Dietzel, Dusseldorf, Germany (*Presenter*) Nothing to Disclose
Lars Schimmoeller, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Michael Quentin, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Dirk Blondin, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Christian Arsov, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Gerald Antoch, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Andreas Hiester, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Robert Rabenalt, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Erhard Godehardt, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Peter Albers, MD, PhD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

This study evaluates the MR-guided in-bore biopsy (IB-GB) in patients, who were either biopsy naive (primary biopsy) or who had undergone at least one previous negative trans-rectal ultrasound-guided biopsy (secondary biopsy) with regard to cancer detection rate, tumor localization and lesion size.

METHOD AND MATERIALS

In total, 1,602 biopsy cores from 297 patients (66.1±7.8y; median PSA 8.2ng/ml; prostate volume 58±30ml) in primary (n=160) and secondary (n=137) prostate biopsies settings were evaluated in this retrospective study. All patients received diagnostic prostate MRI (T2WI, DWI, DCE) at 3T. All lesions described on MRI were biopsied with IB-GB and examined histologically.

RESULTS

In 148 patients 511 cores were positive for prostate cancer (PCa). Clinically significant PCa was found in 82.4% (any Gleason pattern ≥4). PCa detection rate for patients with primary biopsies was 55.6% and 43.1% for secondary biopsies. In patients with primary vs. secondary biopsies, PCa was located peripherally in 62.5% vs. 49.5% (p=0.04), in the transition zone in 27.3% vs. 27.5% (p=0.53), and in the anterior stroma in 10.2% vs. 22.9% (p<0.01). Higher grade PCa (Gleason score ≥4+3=7) occurred apically in 38.5% (p=0.01). PCa detection rates for patients with smaller prostate volumes (<30ml vs. 30-50ml vs. >50ml; p<0.01) or larger lesion sizes (>0.5cm3 vs. 0.5-0.25cm3 vs. <0.25cm3; p<0.01) were significantly higher.

CONCLUSION

In primary and secondary prostate biopsies PCa detection rates were significantly higher for larger lesions and smaller prostate glands. In secondary biopsies, PCa was anteriorly located at a significantly more frequent rate. Higher grade PCa was detected in both settings in an apical location more often.

CLINICAL RELEVANCE/APPLICATION

MRI-guided in-bore biopsy led to high detection rates, especially of clinically significant PCa, in primary and secondary prostate biopsies.

Genitourinary (Multimodality Imaging of Pregnancy and Pelvic Floor)

Tuesday, Dec. 1 3:00PM - 4:00PM Location: E353B

`GU` `MR` `US`

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

Participants
Elizabeth A. Sadowski, MD, Madison, WI (*Moderator*) Nothing to Disclose
Mary C. Frates, MD, Sharon, MA (*Moderator*) Nothing to Disclose

Sub-Events

SSJ11-01   Dynamic Contrast-enhanced MRI Combined with Diffusion Weighted Imaging in Differential Diagnosis of Malignant Gestational Trophoblastic Neoplasia and Postpartum Retained Placental

Tuesday, Dec. 1 3:00PM - 3:10PM Location: E353B

Participants
Kangkang Xue, Zhengzhou, China (*Presenter*) Nothing to Disclose
Jingliang Cheng, MD, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose
Yong Zhang, DO, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose
Tianxia Bei, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To explore the application value of dynamic contrast-enhanced MRI (DCE-MRI) combined with diffusion weighted(DW-MRI) in the differential diagnosis of malignant gestational trophoblastic neoplasia(MGTN) and postpartum retained placental tissue(RPT).

METHOD AND MATERIALS

The institutional review board approved this retrospective stuty and waived the requirement for informed consent. 74 cases(median age, 30.6 years; age range, 20-48 years) of MGTN and RPT confirmed clinically were retrospectively analyzed, all patients underwent DCE-MRI and DW-MRI(500 and 1000 mm²/s) at 3.0T. Types of time signal-intensity curves(TIC) and quantitative analysis of time to peak(TTP), maximum contrast enhancement ratio(MCER) and ADC values of each case were performed. Differences in TTP, MCER, and ADC values between MGTN and RPT were evaluated using the independent samples t-test respectively.The sensitivity, specificity and accuracy of dynamic contrast-MRI, DW-MRI and combination of the two methods in diagnosing MGTN and RPT were calculated.

RESULTS

There were 39 MGTN, of which 13 lesions were invasive mole and 26 lesions were choriocarcinoma. There were 35 RPT, of which 14 lesions were normal retained placenta, 6 lesions were adherent placenta and 15 lesions were implanted placenta. The mean ADC value and TTP of MGTN($1.38\pm0.11\times10\text{-}3$mm²/s, 37.84 ± 3.73 s) were significantly different(p<0.01) from that of RPT($2.03\pm0.56\times10\text{-}3$mm²/s, 102.11 ± 9.14 s).The MECR of MGNT($248.58\pm19.28\%$) was not significantly different (P>0.05) from that of RPT($236.45\pm16.77\%$) statistically. The sensitivity, specificity and accuracy in diagnosing MGTN and RPT was 84.62%, 85.71%, 85.13% for DCE-MRI; 89.74%, 88.57%, 89.19% for DW-MRI; 94.87%, 94.29%, 94.59% for combination of the two methods.

CONCLUSION

MGTN and RPT has different features in DCE-MRI and DW-MRI respectively, and the combination of the two methods can provide high application value for the differential diagnosis of MGTN and RPT.

CLINICAL RELEVANCE/APPLICATION

The clinical issues and standard imaging features of malignant gestational trophoblastic neoplasia and postpartum retained placental tissue are similar, and the combination of DWI and dynamic-enhanced MRI can help clinician distinguish them, so as to decide treatment plans.

SSJ11-02   Variable Sonographic Features and Imaging Underdiagnosis of Partial Molar Pregnancy

Tuesday, Dec. 1 3:10PM - 3:20PM Location: E353B

Participants
Julia Savage, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Katherine E. Maturen, MD, Ann Arbor, MI (*Abstract Co-Author*) Consultant, GlaxoSmithKline plc; Medical Advisory Board, GlaxoSmithKline plc
Erika Mowers, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Katherine Pasque, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Ashish P. Wasnik, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Vanessa Dalton, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Jason Bell, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The goal of this study is to describe the ultrasound findings in histopathologically proven molar pregnancies and to correlate these findings with clinical parameters including serum beta-hCG levels and partial vs. complete molar pregnancy.

METHOD AND MATERIALS

Retrospective chart review revealed 72 women with failed pregnancy or elective termination with histopathologic diagnosis of molar

pregnancy and available ultrasound images between January 1, 2001 to December 31, 2011. Clinical data, ultrasound images and reports were reviewed.

RESULTS

Mean age of women was 30.45 ± 6.97 years of age (range: 16-49), with 1.25 ± 1.49 prior pregnancies (range: 1-11). Mean gestational age (GA) by last menstrual period was 74.45 ± 19.07 days (range: 39-138) and median serum beta-hCG was 64,400 (range: 447-662,000), with expected positive correlations between mean sac diameter (MSD) vs. beta-hCG (r=0.45, p=0.004) and MSD vs. GA (r=0.54, p<.0001). Pathologic results showed 49 partial and 23 complete moles. By imaging, partial moles were more commonly described as having a discrete gestational sac (85.7 vs 21.7%, p<.0001), yolk sac (48.9 vs. 4.6%, p=0.0003), or fetal pole (57.1 vs. 0%, p<.0001), while complete moles were more likely to show clearly abnormal tissue in the uterus (82.6 vs. 20.8%, p<.0001) and to be prospectively diagnosed as molar pregnancy by the dictating radiologist (86.9 vs. 40.82%, p=0.0002).

CONCLUSION

Partial molar pregnancy is associated with a highly variable sonographic appearance and frequent detection of recognizable products of conception, which may contribute to its underdiagnosis by imaging. Complete molar pregnancy is more strikingly abnormal and thus recognizable by imaging, and commonly diagnosed prospectively.

CLINICAL RELEVANCE/APPLICATION

Suspicion of hydatidiform mole in failed pregnancy has impacts on clinical management including: need for uterine evacuation, submission of products of conception to pathology, and serum b-hCG surveillance; failure to prospectively suggest or diagnose molar pregnancy may negatively impact patient care.

Honored Educators

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

Katherine E. Maturen, MD - 2014 Honored Educator

SSJ11-03   Performance of Translabial Ultrasound versus Pelvic Floor MRI in the Detection of Transvaginal Mesh Implant Complications

Tuesday, Dec. 1 3:20PM - 3:30PM Location: E353B

Participants
Karoly Viragh, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Seth A. Cohen, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Shlomo Raz, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Steven S. Raman, MD, Santa Monica, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The goal of the study was to determine the efficacy of 2D and 3D dynamic translabial ultrasound versus pelvic floor MRI in the detection of transvaginal mesh implant complications.

METHOD AND MATERIALS

With IRB approval and HIPAA compliance, a retrospective observational study was performed to correlate the intraoperative findings of transvaginal mesh implant complications (perforation, extrusion, fluid collections) with the standard pre-operative translabial ultrasound and pelvic floor MRI evaluations in women who were treated with suburethral transvaginal mesh implant for stress urinary incontinence or pelvic organ prolapse. The pre-operative translabial ultrasound and MRI examinations were reviewed with attention to technical details. The sensitivity of ultrasound in identifying complications was calculated. The location of the transvaginal mesh with respect to the bladder and urethra was also evaluated (extraluminal, intramural, intraluminal). Factors for technical improvement were identified.

RESULTS

The study cohort included 200 women (mean age 55 years) with transvaginal mesh implants for who underwent 2D and 3D dynamic translabial ultrasound, pelvic floor MRI and mesh excision at our institution between 2007 and 2013. Descriptive statistics were provided. 17 patients were found to have perforation into the urethra and/or bladder during surgery. None were found to have extrusion or significant fluid collections. Translabial ultrasound had a sensitivity of (12/17) 70.5%, whereas detection of mesh fragments by MRI was challenging even in retrospect. Limitations were due to suboptimal visualization of the mesh fragments, which could be improved with pre-procedural hydration for bladder distention and the use of vaginal gel to better image the suburethral space.

CONCLUSION

2D and 3D dynamic translabial ultrasound is a powerful real-time method for transvaginal mesh localization and for visualizing complications, most importantly perforation into the urethra and/or bladder, which allows for better surgical planning and pre-operative patient counseling.

CLINICAL RELEVANCE/APPLICATION

Translabial ultrasonography is a powerful real-time diagnostic technique for the evaluation of female pelvic floor dysfunction and is more sensitive than MR in detecting transvaginal mesh perforation.

SSJ11-04   To Determine the Ultrasound Predictors of Successful Treatment of Ectopic Pregnancy Using a Single Dose Methotrexate Protocol: Preliminary Results

Tuesday, Dec. 1 3:30PM - 3:40PM Location: E353B

Participants
Margarita V. Revzin, MD, Wilton, CT (*Presenter*) Nothing to Disclose
Dennis Toy, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Regina J. Hooley, MD, New Haven, CT (*Abstract Co-Author*) Nothing to Disclose
Leslie M. Scoutt, MD, New Haven, CT (*Abstract Co-Author*) Consultant, Koninklijke Philips NV

PURPOSE

Uncomplicated ectopic pregnancy (EP) usually is managed with methotrexate (MTX) and other non-surgical interventions. There is limited data on the expected US findings of MTX treated EPs. The aim of the present study is to identify US predictors of successful treatment with MTX.

METHOD AND MATERIALS

This is a retrospective IRB approved and HIPAA compliant cohort study, exempt from informed consent. The medical records of 121 women (mean age of 29 + 5.3 years) who were diagnosed with an EP and underwent a single dose treatment with MTX were reviewed. Only those subjects who had a visible EP without heart activity on US prior to treatment and who had a follow up US after treatment were included in the study (n=52). Post treatment EP were evaluated with respect to the change in size, shape, echogenicity of the EP, presence of a gestational and yolk sac, fetal heart rate, vascularity, and hemoperitoneum after treatment. Results were correlated with patient b-hCG levels, clinical symptoms and necessity for surgical intervention. Qualitative and quantitative parameters were analyzed using parametric and nonparametric tests.

RESULTS

Separate assessment of the US findings with respect to their sensitivity(Ss), specificity (Sp), NPV and PPV respectively are as follows: EP change in size 53%, 57%, 45%, 55%, shape 89%, 75%, 85%, 78%, echogenicity 87%, 78%, 85%, 90%, avascularity 79%, 90%, 85%, 88%; and absent or small hemoperitoneum 90%, 86%, 87%, 78% ; A combination of at least three of these findings was most accurate with Ss 95%, Sp 96%, PPV 95%, NPV 90%.Presence of fetal heart activity, increased size of yolk sac and gestational sac, large amount of hemoperitoneum were strong US predictors of failure of MTX treatment with Ss 100%, Sp 100%, PPV 100%, NPV 99%

CONCLUSION

A combination of at least three US findings including stable shape and echogenicity, avascularity and absence or small amount of hemoperitoneum are best US predictors of successful MTX treatment of EPs. Detection of fetal heart activity, large hemoperitoneum, and increase in size of gestational and yolk sac are strong US predictors of a failure of MTX treatment. Change in size of the EP after MTX treatment is not a reliable predictor of either treatment success or failure.

CLINICAL RELEVANCE/APPLICATION

US findings aid in prediction of successful treatment of ectopic pregnancy using a single dose methotrexate protocol

Honored Educators

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

Leslie M. Scoutt, MD - 2014 Honored Educator

SSJ11-05   Accuracy of MRI in the Prenatal Diagnosis of the Abnormally Adherent Placenta: Comparison with Findings at the Time of Delivery

Tuesday, Dec. 1 3:40PM - 3:50PM Location: E353B

Participants
Sherelle L. Laifer-Narin, MD, Englewood, NJ (*Presenter*) Nothing to Disclose
Sidney Z. Brejt, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Sarah Goodman, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Jason Wright, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Jeffrey H. Newhouse, MD, Bronxville, NY (*Abstract Co-Author*) Research Consultant, PAREXEL International Corporation

PURPOSE

To evaluate the accuracy of magnetic resonance imaging in diagnosing invasive placentation.

METHOD AND MATERIALS

A retrospective review of all patients referred for MRI of the placenta from December 2004 to December 2014 was performed. Indications for MRI included abnormal appearance of the placenta on ultrasound, history of prior cesarean delivery, and history of prior uterine surgery. MRI reports were reviewed for placental location, presence or absence of abnormal placentation according to established MRI findings, and suspicion for parametrial involvement. Criteria included the presence of dark intraplacental bands, heterogeneous signal intensity, abnormal vascularization and thickened nodular contour along the urinary bladder surface, uterine bulging into the bladder, and loss of the myometrial margin. MRI was considered positive even if only one of these criteria were present. Comparison was made with findings at either delivery or operation, and pathology reports.

RESULTS

256 MRI exams were reviewed. 144 exams were negative both on MRI and delivery/pathology. 8 exams interpreted as normal on MRI underwent hysterectomy with pathology demonstrating placenta accreta. 80 exams were interpreted as positive for abnormal

placentation, and were diagnosed as accreta, increta, or percreta on delivery/pathology. 24 cases interpreted as positive on MRI had normal placental delivery and pathology. MR diagnosis of abnormal placentation had a sensitivity of 91%, specificity of 86%, PPV of 77%, NPV of 95%, and an accuracy of 87.5%.

CONCLUSION

Placental adhesive disorder is a significant cause of maternal morbidity and mortality. Prenatal MRI is accurate in evaluating invasive placentation in patients at high risk for this condition.

CLINICAL RELEVANCE/APPLICATION

MRI can provide topographic information specifically in cases with lateral extension into the parametrical regions. Identification of abnormal placentation assists the clinician in planning the mode of delivery, extent and location of surgical incision, and determining the need for multidisciplinary involvement and assistance.

SSJ11-06   3T Pelvic MRI Thresholds for Pelvic Organ Prolapse before and after First Childbirth

Tuesday, Dec. 1 3:50PM - 4:00PM Location: E353B

Participants
Mark E. Lockhart, MD, Birmingham, AL (*Presenter*) Nothing to Disclose
Holly Richter, MD, Birmingham, AL (*Abstract Co-Author*) Research Grant, Pelvalon, Inc; Consultant, Pelvalon, Inc; Consultant, Kimberly-Clark Corporation; Royalties, UpToDate, Inc
Gordon W. Bates, MD, Birmingham, AL (*Abstract Co-Author*) Nothing to Disclose
Timothy M. Beasley, PhD, Birmingham, AL (*Abstract Co-Author*) Nothing to Disclose
Desiree E. Morgan, MD, Birmingham, AL (*Abstract Co-Author*) Research support, General Electric Company

PURPOSE

To evaluate the usefulness of published 3T MRI parameters suggesting pelvic organ prolapse before and after first childbirth

METHOD AND MATERIALS

In this IRB-approved HIPAA-compliant prospective cohort study, patients presenting for reproductive assistance were recruited to complete validated questionnaires, clinical pelvic exams, baseline dynamic 3T MRI, and repeat MRI 6 months after delivery. Subjects were nulliparous women, at least 19 years age, and asymptomatic by Pelvic Floor Distress Inventory-20. Predetermined published thresholds or 2 SD beyond means in the literature for pelvic prolapse on MRI were evaluated. Also, a 10% change from baseline to postpartum was considered a significant change. Using 120 cc rectal gel and pelvic phased array coil over the pelvis, static 3mm axial and coronal T2 FSE sequences were followed by 10 mm thick dynamic sagittal HASTE at rest and during strain. The 10 mm sagittal sequence then evaluated pelvic floor mobility during evacuation of the rectal gel. MRI parameters were measured by a fellowship-trained radiologist, blinded to clinical data.

RESULTS

19 subjects (mean age 31 years) completed baseline clinical and MRI studies, and 10 (mean age 30.5 years) of them completed postpartum clinical and MRI studies. None developed significant pelvic floor symptoms by the PFDI-7 and PISQ-12 questionnaires after childbirth. None had levator tears at baseline; two subjects developed tears postpartum. Mean pelvic floor mobility was increased in patients after childbirth and 17 pelvic soft tissue parameters increased by greater than 10% postpartum. At baseline 7/133 (5.3%), 8/209 (3.8%), and 79/209 (37.8%) of pelvic soft tissue measurements exceeded published thresholds (indicating prolapse) at rest, strain, and evacuation, respectively, majority in the anterior compartment. After pregnancy and childbirth, 4/70 (5.7%), 6/110 (5.5%), and 51/110 (46.4%) exceeded thresholds at rest, strain, and evacuation, respectively, in this asymptomatic population. Osseous parameters remained unchanged.

CONCLUSION

Although published soft tissue parameters work well for rest and strain MR imaging, their values in evacuatory series are frequently exceeded, even in asymptomatic nulliparous and primiparous women.

CLINICAL RELEVANCE/APPLICATION

In nulliparous and primiparous women, the evacuatory phase will commonly exceed published MRI thresholds for pelvic organ prolapse and therefore results should be used with caution.

Neuroradiology/Head and Neck (ENT Oncology)

Tuesday, Dec. 1 3:00PM - 4:00PM Location: N228

`HN` `NR` `MR` `RO` `US`

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

Participants
Ashley H. Aiken, MD, Atlanta, GA (*Moderator*) Nothing to Disclose
Barton F. Branstetter IV, MD, Pittsburgh, PA (*Moderator*) Nothing to Disclose

Sub-Events

SSJ19-01 Lymph Node Imaging Reporting and Data System for Ultrasound and Real-time Elastography of Cervical Lymph Node: A Pilot Study

Tuesday, Dec. 1 3:00PM - 3:10PM Location: N228

Participants
Kyeong Hwa Ryu, MD, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kwanghwi Lee, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jiyeon Baik, MD, Busan, Korea, Republic Of (*Presenter*) Nothing to Disclose
Ji-Hwa Ryu, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jung Hee Son, MD, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To analyze ultrasound (US) and real-time elastography (RTE) features of cervical lymph node and propose a structural reporting system for lymph node.

METHOD AND MATERIALS

Between 2013 and 2014, 291 consecutive patients underwent US guided biopsies and follow-up for cervical lymph nodes were enrolled in a single institution. US features were analyzed as follows; shape, margin, echogenicity, echogenic hilum, gross necrosis, calcification, matting and vascular pattern. RTE features were analyzed; elasticity score and strain ratio. By logistic regression analysis, a score for each significant factor was assigned and multiplied by the β coefficient, and then fitted probability of malignancy was calculated. The risk of malignancy of lymph node was determined, based on the number of suspicious features.

RESULTS

Imaging features to be significantly associated with malignancy were round shape, not circumscribed margin, hyperechogenicity, absence of hilum, presence of gross necrosis and calcification, peripheral/mixed vascularity, elasticity score 3 and 4, and high strain ratio ($p < 0.05$). The fitted probability and risk of malignancy increased, as a number of suspicious features increased. Lymph node imaging reporting and data system (LNRADS) was established using a 5-point scale; 1 (probably benign), 2 (low suspicion for malignancy), 3 (moderate suspicion for malignancy), 4 (high suspicion for malignancy), and 5 (highly suggestive for malignancy). The risk of malignancy according to LNRADS categories was as follows; 1: 3.3%, 2: 10.9%, 3: 26.7%, 4: 51.8%-74.4%, 5: 90.6%-98.8%.

CONCLUSION

LNRADS was proposed using risk stratification of cervical lymph node according to the number of suspicious US and RTE features.

CLINICAL RELEVANCE/APPLICATION

LNRADS will help to determine the optimal strategies for management of cervical lymph node.

SSJ19-02 How Can We Differentiate Follicular Nodular Lesions with Ultrasonographic Features?

Tuesday, Dec. 1 3:10PM - 3:20PM Location: N228

Participants
Sun Hye Jeong, MD, Bucheonsi, Korea, Republic Of (*Presenter*) Nothing to Disclose
Hyun-Sook Hong, MD, PhD, Bucheon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Eun Hye Lee, MD, Bucheon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Bora Lee, Bucheon-Si, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

We retrospectively evaluated the ultrasonographic (US) features used to differentiate follicular nodular lesions of thyroid gland (or follicular cell-derived thyroid nodules) and tried to identify specific US features of nodular hyperplasia (NH).

METHOD AND MATERIALS

The study included 178 patients (mean age 46.6 (range 17-82) years) with surgically confirmed NH (n=100), follicular adenoma (FA) (n=56), or follicular carcinoma (FC) (n=22). Two radiologists retrospectively analyzed the US features. To determine the predictors of follicular-patterned lesions, univariate and multivariate multinomial logistic regression analyses were conducted. Receiver operating characteristic (ROC) analyses were performed to determine the effectiveness of the final model at predicting NH, FA, and FC. The inter-observer agreement was calculated.

RESULTS

Tumor diameter, margin, echotexture, cystic changes, calcification, hypoechoic rim, and vascularity were significant in the

univariate analyses. The multivariate multinomial logistic regression analyses revealed that tumor diameter (FA: p=0.002, odds ratio (OR) =1.75, 95% confidence interval (CI) 1.22, 2.51; FC: p=0.001, OR=2.02, 95% CI 1.32, 3.10), absence of cystic changes (FA: p=0.127, OR=2.21, 95% CI 0.80, 6.13; FC: p≤0.001, OR=17.74, 95% CI 4.00, 78.73), and spongiform appearance (FA: p=0.234, OR=0.31, 95% CI 0.04, 2.15; FC: p<0.001, OR=1673.46, 95% CI 671.35, 4171.38) differed significantly among the three follicular nodular lesions, with NH as a reference group. The area under the curve (AUC) for NH, FA, and FC was 0.844, 0.858, and 0.705, respectively. The sensitivity for NH, FA, and FC was 0.698, 0.868, and 0.755, respectively, and the specificity was 0.820, 0.690, and 0.580. Using this model, the diagnostic accuracy of the original data was 72.6%. The inter-observer agreement was moderate to almost perfect.

CONCLUSION

Tumor diameter, cystic changes and spongiform appearance differed significantly among follicular nodular lesions. Using the US criteria, there was moderate diagnostic ability for NH, FA, and FC.

CLINICAL RELEVANCE/APPLICATION

Tumor diameter and the presence of cystic changes differed significantly among NH, FA, and FC (or follicular nodular lesions).

SSJ19-03   The Added Diagnostic Value of DW-MRI to Conventional Parameters in Characterization of Cervical Lymphadenopathy

Tuesday, Dec. 1 3:20PM - 3:30PM Location: N228

Participants
A M Aboelsouad, MSc, Assiut, Egypt (*Presenter*) Nothing to Disclose
Haisam A. Atta, MD, Assiut, Egypt (*Abstract Co-Author*) Nothing to Disclose
Mohamed M. Abd Ellah, MD, Innsbruck, Austria (*Abstract Co-Author*) Nothing to Disclose
Hisham M. Imam, MBBCH, MD, Assiut, Egypt (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess what can DW-MRI add to conventional parameters (Short axis diameter, presence or absence of hilum and presence or absence of necrosis) in prediction of malignant cervical lymphadenopathy.

METHOD AND MATERIALS

The study population included 72 patients having cervical lymphadenopathy underwent MRI with diffusion on 1.5T machine before they underwent biopsy. The cutoff short axis diameter (determined by ROC curve and Youden index), presence or absence of hilum, presence or absence of necrosis and cutoff ADC value (determined by ROC curve and Youden index) were assessed and finding their ability to predict malignant cervical lymphadenopathy each parameter alone, all parameters and comparing DW-MRI efficacy with that of conventional parameters.

RESULTS

The short axis diameter achieved 72.13%,45.45 %,88%,22.73% and 68.06% sensitivity, specificity, positive predictive value, negative predictive value and accuracy respectively. Absent hilum criterion achieved 63.9%,27.3%, 83%,12% and 58.3% sensitivity, specificity, positive predictive value, negative predictive value and accuracy respectively. Present necrosis criterion achieved 21.3%,72.7%,81.3%,14.3% and 29.2% sensitivity, specificity, positive predictive value, negative predictive value and accuracy respectively. Combined conventional criteria achieved 86.9%,0%,82.8%,0% and 73.6%sensitivity, specificity, positive predictive value, negative predictive value and accuracy respectively. The DWI with its cutoff ADC achieved 80.33%,63.64%, 92.45%,36.84% and 83.33%sensitivity, specificity, positive predictive value,negative predictive value and accuracy respectively. The combined conventional parameters and DWI achieved 98.4%,0%,84.5%,0% and 83.3% sensitivity,specificity,positive predictive value,negative predictive value and accuracy respectively.

CONCLUSION

DWI is carrying the highest sensitivity, specificity and accuracy among all conventional parameters, each alone and nearby lower sensitivity with higher specificity and accuracy than combined conventional parameters, thus use of DWI added significant diagnostic value to the ability of conventional parameters to predict malignant cervical lymphadenopathy with no extra time consuming.

CLINICAL RELEVANCE/APPLICATION

DW-MRI is non invasive and non time consuming method that can predict malignancy in cervical lymphadenopathy and its addition to conventional paramters increases their senstiivty with no significant extra time consuming.

SSJ19-04   Proposal for an MRI-based Score to Differentiate Pleomorphic Adenoma and Warthin Tumor in Patients with Benign Parotid Neoplasms

Tuesday, Dec. 1 3:30PM - 3:40PM Location: N228

Participants
Beatrice Sacconi, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Angelo Iannarelli, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Renato Argiro, Rome, Italy (*Presenter*) Nothing to Disclose
Marta Bottero, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Emanuela Basile, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Piero Cascone, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Carlo Catalano, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Mario Bezzi, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the diagnostic efficacy of an MRI-based score in the differential diagnosis between parotid pleomorphic adenoma (PA) and Warthin tumor (WT).

METHOD AND MATERIALS

Twenty patients (M=10, F=10; mean age=63.5 years, range=35-87) complaining of long-standing (stable for at least 3 months) painless parotid mass underwent a 3T MR (Discovery MR750, GE); T2-weighted, DWI and T1-weighted sequences before and after contrast administration (Gadobenic acid, 0,1 ml/Kg) were performed. The lesions were evaluated by three radiologists in consensus using a complex score based on three-point scales rating four different MR features (T2-signal intensity, Apparent Diffusion Coefficient values, enhancement pattern, bilateral/multiple location); total scores of ≤3 and >3 were respectively considered as suggestive of PA or WT. Final diagnosis was based on pathology reports after US-guided fine-needle-aspiration cytology (FNAC) or surgical resection.

RESULTS

Twenty-four lesions were imaged; three lesions were excluded because of MR features suggesting less common histotypes (lipoma, sialolipoma, haemangioma, all confirmed at surgery). Radiologists correctly identified 6/6 PAs and 13/13 WTs; two lesions, defined as PAs, revealed to be an oncocytoma and a granulomatous lymph node (diagnostic accuracy 90.5%).

CONCLUSION

The score allowed the differential diagnosis in all cases of PAs and WTs; an oncocytoma and a granulomatous lymph node were misdiagnosed, but the incidence of benign lesions other than PA and WT is expected to be low. These data need to be confirmed in larger patient cohorts.

CLINICAL RELEVANCE/APPLICATION

In case of benign parotid lesions, the surgical plan depends on histology. MRI can suggest tumor histology in case of uncertain cytologic diagnosis and provide information over the entire neoplasm.

SSJ19-05 Parotid Gland Tumors: Diagnostic Value of Combining Conventional MR Imaging, Diffusion-weighted MR Imaging and Dynamic Contrast Enhanced MR Imaging

Tuesday, Dec. 1 3:40PM - 3:50PM Location: N228

Participants
Gongxin Yang, Shanghai, China (*Presenter*) Nothing to Disclose
Yu Qiang, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Pingzhong Wang, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Yingwei Wu, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Huimin Shi, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Wenjing Zhu, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Xiao-Feng Tao, MD, PhD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Xin Gong, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Weiqing Gao, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the diagnostic value of the combination of echo-planner diffusion-weighted MR imaging (DWI), dynamic contrast enhanced MR imaging (DCE-MRI) and conventional MR imaging in the characterization of solid neoplasms from parotid gland.

METHOD AND MATERIALS

148 subjects (101 benign and 47 malignant) involved with parotid gland tumors were recruited in the study. Prior to surgery and pathologic verification, conventional maxillofacial MR imaging, DWI with b factor of both 0 and 1000 s/mm2 and DCE-MRI were performed on each subject. Logistic regression analysis was performed to see differences of morphological MR features (margin,shape,envelope and signal intensity of masses) between benign and malignant groups. Mean ADC value was calculated from ADC map, and then ADC threshold values between benign and malignant tumors was obtained. Time-intensity curve (TIC) with parameters were obtained from DCE-MRI. Sensitivity, specificity, accuracy, and positive and negative predictive values were calculated for the combination of relative parameters.

RESULTS

Ill-defined margin,irregular shape, no envelope, ADC value lower than cut-off point of $1.12 \times 10{-3}mm2/s$ and TIC pattern with time to peak less than 120s and low washout ratio(<30%)were the valuable parameters for predicting malignancy (P=0.005, 0.004, 0.001, <0.001, <0.001, respectively). However, no significant difference was found in signal intensity of tumors between benign and malignant lesions. A combination of ADC value and TIC pattern yielded a sensitivity, specificity and diagnostic accuracy of 91.5%, 97.0% and 95.3%, respectively. Positive and negative predictive value for distinguishing benign and malignant tumors was 93.5% and 96.1% respectively.

CONCLUSION

Conventional MR imaging combined DWI and DCE-MRI has the ability to improve the diagnostic accuracy in distinguishing between benign and malignant parotid gland tumors.

CLINICAL RELEVANCE/APPLICATION

It will be helpful for clinical diagnosis of Parotid gland tumors

SSJ19-06 Intravoxel Incoherent Motion Diffusion-weighted Magnetic Resonance Imaging for Monitoring of ZD6474 Therapy in Human Nasopharyngeal Carcinoma Xenografts

Tuesday, Dec. 1 3:50PM - 4:00PM Location: N228

Participants
Yanfen Cui, Shanghai, China (*Presenter*) Nothing to Disclose
Caiyuan Zhang, MD, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Huanhuan Liu, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Dengbin Wang, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the value of intravoxel incoherent motion (IVIM) diffusion-weighted (DW) imaging biomarkers for monitoring the early response to ZD6474 in an experimental tumor model by quantitative assessments of tumor microcirculation parameters with histopathological validation.

METHOD AND MATERIALS

Twenty-four female BALB/c nude mice bearing human nasopharyngeal carcinoma xenografts were scanned at baseline and after 1, 3, and 7 days of treatment with ZD6474 (n = 12) or vehicle (n = 12) at a 3T magnetic resonance imager using a custom-built 8-channel receiver coil with 2.5cm inner diameter. For IVIM DW imaging, parameters including apparent diffusion coefficient (ADC), true diffusion coefficient (D), perfusion fracture (f), and blood pseudodiffusion coefficient (D*) were measured with 12 b-values ranging from 0 to 2000 s/mm2. All IVIM DW imaging parameters at different time points were compared between the treated and control groups using Student's t tests or Mann-Whitney tests. Parameters were also analyzed within the treated group by one-way analysis of variance (ANOVA). The relationships between histopathological staining for Ki-67, TUNEL, or CD31 and all IVIM parameters were evaluated by Spearman's rank correlation.

RESULTS

The percent change of the perfusion-related parameters f and D* decreased significantly in the treated group as early as the 1-day follow-up compared with those in the control group . In contrast, the diffusion-related parameters ADC and D were significantly higher in the treated group compared with the control group beginning on day 3 (P < 0.05). The substantial decreases in f at day 1 and D* at day 3 were moderately correlated with the smaller increase in tumor size over the week-long study (r = 0.66 and 0.58, respectively; P < 0.05 for both). Moderate correlations were found between microvessel density and the perfusion-related parameters f and D* and between increased TUNEL index or decreased Ki-67 index and the diffusion-related parameters ADC and D.

CONCLUSION

IVIM DW imaging was sensitive to ZD6474-induced changes in the tumor microenvironment. In particular, the f parameter had the potential to allow early prediction of tumor response to anti-angiogenic treatment.

CLINICAL RELEVANCE/APPLICATION

IVIM DW imaging was sensitive to ZD6474-induced changes in the tumor microenvironment. In particular, the f parameter had the potential to allow early prediction of tumor response to anti-angiogenic treatment.

Ultrasound Elastography

Tuesday, Dec. 1 4:30PM - 6:00PM Location: S406B

`GI` `GU` `HN` `NR` `US`

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

Participants

Sub-Events

RC410A   Thyroid Elastography

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, Toshiba Corporation; Research Grant, Esaote SpA

LEARNING OBJECTIVES

1) Explain the difference between strain and shear wave elastography. 2) Understand the techniques to be able to perform thyroid ultrasound elastography. 3) Apply ultrasound elastography into routine clinical practice of thyroid nodules.

ABSTRACT

Thyroid nodules are very common and work-up of these nodules remains challenging. Fine needle aspiration has been the method of choice for diagnosing suspicious lesions with a sensitivity of 54%-90% and specificity of 60-96% for detection of malignant lesions. Malignant thyroid lesions are statistically stiffer than benign lesions. Ultrasound elastography can assess the stiffness of thyroid lesions. Several studies have been performed evaluating strain and shear wave elastography to characterize thyroid nodules. Strain elastography is qualitative while shear wave elastography is quantitative. These studies suggest that ultrasound elastography may improve sensitivity and specificity of characterizing thyroid lesions over B-mode imaging alone. There is a learning curve for performing adequate thyroid ultrasound elastography. Both cystic lesions and calcified lesions are difficult to evaluate with elastography. There is some overlap of stiffness values between benign and malignant thyroid nodules and elastography should not eliminate biopsy of suspicious lesions based on B-mode imaging. Stiff lesions on elastography should increase the suspicion for malignancy. This presentation will discuss the differences between strain and shear wave elastography, discuss technique and pitfalls in performing the examination, review the literature, and discuss published guidelines.

RC410B   Renal Elastography: Where Are We?

Participants
Nicolas Grenier, MD, Bordeaux CEDEX, France, (nicolas.grenier@chu-bordeaux.fr) (*Presenter*) Advisory Board, Supersonic Imagine; Travel support, Guerbet SA

LEARNING OBJECTIVES

1) To become familiar with the advantages and limits of the different elastography technologies applied to kidney. 2) To understand the factors affecting reliability and reproducibility of elasticity measurement within the kidney. 3) To learn about the intrarenal changes responsible for elasticity changes. 4) To learn about the clinical impact of elasticity measurement in renal parenchymal diseases. 5) To learn about the clinical impact of elasticity measurement in renal tumors.

ABSTRACT

Ultrasound elastography is a new imaging technique under development that provides information about renal stiffness. Kidney elasticity quantification with ultrasound should be better performed with a quantitative technique, based on shear wave velocity measurements (ARFI or SSI methods). Kidney stiffness changes can be affected by mechanical factors such as external pressure induced by the probe and intrarenal characteristics such as tissue anisotropy, which is high in renal medulla, vascularization, which is high within the cortex, and hydronephrosis. Chronic kidney disease (CKD) incidence and prevalence are increasing in Western countries, due particularly to diabetes mellitus and hypertension-related nephropathies. During progression of such renal parenchymal diseases, cellular density may increase, mainly during acute inflammatory phases, and the interstitial matrix may be invaded by fibrosis. All components of these tissue changes may induce an increase of renal elasticity which is not specifically related to fibrosis. Tubular, glomerular, interstitial and vascular changes may also be responsible for an increase of stiffness. This is why, further studies are now necessary before to understand the real impact of elastography measurement in clinical nephrology. Considering characterization of renal tumors with elastography, clinical experience is still limited. Preliminary results show that benign tumors seem to have lower values of elasticity than malignant ones, but, here too, more experience is also necessary.

RC410C   Liver Elastography

Participants
Paul S. Sidhu, MRCP, FRCR, London, United Kingdom, (paulsidhu@nhs.net) (*Presenter*) Speaker, Bracco Group; Speaker, General Electric Company

LEARNING OBJECTIVES

1) To understand the concept of liver fibrosis grading and the implications for healthcare management. 2) To review the basis for the assessment of liver fibrosis using elastography, with emphasis on the different techniques. 3) To understand the differences in the techniques and the variability in measurement assessment. 4) To achieve an overview of the need and position of this technique in clinical care.

ABSTRACT

Liver fibrosis and cirrhosis from many causes is an important cause of long term morbidity and mortlaity. Most cases are a consequence of chronic viral disease (Hepatitis B and C) with alcoholic lever disease an important ethiological factor. The degree of liver fibrosis, and the presence of established cirrhosis confer differnet mamangement stratergies, with imaging playing an important role in the non-invasive assessment of patents with chronic liver disease. Fibrosis grading traditionally performed using the Metavir or Ishak scoring system is essentially a hiistological grading system. Ultimately the possibility to avoid a liver biopsy is the aim, if a non-invasive technique can stage the grade of fibrosis, establishing correct patient management. Liver ultrasound elastography is a developing technique that offers this possibility, with varying methods of aassessment ranging form strain methods and shear wave methods. These techniques will be explained, the status of the current standing of the techniques will be summarised, and the level of technology offered by differnet machines will be reviewed. An overall summary of the current status and the implications for clinical practice will be discussed.

Medical Physics 2.0: Ultrasonography

Tuesday, Dec. 1 4:30PM - 6:00PM Location: S404AB

PH **US**

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

Participants
Ehsan Samei, PhD, Durham, NC (*Director*) Nothing to Disclose
Douglas E. Pfeiffer, MS, Boulder, CO (*Director*) Nothing to Disclose

Sub-Events

RC421A   Ultrasonography Perspective

Participants
Paul L. Carson, PhD, Ann Arbor, MI (*Presenter*) Research collaboration, General Electric Company; Research collaboration, Light Age, Inc

LEARNING OBJECTIVES

1) Understand the roles of medical physicists and other providers of ultrasound system QC, performance evaluation and user education. 2) Gain an understanding of the longer term potential of medical ultrasound to aid in medical physics planning and training.

ABSTRACT

A very brief overview is given of the innovations that have led to current medical ultrasound systems and QC thereof. A clear connection to clinical performance/cost effectiveness has not been established, but the ratio is improving. To aid in medical physics planning and training, more distant (beyond 10 years) and less robust predictions are ventured than in Dr. Hangiandreous' talk. The reduction in artifacts and improvement in resolution will be surprisingly large. It is posed that ultrasound will be headed toward almost ubiquitous use in personal hands as well as those of medical personnel, for monitoring and control of chronic conditions, for direct treatment and for precisely localized drug delivery and enhancement of radiation therapy. Medical physicists who can help keep the computer controls integrated, the systems properly calibrated and the users properly trained will find a substantial role in society.

Active Handout:Paul L. Carson

http://abstract.rsna.org/uploads/2015/13010884/RC421A RSNA015RC221AplcTrim2.pdf

RC421B   Ultrasonography 1.0

Participants
Zheng Feng Lu, PhD, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the current role of ultrasound medical physics in clinical practice. 2) Explain the ultrasound image quality metrics utilized in current ultrasound QA/QC testing. 3) Outline the methods and tools available for ultrasound system QA/QC in current clinical practices. 4) Survey the available standards and voluntary accreditation guidelines for medical ultrasound imaging systems. 5) Understand the need for QC at different levels of time and financial investment.

ABSTRACT

This talk will focus on the present role of ultrasound medical physics in clinical practices. It will review the ultrasound image quality metrics currently utilized in ultrasound QA/QC testing. It will describe testing procedures required and/or recommended by accreditation programs and advisory organizations. General guidelines and available standards will be discussed regarding tolerances for acceptance testing and commissioning of these devices, as well as periodic quality control tests, as applicable to diagnostic B-mode imagers. A brief review of ultrasound phantoms used in these testing procedures will be presented.

Active Handout:Zheng Feng Lu

http://abstract.rsna.org/uploads/2015/13010885/RC421B 20151123-ZFL-Ultrasound_1 0.pdf

Active Handout:Zheng Feng Lu

http://abstract.rsna.org/uploads/2015/13010885/Active RC421B.pdf

RC421C   Ultrasonography 2.0

Participants
Nicholas J. Hangiandreou, PhD, Rochester, MN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the roles expected for medical physics to play in future clinical ultrasound practices. 2) Demonstrate understanding of emerging ultrasound imaging performance metrics that are expected to be in routine practice in the future. 3) Demonstrate understanding of emerging ultrasound imaging technologies that are expected to be in routine practice in the future. 4) Identify approaches for implementing comprehensive medical physics services in future clinical ultrasound practices.

ABSTRACT

Ultrasound imaging is evolving at a rapid pace, adding new imaging functions and modes that continue to enhance its clinical utility and benefits to patients. This talk will look ahead 10-15 years and consider how medical physicists can bring maximal value to the clinical ultrasound practices of the future. The roles of physics in accreditation and regulatory compliance, image quality and exam optimization, clinical innovation, and education of staff and trainees will all be considered. A detailed examination of expected technology evolution and impact on image quality metrics will be presented. Clinical implementation of comprehensive physics services will also be discussed.

Active Handout:Nicholas James Hangiandreou

http://abstract.rsna.org/uploads/2015/13010886/RC421C.pdf

Nerve Ultrasound Based on a Regional Approach: Elbow to Hand (Hands-on)

Tuesday, Dec. 1 4:30PM - 6:00PM Location: E264

MK **NR** **US**

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

Participants
Carlo Martinoli, MD, Genova, Italy, (carlo.martinoli@unige.it) (*Moderator*) Nothing to Disclose
J. Antonio Bouffard, MD, Detroit, MI (*Presenter*) Nothing to Disclose
Catherine J. Brandon, MD, Ann Arbor, MI (*Presenter*) Stock options, VuCOMP, Inc
Mary M. Chiavaras, MD, PhD, Ancaster, ON (*Presenter*) Nothing to Disclose
Joseph G. Craig, MD, Detroit, MI (*Presenter*) Nothing to Disclose
Michael A. Dipietro, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
David P. Fessell, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Ghiyath Habra, MD, Royal oak, MI (*Presenter*) Nothing to Disclose
Marnix T. van Holsbeeck, MD, Detroit, MI, (marnix@rad.hfh.edu) (*Presenter*) Consultant, General Electric Company Consultant, Koninklijke Philips NV Stockholder, Koninklijke Philips NV Stockholder, General Electric Company Grant, Siemens AG Grant, General Electric Company
Rachel B. Hulen, MD, Novi, MI (*Presenter*) Nothing to Disclose
Marina Kislyakova, MD, Moscow, Russia, (mkisliakova@yandex.ru) (*Presenter*) Nothing to Disclose
Joseph H. Introcaso, MD, Neenah, WI (*Presenter*) Nothing to Disclose
Jon A. Jacobson, MD, Ann Arbor, MI (*Presenter*) Consultant, BioClinica, Inc; Royalties, Reed Elsevier; ; ;
Kenneth S. Lee, MD, Madison, WI (*Presenter*) Research Consultant, SuperSonic Imagine; Consultant, Echometrix, LLC; Royalties, Reed Elsevier
Humberto G. Rosas, MD, Madison, WI (*Presenter*) Nothing to Disclose
Matthieu Rutten, MD, Hertogenbosch, Netherlands (*Presenter*) Nothing to Disclose
Courtney E. Scher, DO, Detroit, MI (*Presenter*) Nothing to Disclose
Alberto S. Tagliafico, MD, Genova, Italy (*Presenter*) Nothing to Disclose
Ximena L. Wortsman, MD, Santiago, Chile, (xworts@yahoo.com) (*Presenter*) Nothing to Disclose
Andrea Klauser, MD, Innsbruck, Austria (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Familiarize course participants with the ultrasound appearance of nerves and the scanning techniques used to image them in the distal upper extremity. 2) Emphasize the ultrasound anatomy of the median, ulnar, radial nerves and their divisional branches at the most common sites of entrapments, including the carpal tunnel and the cubital tunnel. 3) Learn the technique to image some minor nerves in their course throughout the distal upper extremity, such as the the lateral and the medial antebrachial cutaneous. 4) Outline the range of clinical conditions where ultrasound is appropriate as the primary imaging modality for nerve assessment.

ABSTRACT

In recent years, ultrasound of the musculoskeletal and peripheral nervous systems is becoming an increasingly imaging tool with an expanding evidence base to support its use. However, the operator dependent nature and level of technical expertise required to perform an adequate ultrasound assessment means that appropriate training is required. For this purpose, the present course will demonstrate the basic principles of musculoskeletal ultrasound with a special focus on nerves of the distal upper extremity (elbow to hand). The standardized techniques of performing an adequate ultrasound study of the median, ulnar, radial and their divisional branches, lateral cutaneous of the forearm and medial cutaneous of the arm and the forearm will be illustrated. The hands-on workshops will provide the opportunity to interactively discuss the role of ultrasound in this field with expert instructors. Participants will be encouraged to directly scan model patients. A careful ultrasound approach with thorough understanding of soft-tissue planes and extensive familiarity with anatomy are prerequisites for obtaining reliable information regarding the affected structure and the site and nature of the disease process affecting it.

Honored Educators

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

Jon A. Jacobson, MD - 2012 Honored Educator

Ultrasound Wednesday Case of the Day

Wednesday, Dec. 2 7:00AM - 11:59PM Location: Case of Day, Learning Center

US

AMA PRA Category 1 Credit ™: .50

Participants
Nirvikar Dahiya, MD, Phoenix, AZ (*Presenter*) Nothing to Disclose
Jason M. Wagner, MD, Oklahoma City, OK (*Abstract Co-Author*) Nothing to Disclose
Melanie P. Caserta, MD, Jacksonville, FL (*Abstract Co-Author*) Nothing to Disclose
Aya Kamaya, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Maryellen R. Sun, MD, Boston, MA (*Abstract Co-Author*) Research Grant, Glaxo SmithKline plc

TEACHING POINTS

1) Participants will learn to list the sonographic appearances of common and uncommon diseases. 2) Participants will learn to describe the differentiating features between similar diseases via a case based format. 3) Participants will learn to discuss the pathophysiology of diseases that are responsible for the sonographic appearance.

Essentials of Genitourinary Imaging

Wednesday, Dec. 2 8:30AM - 10:00AM Location: S100AB

`GU` `MR` `US`

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

Participants

Sub-Events

MSES41A   Catching Ovarian Cancer

Participants
Elizabeth A. Sadowski, MD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review the types of ovarian epithelial neoplasm seen on imaging. 2) Assess the risk of ovarian cancer based on imaging appearance of an adnexal lesion and clinical information. 3) Emphasize the role of MRI in further evaluation of adnexal lesions.

ABSTRACT

There is a spectrum of ovarian epithelial neoplasms ranging from benign to malignant. Current theories regarding the precursor lesions are debated; however, the pathway from benign epithelial neoplasm to low grade carcinoma follows an indolent course and is distinctly different from the aggressive evolution of high grade carcinoma. An understanding of the pathogenesis of low grade versus high grade ovarian epithelial neoplasms can be helpful to radiologists, when they are faced with an adnexal lesion. Identifying the imaging features suggestive of benign, intermediate and worrisome lesions can triage adnexal lesions into follow up versus treatment. The purpose of this presentation is to review the imaging features of benign, indeterminate and worrisome adnexal lesions and to discuss the appropriate follow up in each case.

MSES41B   US and MRI: Imaging of Chronic Pelvic Pain in Women

Participants
Mostafa Atri, MD, Toronto, ON (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To review MRI and US features of adenomyosis and their correlation with pathology. 2) To discuss staging and US and MRI features of endometriosis and their role in the management of this condition. 3) To familiarize imagers with US features of diverticulosis/diverticulitis and how to differentiate it from colitis.

ABSTRACT

Chronic pelvic pain constitutes 10-40% of gynecology visits at a total cost of 39 billion dollars/year in USA. The most common etiologies are gynecological with GI, urology and MSK conditions being the other causes. During this presentation, imaging features of adenomyosis, endometriosis, pelvic congestion, and US features of diverticulosis/diverticulitis are reviewed. Both adenomyosis and endometriosis are common conditions affecting women. They are frequently seen as an incidental finding that can be accurately evaluated by MRI and US in symptomatic patients. There is close correlation between pathology and imaging features of adenomyosis. The main role of imaging in the evaluation of endometriosis is in the staging of the disease to plan for surgery. US features of uncomplicated diverticulitis are discussed. Transvaginal US can accurately diagnose diverticulosis/diverticulitis that should be sought for in women undergoing US to evaluate for chronic pelvic pain.

Handout:Mostafa Atri

http://abstract.rsna.org/uploads/2015/15001868/IMAGING CHRONIC PELVIC PAIN FINAL RSNA 2015 FINAL.pdf

MSES41C   Imaging of the Bladder and Ureters

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

LEARNING OBJECTIVES

1) Review embryology and discuss congenital anomalies of the bladder and ureter. 2) Classify and discuss imaging appearance of ureteric and bladder disease. 3) To discuss the protocols and imaging appearance of bladder and ureteric pathology on various modalities. 4) Review the staging of bladder and ureteric malignancies. 5) Discuss the imaging appearance of various stages of bladder and ureteric cancer. 6) Illustrate the newer techniques for imaging of bladder and ureter.

ABSTRACT

The ureter is an extra-peritoneal structure surrounded by fat.; The ureter is divided into three portions: the proximal ureter (upper) is the segment that extends from the ureteropelvic junction to the area where the ureter crosses the sacroiliac joint, the middle ureter courses over the bony pelvis and iliac vessels, and the pelvic or distal ureter (lower) extends from the iliac vessels to the bladder. It is a dynamic organ and not a simple conduit through which urine flows. Benign and malignant lesions can affect the ureter and these maybe due to contiguous involvement from the kidney or bladder. The ureter can be imaged by a variety of modalities including computed tomography (CT), magnetic resonance imaging (MR), direct pyelography (DP) both antegrade (AP) and retrograde (RP), nuclear medicine diuretic scan and voiding cystourethrography (VCUG). Benign lesions like endometriosis,

Ureteritis, Ureteritis cystica can affect the ureter as well. Transitional cell carcinoma in the ureter is usually diagnosed on imaging. Bladder carcinoma is the fourth most common cancer in men and women. Knowledge of imaging options and appearance is necessary for both radiologists and urologists. Transitional cell carcinoma (TCC) is the most common bladder neoplasm with squamous cell and adenocarcinoma found in less than 10% of cases.; Benign lesions are uncommon but some can be suggested by their imaging appearance. Cystoscopy allows tissue diagnosis and treatment of superficial lesions. Although magnetic resonance imaging (MRI) and computed tomography (CT) both have limitations in detailing depth of muscle invasion, both have a prominent role helping to define the lesion and in staging. This presentation illustrates the role of MR and CT in evaluating bladder and ureter with a discussion of the newer techniques of MR Diffusion Weighted Imaging (DWI) and virtual cystoscopy by CT or MR.

Second and Third Trimester Obstetrical Ultrasound (An Interactive Session)

Wednesday, Dec. 2 8:30AM - 10:00AM Location: E450B

GU **OB** **US**

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

Participants

LEARNING OBJECTIVES

Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

Sub-Events

RC510A   3D Ultrasound in Obstetrics

Participants
Beryl R. Benacerraf, MD, Brookline, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To learn the principles of 3D sonography and the applications for fetal scanning. To evaluate clinical situations where 3D scanning is helpful and where it is not useful beyond the 2D examination. 2) To see examples of fetal malformations scanned in 3D using surface rendering and multiplanar reconstruction. 3) To learn how to use volume scanning to dramatically reduce scan time and improve you scanning efficiency by rescanning stored volumes of complete fetal anatomy.

ABSTRACT

Three-dimensional (3D) ultrasound allows us to acquire a volume and display any plane of section within that volume regardless of the scanning orientation. The ability to display a 3D image of any type or plane has been one of the most powerful recent advances in sonography, particularly in the field of obstetrics and gynecology. In imaging of the fetus, 3D ultrasound is advantageous in demonstrating many types of fetal defects and dysmorphologic facial features using surface rendering. The fetal brain is also one of the areas where 3D ultrasound has been most helpful, since the reconstruction of the third non-scanning plane is crucial in demonstrating planes of section not previously visible sonographically. The corpus callosum is an example of one area not readily imaginable in standard imaging planes. The fetal sutures are also easy to image with 3D, which is particularly helpful in fetuses with suspected craniosynostosis. 3D ultrasound is key for imaging fetal skeletal abnormalities, providing additional information on affected fetuses as compared to 2D. Evaluation of the spine using 3D has been helpful to determine the level of spina bifida, thus providing crucial information regarding prognosis. Evaluation of the fetal heart is an intense area of research interest, and the heart can be imaged in realtime 3D (4D) using a method called STIC. This method provides the ability to obtain a full volume of the beating heart to evaluate in detail off line with or without color Doppler and while it is beating.Volume imaging is also key in improving efficiency of the ultrasound department. The entire fetus can be imaged easily by acquiring and archiving a few volumes. This way, the patient can spend far less time in the ultrasound room and the entire scan can be done remotely and virtually using the stored volumes. This techniques reduces operator dependency usually associated with 2D ultrasound.

RC510B   Fetal Genitourinary Anomalies

Participants
Roya Sohaey, MD, Portland, OR (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Apply the Urinary Tract Dilation classification system to fetal imaging practice. 2) Develop an anatomic approach for differential diagnosis of urinary tract obstruction. 3) Develop an understanding of which cases would benefit from fetal MR.

ABSTRACT

By the conclusion of this course, the participant will be able to apply the prenatal UrinaryTract Dilation (UTD) classification system for diagnosis and follow-up planning. The learner will develop an anatomic approach towards differential diagnosis for obstructive causes of UTD, renal cystic dysplasia and complex genitourinary anomalies. In addition, a fetal sex-based approach for analysis of complex lower tract anomalies will be discussed. The course will demonstrate how fetal MR is useful as a problem solving tool in certain complex cases. The lecture is didactic and case-based in format.

RC510C   Placenta

Participants
Sara M. Durfee, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the cause of vaginal bleeding in patients with placental abnormalities that include placenta previa and placental abruption. 2) Describe the sonographic features of placenta accreta. 3) Define trophotropism and describe how this process leads to both normal and abnormal placentation.

ABSTRACT

After this presentation, the participant will understand how the normal placenta develops and how factors such as trophotropism lead to placental abnormalities. Specific abnormalities such as placenta previa, placental abruption and placenta accreta will be

addressed in detail. In addition, first trimester abnormalities such as the chorionic bump and subchorionic hematomas will be discussed. The presenter will describe the sonographic appearance of succenturiate lobe, circumvallate placenta and sonolucencies within the placenta and will comment on placental masses.

Techniques of Musculoskeletal Interventional Ultrasound (Hands-on)

Wednesday, Dec. 2 8:30AM - 10:00AM Location: E263

`MK` `IR` `US`

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

Participants
Veronica J. Rooks, MD, Honolulu, HI (*Moderator*) Nothing to Disclose
Peter L. Cooperberg, MD, Vancouver, BC (*Presenter*) Nothing to Disclose
Alda F. Cossi, MD, Boston, MA (*Presenter*) Nothing to Disclose
Nathalie J. Bureau, MD, MSc, Montreal, QC, (nathalie.bureau@umontreal.ca) (*Presenter*) Equipment support, Siemens AG
James W. Murakami, MD, Columbus, OH (*Presenter*) Nothing to Disclose
Michael A. Mahlon, DO, Tacoma, WA (*Presenter*) Nothing to Disclose
Paolo Minafra, MD, Pavia, Italy, (paolominafra@gmail.com) (*Presenter*) Nothing to Disclose
Paula B. Gordon, MD, Vancouver, BC (*Presenter*) Stockholder, OncoGenex Pharmaceuticals, Inc ; Scientific Advisory Board, Hologic, Inc; Scientific Advisory Board, RealImaging
Hollins P. Clark, MD, MS, Winston Salem, NC (*Presenter*) Nothing to Disclose
Carmen Gallego, MD, Madrid, Spain, (cgallego@salud.madrid.org) (*Presenter*) Nothing to Disclose
Mabel Garcia-Hidalgo Alonso, MD, Madrid, Spain (*Presenter*) Nothing to Disclose
Michael A. Dipietro, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Horacio M. Padua JR, MD, Boston, MA (*Presenter*) Nothing to Disclose
Patrick Warren, MD, Columbus, OH (*Presenter*) Nothing to Disclose
Stephen C. O'Connor, MD, Boston, MA (*Presenter*) Nothing to Disclose
Sara E. Smolinski, MD, Springfield, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify basic skills, techniques, and pitfalls of freehand invasive sonography, with specific focus on musculoskeletal applications. 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, to include core biopsy, small abscess coaxial catheter drainage, cyst and ganglion aspiration, soft tissue foreign body removal, and intraarticular steriod injection. 4) Incorporate these component skill sets into further life-long learning for expansion of competency and prepartaion for more advanced interventional MSK sonographic learning opportunities.

ABSTRACT

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

Dynamic Musculoskeletal US: Clicks and Clunks of the Lower Extremity (Hands-on)

Wednesday, Dec. 2 8:30AM - 10:00AM Location: E264

MK **US**

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

Participants
Viviane Khoury, MD, Philadelphia, PA, (viviane.khoury@uphs.upenn.edu) (*Presenter*) Nothing to Disclose
Thomas Moser, MD, Montreal, QC, (thomas.moser@umontreal.ca) (*Presenter*) Nothing to Disclose
Mark Cresswell, MBBCh, Vancouver, BC (*Presenter*) Nothing to Disclose
Jon A. Jacobson, MD, Ann Arbor, MI, (jjacobsn@umich.edu) (*Presenter*) Consultant, BioClinica, Inc; Royalties, Reed Elsevier; ; ;
J. Antonio Bouffard, MD, Detroit, MI (*Presenter*) Nothing to Disclose
Joseph G. Craig, MD, Detroit, MI (*Presenter*) Nothing to Disclose
David P. Fessell, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Ghiyath Habra, MD, Royal oak, MI (*Presenter*) Nothing to Disclose
Joseph H. Introcaso, MD, Neenah, WI (*Presenter*) Nothing to Disclose
Marnix T. van Holsbeeck, MD, Detroit, MI (*Presenter*) Consultant, General Electric Company Consultant, Koninklijke Philips NV Stockholder, Koninklijke Philips NV Stockholder, General Electric Company Grant, Siemens AG Grant, General Electric Company
Kenneth S. Lee, MD, Madison, WI (*Presenter*) Research Consultant, SuperSonic Imagine; Consultant, Echometrix, LLC; Royalties, Reed Elsevier
Humberto G. Rosas, MD, Madison, WI (*Presenter*) Nothing to Disclose
Catherine J. Brandon, MD, Ann Arbor, MI (*Presenter*) Stock options, VuCOMP, Inc
Kambiz Motamedi, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Mary M. Chiavaras, MD, PhD, Ancaster, ON (*Presenter*) Nothing to Disclose
Andrea Klauser, MD, Innsbruck, Austria (*Presenter*) Nothing to Disclose
Robert R. Lopez, MD, Charlotte, NC (*Presenter*) Nothing to Disclose
Carlo Martinoli, MD, Genova, Italy (*Presenter*) Nothing to Disclose
Georgina M. Allen, MBBCh, FRCR, Oxford, United Kingdom (*Presenter*) Nothing to Disclose
Girish Gandikota, MBBS, Ann Arbor, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify anatomic structures which can impinge or move abnormally in the hip and ankle causing pain during normal range of motion. 2) Describe the ultrasound anatomy and scanning technique for a dynamic examination of these lesions. 3) Position patients optimally for the dynamic evaluation of the hip and ankle respecting ergonomics.

ABSTRACT

This course will demonstrate standardized techniques of performing the dynamic examination of hip and ankle lesions that are only or best demonstrated dynamically. These include the snapping hip, peroneal tendon subluxation/dislocation, flexor hallucis longus impingement, and ankle ligament instability. In the first portion of the course, probe positioning will be demonstrated on a model patient with overhead projection during live scanning. In the second portion of the course, an international group of expert radiologists will assist participants in learning positioning and scanning of hip and ankle joint lesions described. An emphasis on dynamic maneuvers and ergonomic documentation of tissue dynamics will be taught. Participants will be encouraged to directly scan model patients.

Honored Educators

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

Jon A. Jacobson, MD - 2012 Honored Educator

Breast Imaging (Ultrasound Diagnostics)

Wednesday, Dec. 2 10:30AM - 12:00PM Location: E450A

BR **US**

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

FDA Discussions may include off-label uses.

Participants
Susan Weinstein, MD, Philadelphia, PA (*Moderator*) Consultant, Siemens AG
Regina J. Hooley, MD, New Haven, CT (*Moderator*) Nothing to Disclose

Sub-Events

SSK02-01   Incremental Cancer Detection Utilizing Breast Ultrasound versus Breast MRI in the Evaluation of Newly Diagnosed Breast Cancer Patients

Wednesday, Dec. 2 10:30AM - 10:40AM Location: E450A

Participants
Jeri Sue Plaxo, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Hongying He, MD, PhD, Houston, TX (*Presenter*) Nothing to Disclose
Lei Huo, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Wei Wei, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Rosalind P. Candelaria, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Wei T. Yang, MD, Houston, TX (*Abstract Co-Author*) Researcher, Hologic, Inc
Henry M. Kuerer, MD, Houston, TX (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the incremental detection of breast cancer utilizing bilateral whole breast ultrasound (BWBUS) versus dynamic contrast enhanced MRI in patients with biopsy proven primary breast cancer.

METHOD AND MATERIALS

A retrospective database search in a single institution identified 259 patients with newly diagnosed breast cancer from 1/ 2011 to 8/2014, who underwent mammography, BWBUS and MRI before surgery. Patient demographics, tumor characteristics, lesions seen on mammography, BWBUS, and MRI were recorded. Histopathology of each lesion was used to determine the incremental cancer detection rate by BWBUS and MRI and to calculate the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) of mammography, BWBUS, and MRI. Multifocal, multicentric and contralateral disease were recorded and compared among the three imaging modalities. Effect on surgical planning was obtained from the medical records.

RESULTS

A total of 539 lesions were seen on at least one modality (mammography, BWBUS, or MRI) with histopathology, of which 393 (73%) were malignant and 146 (27%) benign. The sensitivity and specificity of mammography, BWBUS, and MRI were 77%, 89%, and 93%, and 75%, 67%, and 39%, respectively. PPV and NPV of mammography, BWBUS, and MRI were 89%, 88%, and 80%, and 55%, 69%, and 69%, respectively. MRI was significantly more sensitive than BWBUS (p=0.02). However, there was no significant difference in sensitivity between mammography plus BWBUS and MRI. In addition, mammography and BWBUS had significantly higher specificity than MRI (p<0.0001). Mammography plus BWBUS and mammography plus MRI significantly improved the detection of additional malignant foci (multifocal, multicentric or contralateral) (p<0.0001) compared to mammography alone. All three modalities combined further significantly improved the detection of additional malignant foci. However, surgical planning was not changed in the majority of the patients with multicentric disease found on MRI.

CONCLUSION

Breast MRI is more sensitive than BWBUS beyond mammography in breast cancer detection. Mammography and BWBUS are more specific than MRI. Addition of MRI improved the detection of multifocal, multicentric and contralateral disease, without altering surgical planning in the majority of patients with multicentric disease.

CLINICAL RELEVANCE/APPLICATION

The exact role of breast MRI in breast cancer detection and management needs to be further defined.

SSK02-02   The Breast Tumor Strain Ratio Is a Predictive Parameter for Axillary Lymph Node Metastasis in Patients with Invasive Breast Cancer

Wednesday, Dec. 2 10:40AM - 10:50AM Location: E450A

Participants
Jin You Kim, MD, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Shinyoung Park, MD, Busan, Korea, Republic Of (*Presenter*) Nothing to Disclose
Jin Il Moon, MD, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ji Won Lee, MD, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Suk Kim, MD, Pusan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the association between the breast tumor strain ratio and axillary lymph node metastasis in patients with invasive breast cancer.

METHOD AND MATERIALS

Between 2013 and 2014, 284 consecutive patients (mean age, 52.2 years; range, 24-78 years) diagnosed with invasive breast cancer (mean size, 2.3 ± 1.5 cm; range, 0.2-9.0 cm) underwent ultrasound (US) elastography before surgery. The strain ratio, defined as the fat-to-lesion ratio and indicative of the relative stiffness of the breast lesion, was calculated using dedicated software within the US equipment. The associations of axillary node metastasis with the tumor strain ratio and clinicobiological variables were evaluated using univariate and multivariate logistic regression analyses.

RESULTS

Among 284 tumors, 85 (29.9%) showed axillary lymph node metastasis by surgical histopathology. The strain ratio was significantly higher in tumors with a node-positive status than in those with a node-negative status (5.19 ± 1.28 vs. 4.17 ± 1.30, respectively; $P < 0.001$). A receiver operating characteristic curve demonstrated that a tumor strain ratio of 3.89 was the optimal cutoff for predicting axillary nodal involvement in breast cancer (sensitivity, 91.8%; specificity, 45.7%; area under the curve, 0.701; SE, 0.032; $P < 0.001$). On univariate analysis, a higher strain ratio (> 3.89), larger tumor size (>2 cm), higher histologic grade (grade 3), presence of lymphovascular invasion, palpability, and higher expression of Ki-67 ($\geq 14\%$) were associated with a higher probability of axillary node metastasis. On multivariate analysis, a higher strain ratio (> 3.89) (odds ratio (OR): 14.208; $P < 0.001$), presence of lymphovascular invasion (OR: 17.437; $P < 0.001$), and higher expression of Ki-67 ($\geq 14\%$) (OR: 3.744; $P = 0.002$) maintained independent significance for predicting axillary lymph node metastasis.

CONCLUSION

The breast tumor strain ratio on US elastography is associated independently with axillary lymph node metastasis in patients with invasive breast cancer.

CLINICAL RELEVANCE/APPLICATION

Preoperative prediction of axillary nodal status is valuable. Implementation of US elastography during preoperative US evaluation could help predict axillary node metastasis in breast cancer patients.

SSK02-03   Differentiating Benign and Malignant Breast Tissue Using a Handheld Terahertz Probe

Wednesday, Dec. 2 10:50AM - 11:00AM Location: E450A

Participants
Maarten Grootendorst, MSc, London, United Kingdom (*Presenter*) Nothing to Disclose
Susan Brouwer de Koning, BSC, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Anthony J. Fitzgerald, Cambridge, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Alessia Portieri, PhD, Cambridge, United Kingdom (*Abstract Co-Author*) Senior Scientist, Teraview Ltd
Aida Santa Olalla, MSc, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Massi Cariati, MBChB,PhD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Michael Pepper, PhD, London, United Kingdom (*Abstract Co-Author*) Chief Scientific Officer, TeraView Ltd
Vincent Wallace, PhD, Crawley, Australia (*Abstract Co-Author*) Nothing to Disclose
Sarah Pinder, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Arnie Purushotham, MD,PhD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To develop histopathological methods to analyse breast tissue samples scanned with a handheld TeraHertz (THz) probe, and evaluate the ability of THz time and frequency domain pulses and parameters to discriminate between benign and malignant tissue, with the aim of developing a technique to assess tumour resection margins in breast-conserving surgery.

METHOD AND MATERIALS

In all, 15 breast tissue samples (13 patients) from freshly excised wide local excision and mastectomy specimens were scanned using a handheld THz probe with a bandwidth of 0-2.0 THz (Teraview Ltd., UK). For each sample detailed pathology, including type of predominant tissue (tumour and tumour type, fibrous or adipose), type of background tissue, and cell density were obtained at 1.0mm-intervals, and correlated with THz data. Samples with a predominant tissue cell density of >= 60% were included. The full THz time and frequency domain pulses, as well as individual parameters, were evaluated. An area under the receiver operating characteristic curve (AUROC) analysis was performed to quantify the performance of each parameter in discriminating between tumour and fibrous tissue. Parameters with an AUROC value >0.75 were included. A Mann-Whitney U test was performed to determine whether the differences in parameter values were statistically significantly different.

RESULTS

In all, 6 invasive ductal carcinomas, 1 invasive lobular carcinoma, 4 fibrous and 4 adipose samples were used. Adipose tissue could be readily discriminated from tumour/fibrous tissue using the full time-domain pulse (Fig. 1). Tumour could be discriminated from fibrous tissue using a total of 35 parameters; all these parameters had parameter values that were statistically significantly different between tumour and fibrous ($p<0.001$). Especially, the power at frequency 0.18-0.29THz proved to be a strong discriminator (AUROC >= 0.97).

CONCLUSION

Time-domain pulses and parameters from handheld THz probe measurements can accurately discriminate between benign breast and malignant tissue in an ex vivo setting. More high-dense tumour samples from different tumour types and low-dense samples are needed to further evaluate this technique prior to in vivo patient studies.

CLINICAL RELEVANCE/APPLICATION

THz pulsed imaging distinguishes malignant from benign breast tissue and can potentially assess tumour margins intraoperatively in breast-conserving surgery, aiming to achieve lower re-excision rates

SSK02-04   Association of US Features and the 21-gene Recurrence Score Assays in Estrogen Receptor-Positive Invasive Breast Cancers

Wednesday, Dec. 2 11:00AM - 11:10AM Location: E450A

Participants
Eun Young Chae, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Hak Hee Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Woo Kyung Moon, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Won Hwa Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Joo Hee Cha, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hee Jung Shin, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Woo Jung Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sei Hyun Ahn, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To identify the relation of imaging features on ultrasound (US) and the recurrence score (RS) of the 21-gene expression assay in patients with estrogen receptor (ER) positive breast cancer.

METHOD AND MATERIALS

Institutional review board approved this study, and the requirement for informed consent was waived. 267 patients with ER-positive invasive breast cancer who underwent US and Oncotype Dx assay were included in this study. US images were independently reviewed by dedicated breast radiologists who were blind to the RS, according to BI-RADS lexicon. In addition, tumor roundness was measured by a laboratory-developed software program. The pathological data were also reviewed including immunohistochemistry results. Univariate analysis was done to assess the associations between the RS and each variables. Multiple logistic regression analysis was used to identify independent predictors of high RS (≥31).

RESULTS

Of 267 patients, 147 (55%) had low, 96 (36%) intermediate, and 24 (9%) had high RS. In univariate analysis, the parallel orientation, circumscribed margin, posterior acoustic enhancement, presence of calcification in the mass and tumor roundness was positively associated with high RS. Multiple logistic regression analysis showed that parallel orientation (OR=5.525) and tumor roundness (OR=1.699 per 10 increase) remained independent variables associated with high RS. The area under the ROC curve from the model was 0.78 in distinguishing high RS from low or intermediate RS and increased to 0.88 when combined with pathological data.

CONCLUSION

The tumor roundness and parallel orientation were independent variables that may predict a high RS in patients with ER-positive breast cancer.

CLINICAL RELEVANCE/APPLICATION

ER-positive breast cancers have distinguishing US features according to recurrence score. US can help to differentiate candidates for adjuvant chemotherapy in ER-positive cancer.

SSK02-05 Tumor Growth Rate during Wait Times for Surgery in Women with Breast Cancers Assessed by Ultrasonography

Wednesday, Dec. 2 11:10AM - 11:20AM Location: E450A

Participants
Su Hyun Lee, MD,PhD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Sung Ui Shin, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jung Min Chang, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Nariya Cho, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Woo Kyung Moon, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate tumor growth rate (TGR) during the wait times for surgery in women with invasive breast cancers and to identify clinicopathologic factors associated with TGR.

METHOD AND MATERIALS

This study was approved by our institutional review board and the requirement for written informed consent was waived. A retrospective chart review in a tertiary care center identified 1,580 women who had breast surgery for invasive carcinoma between August 1, 2013 and August 31, 2014. Among them, a total of 307 consecutive women (mean age, 53 yrs; range, 27-81 yrs) with T1-2 breast cancers eligible for TGR assessment by using ultrasonography (US) were included. All women underwent serial breast US at the time of initial diagnosis and one day before surgery as a routine protocol in our hospital. The three perpendicular diameters of tumors were measured on US images at each time point and the maximum diameter and volume of tumors were compared using paired samples t-test. TGR was quantified using the parameter of specific growth rate (SGR; %/day) and was compared with clinicopathologic variables using univariate and multivariate analyses.

RESULTS

The median time from diagnosis to surgery was 31 days (range, 8-78 days). The maximum diameter and volume of tumors at surgery (mean, 15.8 ± 6.8 mm and 1.73 ± 2.6 cc) were significantly larger than those at diagnosis (15.0 ± 6.5 mm and 1.47 ± 2.3 cc) (P<0.001, both). Tumor subtype (ER-positive [n=206], HER2-positive [n=35], and triple negative cancers [n=66]) was the only independent clinicopathologic factor associated with SGR on multivariate analysis (P=0.006). Triple negative cancers showed the highest SGR (0.980 ± 1.071) followed by HER2-positive (0.550 ± 1.219) and ER-positive cancers (0.192 ± 0.995) (P < 0.001). Clinical T stage was not significantly changed between diagnosis and surgery in ER- and HER2-positive cancers, however, higher T stage at surgery was more frequent in triple negative cancers (P=0.027).

CONCLUSION

Triple negative cancers showed the highest TGR during the wait times for surgery and clinical T stage can be upgraded between diagnosis and surgery in triple negative cancers.

It is desirable to minimize wait times for surgery in patients with triple negative breast cancers.

SSK02-06   Diagnostic Yield of Axillary Ultrasound and Fine-Needle Aspiration during Screening Breast Ultrasound

Wednesday, Dec. 2 11:20AM - 11:30AM Location: E450A

Participants
Inyoung Youn, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Min Jung Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Eun-Kyung Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hee Jung Moon, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jung Hyun Yoon, MD, Seongnam, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jieun Koh, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose

PURPOSE

The purpose of our study was to assess the positive predictive value (PPV), as a measure of the diagnostic yield, of ultrasound (US)-guided fine-needle aspiration (US-FNA) and cancer detection rate for incidentally detected abnormal axillary lymph node (LN) in patients who underwent screening US.

METHOD AND MATERIALS

We retrospectively reviewed 72 LNs of 69 patients (mean age, 44.9 years) who underwent US-FNA for incidentally detected abnormal axillary LNs on 50,488 screening US during January 2005 to December 2011. The PPV of US-FNA and cancer detection rate were calculated. We evaluated US images for LN size, abnormal findings (hilum loss, eccentric cortical thickening, round shape, extranodal extension or marked hypoechoic cortex), and mammography for the identification of abnormal LNs. The PPV of each finding were also calculated.

RESULTS

The PPV of US-FNA and cancer detection rate was 2.8% (2/72) and 0.004% (2/50,488). The mean measurements for long axis, short axis, and cortical thickening of the LNs were 14.9±5.9 mm, 8.5±3.5 mm, and 5.8±2.8 mm. Of the positive LNs, US findings of hilum loss, eccentric cortical thickening, and extranodal extension were found, and each corresponding PPV was 6.3% (1/16), 1.8% (1/56), and 14.3% (1/7), respectively. The PPV of mammography was 14.3% (1/7).

CONCLUSION

Our results suggest that the PPV of US-FNA and the cancer detection rate for incidentally detected abnormal axillary LNs during screening US are too low to recommend axillary US during breast US screening and that follow-up is acceptable for abnormal LNs detected during screening breast US that do not have extranodal extension or are negative on mammography.

Follow-up US would be acceptable for abnormal LNs detected during screening breast US that did not have extranodal extension or were negative in mammography.

SSK02-07   Microcalcifications in Breast Cancers Affect Ultrasound Dtrain Elastography

Wednesday, Dec. 2 11:30AM - 11:40AM Location: E450A

Participants
Yumi Kashikura, MD,PhD, Tsukuba, Japan (*Presenter*) Nothing to Disclose
Ei Ueno, MD, PhD, Tsukuba, Japan (*Abstract Co-Author*) Nothing to Disclose
Eriko Tohno, MD, Tsukuba, Japan (*Abstract Co-Author*) Nothing to Disclose
Takeshi Umemoto, MD, Tsukuba, Japan (*Abstract Co-Author*) Nothing to Disclose
Isamu Morishima, Tsukuba, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Some non-palpable breast cancer lesions may exhibit false-negative findings on ultrasound strain elastography. This study aims to investigate the causes of such false-negative findings.

METHOD AND MATERIALS

Between January 2012 and December 2014, 196 patients with pTis to pT1b breast cancer underwent surgery at our hospital. We retrospectively divided the patients into 2 groups by the presence or absence of microcalcifications and compared their elastography data. The presence or absence of calcifications was confirmed by mammography (MMG), and negative lesions were reconfirmed by microscopy. Elastography was performed by several experienced physicians and sonographers, and each physician classified the images according to the 1 to 5 scale of the Tsukuba Elasticity Score. Considering the effect of previous interventions, patients with a history of core needle biopsy and vacuum-assisted biopsy were excluded from the study. Accordingly, 79 patients were excluded and 117 cases were included.

RESULTS

Microcalcifications were absent in 51 (43.6 %) lesions and present in 66 (56.4 %) lesions. The presence of calcifications was microscopically confirmed in 14 patients. Of the lesions without calcifications, 1 (2.0%), 15 (29.4%), 15 (29.4%), and 23 (45.1%) showed elasticity scores of 2, 3, 4, and 5, respectively, while of those with calcifications, 3 (4.5%), 14 (21.2%), 16 (24.2%), 16 (24.2%), and 17 (25.8%) showed elasticity scores of 1, 2, 3, 4, and 5, respectively. Assuming that scores of 3, 4, and 5 indicate positive findings, the overall sensitivity was 84.6 %, while sensitivity for the lesions with and without calcifications was 74.2% and 98.0%, respectively (P = 0.003). When the presence of microcalcifications was judged only by MMG, the sensitivity for the lesions with and without calcifications was 73.1% and 96.9%, respectively. As strain elastography is based on combined autocorrelation, microcalcifications seem to cause an apparent strain even though the tissue is harder than normal.

CONCLUSION

Although breast ultrasound elastography shows high sensitivity, our study revealed an obvious difference in sensitivity between the lesions with and without microcalcifications.

CLINICAL RELEVANCE/APPLICATION

Clinicians should be careful while evaluating breast ultrasound strain elastography findings for lesions with microcalcifications on mammography.

SSK02-08   Mass-like Focal Breast Fibrosis - A Benign Entity Mimicking Malignancy on Ultrasonography

Wednesday, Dec. 2 11:40AM - 11:50AM Location: E450A

Participants
Eleonora Horvath, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Aleen V. Altamirano, MD, Masaya, Nicaragua (*Presenter*) Nothing to Disclose
Eduardo Soto, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Marcela Uchida, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Miguel A. Pinochet, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Claudio S. Silva Fuente-Alba, MD, MSc, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Marcela Gallegos, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Jocelyn Galvez, Vitacura, Chile (*Abstract Co-Author*) Nothing to Disclose
Maria Flavia Pizzolon, MD, Vitacura, Chile (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the sonographic characteristics of core biopsy-proven Mass-like Focal Breast Fibrosis (MFBF).

METHOD AND MATERIALS

IRB approved, retrospective study. Between April 2007 and January 2015, 3051 US-guided breast biopsies with 14G core needle, were performed, 251 of them with a diagnosis of stromal breast fibrosis. We excluded 128 cases where fibrosis was not the primary histologic diagnosis. Only MFBF cases were included, histopathologically defined as a localized area of dense fibrous tissue associated with hypoplastic mammary ducts and lobules, without vascular structures and inflammatory changes. Imaging features were tabulated and analyzed. Follow-up imaging was reviewed to document lesion stability.

RESULTS

In 121 women (median age: 50 years, range: 25-83) we found 123 cases of MFBF (incidence: 4%). Lesion size ranged from 4 to 35 mm (median: 10 mm), non-palpable in 94% of the cases. Eighty-seven (71%) of them developed in highly or heterogeneously dense breast (ACR 4 and 3). Only 7 (6%) were evident on mammography. We identified two distinct sonographic patterns of MFBF. Pattern A (28%): well-circumscribed, hypoechoic, avascular mass. Pattern B (72%): ill defined, irregular, avascular, markedly hypoechogenic or spiculated lesion with or without a definable mass and markedly shadowing, located intraparenchymatous or under Cooper ligament. Sixty-seven (54%) lesions were reported as BI-RADS 5, 4C or 4B. MRI study was performed in 7 patients with negative outcome. One lesion was surgically removed and in 4 patients a new large (8G) core biopsy was performed due to radio-histological discordance, obtaining the same results. Patients remain in follow-up (median: 30 months, range: 2 to 94 months), without malignancy.

CONCLUSION

The mass-like focal breast fibrosis is a benign entity with the potential to mimic malignancy. Is important that radiologists know the specific US patterns and if proven on core needle biopsy, it may be taken as a concordant diagnosis.

CLINICAL RELEVANCE/APPLICATION

We report a large series of MFBF, detailing its US-pattern. Should these US patterns be identified, it is reasonable to accept this benign histopathological diagnosis postbiopsy as concordant.

SSK02-09   Hypoechoic Non-mass Lesion on Screening Breast Ultrasound

Wednesday, Dec. 2 11:50AM - 12:00PM Location: E450A

Participants
Jin Hwa Lee, MD, Busan, Korea, Republic Of (*Presenter*) Nothing to Disclose
Cherie M. Kuzmiak, DO, Chapel Hill, NC (*Abstract Co-Author*) Research Grant, FUJIFILM Holdings Corporation;
Ji Hyun Lee, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jong-Young Oh, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hee-Jin Kwon, MD, Busan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The current ACR BI-RADS lexicon only covers mass lesions. The purpose of this study is to determine the significance of hypoechoic non-mass lesion (HNML) which is recognized during screening breast ultrasound (SBUS).

METHOD AND MATERIALS

An IRB approved retrospective database review was performed from March 2008 to June 2012 of patients who had SBUS. The indications of SBUS at our institution were asymptomatic patients with dense breast tissue on mammography, routine follow-up of a BI-RADS category 3 lesion with 2 years of stability or a biopsy-proven benign lesion on prior examination, and postoperative screening after surgery for breast cancer. We included patients with HNML on ultrasound and with no suspicious finding on mammography. Excluded from the study were lesions related to the past history of biopsy or operation at the area of HNML. A HNML was defined as a hypoechoic area that does not conform to the definition of a mass and has different character from that of surrounding glands or the same area in the contralateral breast. The final diagnoses were based on pathology results and clinical or sonographic follow-up more than 12 months. We calculated the incidence and likelihood of malignancy of the HNML on SBUS.

RESULTS

A total of 17868 SBUS were performed on 8856 asymptomatic patients. Ninety-six HNMLs were detected in 89 patients (1.0%). On final pathology or follow-up of HMLs, three (3.1%) lesions were malignant, 78 (81.3%) lesions were benign, and two (2.1%) lesions were high risk. In addition, there were 13 (13.5%) lesions that were lost to follow-up or without final surgical pathology. The likelihood of malignancy of a HNML on SBUS was 3.1%.

CONCLUSION

The likelihood of malignancy for a hypoechoic non-mass lesion on SBUS was greater than 2%. Therefore, it should be classified as a BI-RADS category 4 lesion and tissue diagnosis is warranted.

CLINICAL RELEVANCE/APPLICATION

Large prospective studies are needed to further validate which management recommendation is most appropriate for the HNML on SBUS.

ISP: Gastrointestinal (Pancreas Benign Diseases)

Wednesday, Dec. 2 10:30AM - 12:00PM Location: E353B

| GI | CT | MR | US |

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

Participants
Elizabeth M. Hecht, MD, New York, NY (*Moderator*) Nothing to Disclose
Koenraad J. Mortele, MD, Boston, MA (*Moderator*) Nothing to Disclose
Atif Zaheer, MD, Baltimore, MD (*Moderator*) Nothing to Disclose

Sub-Events

SSK07-01 Gastrointestinal Keynote Speaker: Update on Imaging Benign Pancreatic Diseases

Wednesday, Dec. 2 10:30AM - 10:40AM Location: E353B

Participants
Koenraad J. Mortele, MD, Boston, MA (*Presenter*) Nothing to Disclose

SSK07-02 Using T1 Mapping for the Diagnosis of Mild Chronic Pancreatitis

Wednesday, Dec. 2 10:40AM - 10:50AM Location: E353B

Participants
Temel Tirkes, MD, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose
Jordan K. Swensson, MD, Indianapolis, IN (*Presenter*) Nothing to Disclose
Chen Lin, PhD, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose
Qun Zhong, MD, PhD, Fuzhou, China (*Abstract Co-Author*) Nothing to Disclose
Qiushi Wang, MD, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose
Evan Fogel, MD, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose
Fatih Akisik, MD, Indianapolis, IN (*Abstract Co-Author*) Nothing to Disclose
Kumaresan Sandrasegaran, MD, Carmel, IN (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine if the pancreatic signal intensity on T1 mapping can be used to diagnose mild chronic pancreatitis.

METHOD AND MATERIALS

This retrospective study analyzed patients with suspected chronic pancreatitis who underwent MRI between March 2014 and December 2014. All MRI studies were performed on 3.0 T Magnetom Verio (Siemens Medical Solutions, Malvern, PA) scanner. T1 mapping was acquired with gradient echo sequence using TR 3.87 ms, TE 1.32, flip angles of 2° and 13°, NEX of 1 and matrix of 320x168. Of 127 patients scanned, patients < 18 years age, and those with acute pancreatitis, pancreatic neoplasm, iron overload, or cystic fibrosis were excluded from the analysis. Patients were grouped as normal or mild chronic pancreatitis based on secretin-enhanced MR pancreatography using the Cambridge classification. There were 55 normal and 21 patients with mild chronic pancreatitis. Region of interest (ROI) measurements (~1cm2) were drawn in the homogenous regions of the head, body and tail of the pancreas by two independent and blinded reviewers. The two-tailed t-test was used to determine differences of T1 relaxation times between the normal and mild CP patients. Receiver operating characteristic (ROC) curve analysis was performed to determine the accuracy of the T1 relaxation time as a differentiating criterion.

RESULTS

There was a significant difference ($p< 0.0001$) in the T1 relaxation times of the pancreas between the normal (mean 819 ms, 95%CI: 739-898) and mild chronic pancreatitis (mean: 1141 ms, 95%CI: 1027-1255) groups. T1 relaxation time cut off value of 1000 ms was 72% sensitive (95%CI: 48-89) and 75% specific (95%CI: 61-85) for the diagnosis of mild chronic pancreatitis (AUC=0.80, p<0.0001). There was substantial inter-observer agreement (kappa=0.74) of measured T1 relaxation times.

CONCLUSION

There is significant difference in the T1 relaxation times of the pancreas between the normal and mild chronic pancreatitis patients.

CLINICAL RELEVANCE/APPLICATION

T1-mapping may be a practical imaging technique for diagnosis of mild chronic pancreatitis.

Honored Educators

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

Temel Tirkes, MD - 2013 Honored Educator
Temel Tirkes, MD - 2014 Honored Educator
Kumaresan Sandrasegaran, MD - 2013 Honored Educator
Kumaresan Sandrasegaran, MD - 2014 Honored Educator
Fatih Akisik, MD - 2014 Honored Educator

SSK07-03 Quantitative MRI Evaluation of the Pancreatic Parenchyma in Diabetes Mellitus

Participants
Fabio A. Uyeno, MD, Sao Carlos, Brazil (*Presenter*) Nothing to Disclose
Jorge Elias JR, MD, PhD, Ribeirao Preto, Brazil (*Abstract Co-Author*) Nothing to Disclose
Natalia P. Ito, MD, Ribeirao Preto, Brazil (*Abstract Co-Author*) Nothing to Disclose
Iana M. Araujo, Ribeirao Preto, Brazil (*Abstract Co-Author*) Nothing to Disclose
Adriana L. Carvalho, Ribeirao Preto, Brazil (*Abstract Co-Author*) Nothing to Disclose
Francisco A. Paula, Ribeirao Preto, Brazil (*Abstract Co-Author*) Nothing to Disclose
Valdair F. Muglia, MD, PhD, Ribeirao Preto, Brazil (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the pancreatic fat fraction and ADC in healthy, obese and diabetic (type 1 and 2) subjects

METHOD AND MATERIALS

A retrospective study of abdominal MR images of 89 subjects (56 controls incluing obese subgroup; 33 diabetics) was carried out. Two radiologists reviewed all images independently and proceed the calculation of pancreatic fat fraction through in and out-of-phase GRE T1-weighted sequences, and the ADC through diffusion with maximum b=1000. Pancreatic fat fractions and average values of ADC were obtained and compared.

RESULTS

We observed significant differences between pancreatic fat fractions of diabetics type 2 (DM2) and healthy and diabetic type 1 (DM1) individuals, with p values of 0.01 and 0.02 for men and 0.02 and 0.01 for women, with good interobserver reliability (intraclass correlation coefficients > 0.8). Obese non-diabetic sujects showed high pancreatic fat fraction similar to DM2. There was also a significant difference in ADC values between DM2 and DM1 and healthy individuals (p: 0.02 and 0.03 in males; p: 0.002 and 0.001 in females), lower in DM2.

CONCLUSION

We observed significantly higher pancreatic fat fractions in DM2, when compared to healthy and DM1 subjects. This finding favors the hypothesis of fatty infiltration of the organ as a possible associated causal factor to the pancreatic beta cells failure, although obese subjects had pancreatic fat fractions similar to DM2.

CLINICAL RELEVANCE/APPLICATION

Pancreatic fatty infiltration ocurring can be evaluated by MRI and its role in Diabetes Mellitus need further assessment.

SSK07-04   Co-existing Liver and Pancreas Steatosis Related to Chronic Non-alcoholic Liver Diseases (NALD) but not to Viral Infection

Participants
Manuela Franca, MD, Porto, Portugal (*Presenter*) Nothing to Disclose
Angel Alberich-Bayarri, MD, Valencia, Spain (*Abstract Co-Author*) Nothing to Disclose
Luis Marti-Bonmati, MD, PhD, Godella, Spain (*Abstract Co-Author*) Nothing to Disclose
Joao A. Oliveira, Porto, Portugal (*Abstract Co-Author*) Nothing to Disclose
Francisca E. Costa, MD, Porto, Portugal (*Abstract Co-Author*) Nothing to Disclose
Jose Ramon Vizcaino Vazquez, Porto, Portugal (*Abstract Co-Author*) Nothing to Disclose
Helena Pessegueiro Miranda, Porto, Portugal (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Liver steatosis is related to metabolic syndrome but is also present in other diffuse liver diseases. Pancreas steatosis may be also present in association with steatohepatitis and metabolic syndrome. However, little is known about pancreas fat deposition in other diffuse liver diseases such as viral hepatitis.Our purpose was to assess the Proton Density Fat Fraction (PDFF) of the liver and pancreas, with a multiecho GRE MR sequence, in patients with diffuse liver diseases, and to evaluate the relationship between fat infiltration of both organs and the influence of the underlying liver disease.

METHOD AND MATERIALS

The study population included consecutive patients with diffuse liver disorders and clinically indicated liver biopsy, who underwent a 3T MR examination using a single breath-hold multiecho chemical shift GRE sequence with 12 echoes. PDFF quantification was performed with magnitude and phase reconstruction, T1 and T2* biases corrected, selecting a ROI in the biopsied liver segment and also in 3 pancreatic regions (head, body, tail). Differences of liver and pancreas PDFF between histologic grades were assessed by ANOVA tests. The relationship between liver and pancreas PDFF values and histologic grading was assessed with Spearman correlation analysis. Furthermore, the study population was categorized by clinical diagnosis (chronic viral hepatitis vs. chronic NALD).

CONCLUSION

We found a significant correlation between liver and pancreas PDFF quantification, in patients with NALD but not in patients with viral hepatitis.

CLINICAL RELEVANCE/APPLICATION

Fat deposition in liver and pancreas appears to be related in patients with chronic non-alcoholic disease but not in chronic viral hepatitis.

SSK07-05   Intravoxel Incoherent Motion Diffusion-weighted MR Imaging in Characterizing Tumorous and Inflammatory Pancreatic Diseases

Participants
Bohyun Kim, MD, Suwon, Korea, Republic Of (*Presenter*) Nothing to Disclose
Seung Soo Lee, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yu Sub Sung, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jin Hee Kim, 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
Jae Ho Byun, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the feasibility of intravoxel incoherent motion (IVIM) parameters in differentiating acute pancreatitis, autoimmune pancreatitis (AIP), neuroendocrine tumor (NET), solid pseudopapillary tumor (SPT), pancreatic ductal adenocarcinoma (PAC), and normal pancreas.

METHOD AND MATERIALS

The institutional board approved this retrospective study, and informed consent was waived. We evaluated IVIM diffusion-weighted images (10 b values for 0 to 900 sec/mm^2) of 104 consecutive patients (mean age, 53.7 years; M:F=58:46) with pathologically confirmed pancreatic neoplasms (n =54; 15 NETs, 9 SPTs, and 30 PACs) > 2cm, acute pancreatitis (n =13), AIP (n =7), and normal pancreas (n =30). The slow diffusion coefficient (Dslow), fast diffusion coefficient (Dfast), and perfusion fraction (f) were measured on two consecutive sections covering the largest part of the lesions. The differences in IVIM parameters among the diagnoses of pancreatic lesions were compared using the ANOVA test and the post-hoc Bonferroni multiple comparisons test.

RESULTS

PAC had significantly lower f values (0.13 ± 0.06) than normal pancreas (0.24 ± 0.05), NET (0.21 ± 0.06), and acute pancreatitis (0.25 ± 0.01) and significantly lower Dfast values (20.0 ± 12.6 x 10^-3mm^2/sec) than normal pancreas (48.2 ± 23.9 x 10^-3mm^2/sec) (P<.05). For AIP, f value (0.14 ± 0.06) was significantly lower than that of normal pancreas (P<.05). Dfast values of acute pancreatitis (25.4 ± 14.6 x 10^-3mm^2/sec), NET (26.5 ± 19.9 x 10^-3mm2^/sec), and SPT (17.8 ± 9.5 x 10^-3mm^2/sec) were lower than that of normal pancreas. Although the Dslow of AIP (1.06 ± 0.19 x 10^-3mm^2/sec) were lower than normal pancreas (1.14 ± 0.15 x 10^-3mm^2/sec) and the other pancreatic diseases, the difference was not statistically significant.

CONCLUSION

Perfusion related parameters (f and Dfast) are more helpful in characterizing pancreatic diseases than Dslow . PAC and AIP are characterized by decreased perfusion fraction (f) compared with normal pancreas.

CLINICAL RELEVANCE/APPLICATION

IVIM is feasible for assessing the different perfusion and diffusion characteristics of pancreatic diseases.

SSK07-06 Evaluation of Pancreatic Exocrine Insufficiency by Cine-Dynamic MRCP Using Spatially Selective IR Pulse: Correlation with Severity of Chronic Pancreatitis based on Morphological Changes of Pancreatic Duct

Participants
Kazuya Yasokawa, Kurashiki, Japan (*Presenter*) Nothing to Disclose
Katsuyoshi Ito, MD, Okayama, Japan (*Abstract Co-Author*) Nothing to Disclose
Tsutomu Tamada, MD, PhD, Kurashiki, Japan (*Abstract Co-Author*) Nothing to Disclose
Akira Yamamoto, MD, Kurashiki, Japan (*Abstract Co-Author*) Nothing to Disclose
Akihiko Kanki, MD, Kurasiki, Japan (*Abstract Co-Author*) Nothing to Disclose
Daigo Tanimoto, MD, Kurashiki, Japan (*Abstract Co-Author*) Nothing to Disclose
Yasufumi Noda, Kurashiki, Japan (*Abstract Co-Author*) Nothing to Disclose
Ayumu Kido, Kurashiki, Japan (*Abstract Co-Author*) Nothing to Disclose
Teruyuki Torigoe, Kurashiki, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Recent study showed a significantly positive correlation between secretion grades of pancreatic juice at cine dynamic MRCP with a selective inversion recovery (IR) pulse and pancreatic exocrine function test. This study evaluated pancreatic exocrine insufficiency by cine-dynamic MRCP using spatially selective IR pulse in patients with chronic pancreatitis in correlation with the severity of morphological changes of pancreatic duct.

METHOD AND MATERIALS

41 patients with suspected chronic pancreatitis underwent cine-dynamic MRCP with a spatially selective IR pulse. Mean secretion grading score (5-point scale) based on the moving distance of pancreatic juice inflow on cine-dynamic MRCP was assessed. Based on the previous report, cutoff value of secretion grade less than 0.70 in cine-dynamic MRCP was used for the criterion of pancreatic exocrine insufficiency. Mean secretion grades were compared with Cambridge grade which defined the severity of chronic pancreatitis based on morphological changes of pancreatic duct.

RESULTS

In comparisons among patient groups with Cambridge grade1 (normal; n=6), 2 (equivocal; n=3), 3 (mild; n=6), 4 (moderate; n=9) and 5 (severe; n=17), median secretion grading score of Cambridge5 (score=0) was significantly lower than Cambridge1-4 (1.13, 0.55, 0.50, 0.15; P<0.001, P<0.015, P<0.002, P<0.028, respectively). In all 17 patients in Cambridge5, secretion grading score was less than 0.70. Median secretion grading score of Cambride1 was significantly higher than Cambridge3-5 (P<0.030, P<0.011, P<0.001, respectively). In Cambridge2-4, there were no significant differences in secretion grading score between any groups. In Cambridge2, secretion grading score was less than 0.70 in 2 (67%) of 3 patients showing pancreatic exocrine insufficiency. Conversely, in Cambridge3 and 4, secretion grading score was more than 0.70 in 3 (20%) of 15 patients showing normal pancreatic exocrine function.

CONCLUSION

It should be noted that the degree of morphological changes of pancreatic duct does not necessarily reflect the severity of pancreatic exocrine insufficiency at cine-dynamic MRCP in Cambridge grade 2-4 (equivocal to moderate) chronic pancreatitis.

CLINICAL RELEVANCE/APPLICATION

Cine-dynamic MRCP with selective IR pulse may have a potential to evaluate pancreatic exocrine insufficiency in patients with Cambridge grade 2-4 (equivocal to moderate) chronic pancreatitis.

SSK07-07   Imaging Evaluation of Ablative Margin and Index Tumor Immediately after Combined Treatment of TACE and RF Ablation for Hepatocellular Carcinoma: Comparison between Multi-detector CT and MR Imaging

Wednesday, Dec. 2 11:30AM - 11:40AM Location: E353B

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

PURPOSE

To prospectively compare multi-detector CT and MR imaging in assessment of ablative margin (AM) and index tumor within ablation zones immediately after combined treatment of transcatheter arterial chemoembolization (TACE) and radiofrequency (RF) ablation for hepatocellular carcinoma (HCC)

METHOD AND MATERIALS

Based on our preliminary data, necessary number of patients was estimated to be at least 30 when an α error of 0.05 and a β error of 0.2 were applied. A total of 33 consecutive patients with 45 HCCs, who had successfully undergone contrast-enhanced CT and MR imaging after RF ablation combined with TACE, was enrolled in this study. CT and MR imaging were performed within 3 and 7 hours after completion of combined therapy of TACE and RF ablation, respectively. Both CT and MR images were reviewed in consensus by two radiologists in two separate sessions regarding visual discrimination between AM and index tumor and status of AM within ablation zones. The status of AM was classified as AM plus (AM completely surrounded tumor), AM zero (AM was partly discontinuous, without protrusion of tumor beyond postulated border of ablated area) and AM minus (AM was partly discontinuous, with protrusion of tumor). Any ablation zone with AM plus or AM zero was considered as imaging evidence to predict technical effectiveness, which was based on one-month follow-up CT, as well as to represent technical success.

RESULTS

With CT and MR imaging, visual discrimination between AM and index tumor was possible in 34 (75.6%) and 40 (88.9%) of 45 ablation zones, respectively (P = .1094). Among 34 and 40 ablation zones in which status of AM could be evaluated on CT and MR imaging, AM status was categorized into AM plus (n=25 and 31, respectively), AM zero (n=9 and 8, respectively) and AM minus (n=0 and 1, respectively). The technical effectiveness was noted in all of ablation zones on one-month follow-up CT. Based on CT and MR imaging, technical success and effectiveness were determined to be achieved in 34 (75.6%) and 39 (86.7%), respectively (P= .1797).

CONCLUSION

There was no significant difference in assessment of ablative margin and index tumor within ablation zones immediately after combined treatment of TACE and RF ablation between CT and MR imaging.

CLINICAL RELEVANCE/APPLICATION

CT and MR imaging have equivalent ability to evaluate technical success immediately after combined treatment of TACE and RFA. Thus, MR imaging may not be necessary.

SSK07-08   Methodology for True Dynamic Contrast-Enhanced MRI of Pancreatic Lesions

Wednesday, Dec. 2 11:40AM - 11:50AM Location: E353B

Participants
Eric Paulson, Milwaukee, WI (*Presenter*) Nothing to Disclose
Paul M. Knechtges, MD, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose
Beth A. Erickson, MD, Milwaukee, WI (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Dynamic contrast-enhanced (DCE) MR imaging offers promise to improve the diagnosis, therapy planning, and response assessment of pancreatic lesions. However, organ motion arising from respiration and peristalsis can challenge voxel-wise estimation of pharmacokinetic (PK) parameters in abdominal DCE-MRI. We introduce here a novel methodology to correct DCE-MRI datasets for inter-scan motion, facilitating true voxel-wise DCE-MRI in the abdomen.

METHOD AND MATERIALS

Five patients with pancreatic cancer were imaged at 3T. An anti-peristaltic agent (glucagon, 1mg IV) was administered to suppress bowel motion. Multi-flip angle breath hold images (2/5/15/25 deg) were acquired using a 3D Dixon VIBE sequence. A time series of 16 breath hold 3D Dixon VIBE images was then acquired before (3), during (1), and after (12) bolus administration of contrast (0.1 mmol/kg, Multihance). Deformable image registration (DIR) software was used to construct deformation vector fields (DVFs) required to align the fat-only Dixon (FD) images at each time point to one pre-contrast FD reference image. The DVFs were then applied to the corresponding water-only Dixon (WD) images at each time point to motion-correct the DCE-MRI time series. Baseline

T1 maps were estimated using a linearized Ernst model fit to the multi-flip angle WD images. PK parameters (Ktrans, kep, ve, vp) were estimated on a voxel-wise basis by fitting of the linearized Extended Tofts model to concentration-time curves constructed using the motion-corrected WD images.

RESULTS

FD images were robust against spatial and temporal variations in signal intensity arising from wash-in and wash-out of contrast, facilitating construction of DVFs. Applying the FD-derived DVFs to WD successfully corrected the WD images for inter-scan motion arising from inconsistent breath holds, facilitating voxel-wise PK parameter estimation for all patients studied. The methodology facilitated extraction of late-arterial phase images for conventional radiologic interrogation.

CONCLUSION

The novel use of Dixon and DIR facilitates voxel-wise estimation of PK parameters from abdominal DCE-MRI datasets. Future work will incorporate Dixon with radial k-space sampling to improve intra-scan motion robustness during breath hold acquisitions.

CLINICAL RELEVANCE/APPLICATION

Potential to improve disease diagnosis, therapy selection and planning, and response assessment of abdominal organs (e.g., pancreas, liver, kidneys, etc).

SSK07-09 Test-retest Reliability of 3D-EPI MR Elastography in Pancreas

Wednesday, Dec. 2 11:50AM - 12:00PM Location: E353B

Participants
He An, Shenyang, China (*Presenter*) Nothing to Disclose
Yu Shi, PhD, Shengyang, China (*Abstract Co-Author*) Nothing to Disclose
Qiyong Guo, MD, Shenyang, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The aim of the study is to conduct a rigorous evaluation of the repeatability of pancreas stiffness assessed by 3D echo-planar-imaging magnetic resonance elastography (3D-EPI MRE) in healthy volunteers, patients with chronic pancreatitis and pancreatic ductal adenocarcinoma (PDAC).

METHOD AND MATERIALS

A repeatability study using 3D-EPI MRE was conducted in 5 healthy volunteers and 8 patients confirmed by histopathologic examinations (5 with PDAC and 3 with chronic pancreatitis). Subjects were scanned by using a GE 3.0 T MR scanner to assess the mean stiffness of the tumors in PDAC cases, the parenchyma of pancreas in chronic pancreatitis cases and healthy volunteers with a multi-slice EPI pulse sequence(timepoint 1). Direct inversion algrithm with 3D post-processing was used to estimate shear stiffness and generate stiffness maps. Subjects were re-evaluated one day later (timepoint 2).Stiffness was measured by 2 independent analysts (one with three and another with one year experience of MRE measurement).

RESULTS

For the 2 analysts, the mean stiffness in all subjects was highly reproducible with intraclass correlation coefficient (ICC) of 0.975(95% confidence interval [CI]: 0.944-0.989) across timepoints (r=0.973,P<0.001). Bland-Altman analysis showed mean stiffness difference was 0.01kPa(95% agreement limits:-0.54-0.55kPa). For the 2 timepoints, the ICC was 0.973(95% CI: 0.940-0.988) across the 2 analysts (r=0.975,P<0.001). Bland-Altman analysis showed the stiffness difference was 0.05kPa(95% agreement limits:-0.51-0.62kPa).The averaging stiffness value was 1.46±0.21kPa for chronic pancreatitis and 3.28±1.09kPa for PDAC, in contrast with 1.11±0.08kPa for normal pancreas.

CONCLUSION

3D MRE is a highly reproducible modality for assessing stiffness of pancreas.

CLINICAL RELEVANCE/APPLICATION

It is suggested to incorporate MRE into a standard MRI study, which offers stable and accurate stiffness of pancreas and pancreatic masses relatively.

Genitourinary (Functional Imaging of the Kidneys)

Wednesday, Dec. 2 10:30AM - 12:00PM Location: E450B

`GU` `MR` `US`

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

Participants
Harriet C. Thoeny, MD, Bern, Switzerland (*Moderator*) Nothing to Disclose
Zhen J. Wang, MD, Hillsborough, CA (*Moderator*) Nothing to Disclose

Sub-Events

SSK08-01   **Assessing the Role of Quantification of Shear Wave Velocity and Tissue Elasticity in the Detection of Interstitial Fibrosis within the Transplant Kidney**

Wednesday, Dec. 2 10:30AM - 10:40AM Location: E450B

Participants
David Ferguson, MBBCh, Vancouver, BC (*Presenter*) Nothing to Disclose
Amdad M. Ahmed, MBChB, FRCR, Birmingham, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Mohammed F. Mohammed, MBBS, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Caitlin Schneider, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Christopher Nguan, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Alison C. Harris, MBChB, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Novel ultrasound techniques allow for the assessment of tissue fibrosis. One such technique ('Virtual Touch IQ') allows for both qualitative and quantitative measurement of shear wave velocity to assess tissue strain and detect underlying fibrosis. Using this technique, in the setting of renal allograft failure, we aim to compare the gold standard of renal biopsy and histological grade with that of shear wave velocity measurement to evaluate for potential underlying interstitial fibrosis.

METHOD AND MATERIALS

Patients undergoing renal biopsy for renal graft dysfunction within the ultrasound department were enrolled prospectively over an eight-month period. In addition to routine routine renal ultrasound with Doppler imaging, shear wave velocity measurements using 'Virtual Touch IQ' were obtained from the target area for renal cortical biopsy. Sufficient magnitude of the shear wave was confirmed on quality display. Biopsies were performed and reviewed by a nephropathologist, blinded to the imaging results, with histological categorization according to the Banff classification.Shear wave velocities and histological grade were compared to determine significance. Statistical analysis was performed using the Mann Whitney test and Spearman-correlation-coefficient (rho).

RESULTS

Fourteen patients were identified and subcategorized according to the Banff category with respect to interstitial fibrosis as normal (n=4), grade 1(n=4), grade 2 (n=3) and grade 3(n=3). Median shear wave velocity was demonstrated to be significantly higher in renal transplants with biopsy proven interstitial fibrosis (median=2.512m/s) than those without interstitial fibrosis (median=1.925m/s) (Mann Whitney U=4, n1=4, n2=10, p<0.05). Positive correlation was also identified between the mean shear wave velocity and Banff categories (rho= 0.731, p=0.003).

CONCLUSION

Preliminary data indicates that shear wave velocity within cortex of the transplant kidney correlates significantly with interstitial fibrosis in the context of renal allograft failure.

CLINICAL RELEVANCE/APPLICATION

Shear wave velocity analysis is a potentially valuable non-invasive tool to assess for renal allograft interstitial fibrosis.

SSK08-02   **Improved Temporal Resolution and Image Contrast for Kidney DCE-MRI by 3D Spoiled Gradient-recalled Echo Sequence with Compressed Sensing**

Wednesday, Dec. 2 10:40AM - 10:50AM Location: E450B

Participants
Kai Zhao, PhD, Beijing, China (*Presenter*) Nothing to Disclose
Bin Chen, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Jue Zhang, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Xiaoying Wang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To verify the feasibility of combine Compressed Sensing (CS) technique in dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) of kidney

METHOD AND MATERIALS

Nine healthy New Zealand rabbits underwent kidney DCE-MRI studies on a clinical 3.0T MR scanner. 3D spoiled gradient-recalled echo sequence modified with CS scheme was scanned before and after the administration of 0.05 mmol/kg of Gd-DTPA with the following parameters: TR = 3.3ms, TE = 1.3ms, FA = 15°, slice thickness = 3 mm, matrix =128×128, FOV = 180mm and 16 slices were acquired. Four accelerations (2-x, 3-x, 4-x, 8-x) were scanned as well as the fully sampling every other day for each animal in

DCE MR imaging. The contrast-to-noise ratio (CNR) and signal-to-noise ratio (SNR) of the reconstructed images of the kidney were analyzed and compared to that of the fully sampled images separately.

RESULTS

The images with 2-X, 3-X, 4-X, 8-X CS acceleration and fully sampled results were shown from row 1 to row 5. The 8-X accelerated images appeared blurring which may due to the loss of a mass of high frequency information (Figure 1).Signal intensity curves of cortex and medulla were represented in Figure 2. The reconstructions of 8-X were also blurring.Superior CNR performance between cortex and tissue CNR_ct, and medulla and tissue CNR_mt were found for all the time points after contrast administration. CNR_ct of CS reconstructed images were significantly larger than that of the conventional fully sampled images at all accelerations throughout the enhancement (p<.01 for 2-X; p<.001 for 3-X and 4-X). CNR_mt of CS reconstructed images were also significantly larger than that of the fully sampled images (p<.01 for 2-X; p<.001 for 3-X and 4-X). CNR_cm measured from cortical and medullary regions were larger in CS reconstructed images, especially at the initial time of enhancement: 44.00 10.0 for 2-X, 43.30 8.0 for 3-X and 49.78 14.9 for 4-X vs. 15.28 6.7 for 1-X (p<.001 for all) (Table 1).In SNR analysis, SNR-cortex (SNR_c) and SNR-medulla (SNR_m) of CS reconstructed images were all found statistically different from conventional fully sampled images (p<.001) (Table 2).

CONCLUSION

Compressed sensing is a feasible and promising acceleration method to improve temporal resolution and image contrast in renal DCE-MRI.

CLINICAL RELEVANCE/APPLICATION

CS is a promising imaging method with both improved temporal resolution and image contrast, which will be widely used in the future.

SSK08-03   Noninvasive Evaluation of Stable Renal Allograft Function Using Shear-Wave Elastography

Wednesday, Dec. 2 10:50AM - 11:00AM Location: E450B

Participants
Jung Jae Park, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Chan Kyo Kim, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Beom Jun Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Byung Kwan Park, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Protocol renal allograft biopsies improve outcomes via early detection and treatment of subclinical rejection (SCR). Shear-wave elastography (SWE) assesses quantitatively the tissue elasticity. The aim of our study was to investigate the feasibility of SWE in evaluating patients with stable renal allograft function who underwent protocol biopsies.

METHOD AND MATERIALS

95 patients (mean age, 48.3 years; range, 21-73 years) with stable renal allograft function who underwent ultrasound (US)-guided protocol biopsies at 10 days or 1 year after transplantation were enrolled in this retrospective study. All US and elasticity examinations of renal allograft were performed by a commercial scanner using a convex transducer (C5-1 ElastoPQ, Philips iU 22). SWE was performed immediately before protocol biopsies. Tissue elasticity (kPa) in the cortex was measured for all renal allografts. Clinical and US variables were compared between patients with SCR and without SCR using the Student t -test. The correlation between estimated glomerular filtration rate (eGFR) and tissue elasticity was evaluated in all patients by Pearson correlation. Diagnostic performance of tissue elasticity to distinguish between patients with SCR and without SCR was analyzed using a receiver operating characteristics (ROC) curve analysis.

RESULTS

Acute rejection (AR) was pathologically confirmed in 34 patients. The mean tissue elasticity of ARs (31.0 ± 12.8 kPa) was statistically greater than that no ARs (24.5 ± 12.2 kPa) (P < 0.001), while the resistive index values did not show statistical difference between ARs and no ARs (P = 0.112). Clinical variables including age, kidney size, creatinine and eGFR revealed statistical differences between ARs and no ARs (P < 0.05). Tissue elasticity demonstrated a moderate negative correlation with eGFR (correlation coefficient= -0.604, P < 0.001). At ROC curve analysis, the area under the curve (AUC) of tissue elasticity was 0.651 and followed eGFR (AUC= 0.728).

CONCLUSION

SWE, as a noninvasive tool, may be feasible in distinguishing between allograft with SCR and without SCR in patients with stable renal function. Moreover, it may demonstrate functional state of renal allografts.

CLINICAL RELEVANCE/APPLICATION

As a feasible technique, shear-wave elastography may help to noninvasively assess functional state of patients with stable renal allograft function.

SSK08-04   Assessment of Renal Allograft Function Early after Transplantation Using Renal IVIM with Healthy as Control

Wednesday, Dec. 2 11:00AM - 11:10AM Location: E450B

Participants
Lihua Chen, Tianjin, China (*Presenter*) Nothing to Disclose
Tao Ren, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose
Wen Shen, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose
Panli Zuo, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Graft dysfunction is a common complication following transplantation,which is associated with allograft survial. Intravoxel incoherent

motion (IVIM) has potential to assess renal function in patients with renal and allograft dysfunction. The purpose of the current study in renal allografts early after transplantation was to investigate relationship between estimated glomerular filtration rate (eGFR) and diffusion and perfusion parameters calculated using IVIM imaging, compared with healthy kidney, and to gain the sensitive IVIM parameters for monitoring allograft function.

METHOD AND MATERIALS

A total of 71 subjects were performed on a 3.0T MRI scanner (MAGNETOM Trio, a Tim system, Siemens AG, Erlangen, Germany) using IVIM sequence with 11 b values(0, 10, 20, 40, 60, 100, 150, 200, 300, 500, and 700 s/mm2). Subjects were divided into 3 groups: group 1, healthy volunteers (n=19); group 2, allografts with good allograft function(eGFR≥60mL/min/1.73m2, n=33); group 3, allografts with impaired allograft function(eGFR<60mL/min/1.73m2, n=19).To separate the perfusion and diffusion, a bi-exponential fit was used to calculate the diffusion coefficient of slow (ADCslow); the diffusion coefficient of fast (ADCfast) and perfusion fraction (FP). Differences in IVIM parameters between the cortex and medulla in each group were compared using paired samples t test. Differences of IVIM parameters between three groups were compared using LSD test.Relationships between eGFR and IVIM parameters were assessed using spearman correlation coefficient.

RESULTS

The ADC, ADCslow, Fp values of renal cortex were significantly higher in group 1 and group 2 compared to group 3(all p<0.01). The ADC, ADCslow values of renal medulla were significantly higher in group 1 and group 2 compared to group 3(all p<0.01). For allografts, significant differences in ADC, ADCslow, FP values of renal cortex and ADC, ADCslow values of renal medulla were observed between group 2 and group 3. In renal allografts, there was a significant positive correlation between eGFR and ADC, ADCslow , Fp value of cortex, ADC, ADCslow value of medulla(all p<0.05).

CONCLUSION

The ADC, ADCslow, FP values of renal cortex and ADC, ADCslow values of renal medulla may be useful for detect renal allograft dysfunction. IVIM technique is a reliable imaging for evaluating and monitoring allograft function.

CLINICAL RELEVANCE/APPLICATION

IVIM technique can be used to evaluate and monitor allograft function

SSK08-05   Renal Hemodynamics and Oxygenation Evaluated by ASL, BOLD and Oxygen Extraction Fraction (OEF) Imaging in Animal Model of Diabetic Nephropathy

Wednesday, Dec. 2 11:10AM - 11:20AM Location: E450B

Awards
Trainee Research Prize - Medical Student

Participants
Rui Wang, PhD, Beijing, China (*Presenter*) Nothing to Disclose
Xiaoying Wang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Xuedong Yang, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Kai Zhao, PhD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Xueqing Sui, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Zhiyong Lin, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the feasibility of evaluating renal hemodynamics and oxygenation changes by arterial spin labeling (ASL), blood oxygen level dependent (BOLD) and oxygen extraction fraction (OEF) imaging in diabetic nephropathy (DN) rabbits.

METHOD AND MATERIALS

Seventeen New Zealand rabbits were divided into 2 groups: DN group, 12 rabbits with intravenously injection of alloxan at 100 mg/kg; and control group, 5 rabbits with injection of same dosage of 0.9% saline. At 72hr after the injection, blood glucose level was tested for all. Rabbits with blood glucose level higher than 16.0 mmol/L were considered as successfully established of diabetes mellitus (DM) model. MR examination was performed at 3T MR scanner (GE) with an 8-channel knee coil. For each rabbit, 2 times of MR exam were performed: baseline (before injection) and 72hr after model established successfully. ASL imaging was conducted with the labeling strategy of flow-sensitive alternating inversion recovery (FAIR) and BOLD was conducted with multiple gradient echo (mGRE) sequence. The measurement of renal OEF was derived from Yoblonsky's model with multi-echo gradient and spin echo (MEGSE) sequence. Then the rabbits were sacrificed for pathological study of the kidney. Quantitative RBF, R2* and OEF values were obtained within manually drawn ROIs, including cortex (CO) and outer medulla (OM). One-way ANOVA and paired-sample T test was performed to test the differences of RBF, R2* and OEF for inter- and inner-group.

RESULTS

Ten of 12 rabbits in DN group were successfully established DM model and renal pathological damages can be observed in these rabbits. There was no statistically significant difference of RBF, R2* or OEF between two groups at baseline (p>0.05). Compared with baseline, R2* and OEF in OM at 72 hr was significantly increased in DN group (p=0.018 and 0.048, respectively), while the control group was not (p>0.05). In CO, R2* also elevated significantly at 72 hr compared with baseline (p=0.04). For control group, there was no significant difference in CO or OM between baseline and 72 hr (p>0.05).

CONCLUSION

The combination of ASL, BOLD and OEF MRI may enable a comprehensive assessment of the functional status of early DN pathophysiological changes.

CLINICAL RELEVANCE/APPLICATION

It would be valuable for clinicians to early detect renal pathophysiological changes for diabetes without symptoms.

SSK08-06   Diffusion Weighted Imaging and Diffusion Tensor Imaging for Detection of Acute Kidney Injury in Patients Following Lung Transplantation

Participants
Susanne Tewes, MD, Hannover, Germany (*Presenter*) Nothing to Disclose
Gregor Warnecke, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Mi-Sun Jang, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Dagmar Hartung, MD, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Matti Peperhove, MD, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Marcel Gutberlet, Dipl Phys, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Christine Fegbeutel, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Bjoern Juettner, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Axel Haverich, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Frank K. Wacker, MD, Hannover, Germany (*Abstract Co-Author*) Research Grant, Siemens AG Research Grant, Pro Medicus Limited
Faikah Gueler, MD, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose
Katja Hueper, Hannover, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Loss of renal function is a frequent complication after lung transplantation (lutx) and is associated with higher morbidity. Thus, imaging biomarkers to noninvasively monitor renal damage and to guide treatment strategies to preserve renal function are of clinical relevance. The purpose was to evaluate diffusion weighted imaging (DWI) and diffusion tensor imaging (DTI) for detection of renal impairment in lutx-patients.

METHOD AND MATERIALS

54 patients 14±2 days after lutx and 12 healthy volunteers underwent MRI on a 1.5T scanner. Respiratory-triggered DWI (10 b-values, 0-1000 s/mm²) and DTI sequences (20 diffusion direction, b=0,600 s/mm²) were acquired. Maps of apparent diffusion coefficient (ADC) and fractional anisotropy (FA) were calculated. Renal function was monitored daily and acute kidney injury (AKI) was defined according to AKIN-criteria within 48h after surgery. Factors contributing to AKI such as duration of surgery, immunosuppressive drugs and blood product infusion were documented. Statistical analysis comprised ANOVA and correlation analysis. Values are given as mean±SEM.

RESULTS

59% (32/54) of lutx-patients developed AKI. ADC of renal medulla was significantly lower in patients with AKI compared to patients without AKI (2.07±0.03 vs 2.17±0.04*10⁻³ mm²/s, p<0.05) and to healthy volunteers (2.07±0.03 vs 2.21±0.03*10⁻³ mm²/s, p<0.01). FA-values of renal medulla were significantly reduced compared to healthy volunteers in both groups (AKI: 0.27±0.01, no AKI: 0.28±0.01, healthy: 0.33±0.02, p<0.001), and did not differ between patients with and without AKI. ADC and FA negatively correlated with the amount of blood product infusion (r=-0.41 and r=-0.42, p<0.01) and ADC was correlated with eGFR at the day of MRI (r=-0.52, p<0.001). No correlations with duration of surgery and tacrolimus levels at the day of the MRI were observed.

CONCLUSION

Diffusion imaging showed significant renal changes in lutx-patients compared to healthy volunteers irrespective of whether AKI was diagnosed according to standard criteria. ADC reduction was stronger in patients with AKI. Amount of blood product infusion correlated with MRI parameters and may be a contributing factor to renal damage following major surgery.

CLINICAL RELEVANCE/APPLICATION

Diffusion imaging detects renal damage following major surgery and may help to improve patient management to prevent further renal damage.

SSK08-07   Evaluation of Ultra-fast, Single Breath-Hold Renal ASL Perfusion-Preliminary Results of Healthy Volunteers

Participants
Melissa Ong, MD, Mannheim, Germany (*Presenter*) Nothing to Disclose
Thorsten Honroth, Bremen, Germany (*Abstract Co-Author*) Research funded, Siemens AG
Guenther Matthias, Bremen, Germany (*Abstract Co-Author*) Research funded, Siemens AG
Bernd Kuehn, PhD, Erlangen, Germany (*Abstract Co-Author*) Nothing to Disclose
Stefan O. Schoenberg, MD, PhD, Mannheim , Germany (*Abstract Co-Author*) Institutional research agreement, Siemens AG
Daniel Hausmann, MD, Mannheim, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Evaluation of 3D ultra-fast, single breath-hold arterial spin labeling magnetic resonance imaging (ASL MRI) for the measurement of renal perfusion.

METHOD AND MATERIALS

We included 7 (5 male, mean age 29) healthy volunteers who did not suffer from any medical condition. A single-shot pulsed ASL (PASL) prototype sequence with a 3D GRASE readout using background suppression was implemented on a 3.0 Tesla Magnetom Skyra MRI scanner (Siemens Healthcare, Erlangen, Germany). 24 slices with a resolution of 4.7mm x 4.7mm x 4mm were acquired for 4 different inflow times (TI = 750ms, 1000ms, 1250ms, 1500ms) within a single breath-hold of 23s, including an integrated calibration scan (M0). The prototype sequence allowed a multi-slice measurement of the whole kidney in one exam. The exam was performed using a standard 18-channel body matrix coil. No contrast agent was applied. Subjective image quality was rated by two radiologists according to a 5-point Likert-scale (5=excellent; 1=non-diagnostic). Mean renal cortical and medullary blood flow was measured in the upper and lower pole of the kidney.

RESULTS

All images were rated as diagnostic. Overall image quality was rated as good (4; 25-75% quartile 3-4). Mean cortical perfusion values were 224±28 mL/100mL/min for the upper and 224±37 mL/100mL/min for the lower pole, mean medullary perfusion value

ranged between 107±16 mL/100mL/min and 101±14 mL/100mL/min for the upper and lower pole, respectively.

CONCLUSION

Ultra-fast, single breath-hold renal ASL perfusion in healthy volunteers shows promising results regarding image quality and feasibility.

CLINICAL RELEVANCE/APPLICATION

Ultra-fast, single breath-hold ASL perfusion facilitates contrast-free creation of parametric perfusion maps, which can be repeated arbitrarily and hence potentially serve to monitor therapy.

SSK08-08   Diffusion-weighted Magnetic Resonance Imaging of Kidneys in Patients with Chronic Kidney Disease

Wednesday, Dec. 2 11:40AM - 11:50AM Location: E450B

Participants
Katarzyna M. Sukowska, MD, Warsaw, Poland (*Presenter*) Nothing to Disclose
Piotr Palczewski, MD, Warsaw, Poland (*Abstract Co-Author*) Nothing to Disclose
Agnieszka Furmanczyk-Zawiska, Warsaw, Poland (*Abstract Co-Author*) Nothing to Disclose
Wojciech Szeszkowski, Warsaw, Poland (*Abstract Co-Author*) Nothing to Disclose
Dorota Piotrowska-Kownacka, Warsaw, Poland (*Abstract Co-Author*) Nothing to Disclose
Magdalena Durlik, Warsaw, Poland (*Abstract Co-Author*) Nothing to Disclose
Marek Golebiowski, Warsaw, Poland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the apparent diffusion coefficient (ADC) values of renal parenchyma in patients in different stages of chronic kidney disease (CKD). To correlate ADC measurements with creatinine blood level, estimated glomerular filtration rate (eGFR), and ADC values obtained from healthy subjects.

METHOD AND MATERIALS

20 healthy volunteers and 34 patients in different stages of CKD were examined on a 1.5 unit (Ingenia, Philips, The Netherlands). The inclusion criteria for patients with CKD were: biopsy proven CKD and no hydronephrosis or renal artery stenosis. Blood samples to assess the serum creatinine level were taken immediately before examination. The MR examination included two diffusion weighted sequences: one with 16 b values uniformly distributed from 0 to 750; the other one with 10 b values including 6 low (0-150) and 4 high (300-900) b values. ADC values were measured with whole-kidney manually placed region of interest. Statistical analysis was performed using the Statistica software (version 10.0; Statsoft, Inc., US). Unpaired Student's t-test were used to evaluate the differences in ADC. ROC curves were drawn to find out area under the curve for differentiation of CKD groups and cut-off ADC values were calculated so as to achieve the highest average sensitivity and specificity. To investigate the relationship between ADC values and serum creatinine / eGFR, Pearson's correlation coefficient was calculated by bivariate correlation. All P values <0.05 were taken as statistically significant.

RESULTS

A significant positive correlation between ADC and eGFR and a negative correlation between ADC and creatinine blood level was observed. There were statistical differences between ADC values in healthy individuals and patients in moderate and severe stage of CKD. Based on ADC measurements cut-off values were established allowing for identification of patients with eGFR higher than 60 ml/min/1.73m2 and lower then 30ml/min/1.73m2.

CONCLUSION

The DWI has a potential role in assessing renal function as ADC values correlate with eGFR and the level of renal damage in severe stages of CKD.

CLINICAL RELEVANCE/APPLICATION

The ability of DWI to noninvasively assess eGFR may provide an additional tool for monitoring the course of disease and for stratifying the risk of contrast medium administration in patients with CKD.

SSK08-09   Intravoxel Incoherent Motion MRI for Differentiating Renal Hypoperfusion from Increased Cellularity after Ischemia-Reperfusion

Wednesday, Dec. 2 11:50AM - 12:00PM Location: E450B

Participants
Mike Notohamiprodjo, Munich, Germany (*Presenter*) Nothing to Disclose
Katharina Stella Winter, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Michael Staehler, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Andreas D. Helck, MD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Olaf Dietrich, PhD, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose
Moritz Schneider, Munich, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To differentiate hypoperfusion from inflammatory hypercellularity after renal ischemia-reperfusion due to partial nephrectomy using Intravoxel Incoherent Motion MRI.

METHOD AND MATERIALS

This IRB approved prospective study was performed according to the declaration Helsinki. 15 patients with renal tumors underwent MR at 3T (Magnetom Verio, Siemens Healthcare) directly before and one week after partial nephrectomy. Diffusion weighted imaging was acquired with an EPI-sequence (10 b-values 0-800 s/mm2, 3 averages, 6 directions). IVIM-analysis was performed with home-built software (PMI 0.4, IDL) by biexponential fitting of the tissue Dslow (mm2/s*10-3) and the pseudo-diffusion Dfast (mm2/s*10-3) as well as the perfusion component f (%). Apparent diffusion coefficient (ADC; mm2/s*10-3) was derived from monoexponential

analysis. To compare parameters between baseline and follow-up the paired Wilcoxon signed-rank test and to compare non-nephrectomized and partially nephrectomized kidneys the non-paired Mann-Whitney U test was used.

RESULTS

In the baseline examination prior to partial nephrectomy there were no significant differences between tumor bearing and contralateral kidney, whereas the follow-up measurement showed significant differences for ADC ($p<0.001$), Dfast ($p=0.02$) and most pronounced for f ($p<0.001$). Partially nephrectomized kidneys showed a significant decrease of ADC (2.5 ± 0.3 vs. 2.3 ± 0.2, $p<0.01$), Dfast (8.6 ± 1.8 vs. 7.3 ± 1.7, $p = 0.02$) and again most pronounced for f (19.2 ± 3.0 vs. 13.7 ± 4.4 $p < 0.01$). There were no significant differences for Dslow (operated kidney 2.0 ± 0.2 vs. 2.0 ± 0.2; contralateral kidney 2.1 ± 0.2 vs. 2.0 ± 0.1) Non-nephrectomized contralateral kidneys expressed a significant increase of ADC (2.5 ± 0.2 vs. 2.7 ± 0.3, $p < 0.01$), and f (19.3 ± 2.6 vs. 21.5 ± 4.0, $p = 0.03$). There was no significant correlation of the alteration of each parameter to clamping time.

CONCLUSION

IVIM detects significant changes, particularly of the perfusion fraction in the operated and contralateral kidney after partial nephrectomy suggesting that ischemia-reperfusion associated diffusion restriction is correlated to hypoperfusion rather than increasing inflammatory cellularity.

CLINICAL RELEVANCE/APPLICATION

IVIM MRI suggest that renal ischemia-reperfusion associated diffusion restriction is correlated to hypoperfusion rather than increasing inflammatory cellularity.

Breast Wednesday Poster Discussions

Wednesday, Dec. 2 12:45PM - 1:15PM Location: BR Community, Learning Center

BR

AMA PRA Category 1 Credit ™: .50

Participants
Jiyon Lee, MD, New York, NY (*Moderator*) Nothing to Disclose

Sub-Events

BR260-SD-WEB1 Comparative Diagnostic Value of Two-dimensional Synthesized Mammogram and Conventional Full-field Digital Mammogram for Evaluation of Breast Cancer

Station #1

Participants
Ok Hee Woo, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Gayoung Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Hye Seon Shin, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Seonah Jang, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyu Ran Cho, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Bo Kyoung Seo, MD, PhD, Ansan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare diagnostic efficacy of two-dimensional synthesized mammogram (2D SM) from digital breast tomosynthesis (DBT) and conventional full-field digital mammogram (FFDM) in patients undergone DBT for evaluation of breast cancer

METHOD AND MATERIALS

A retrospective observer performance study on blindly paired 2D SM from DBT and FFDM was performed by 3 radiologists specialized in breast imaging (12 years, 5 years, and 3 years of experience each). Images of biopsy confirmed 258 breast lesions in 229 patients were collected from 21st April, 2014 to 28th February, 2015 in our institution. The diagnostic sensitivities of both 2D SM and FFDM were calculated and compared by McNemar's test and the interobserver agreement on both exams was evaluated by kappa value. Also, detailed lesion characterization by DBT, 2D SM, FFDM, US, and MRI was done according to BI-RADS 2013 and each observer chose better modality between 2D SM and FFDM blindly.

RESULTS

All patients were female and the mean age was 51.6 years (ranged 22-87 years). Among total 258 lesions, 208 were malignant and 49 were benign. The diagnostic sensitivity for malignant lesion of 2D SM was 92.2% and FFDM was 91.1%, and specificity was 91.3% and 87.5% each. AUC of diagnostic accuracy for 2D SM was 0.917 and FFDM was 0.89 which showed no statistically significant difference (p-value 0.573). Kappa values for the interobserver agreement evaluation were 0.973 for observer 1 and 2, 0.944 for 2 and 3, and 0.972 for 1 and 3 which showed almost perfect interobserver agreement. The observers chose 2D SM as a better modality in 20.54%, FFDM in 3.49%, and equal in 75.97%, and especially spiculated margin and architectural distortion were more clearly detectable in 2D SM (p-value <0.05).

CONCLUSION

2D SM showed equivalent diagnostic values as compared with FFDM. Overall characterization of the lesion was better in 2D SM, and especially 2D SM showed statistically significant superiority in evaluation of spiculated margin and architectural distortion.

CLINICAL RELEVANCE/APPLICATION

Evaluation with 2D SM in symptomatic patients with suspicious breast lesion and indicated for DBT might help to avoid additional radiation exposure.

BR261-SD-WEB2 Volumetric Breast Density and Mean Glandular Dose Estimated from Digital Breast Tomosynthesis Projections and Digital Mammograms

Station #2

Participants
Susie Lau, Kuala Lumpur, Malaysia (*Abstract Co-Author*) Nothing to Disclose
Kwan Hoong Ng, PhD, Kuala Lumpur, Malaysia (*Abstract Co-Author*) Nothing to Disclose
Yang Faridah Abdul Aziz, Kuala Lumpur, Malaysia (*Abstract Co-Author*) Nothing to Disclose
Ralph P. Highnam, PhD, Wellington, New Zealand (*Presenter*) CEO, Matakina Technology Limited; CEO, Volpara Solutions Limited
Ariane Chan, PhD, Wellington, New Zealand (*Abstract Co-Author*) Employee, Matakina Technology Limited;

PURPOSE

To compare the volumetric breast density (VBD) and mean glandular dose (MGD) assessments using an automated VBD measurement system on digital breast tomosynthesis (DBT) projections and digital mammograms (DM) obtained on a DBT system.

METHOD AND MATERIALS

An automated VBD measurement system (Volpara Version 1.5.1) was used to analyze and compare the fibroglandular tissue volume (FGV), breast volume (BV), VBD and MGD from DBT projections and DM, including cranial-caudal (CC) and mediolateral oblique (MLO) views, for 315 women (mean age: 58±10 years) acquired with the combo procedure on a DBT system (Hologic Selenia Dimensions).

RESULTS

The mean FGV, BV, VBD and MGD estimated using DBT projections were 49.6±30.7 cm3, 591.2±338.0 cm3, 9.6±5.1 % and 2.1±0.6 mGy, respectively. While using DM, the mean FGV, BV, VBD and MGD estimated were 50.2±30.6 cm3, 593.2±338.7 cm3, 9.9±5.4 % and 1.9±0.8 mGy, respectively. There were strong, positive correlations between FGV, BV, VBD and MGD estimated from DBT projections and those from DM, which were highly statistically significant (p<0.0001), with r = 0.95, 1.00, 0.94 and 0.85, respectively. There was substantial agreement between the density grades (VDG 1, VDG 2, VDG 3, VDG 4) evaluated using DBT projections and DM with weighted κ = 0.79 (p<0.0001). The MGD reported by the DBT system were found to be generally lower than those estimated by the automated VBD measurement system for both DBT projections and MD, respectively.

CONCLUSION

Our study showed the results obtained from the DBT projections agreed well with those obtained from DM. Hence, the automated VBD measurement system can be used to assess volumetric and MGD measurements on both DBT projections and DM acquired on a DBT system.

CLINICAL RELEVANCE/APPLICATION

VBD can be estimated from both DBT projections and DM by using the automated VBD measurement system. Though in good agreement, the MGD reported by the DBT system are generally lower than those estimated by the automated VBD measurement system for both DBT projections and DM.

BR263-SD-WEB4 Which Additional Technique after Negative Mammography Detects More Cancers in Dense Breasts: Tomosynthesis or US?

Station #4

Participants
Maite Millor, MEd, Pamplona, Spain (*Presenter*) Nothing to Disclose
Paula Garcia Barquin, MD, Pamplona, Spain (*Abstract Co-Author*) Nothing to Disclose
Luis Pina, MD, PhD, San Sebastian, Spain (*Abstract Co-Author*) Nothing to Disclose
Arlette Elizalde, Pamplona, Spain (*Abstract Co-Author*) Nothing to Disclose
Paula Martinez Miravete, Zaragoza, Spain (*Abstract Co-Author*) Nothing to Disclose
Begona Olartecoechea, Pamplona, Spain (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

It is well known that the sensitivity of Digital Mammography (DM) drops in dense patterns (c and d). Both US and Digital Breast Tomosynthesis (DBT) can detect additional cancers in these patterns. Our aim was to evaluate which additional technique (DBT and/or US) can detect more cancers in dense patterns (c and d).

METHOD AND MATERIALS

We retrospectively reviewed 110 breast cancers in 84 patients. All of them underwent DM (using conventional 45º MLO and CC views) as well as complementary DBT (45º MLO view using a wide angle acquisition technique) and hand held US. 60 cancers were detected by DM and the remaining 50 cancers (not seen on DM) were detected by additional DBT, US, MRI or surgical specimen. Out of these 50 additional cancers, 36 were diagnosed in dense breasts (ACR patterns "c" and "d"). These 36 cancers were evaluated by one single reader, blinded to the final diagnosis. Initially the reader evaluated all the DBT studies as positive or negative. Four weeks later the same reader assessed the US exams. The sensitivities of both techniques were calculated and compared using a McNemar test (SPSS 20.0).

RESULTS

DBT detected 13/36 cancers (36.1%), US detected 22/36 cancers (61.1%), DBT + US detected 26/36 cancers (72.2%). The remaining 10/36 cancers were detected by preoperative MRI and or by the pathologist in the surgical specimen. Comparing the additional tumors detected by DBT and US, the sensitivity of US was significantly superior to the sensitivity of DBT (p=0.035).

CONCLUSION

According to our results, additional US had a higher sensitivity than DBT in dense breasts.

CLINICAL RELEVANCE/APPLICATION

Breast cancers can be occult in dense patterns "c" and "d". Additional techniques such as Ultrasound and Tomosynthesis have proven to detect additional cancers. In our experience, US is superior to Tomosynthesis to detect cancers that are not visible on digital mammography.

BR264-SD-WEB5 US Evaluation for Axillary Lymph Node in Breast Cancer Patients with Clinically Negative Axilla

Station #5

Participants
Ga Ram Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Eun Young Ko, MD, PhD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Boo-Kyung Han, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Eun Sook Ko, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ji Soo Choi, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the role of US evaluation for the axillary lymph nodes in the patients with T1 or T2 stage breast cancers and clinically negative axilla

METHOD AND MATERIALS

In this study, we reviewed the clinical records, US reports, and surgical results and 5-year follow up data of 1463 patients underwent breast cancer surgery from January to December 2009. We excluded 309 patients who received neoadjuvant

chemotherapy before surgery or who had ductal carcinoma in situ, or had recurrent breast cancer after previous axillary surgery. Among the remaining 1154 patients, 1105 patients had T1 or T2 breast cancers and included in this study. We reviewed the records of physical examination for axillary status by breast surgeons and selected the patients with clinically negative axilla, US assessment for their axillary lymph node status, and pathology of the surgical results.

RESULTS

Among the 1105 patients with T1 or T2 stage of breast cancers, 142 had palpable axillary lymph nodes and 963 had clinically negative axilla. In 963 patients with clinically negative axilla, 305 patients (31.7%) had metastatic axillary lymph nodes. US detected suspicious lymph nodes in 119/305 (39%) patients among them. Patients with suspicious lymph nodes on US (n=250) had metastatic axillary lymph nodes in 47.6% (119/250), the mean number of metastatic lymph nodes after axillary dissection was 4.8, and 42% of the patients had 3 or more metastatic lymph nodes. On the other hand, patients with negative US findings (n=713) had metastatic axillary lymph nodes in 26.1% (186/713), the mean number of metastatic lymph nodes was 2.7, and 28% of the patients had 3 or more metastatic lymph nodes.

CONCLUSION

In patients with T1 or T2 stage of breast cancer and clinically negative axilla, positive US finding suggested 39% probability and large number (4.8) of metastatic axillary lymph nodes, which needs subsequent axillary dissection. Metastatic lymph nodes in patients with clinically and sonographically negative axilla were small in number (2.7).

CLINICAL RELEVANCE/APPLICATION

The results of this study will provide the basis of preoperative sonographic evaluation for the axillary lymph node in the patients with T1 or T2 stage breast cancers.

BR265-SD-WEB6 — Pre-treatment Cross-sectional Imaging to Evaluate for N3 Disease in Breast Cancer Patients Undergoing Neoadjuvant Therapy: Can We Predict Pathologic Nodal Stage and Tailor Locoregional Therapy?

Station #6

Participants
Tara L. Anderson, MD, Rochester, MN (*Presenter*) Nothing to Disclose
Tina Hieken, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Brittany Murphy, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Katrina N. Glazebrook, MBChB, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose
Lyndsay D. Viers, MD, Rochester, MN (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Cross-sectional imaging is performed in breast cancer patients undergoing neoadjuvant therapy (NAC) and may identify extra-axillary and level III axillary disease. Our aim was to investigate the effect of radiologic nodal staging on pathological N stage at operation and to explore how this might aid surgical and radiotherapy treatment planning.

METHOD AND MATERIALS

With IRB approval, we reviewed pre-NAC breast MRI, PET/CT, and CT imaging and clinicopathologic data on 348 breast cancer patients with imaging available for review undergoing NAC followed by operation at our institution 1/2008-9/2013. We defined abnormal lymph node findings on MRI, CT, and PET/CT to include cortical thickening, FDG-avidity, and loss of fatty hilum. Patients were assigned a radiologic N (rN) stage based on imaging findings. Statistical analysis was performed using JMP 10.1 software.

RESULTS

Pre-NAC imaging included axillary ultrasound in 338 patients (97%), breast MRI in 305 (88%), and PET/CT or CT in 215 (62%). 213 (61%) were biopsy-proven axillary lymph node-positive (LN+) pre-NAC. cT stage was T1 in 9%, T2 in 49%, T3 in 29%; median tumor size was 4 cm. 163 were ER+/HER2-, 64 ER+/HER2+, 31 ER-/HER2-, and 89 ER-/HER2-. Pre-NAC rN stage was rN0 in 92 (26%), rN1 in 167 (48%), and rN3 in 89 (26%). rN3 disease included level III axillary, supraclavicular, and suspicious internal mammary LNs in 47 (53%), 32 (37%), and 45 (52%), respectively. Of patients LN+ at diagnosis, 78 (37%) were rN3. After NAC, 162 patients (47%) were LN+ at operation with a median (mean) of 3 (5.9±0.4) positive LNs including 128/213 (60%) LN+ at diagnosis. Pre-NAC rN stage correlated with the likelihood and extent of axillary disease at operation, p=0.002. 54 of 89 rN3 patients (61%) were LN+ at operation with a median (mean) of 5 (8±1) LN+. rN3 patients had larger metastasis (median 9 vs 6 mm) and more extranodal extension (61% vs 43%) both p<0.03.

CONCLUSION

Information on rN stage from pre-NAC cross-sectional imaging informs the likelihood and extent of axillary nodal disease at operation. This information may be used to inform patient expectations and for surgical and radiotherapy treatment planning.

CLINICAL RELEVANCE/APPLICATION

The benefit of MRI or PET/CT prior to neoadjuvant therapy to assess level III and extra-axillary nodal disease in breast cancer patients is unknown. These modalities predicted pN stage at operation.

BR266-SD-WEB7 — Diagnostic Performance and Reproducibility of Breast Acoustic Radiation Force Impulse (ARFI) Imaging in the Clinical Setting

Station #7

Participants
Panagiotis Kapetas, Vienna, Austria (*Presenter*) Nothing to Disclose
Ramona Woitek, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Paola Clauser, MD, Udine, Italy (*Abstract Co-Author*) Nothing to Disclose
Maria Adele Marino, MD, Messina, Italy (*Abstract Co-Author*) Nothing to Disclose
Mukta D. Mahajan, MBBS, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose
Katja Pinker-Domenig, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose

Maria Bernathova, Wien, 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

Pascal A. Baltzer, MD, Vienna, Austria (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate breast acoustic radiation force impulse (ARFI) imaging within the clinical setting regarding its diagnostic performance and its reproducibility.

METHOD AND MATERIALS

One hundred and eleven patients (mean age 50.7 years) with one hundred and thirteen breast lesions receiving ARFI imaging (Virtual Touch IQ ™, Siemens Acuson S3000, 9 MHz transducer) as part of their diagnostic ultrasound workup were investigated between June 2013 and October 2014. Two independent ARFI measurements of identified lesions were performed by two out of a pool of seven experienced radiologists. Regions of Interest (ROI) were placed into the lesion and the shear wave velocities (SWV) were measured. The overall examination time was below 1 minute for each examiner. ROC-analysis was used for calculating diagnostic performance of SWV measurements, whereas the intraclass correlation coefficient (ICC) was used to evaluate the reproducibility of the measurements.

RESULTS

There were 69 benign and 44 malignant lesions. All measurements showed equal diagnostic performance as measured by the Area under the ROC curve (0.863 and 0.858 for each examiner respectively; $p>0.05$). A cut-off value of ~3.4 m/s revealed a sensitivity and specificity of 81.8/82.6% (examiner 1) and 72.7/94.2% (examiner 2. The SWV measurements of both observers showed almost perfect agreement (ICC= 0.97, CI 0.96-0.98).

CONCLUSION

ARFI provides quantitative data valid for differentiation between benign and malignant breast lesions. The measurements acquired are reproducible by different investigators.

CLINICAL RELEVANCE/APPLICATION

ARFI measurements are fast and can help differentiate benign from malignant lesions and can thus be implemented into routine ultrasound workup of breast lesions.

BR156-ED-WEB8   The Autologously Reconstructed Breast

Station #8

Participants
Jane L. Hur, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose

Alexander B. Sevrukov, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

Understand clinical indications for, anatomy of, and surgical technique involved in creating the autologously reconstructed breast. Understand normal imaging appearance of the autologously reconstructed breast on mammogram, ultrasound, and MRI. Become familiar with the clinical presentation of, risk factors for, and imaging appearance of recurrence in a reconstructed breast. Recognize clinical features and imaging findings related to complications unique to the reconstructed breast. Learn how anatomy and vasculature of a flap affects biopsy considerations.

TABLE OF CONTENTS/OUTLINE

Clinical and surgical considerations for flap formation Clinical indications and contraindications Preoperative planning: CTA and MRA protocols Anatomy of flap reconstruction Surgical technique Normal sonographic, mammographic, and MRI appearance TRAM DIEP Latissimus Dorsi SGAP Imaging features of malignancy within a flap Clinical presentation and risk factors Locations of recurrence: skin, nipple-areolar complex, chest wall Knowledge of vascular anatomy for biopsies Discussion of imaging for monitoring after mastectomy Clinical presentation and imaging findings of complications unique to flap reconstruction Infection Seroma Hematoma Fat necrosis Radiation changes Scarring

MSCU41

Case-based Review of US (An Interactive Session)

Wednesday, Dec. 2 1:30PM - 3:00PM Location: S406A

VA **IR** **US**

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

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

LEARNING OBJECTIVES

1) Recognize the diverse applications of ultrasound throughout the body and when it provides the optimal diagnostic imaging choice. 2) Understand the fundamental interpretive parameters of ultrasound contrast enhancement and its applications in the abdomen. 3) Know the important factors to consider when choosing ultrasound vs CT for image guided procedures and how to optimize ultrasound for technical success.

ABSTRACT

Ultrasound is a rapidly evolving imaging modality which has achieved widespread application throughout the body. In this course we will address the major anatomic areas of ultrasound use, including the abdominal and pelvic organs, superficial structures and the vascular system. Challenging imaging and clinical scenarios will be emphasized to include the participant in the decision-making process. Advanced cases and evolving technology will be highlighted, including the use of ultrasound contrast media as a problem solving tool, and the appropriate selection of procedures for US-guided intervention.

Sub-Events

MSCU41A   Problem Solving with Contrast Enhanced Ultrasound

Participants
Stephanie R. Wilson, MD, Calgary, AB (*Presenter*) Research Grant, Lantheus Medical Imaging, Inc; Equipment support, Siemens AG; Equipment support, Koninklijke Philips NV

LEARNING OBJECTIVES

1) Attendees will appreciate the multiple varied applications for CEUS in the abdomen. 2) They will recognize the value of CEUS as a real time procedure with exquisite sensitivy to its contrast agent allowing for superior detection of arterial phase vascularity. 3) They will realize the safety of CEUS with no requirement for ionizing radiation, and no nephrotoxicity for evaluation of any problems requiring contrast enhancement in those with renal failure. 4) They will understand the fundamentals for interpretation of contrast enhancement patterns for the noninvasive diagnosis of focal liver masses and other pathology.

ABSTRACT

MSCU41B   Image Guided Intervention: When Is Ultrasound Best?

Participants
Michael D. Beland, MD, Providence, RI (*Presenter*) Consultant, Hitachi, Ltd

LEARNING OBJECTIVES

1) Understand factors to consider when choosing ultrasound versus CT as a modality for image guidance. 2) Review the potential challenges and advantages of ultrasound for procedure guidance. 3) Demonstrate the variety of cases for which ultrasound can be used to perform image guided procedures and learn some techniques for maximizing success.

ABSTRACT

Image-guided procedures are commonly performed. There are several important considerations when selecting an appropriate imaging modality to guide the procedure. Ultrasound has several advantages over CT but there are also limitations. These advantages and disadvantages will be reviewed, including various factors to consider when evaluating a case for a potential procedure. When ultrasound is used, there are techniques which may offer increased likelihood of success or decreased procedural time. Through multiple case presentations, this session will review the considerations and techniques for successful ultrasound guided interventions.

MSCU41C   Vascular Ultrasound Update

Participants
Laurence Needleman, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

Breast Imaging (Ultrasound Advanced Applications)

Wednesday, Dec. 2 3:00PM - 4:00PM Location: E451B

BR **US**

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

FDA Discussions may include off-label uses.

Participants
Sughra Raza, MD, Boston, MA (*Moderator*) Nothing to Disclose
Catherine S. Giess, MD, Wellesley, MA (*Moderator*) Nothing to Disclose

Sub-Events

SSM02-01 The Utility of Ultrasound Superb Microvascular Imaging for Evaluation of Vascularity in Solid Breast Masses: Comparison with Color and Power Doppler Imaging-Interobserver Variability and Diagnostic Performance

Wednesday, Dec. 2 3:00PM - 3:10PM Location: E451B

Participants
Ah Young Park, MD, Ansan , Korea, Republic Of (*Presenter*) Nothing to Disclose
Bo Kyoung Seo, MD, PhD, Ansan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyu Ran Cho, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ok Hee Woo, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyoonsoon Jung, Anyang, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jaehyung Cha, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Seon Jeong Oh, MD, Ansan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the utility of ultrasound Superb Microvascular Imaging (SMI) for evaluation of solid breast masses by comparing with conventional Doppler imaging.

METHOD AND MATERIALS

A total of 191 solid breast masses in consecutive 169 patients were prospectively evaluated with color Doppler (CDI), power Doppler (PDI) and SMI before core needle biopsy between February 2014 and March 2015. Three breast radiologists analyzed number, distribution (peripheral, central, or both), and morphology (dot, linear, branching or tortuous/penetrating) of vessels within the masses, and assessed BI-RADS categories on gray-scale images and all vascular images of each mass. These features were correlated with pathological results. We evaluated interobserver variability in imaging analyses with intraclass correlation and compared diagnostic performance between gray-scale imaging only and combined use of gray-scale and each vascular imaging, CDI, PDI, and SMI for discrimination between benign and malignant masses with receiver operating characteristic (ROC) curve analysis. In addition, we used Kruskal-Wallis test to determine whether three vascular imaging techniques had significant difference.

RESULTS

Pathological diagnoses revealed 92 cancers and 99 benign lesions. Interobserver variability was excellent in assessment of BI-RADS categories and analyses of vascular images (range of intraclass correlation coefficients, 0.86-0.98). SMI showed more number of vessels and more frequent central or both distribution and branching or tortuous/penetrating morphology than CDI and PDI (P<.0001). In the diagnostic performance, the area under the ROC curve (AUC) was the best in combined use of gray-scale and SMI (AUC=0.815) when compared with other modalities (AUC=0.774 for gray-scale only, 0.789 for combined use of gray-scale and CDI, and 0.791 for combined use of gray-scale and PDI) and this was statistically significant (P<.0001).

CONCLUSION

SMI is superior to CDI or PDI in the demonstration and characterization of vascularity in solid breast masses. The combined use of gray-scale and SMI can improve the diagnostic performance for the differentiation of benign and malignant breast masses.

CLINICAL RELEVANCE/APPLICATION

SMI is a recommendable technique for evaluation of tumor vascularity in the breast and could be a supportive tool for the differentiation between benign and malignant breast masses.

SSM02-02 Shear Wave Elastography Assessed with Maximum Visual Color Stiffness in Breast Lesions: The Role as a Complementary Study on B-mode US

Wednesday, Dec. 2 3:10PM - 3:20PM Location: E451B

Participants
Shin Ho Kook, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Seon Hyeong Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yoon Jung Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jung Eun Lee, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Inyoung Youn, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the diagnostic performance of shear-wave elastography (SWE) with maximum visual color elasticity assessment in addition to B-mode US and the value as a complementary study on B-mode US in breast lesions.

METHOD AND MATERIALS

From Jan 2011 to Dec 2013, 1621 lesions (1293 benign, 328 malignant) of 1561 patients (mean age, 50.5) who underwent B-mode US and SWE before biopsy were included. The size and BI-RADS final assessment of B-mode US features of each lesion were recorded. Color SWE was retrospectively assessed with maximum color stiffness, using the color scale. Two cut-off values as blue (<40kPs, group 1) or blue to green (<80kPs, group 2) were used as benign reference points to differentiate from malignant lesions. Diagnostic performance (sensitivity, specificity, PPV, NPV and diagnostic accuracy) of each B-mode US, color SWE, and combination of two modalities were statistically evaluated.And they were also evaluated according to the lesion size (<1cm, 1-2 cm, 2-3cm, 3cm <).

RESULTS

SWE with maximum visual color elasticity assessment showed improvement of 1.3 and 0.9% in specificity and 8.5 and 5.1% in PPV by adding color SWE on B-mode US in group 1 and 2 (p<0.001), without improvement of overall diagnostic accuracy. The sensitivity, specificity, PPV, NPV and diagnostic accuracy are as follows; 75.5%, 95.9%, 84.5%, 93% and 91.3% for B-mode only, and 38.3%, 97.2%, 93%, 61.9% and 68.2% in group 1, 52.8%, 96.8%, 89.6%, 79.7% and 81.7% in group 2 for combination of B-mode and color SWE respectively. Combination of B-Mode US and SWE results, according to the lesion size showed improvement of 1.1-1.8% in specificity and 5.1-17.8% in PPV in group 1 and 2. There was statistical significance in the lesions less than 2 cm in group 1 and 2 (p<0.001).

CONCLUSION

SWE with maximum visual color elasticity assessment added to B-mode US revealed improvement of specificity and PPV (P<0.001), without improvement of overall diagnostic accuracy. And it could be helpful as a complementary study to reduce the false positive diagnosis with confidence before making the decision of biopsy.

CLINICAL RELEVANCE/APPLICATION

B-mode US shows high sensitivity and relatively low specificity. SWE can decrease false positive by adding on B-mode US as a complementary tool with higher specificity and PPV than B-mode US

SSM02-03   Downclassification of Suspicious Breast Masses Using Opto-Acoustic Imaging

Wednesday, Dec. 2 3:20PM - 3:30PM Location: E451B

Participants
Erin I. Neuschler, MD, Chicago, IL (*Presenter*) Nothing to Disclose
A. Thomas Stavros, MD, San Antonio, TX (*Abstract Co-Author*) Advisor, Devicor Medical Products, Inc; Advisor, General Electric Company; Advisor, SonoCine, Inc; Owner, Ikonopedia, LLC; Medical Director, Seno Medical Instruments, Inc;
Philip T. Lavin, PhD, Framingham, MA (*Abstract Co-Author*) Research Consultant, Seno Medical Instruments, Inc
Michael J. Ulissey, MD, Auburn, WA (*Abstract Co-Author*) Consultant, Seno Medical Instruments, Inc; Stockholder, Tractus Company Limited

PURPOSE

Diagnostic specificity remains disappointingly low for methodologies optimized to achieve near 100% sensitivity. Seno Medical's opto-acoustic (OA) imaging fuses real time co-registered, interleaved laser optic and ultrasound imaging showing dual functional findings (hemoglobin de-oxygenation) and morphology (angiogenesis) for breast masses using a hand-held probe. A 100 subject pilot study, conducted as part of a larger pivotal study, was evaluated for the potential ability of OA to downgrade BI-RADS (BR) scores in benign masses, specifically whether masses originally scored BR 4a or 4b could be downgraded to either BR 3 or 2 and if masses coded BR 3 could be downgraded to 2.

METHOD AND MATERIALS

7 independent readers (IRs) and the expert radiologist (ER) trainer blindly assessed all 102 masses from the 100 pilot study cases using only OA without any knowledge of clinical data or outcome. There were 75 biopsied masses (39 benign, 36 malignant). Gray-scale ultrasound images were taken with the OA device immediately prior to the OA exam. Later, the IRs assigned a BR score to these images, the internal ultrasound control (IUC). IRs were trained by the ER to identify and score three OA internal features and two OA external features for all masses. They were then immediately offered the results of two nomograms (that were calculated from their OA feature scores) to help predict the Probability of Malignancy (POM). A 2% or less POM was used as the threshold to define a mass that could be down classified to BR 3. A 0% POM was used to downgrade a mass to BR 2.

RESULTS

Using OA, the IRs were able to downgrade site-CDU classified BR 3 masses to BR 2 in 33% of cases, BR 4a masses to BR 2 or 3 in 53% of cases, and BR 4b masses to BR 3 or 2 in 33% of cases. Using OA, the IRs downgraded IUC-classified BR 3 masses to BR 2 in 43% of cases, BR 4a to either BR 3 or 2 in 43% of cases, and BR 4b masses to either BR 3 or 2 in 13% of cases. OA (IRs) had 97.6% sensitivity and 44.4% specificity.

CONCLUSION

Benign masses classified as BR 3, 4a and 4b could be potentially downgraded to BR 3 or 2 by using OA with the aid of nomograms. The multi-center 2097 subject pivotal study will allow for confirmation.

CLINICAL RELEVANCE/APPLICATION

Downgrading BR 3, 4a and 4b masses without missing cancers is an unmet need. If verified, these findings could prevent not only biopsies but multiple follow-up ultrasound exams over 2 years.

SSM02-04   Prediction of Invasive Breast Cancer Using Shear-wave Elastography in Patients with Biopsy-confirmed Ductal Carcinoma in Situ

Wednesday, Dec. 2 3:30PM - 3:40PM Location: E451B

Participants
Jae Seok Bae, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose

Jung Min Chang, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Su Hyun Lee, MD,PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Sung Ui Shin, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Woo Kyung Moon, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate whether lesion stiffness measured by shear-wave elastography (SWE) could predict histologic upgrade of ductal carcinoma in situ (DCIS) confirmed by ultrasound (US)-guided core needle biopsy (CNB).

METHOD AND MATERIALS

This retrospective study was conducted with institutional review board approval, and informed consent was waived. From January 2012 to February 2015, database search revealed 120 biopsy-confirmed DCIS in patients (mean age 52.4 ± 9.8) who underwent B-mode US and SWE prior to surgery. Clinicopathologic results, B-mode findings, size on US, mean and maximum elasticity values on SWE were recorded. Three radiologists independently analyzed qualitative color scores on SWE images using 5 point scale. To identify the preoperative factors associated with upgrade to invasive cancer, B-mode US findings, SWE information, and clinical variables were analyzed using univariate and multivariate logistic regression analysis. Qualitative color scores assessed by individual radiologists were analyzed to identify correlation with clinicopathologic variables, lesion size, and findings on B-mode US using multiple linear regression analysis. Interobserver agreements among radiologists on qualitative color score were assessed using multi-rater kappa statistic.

RESULTS

The overall upgrade rate was 41.7% (50 of 120). Mean, maximum stiffness values, qualitative color scores, and lesion size showed significant differences in upgrade and non-upgrade groups. Multivariate logistic regression analysis revealed mean (P=0.012), maximum stiffness (P=0.039), and lesion size (P<0.001) were significantly correlated with histologic upgrade. In reader study, color scores were correlated with the histologic upgrade, mammographic density, and B-mode category in all three radiologists (P value <0.04). The overall interobsever agreement for elasticity score was excellent (κ= 0.814 -0.887).

CONCLUSION

Breast lesion stiffness measured by SWE could be helpful to predict the upgrade to invasive cancer in US-guided biopsy proven DCIS patients.

CLINICAL RELEVANCE/APPLICATION

For patients with DCIS confirmed by US-guided CNB, stiffness values on SWE can lead patient to undergo a proper one-step operation when surgical excision is performed.

SSM02-05   Is Contrast Enhanced Ultrasound as Good or Better than MRI in Evaluation of Breast Cancer Patients Receiving Neoadjuvant Chemotherapy?

Wednesday, Dec. 2 3:40PM - 3:50PM Location: E451B

Participants
Sandy C. Lee, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
Edward G. Grant, MD, Los Angeles, CA (*Abstract Co-Author*) Research Grant, General Electric Company ; Medical Advisory Board, Nuance Communications, Inc
Pulin A. Sheth, MD, Santa Monica, CA (*Abstract Co-Author*) Nothing to Disclose
Bhushan Desai, MBBS, MS, Los Angeles, 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
Mary W. Yamashita, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Linda Hovanessian-Larsen, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The purpose of this pilot study is to evaluate the performance of Contrast Enhanced Ultrasound (CEUS) versus Contrast Enhanced MRI (CE-MRI) in monitoring treatment response in breast cancer (BC) patients receiving preoperative neoadjuvant chemotherapy (NAC) by comparing tumor visibility and size.

METHOD AND MATERIALS

We prospectively studied 18 women diagnosed with invasive BC and receiving NAC, who had CEUS and CE-MRI as part of their preoperative imaging to detect tumor response. Each woman had three CEUS scans and at least two CE-MRI scans: (1) baseline prior to initiating NAC, (2) 3 weeks after initiation of NAC, and (3) after completion of NAC prior to surgery. The breast imager interpreting the CEUS or the CE-MRI was blinded to results of the other study. The presence of a lesion, tumor size, percent necrosis, and peak intensity were recorded. Results of the two techniques were compared to each other and to the gold standard histopathology obtained at surgery. Spearman correlation and intraclass correlation with absolute agreement were used to evaluate the findings.

RESULTS

All 18 women have biopsy proven invasive ductal carcinoma. The mean size of enhancing tumor at baseline on CEUS is 3.4 cm (range 1.5-6.9 cm) and on CE-MRI is 4.3 cm (range 2.5-7.7 cm). The results demonstrate a strong correlation in tumor size between CEUS and CE-MRI r=0.87 (p<0.01). Intraclass correlation also shows good absolute agreement, icc=0.78 (p<0.01). When comparing percent tumor necrosis between CEUS vs. CE-MRI, there is 80% agreement (95% CI of 40%, 98%). Comparable quantitative parameters, namely "peak intensity (tumor - normal)" for CEUS and "peak enhancement at one minute" for CE-MRI, demonstrate correlation with r=0.46 (p=0.05). Trends suggest that CEUS has a better degree of correlation and agreement than CE-MRI with tumor size at surgical pathology.

CONCLUSION

CEUS is comparable to CE-MRI in evaluating treatment response of breast cancer in patients receiving NAC. In our pilot series, CEUS was found to be a valuable imaging modality for determining the tumor size, percent necrosis, and peak intensity, and is

comparable to the results of CE-MRI.

CLINICAL RELEVANCE/APPLICATION

Further investigation with a larger cohort may prove that CEUS can be a better, more cost effective method than CE-MRI in monitoring treatment response in breast cancer patients receiving NAC.

SSM02-06   Impact of Real-time MRI Navigated Ultrasound in Preoperative Breast Cancer Patients

Wednesday, Dec. 2 3:50PM - 4:00PM Location: E451B

Participants
Ah Young Park, MD, Ansan , Korea, Republic Of (*Presenter*) Nothing to Disclose
Bo Kyoung Seo, MD, PhD, Ansan, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyu Ran Cho, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Ok Hee Woo, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jaehyung Cha, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the utility of real-time MRI navigated ultrasound (US) for second-look examination in preoperative breast cancer patients.

METHOD AND MATERIALS

Between October 2013 and February 2015, 55 consecutive breast cancer patients who underwent second-look US examination with real-time MRI navigated US to identify MRI-detected lesions on preoperative evaluation were enrolled. Of a total of 67 breast lesions, 41 lesions were detected on conventional US, 23 were additionally detected on MRI navigated US, and the remaining two were not found. The detection rates of conventional US and MRI navigated US were compared with McNemar test. We evaluated clinical data (age and change of surgical plan), and US findings (background echotexture, distance from nipple, and mass characteristics) and MRI findings (size, depth, type, characteristics, and kinetics of lesions) based on the BI-RADS lexicon. We compared these features between two groups with student T test, chi-square, or Fisher's exact test; 41 lesions detected with both conventional US and MRI navigated US (Group 1) and 23 lesions detected with only MRI navigated US (Group 2).

RESULTS

The detection rates of conventional US and MRI navigated US were statistically different, 61.2% (41/67) vs 95.5% (65/67) (P<.0001). Hetergeneous background echotexture (69.6% [16/23] vs 34.1% [14/41], P=.012), isoechoic masses on US (65.2% [15/23] vs 7.3% [3/41], P<.0001), and deep location on MRI (26.1% [6/23] vs 14.6% [6/41], P=.041) were more common in Group 2. The proportion of change in surgical plan was higher in Group 2 although there was less statistical significance (43.5% [10/23] vs 22.0% [9/41], P=.071). In 10 patients with change of surgical plan in Group 2, four underwent mastectomy due to multicentric cancers and six underwent additional excision due to concurrent high-risk lesions.

CONCLUSION

Real-time MRI navigated US improves identification of MRI-detected lesions during second-look US examination for preoperative evaluation in breast cancer patients. Background echotexture, echo pattern of breast lesions, and lesion depth on MRI can affect the detection of breast lesions in second-look US examination.

CLINICAL RELEVANCE/APPLICATION

Real-time MRI navigated US is useful to identify breast lesions on second-look US examination for MRI-detected additional lesions in breast cancer patients, which can affect treatment plan.

Gastrointestinal (Loco-regional Therapy Liver Imaging)

Wednesday, Dec. 2 3:00PM - 4:00PM Location: E353A

`GI` `CT` `IR` `MR` `OI` `US`

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

Participants
Debra A. Gervais, MD, Chestnut Hill, MA (*Moderator*) Nothing to Disclose
Steven S. Raman, MD, Santa Monica, CA (*Moderator*) Nothing to Disclose

Sub-Events

SSM08-01　Irreversible Electroporation in Patients with Hepatocellular Carcinoma: Immediate Versus Delayed Findings on MR Imaging

Wednesday, Dec. 2 3:00PM - 3:10PM Location: E353A

Participants
Guy E. Johnson, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Matthew J. Kogut, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
James O. Park, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Raymond S. Yeung, MD, Seattle, WA (*Abstract Co-Author*) Nothing to Disclose
Daniel S. Hippe, MS, Seattle, WA (*Abstract Co-Author*) Research Grant, Koninklijke Philips NV; Research Grant, General Electric Company
Siddharth A. Padia, MD, Seattle, WA (*Presenter*) Nothing to Disclose

PURPOSE

Irreversible electroporation (IRE) is a non-thermal technique used to ablate soft tissue tumors. Our study assessed MR imaging appearance after IRE for the treatment of hepatocellular carcinoma (HCC).

METHOD AND MATERIALS

In this institutional review board-approved retrospective study with waiver of informed consent, twenty patients with HCC were treated with IRE over a 2.5 year period. Median patient age was 62, and 75% of patients had Child-Pugh A cirrhosis. Median tumor diameter was 2.0 cm (range 1.0-3.3 cm). Contrast-enhanced multiphase MR was performed on post-procedure day 1, 30, and every 90 days thereafter. Ablation zone sizes and signal intensities were compared between each time point for both T1- and T2-weighted images. Trends in MR signal intensity and tumor dimensions over time were quantified using generalized linear models.

RESULTS

MR appearance of a treated tumor includes a zone of peripheral enhancement with centripetal filling on delayed post-contrast images. Compared to post-procedure day one, there is a decrease in enhancing ablation zone size of 28.9% (mean) every 90 days. There is a trend towards decreasing signal intensity of the peripheral ablation zone over time on both T2 (p=0.01) and contrast-enhanced T1 weighted images (p<0.08). Conversely, the tumor itself typically demonstrates increased signal intensity over the same sequences.

CONCLUSION

IRE of HCC results in a large region of enhancement on immediate post-procedure MR, which involutes on follow-up imaging. This is associated with decreasing signal intensity of the peripheral ablation zone over time. This phenomenon may represent resolution of the reversible penumbra.

CLINICAL RELEVANCE/APPLICATION

1. Understanding of the standard MR imaging appearance after IRE can help guide future therapy and assess prognosis with respect to tumor response.2. The large area of enhancement seen after IRE may represent regions of reversible electroporation, which may be used to optimize treatment protocols or target localized drug delivery in future studies.

SSM08-02　Local Hepatic Tumor Control in Patients with HCC Undergoing Transarterial Lipiodol Embolisation Followed by Microwave Ablation

Wednesday, Dec. 2 3:10PM - 3:20PM Location: E353A

Participants
Roland M. Seidel, MD, Homburg, Germany (*Presenter*) Nothing to Disclose
Alexander Massmann, MD, Homburg/Saar, Germany (*Abstract Co-Author*) Nothing to Disclose
Peter Fries, MD, Homburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Guenther K. Schneider, MD, PhD, Homburg, Germany (*Abstract Co-Author*) Research Grant, Siemens AG; Speakers Bureau, Siemens AG; Speakers Bureau, Bracco Group; Research Grant, Bracco Group;
Arno Buecker, MD, Homburg, Germany (*Abstract Co-Author*) Consultant, Medtronic, Inc Speaker, Medtronic, Inc Co-founder, Aachen Resonance GmbH Research Grant, Siemens AG

PURPOSE

To investigate local tumor control in patients with HCC undergoing lipiodol embolization and subsequent microwave ablation.

METHOD AND MATERIALS

25 patients with 35 HCC (mean size 23mm, SD 9mm) underwent superselective transarterial embolization with lipiodol. Subsequently

percutaneous CT guided microwave ablation of the tumors was performed using a 2,45 GHz generator (power output 80 to 120W) with cooled tip probes (Acculis , Angiodynamics, USA). All patients were investigated before therapy by unenhanced and dynamic contrast enhanced MR or CT; follow up was performed within 1, 3, 6 and more months after treatment. Treatment was rated as successful in case of a complete rim of necrosis surrounding the lesion and no further tumor growth. Patient data were evaluated retrospectively on a PACS workstation by two readers in consensus.

RESULTS

In 24 of 25 (96%) patients a complete ablation was diagnosed on the early follow up imaging. The patient rated with incomplete ablation presented tumor progression on follow up imaging. 1 patient initially rated as complete ablation presented lesion progression and underwent chemoembolization with no residual tumor up to 510 d after microwave ablation. Overall complete ablation rate per patient was 92% (23 of 25 patients) and 94% per lesion (33 of 35 lesions).

CONCLUSION

Microwave ablation in combination with lipiodol embolization for patients with HCC is a valuable therapeutic procedure for smaller hepatic tumors. Especially the targeting and embolizing potential of the retained lipiodol is likely to contribute to a more reliable tumor access and ablation effect .

CLINICAL RELEVANCE/APPLICATION

The treatment of smaller local HCC tumors becomes more and more an issue in the bridging to transplant situation and therefore minimal invasive percutaneous ablation techniques become attractive, since local tumor control is in the range of surgical treatments. This study demonstrates a reliable minimal invasive targeting and embolization technique in combination with microwave ablation for the enhancement of local tumor control.

SSM08-03 Analysis of a Series of Microwave Ablated Native HCCs: Which Parameters do Affect Outcome after Treatment?

Wednesday, Dec. 2 3:20PM - 3:30PM Location: E353A

Participants
Valentina Battaglia JR, MD, Pisa, Italy (*Presenter*) Nothing to Disclose
Salvatore Mazzeo, MD, Pisa, Italy (*Abstract Co-Author*) Nothing to Disclose
Carla Cappelli, MD,PhD, Pisa, Italy (*Abstract Co-Author*) Nothing to Disclose
Rosa Cervelli, Pisa, Italy (*Abstract Co-Author*) Nothing to Disclose
Piercarlo Rossi, MD, Pisa, Italy (*Abstract Co-Author*) Nothing to Disclose
Carlo Bartolozzi, MD, Pisa, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the efficacy at 1 month after treatment of ultrasound-guided percutaneous microwave ablation (MWA) of series of native HCCs.

METHOD AND MATERIALS

From January 2013 to February 2015, 221 patients with a single HCC lesion were candidate for ultrasound-guided percutaneous MWA. Of them, 113 were excluded because of patients' habitus or limited US visibility of the lesion (42 and 71 patients respectively). Finally, our study included 108 patients who were treated with MWA for a single hepatic lesion. All lesions were classified on the basis of dimensions, location and venous vessel contiguity. A cooled shaft antenna of 16 or 14 Gauge was percutaneously inserted into the tumor under ultrasound guidance. Microwave emitting power and time of treatment were tailored to tumor size (ranging from 35 to 50W). Lesions were classified on the basis of dimensions (1.5cm to 2cm: 31/108; 2.1 to 3cm: 54/108; 3.1 to 4cm: 23/108), of location: centrohepatic, subcapsular, close to gallbladder, para-hilar and para-caval. Moreover, lesions were divided into subdiaphragmatic (23: yes; 86: no) and on the basis of proximity (<5mm) to vascular structures (59: yes; 49: no).In all cases, a CT evaluation performed 1 month after procedure was done. Tumor response after treatment was evaluated by means of mRECIST.Statistical analysis was performed by means of Chi-square test and bivariate correlation.

RESULTS

All neoplasm were ablated in a single session and no major complication occurred.At CT evaluation, 84 lesions showed a Complete Response, 23 Partial response and 1 lesion Stable Disease.Statistical analysis showed no significant relationship between complete response and tumor size, time of ablation or power applied. At bivariate analysis, tumor location and subdiaphragmatic position did correlate (p<0.0001) with lesions'response to treatment, independently from dimensions and technical parameters of power emission.

CONCLUSION

In our series, tumor size did not appear to impact complete ablation rates, whereas lesion localization represents the most important factor influencing tumor response.

CLINICAL RELEVANCE/APPLICATION

Lesions'characteristics might lead to formulate a grading on the basis of whom to predict tumor response after treatment.

SSM08-04 Local Treatment for Colorectal Cancer Liver Metastases, Comparison of Radiofrequency Ablation and Surgical Metastasectomy

Wednesday, Dec. 2 3:30PM - 3:40PM Location: E353A

Participants
Naik Vietti Violi, Lausanne, Switzerland (*Presenter*) Nothing to Disclose
Alban L. Denys, MD, Lausanne, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Pierre E. Bize, MD, Lausanne, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Rafael Duran, MD, Baltimore, MD (*Abstract Co-Author*) Nothing to Disclose
Nicolas Demartines, MD, Lausanne, Switzerland (*Abstract Co-Author*) Nothing to Disclose
Nermin Halkic, Lausanne, Switzerland (*Abstract Co-Author*) Nothing to Disclose

Jean-Francois Knebel, Lausanne, Switzerland (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare local recurrence rate of radiofrequency ablation (RFA) and surgical metastasectomy for colorectal cancer liver metastases from a surgical and radiological database of consecutive patients and to define the best candidates for each treatment.

METHOD AND MATERIALS

We analyzed, lesion by lesion, 121 metastases treated by metastastectomy (in 43 patients, median follow up 798 days) and 110 metastases treated by RFA (in 60 patients, median follow up 590 days). We compared rate of local recurrence (LR) and hepatic recurrence (HR) between the two groups. Predictive factors for recurrence (patients and primary tumor characteristics and metastasis data - size, depth in the liver (distance between metastasis and hepatic capsule), distance to vascular structures (all veins located within 10 mm to the metastasis were registered), pathological margins in case of surgery (R0/R1 status)), were analyzed by Chi square and logistic regression in uni and multivariate analysis.

RESULTS

We found no difference between the two groups for patients and primary tumor characteristics. Survival curves were similar between the two groups. Mean metastasis size was larger in metastectomy group than RFA group (18mm, range 2-90mm, standard error=0.11 and 15mm, range 3-55mm, standard error=0.06; p=0.03). Rate of LR and HR between the two groups were nearly statistically different in favor of RFA: LR was 19% for metastasectomy group and 10% for RFA group (p=0.06, delay: 245 and 289days, p=0.56), HR were 78.5% for metastasectomy and 66% for RFA (p=0.054, delay: 226 and 235days, p=0.81). R1 status and metastasis deepness were predictive factors for recurrence in the metastasectomy group (p=0.03 and p=0.02, respectively). Metastases deepness and proximity to vascular structure increased risk for R1 (p=0.04 and p<0.001, respectively). We found no predictive factor for recurrence in RFA group.

CONCLUSION

Pending proper selection (small lesions visible under imaging guidance), RFA tends to have a lower recurrence rate than metastasectomy. Lesions localized in depth in the liver parenchyma, close to large veins are at risk of local recurrence after metastasectomy.

CLINICAL RELEVANCE/APPLICATION

Metastasectomy and radiofrequency ablation are currently used for treatment of colorectal cancer liver metastasis aiming for total tumor ablation and sparing liver parenchyma. There is no study comparing results and risk of local recurrence between metastasectomy and RFA.

SSM08-05   **Diagnostic Performance of DECT in the Assessment of Treated Zone Following Percutaneous Ablation in Renal Cell Cancer: Image Quality and Radiation Dose Considerations**

Wednesday, Dec. 2 3:40PM - 3:50PM Location: E353A

Participants
Diana Murcia, MD, Boston, MA (*Presenter*) Nothing to Disclose
Andrea Prochowski Iamurri, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Manuel Patino, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Ronald S. Arellano, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Dushyant V. Sahani, MD, Boston, MA (*Abstract Co-Author*) Research Grant, General Electric Company; Research Consultant, Allena Pharmaceuticals, Inc
Avinash R. Kambadakone, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To determine the diagnostic performance of DECT in the evaluation of treated zone following percutaneous ablation of renal cell cancer (RCC) with assessment of value of iodine images (MD-I), image quality and radiation dose considerations.

METHOD AND MATERIALS

In this retrospective study, 26 patients (17 M, 9 F, mean age 69 years) with RCC treated with percutaneous ablation were included. The patients underwent contrast enhanced nephrographic phase dual energy CT scan with a single-source dual energy CT (750HD GE Healthcare, Milwaukee WI) as part of post ablation surveillance. In this cohort, 13 patients had single energy unenhanced scans. All the patients in this cohort had renal mass protocol single energy CT (SECT) at different time-points. Post processed subtraction, material density iodine (MD-I) and virtual unenhanced images were generated. Two blinded radiologists reviewed the SECT and DECT images in two separate sessions for ablation zone margin, presence of residual/recurrent tumor, image quality and presence of artifacts with a 5 point confidence score. The CTDI and DLP were recorded and compared between DECT series and SECT series.

RESULTS

A total of 28 RCC underwent percutaneous ablation. DECT with MD-I iodine images demonstrated higher specificity for detection of abnormal enhancement in the ablation zone suggesting residual tumor/recurrence compared to SECT (30% vs 91%). The image quality score for DECT (with MD-I) was higher compared to standard SECT images (5 vs 4.1 of SECT with p<0.05) with higher number of artifacts recorded in the subtraction images generated from standard non-contrast and contrast enhanced CT images (25% of cases). A single phase DECT had significant radiation dose reduction in comparison to dual phase SECT scans (736.11±231.6 mGy-cm vs 1596.5±450.2 mGy-cm; p<0.001) and the radiation dose considerations of nephrographic phase DECT and SECT were comparable (736.11±231.6 mGy-cm vs 609.5±169.1 mGy-cm; p=0.179)

CONCLUSION

DECT with iodine specific images improves diagnostic performance in the evaluation of ablation zone in RCC as compared to standard SECT images with significant reduction of radiation dose due to exclusion of non-contrast phase.

CLINICAL RELEVANCE/APPLICATION

Post ablation surveillance of treated zone in patients with RCC can present diagnostic challenges with the need for non-contrast

scans and subtraction images which increase the cumulative radiation dose and are affected by artifacts.

SSM08-06 CT and MR Imaging Features to Predict Residual or Recurrent Hepatocellular Carcinoma after Trans-arterial or Percutaneous Treatment

Wednesday, Dec. 2 3:50PM - 4:00PM Location: E353A

Participants
Eric C. Ehman, MD, San Francisco, CA (*Presenter*) Nothing to Disclose
Sarah Umetsu, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Nicholas Fidelman, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Linda Ferrell, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Michael A. Ohliger, MD, PhD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Benjamin M. Yeh, MD, San Francisco, CA (*Abstract Co-Author*) Research Grant, General Electric Company; Author with royalties, Oxford University Press; Shareholder, Nextrast, Inc;
Judy Yee, MD, San Francisco, CA (*Abstract Co-Author*) Research Grant, EchoPixel, Inc
Thomas A. Hope, MD, San Francisco, CA (*Abstract Co-Author*) Advisory Committee, Guerbet SA; Research Grant, General Electric Company

PURPOSE

To determine which CT and MR features are most predictive of viable hepatocellular carcinoma (HCC) following percutaneous or transarterial therapy.

METHOD AND MATERIALS

Pathology reports for liver explants from 12/2012-7/2014 with CT or MR imaging performed within 90 days of transplant (45±28 days) were reviewed. Patients with a history of hepatocellular carcinoma and preoperative treatment including transarterial chemoembolization (TACE) or percutaneous ablation (radiofrequency, microwave, cryo, ethanol) were included. Each lesion was reviewed on the most recent pre-transplant imaging study and size, location and enhancement features recorded. Pathology slides were reviewed and the size of viable tumor nodule recorded (if present).

RESULTS

91 patients with 135 treated lesions were included. 88(65%) lesions were imaged with CT and 47(35%) with MR, including 89(66%) post-TACE, 24(18%) post-ablation, and 22(16%) post both TACE and ablation. At explant, 69(51%) of lesions showed viable tumor. 11/42(26%) of viable lesions at CT and 15/27(56%) at MR demonstrated nodular arterial enhancement (p=0.02). Washout was seen in 13/42(31%) of viable HCCs at CT and in 6/27(22%) at MR (p>0.05). Capsule appearance was seen in 2/42(5%) of viable lesions at CT and in 1/27(4%) at MR (p>0.05). Using each criteria to diagnose a study positive for recurrence, sensitivity and specificity were 38% and 92% for nodular enhancement, 28% and 94% for washout and 4% and 100% for capsule. Using any of the three criteria, overall sensitivity and specificity were 45% and 91%. Detection rate for nodular recurrence was 33% for lesions <1cm, 55% for lesions 1-2cm and 71% for lesions >2cm. Lesion detection by size was similar at CT and MR.

CONCLUSION

No single imaging finding was sensitive for viable HCC following treatment. Nodular arterial enhancement was the most frequently seen, and seen significantly more at MR than at CT. Washout was less frequently seen and seen equally at MR and CT. Capsule was rarely seen but when present always predicted recurrence. There is limited detection of lesions <1cm both at MR and CT and only marginal detection between 1-2cm.

CLINICAL RELEVANCE/APPLICATION

Post-treatment imaging is difficult to interpret and imaging features predictive of recurrent or residual disease are not well understood. Accurate diagnosis of viable tumor at post-treatment imaging is important to guide future therapy such as repeat TACE or ablation.

Case-based Review of US (An Interactive Session)

Wednesday, Dec. 2 3:30PM - 5:00PM Location: S406A

GI   GU   US

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

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

LEARNING OBJECTIVES

1) Recognize the diverse applications of ultrasound throughout the body and when it provides the optimal diagnostic imaging choice. 2) Understand the fundamental interpretive parameters of ultrasound contrast enhancement and its applications in the abdomen. 3) Know the important factors to consider when choosing ultrasound vs CT for image guided procedures and how to optimize ultrasound for technical success.

ABSTRACT

Ultrasound is a rapidly evolving imaging modality which has achieved widespread application throughout the body. In this course we will address the major anatomic areas of ultrasound use, including the abdominal and pelvic organs, superficial structures and the vascular system. Challenging imaging and clinical scenarios will be emphasized to include the participant in the decision-making process. Advanced cases and evolving technology will be highlighted, including the use of ultrasound contrast media as a problem solving tool, and the appropriate selection of procedures for US-guided intervention.

Active Handout:Deborah J. Rubens

http://abstract.rsna.org/uploads/2015/15002752/Active MSCU42.pdf

Sub-Events

MSCU42A   Challenging Abdominal Cases

Participants
Oksana H. Baltarowich, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

View abstract under main course title.

MSCU42B   Acute Pelvic Pain

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

LEARNING OBJECTIVES

View learning objectives under main course title.

Honored Educators

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

Leslie M. Scoutt, MD - 2014 Honored Educator

MSCU42C   Superficial Ultrasound Imaging: Head to Toe

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

LEARNING OBJECTIVES

View learning objectives under main course title.

Controversy Session: US, CT, or MR Imaging in Possible Appendicitis in Children: Three Pegs and Often Only One Hole

Wednesday, Dec. 2 4:30PM - 6:00PM Location: E451A

GI | CT | MR | US | ER | PD

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

Participants
Nancy R. Fefferman, MD, New York, NY, (nancy.fefferman@nyumc.org) (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

Sub-Events

SPSC41A   US

Participants
Nancy R. Fefferman, MD, New York, NY, (nancy.fefferman@nyumc.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the advantages, disadvantages and limitations of US as an effective imaging modality in the diagnosis of appendicitis in children. 2) Review the current literature addressing the diagnostic performance of US for pediatric appendicitis. 3) Discuss the role of US in the imaging evaluation of suspected appendicitis in children.

ABSTRACT

SPSC41B   CT

Participants
Michael J. Callahan, MD, Boston, MA, (michael.callahan@childrens.harvard.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Highlight the advantages, disadvantages and versatility of computed tomography for the diagnosis of suspected acute appendicitis in children. 2) Describe published sensitivity and specificity values for computed tomography in the setting of suspected acute appendicitis in the pediatric population. 3) Explain the challenges and potential barriers for standardization of pediatric appendicitis clinical practice guidelines at academic and non-academic centers.

SPSC41C   MR

Participants
R. Paul Guillerman, MD, Houston, TX, (rpguille@texaschildrens.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Develop an MRI protocol for suspected pediatric appendicitis. 2) Estimate the diagnostic efficacy of MRI for suspected pediatric appendicitis. 3) Appraise how radiation-induced cancer risks and diagnostic performance characteristics influence the optimal selection of US, CT and MRI for suspected pediatric appendicitis.

Controversy Session: Ultrasound versus CT for Suspected Renal Colic: Which Modality Rocks in the ER?

Wednesday, Dec. 2 4:30PM - 6:00PM Location: S404CD

GU **CT** **US** **ER**

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

Participants
Judy Yee, MD, San Francisco, CA (*Moderator*) Research Grant, EchoPixel, Inc
Mitchell E. Tublin, MD, Pittsburgh, PA (*Presenter*) Nothing to Disclose
Aaron D. Sodickson, MD, PhD, Wayland, MA, (asodickson@bwh.harvard.edu) (*Presenter*) Research Grant, Siemens AG; Consultant, Bracco Group
D. Mark Courtney, MD, MSc, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the advantages of ultrasound and present a cost effective, rational algorithm for its use in the evaluation of ER patients with potential renal colic. 2) Understand the benefits of CT over ultrasound in ER imaging of suspected renal colic. 3) Understand the perspective and preferences of the ER physician for the workup of renal colic and the effect on clinical workflow.

Honored Educators

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

Aaron D. Sodickson, MD, PhD - 2014 Honored Educator

Ultrasound Thursday Case of the Day

Thursday, Dec. 3 7:00AM - 11:59PM Location: Case of Day, Learning Center

US

AMA PRA Category 1 Credit ™: .50

Participants

Nirvikar Dahiya, MD, Phoenix, AZ (*Presenter*) Nothing to Disclose
Jason M. Wagner, MD, Oklahoma City, OK (*Abstract Co-Author*) Nothing to Disclose
Melanie P. Caserta, MD, Jacksonville, FL (*Abstract Co-Author*) Nothing to Disclose
Aya Kamaya, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Maryellen R. Sun, MD, Boston, MA (*Abstract Co-Author*) Research Grant, Glaxo SmithKline plc
Robert A. Kane, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Stella Lam, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1) Participants will learn to list the sonographic appearances of common and uncommon diseases. 2) Participants will learn to describe the differentiating features between similar diseases via a case based format. 3) Participants will learn to discuss the pathophysiology of diseases that are responsible for the sonographic appearance.

RC610

Ultrasound Contrast (An Interactive Session)

Thursday, Dec. 3 8:30AM - 10:00AM Location: S402AB

`GI` `GU` `US`

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

`FDA` Discussions may include off-label uses.

Participants

Sub-Events

RC610A   Renal Masses

Participants
Edward G. Grant, MD, Los Angeles, CA (*Presenter*) Research Grant, General Electric Company ; Medical Advisory Board, Nuance Communications, Inc

LEARNING OBJECTIVES

1) Understand the indications for the use of contrast enhanced ultrasound in renal masses. 2) Be familiar with the advantages and disadvantages of contrast enhanced ultrasound in comparison to other forms of cross sectional imaging with regard to its application to renal masses. 3) Be able to analyze contrast enhanced ultrasound images of the kidney. 4) Understand the basics of quantitative contrast imaging of renal masses.

ABSTRACT

Contrast enhanced ultrasound (CEUS) has numerous applications in the imaging of renal masses. It has the particular advantage in this population of being able to be used in patients with renal failure which is not the case with either CT or MRI. Obviously CEUS does not use ionizing radiation and is less expensive than other techniques. A further advantage is the fact that ultrasound is a real time technique and vascular characteristics of lesions can be evaluated throughout the examination. Applications of CEUS in the kidney include imaging of complex cysts (flow in wall, septae etc.) and evaluation of pseudolesions (column of Bertin, infarct, scars). It can also be used to further characterize indeterminate masses on CT/MR and may be able to classify some lesions as benign versus malignant, or suggest their actual histology. The diagnostic capability of CEUS is facilitated by its ability to provide quantitative information. Given the lack of ionizing radiation and absence of nephrotoxicity CEUS is ideal for patients undergoing active surveillance of a renal mass or post resection/RFA.The evaluation of complex renal cysts is one of the most common indications for CEUS. Observed features at CEUS are typically similar to those of the Bosniak classification and this has now been adapted for use with ultrasound contrast. In solid renal masses CEUS may provide information that can help determine the nature of the mass and its anatomy as well as the number of individual lesions. This is particularly valuable in patients in whom other contrast agents are contraindicated. One notable example is the characteristic enhancement pattern of papillary versus clear cell renal cell carcinoma. The former typically enhances less than the surrounding parenchyma throughout the examination while the latter dramatically hyperenhances in the arterial phase. Again, quantitative imaging can further add to the confidence of the diagnosis in such cases.

RC610B   Contrast Ultrasound of the Liver and Gallbladder

Participants
Hans-Peter Weskott, MD, Hannover, Germany, (weskotthp@t-online.de) (*Presenter*) Luminary, General Electric Company; Speaker, Bracco Group

LEARNING OBJECTIVES

1) Understanding the indications of contrast enhanced ultrasound (CEUS) in focal liver and gallbladder diseases. 2) Learning about the importance of the three contrast phases and how CEUS performes in detecting and characterizing focal liver lesions and to characterize inflammatory and tumorous changes of the gallbladder wall. 3) Learning about the potential value as well as the limitations of CEUS in liver an gallbladder diseases. 4) Learning how CEUS performs when compared to B-mode and Color Doppler ultrasound, CT and MRI imaging.

ABSTRACT

Liver: In patients with favorable scanning conditions CEUS is at least as sensitive as contrast enhanced CT (CECT) in detecting malignant liver lesions. Due to its high temporal resolution, even a hyper-enhancement of a few seconds can reliably be detected, thus improving the characterization of focal liver lesions. A majority of malignant lesions can therefore be characterized as hypo-, iso- or hyper-enhancing. During the arterial phase the tumor`s vessel architecture and direction of contrast filling is important for characterizing a lesions character. Due to a high spatial resolution, novel contrast imaging techniques allow detection of washed out lesions down to 3mm in size. CEUS characterizes focal liver lesions with a much higher diagnostic confidence than conventional US and is comparable to CT and MRI. CEUS also improves intraoperative tumor detection and characterization. Using time intensity analysis a change in contrast enhancement and kinetics helps in estimating tumor response to chemotherapy. CEUS is also used to monitor local ablation therapy and is a useful imaging tool to detect early tumor recurrence. Gallbladder: CEUS can be used to better visualize ulceration, perforation, and tumors of its wall. It thus helps in optimizing clinical management, including timing for surgery. CEUS does not affect renal or thyroid function and is therefore helpful in older patients and the preferred imaging technique in young patients and those with impaired renal function.

RC610C   Contrast Ultrasound of Bowel

Participants

Stephanie R. Wilson, MD, Calgary, AB (*Presenter*) Research Grant, Lantheus Medical Imaging, Inc; Equipment support, Siemens AG; Equipment support, Koninklijke Philips NV

LEARNING OBJECTIVES

1) Attendees will recognize the association of hypervascularity with inflammatory processes in the bowel on the basis of neoangiogenesis. 2) They will appreciate the value of CEUS of the bowel, with provision of both subjective and objective blood flow determinations, useful in determining disease activity and in assessing response to therapy. . 3) They will apply the common interpretations of time itensity curves to obtain peak enhancement and area under the curve information, recognizing their direct relationship to inflammatory disease with increasing parameters.

ABSTRACT

BI-RADS (An Interactive Session)

Thursday, Dec. 3 8:30AM - 10:00AM Location: E450A

BR **DM** **MR** **US**

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

Participants

Sub-Events

RC615A   **BI-RADS: Mammography**

Participants
Edward A. Sickles, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand and use the new approach to classifying breast density. 2) Properly use current BI-RADS assessment categories. 3) Report discordances between assessment category and management recommendation.

RC615B   **Ultrasound**

Participants
Ellen B. Mendelson, MD, Chicago, IL (*Presenter*) Medical Advisory Board, Delphinus Medical Technologies, Inc; Research support, Siemens AG; Consultant, Siemens AG; Speaker, Siemens AG; Medical Advisory Board, Quantason, LLC; Consultant, Quantason, LLC;

LEARNING OBJECTIVES

At the conclusion of this session on BI-RADS for US, learners will be able to 1. Understand inseparability of image quality and interpretability. 2. Assess breast masses using a trio of feature categories: shape, margin, orientation. 3. Apply the principle of multiple benign masses to address low PPV's of breast US. 4. Recognize architectural distortion and other Associated Features.

ABSTRACT

RC615C   **MRI**

Participants
Elizabeth A. Morris, MD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the new MRI BI-RADS® descriptors including background parenchymal enhancement (BPE). 2) Properly apply the Final Assessment categories, particularly BI-RADS® 0 for MRI. 3) Apply the audit recommendations to your breast MRI practice.

US for Thyroid Cancer: Diagnosis, Surveillance, and Treatment

Thursday, Dec. 3 8:30AM - 10:00AM Location: E351

| NR | US | HN | OI |

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

Participants
Jill E. Langer, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Kathryn A. Robinson, MD, Saint Louis, MO (*Presenter*) Nothing to Disclose
Sheila Sheth, MD, Cockeysville, MD, (ssheth@jhmi.edu) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the sonographic characteristics of thyroid nodules that are suspicious for malignancy. 2) a. Discuss the Bethesda Cytology Classification of Thyroid FNA results and the risk of malignancy associated with each category. b. Describe the indications for two new genetic tests that may be performed on FNAs obtained from thyroid nodules with indeterminate cytology. 3) a. Describe the technique of US-guided biopsy of thyroid nodules and cervical lymph nodes in patients who have undergone thyroidectomy for thyroid cancer. b. Discuss the rationale and method of performance of US-guided ethanol ablation of malignant cervical adenopathy in post thyroidedctomy patients.

ABSTRACT

This presentation will consist of a three individual presentations. The first will review the sonographic characteristics of thyroid nodules that are suggestive of malignancy. Recommendations for selecting which thyroid nodules require ultrasound-guided biopsies which have been provided by both Radiology consensus conferences and published Endocrinology guidelines will be discussed. The second presentation will review with the Bethesda Cytology Classification of Thyroid FNA results and the risk of malignancy associated with each category. Additionally this presentation describes the indications for two new genetic tests that may be performed on FNAs obtained from thyroid nodules with indeterminate cytology. The last presentation will provide a detailed description of the technique for performing ultrasound guided biopsy of thyroid nodules and cervical lymph nodes. Various methods will be discussed and required equipment outlined. Possible complications, though rare, will be described. A comparison of the typical sonographic features of normal versus abnormal lymph nodes will be presented in an effort to identify those patients in whom sonographic follow up can be used instead of biopsy. A discussion of the possible advantages of adding thyroglobulin assay to cytologic evaluation will be provided. The rationale for and technique of performing ultrasound guided ethanol ablation of malignant cervical lymph nodes in patients with thyroid cancer will be undertaken.

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

Thursday, Dec. 3 8:30AM - 10:00AM Location: E264

US **IR**

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

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

LEARNING OBJECTIVES

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

ABSTRACT

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

MSCA52

Case-based Review of the Abdomen (An Interactive Session)

Thursday, Dec. 3 3:30PM - 5:00PM Location: S406A

`GI` `US`

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

Participants
Douglas S. Katz, MD, Mineola, NY, (dkatz@winthrop.org) (*Director*) Nothing to Disclose

LEARNING OBJECTIVES

1) To review a series of clinically relevant, abdominal imaging cases, with audience participation. 2) To review important concepts and potential pitfalls of: the liver on sonography; the acute abdomen on US, CT, and MR; liver transplants on multi-modality imaging; genitourinary imaging; and trauma imaging. 3) To provide take home points for the audience based on specific actual case material which was instructional or problematic for the presenters.

ABSTRACT

Sub-Events

MSCA52A   Abdominal Transplant Imaging

Participants
Matthew T. Heller, MD, Pittsburgh, PA, (hellermt@upmc.edu) (*Presenter*) Consultant, Reed Elsevier; Author, Reedl Elsevier

LEARNING OBJECTIVES

1) Describe normal post-operative imaging of liver transplantation. 2) Categorize the complications of liver transplantation and summarize common imaging findings. 3) Integrate the role of imaging in the treatment plan of the transplant patient.

ABSTRACT

Active Handout:Matthew Thomas Heller

http://abstract.rsna.org/uploads/2015/15002757/MSCA52A Hepatic Transplantation.pdf

MSCA52B   Adrenal Imaging

Participants
Julie H. Song, MD, Providence, RI, (jsong2@lifespan.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the imaging appearances of common adrenal masses and review uncommon lesions. 2) Understand the principles of imaging characterization of adrenal masses and apply imaging tools appropriately. 3) Learn to avoid pitfalls and misdiagnoses of adrenal lesions.

MSCA52C   Hepatic Sonography: Pearls and Pitfalls

Participants
Terry S. Desser, MD, Stanford, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Correctly identify common and uncommon sonographic pathology in the liver. 2) Use your understanding of basic sonographic and physiologic principles to infer the correct diagnosis in unusual ultrasound cases.

Active Handout:Terry S. Desser

http://abstract.rsna.org/uploads/2015/15002759/Active MSCA52C.pdf

GU Ultrasound 2015: The Expert's Update on Kidney, Gynecologic and Testicular US

Thursday, Dec. 3 4:30PM - 6:00PM Location: N227

GU **OB** **US**

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

Participants

John J. Cronan, MD, Providence, RI (*Coordinator*) Nothing to Disclose
Mindy M. Horrow, MD, Philadelphia, PA, (horrowm@einstein.edu) (*Presenter*) Spouse, Director, Merck & Co, Inc
Paula J. Woodward, MD, Salt Lake City, UT (*Presenter*) Vice President, Reed Elsevier

LEARNING OBJECTIVES

1) The learner will be made aware of the importance of acute kidney injury (AKI) and associated ultrasound findings. 2) Ultrasound criteria of cystic adnexal masses will be reviewed. 3) Testicular and scrotal pathology and the importance of ultrasound will be explained.

ABSTRACT

Ultrasound has taken on new importance in the evaluation of the kidney, female pelvis and the scrotum/ testicles. We will explain the ultrasound findings of acute kidney injury (AKI), the evaluation of pelvic masses and the necessary follow-up. Finally, a review of the testicle and ultrasound findings will complete the course.

Honored Educators

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Mindy M. Horrow, MD - 2013 Honored Educator

Thyroid and Neck Ultrasound (An Interactive Session)

Thursday, Dec. 3 4:30PM - 6:00PM Location: S402AB

`HN` `NR` `US`

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

Participants

Sub-Events

RC710A   Thyroid Nodules: When and What to Biopsy

Participants
Jill E. Langer, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the sonographic characteristics that are associated with a high probability that a thyroid nodule is likely malignant or likely benign. 3) Gain an understanding of the rationale of the current guidelines for recommending thyroid fine needle aspiration.

ABSTRACT

As an overview, this presentation will review the epidemiology of thyroid nodules and correlate the sonographic findings with the risk of malignancy or the likelihood that the appearance represents a benign hyperplastic thyroid nodule rather than a true neoplasm. Additionally, the rationale for current guidelines for recommending thyroid fine needle aspiration will be discussed. The prevalence of palpable thyroid nodules is estimated to be 6.4% in women and 1.5% in men between 30 to 60 years of age, living in iodine-sufficient regions. However, high resolution sonography of the neck has been shown to be a much more sensitive technique than palpation, detecting nodules in 19 to 67% of randomly selected adults, with detection rates greater in women and increasing with age for both genders. Fortunately the vast majority of sonographically detected thyroid nodules are benign, hyperplasic regions of the thyroid. Fine-needle aspiration biopsy (FNA) is still considered the most reliable diagnostic test to determine if a thyroid nodule is malignant. Malignant nodules account for approximately 5% of all nodules that undergo palpation-guided FNA and approximately 10 to 15% of nodules that undergo sonography-guided FNA procedures. Analysis of the sonographic features of thyroid nodules has become the preeminent non-invasive tool for analyzing the risk of malignancy of thyroid nodules and aids in selecting which nodules should undergo fine needle aspiration (FNA). A number of recently published guidelines and consensus statements emphasize that the sonographic appearance of a nodule is a superior predictor of malignancy compared with nodule size or palpability and that when sonographic features of malignancy are noted, the nodule should undergo FNA. A number of sonographic features have shown a high specificity for the diagnosis of thyroid cancer and include marked hypoechogenicity, the presence of microcalcifications, infiltrating or micro-lobulated borders, and a taller-

RC710B   Post-Thyroidectomy Neck

Participants
Carl C. Reading, MD, Rochester, MN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the sonographic appearance of recurrent and metastatic disease, and other abnormalities, in the post-operative neck.

ABSTRACT

In the post-thyroidectomy neck, ultrasound surveillance is a highly effective method to evaluate for residual and recurrent disease. Recurrence can occur anywhere within the neck, but typically is located in the mid and low internal jugular chains and thyroid bed region. Abnormal cervical lymph nodes can be recognized with a high degree of accuracy due to abnormal size, shape, internal architecture, and color Doppler appearance. In patients with suspected metastatic papillary cancer, the presence of internal fluid or calcifications is highly predictive of malignancy. Abnormal nodal color Doppler flow including peripheral (non-hilar), increased, and irregular flow is highly predictive of malignancy. Within the post-operative thyroid bed, itself, residual thyroid tissue, tumor recurrence, and suture granulomas can occur. FNA for cytologic analysis of suspected abnormalities can be performed, and the addition of thyroglobulin and calcitonin assay of the specimen, for papillary and medullary cancer, respectively, adds a high degree of accuracy to this procedure.

RC710C   Parathyroid and Other Neck Masses

Participants
Mary C. Frates, MD, Sharon, MA, (mfrates@partners.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify abnormal parathyroid glands based on sonographic characteristics 2) Develop an accurate differential for cystic lesions in the neck based on sonographic characteristics, lesion location and clinical circumstances. 3) List the most common etiologies of solid lesions located between the thyroid and the superior mediastinum.

ABSTRACT

Elastography-Imaging Tissue Stiffness: Approaches and Applications

Thursday, Dec. 3 4:30PM - 6:00PM Location: S505AB

`MR` `US` `PH`

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

`FDA` Discussions may include off-label uses.

Participants
Juergen K. Willmann, MD, Stanford, CA (*Moderator*) Research Consultant, Bracco Group; Research Consultant, Triple Ring Technologies, Inc; Research Grant, Siemens AG; Research Grant, Bracco Group; Research Grant, Koninklijke Philips NV; Research Grant, General Electric Company

LEARNING OBJECTIVES

1) To understand the principle technical aspects of ultrasound and MR elastography. 2) To learn clinical applications of elastography. 3)To learn the advantages and disadvantages of ultrasound and MR elastography for assessing tissue stiffness in various organs.

Sub-Events

RC717A   US Elastography of the Liver

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, Toshiba Corporation; Research Grant, Esaote SpA

LEARNING OBJECTIVES

1) To describe the clinical need for liver stiffness evaluation. 2) To describe the principles of ultrasound shear wave liver elastography To review the technique of shear wave liver elastography. 3) To discuss pitfalls in performing and interpreting ultrasound liver elastography To describe the basic approach to interpret ultrasound liver elastography.

ABSTRACT

Diffuse liver disease is one of the major health problems in the world. Hepatitis C (HCV) and Hepatitis B (HBV) viruses are the leading causes of chronic liver disease. It is estimated that 180 million and 350 million people worldwide are chronically infected with HCV and HBV respectively. In western countries, liver disease caused by HCV is the main indication for liver transplantation. Liver biopsy has been considered the reference standard for fibrosis assessment and stage classification. However, biopsy is invasive, with potential complications that can be severe in up to 1% of cases. In addition, a liver biopsy represents roughly 1/50,000 of the liver volume and there is interobserver variability at microscopic evaluation. Elastography is a non-invasive method for liver fibrosis assessment and has been an area of intense research. With ultrasound elastography systems now widely available worldwide this technique is beginning to replace liver biopsy as method for diagnosis and follow-up of liver fibrosis. This technique is easy to perform but requires attention to detail. This course will review the principles of shear wave elastography (SWE) for liver fibrosis assessment. A review of the technique and pitfalls will be presented. The literature will be reviewed as well as published guidelines on the use of SWE for liver fibrosis assessment. A discussion of the clinical applications of this technique and future potential applications will be discussed.

RC717B   Non-liver Applications of US Elastography

Participants
Anthony E. Samir, MD, Boston, MA, (ASAMIR@mgh.harvard.edu) (*Presenter*) Consultant, Pfizer Inc; Consultant, General Electric Company; Consultant, PAREXEL International Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Siemens AG; Research Grant, Toshiba Corporation; Research Grant, General Electric Company; Research Grant, Samsung Electronics Co, Ltd; Research Grant, Analogic Corporation; Research support, SuperSonic Imagine; Research support, Hitachi, Ltd

LEARNING OBJECTIVES

1) This refresher course provides a summary of current state-of-the-art Ultrasound (US) elastography methods in non-hepatic conditions including thyroid nodules, prostate cancer, deep vein thrombosis and renal fibrosis and neoplasms.

ABSTRACT

(1) A brief discussion of the evolution of SE over 20 years; physics primer including tissue elasticity, strain, shear wave and Young modulus; classification: quasi-quantitative method (strain elastography, elasticity ratio), quantitative methods by shear wave and comparison of various methods in terms of their advantages and limitations.(2) A discussion of applications of SE techniques in non-hepatic conditions. We compare diagnostic performance and reliability advantages and limitations of various SE techniques.A. Thyroid:SE methods can be used for differentiating benign and malignant thyroid nodules. It may be especially helpful for a group of indeterminate nodules with follicular lesions finding on fine needle aspirationB. Kidney:SE may be useful for detecting renal fibrosis. SE may also has adjunctive role in diagnosis of renal masses.C. Prostate:The main role of SE is prostate cancer detection, and assistance with biopsy targeting.D. Pancreas:SE methods can be used to evaluate the pancreas by upper gastrointestinal endoscopy.E. Deep vein thrombosis:Main clinical application of SE can be measuring time-dependent viscoelastic properties (aging) of blood clots in venous system.SE is a rapidly evolving set of methods that have a promising role as a biomarker in various pathologic conditions through providing information about the physical properties of the tissues that is complementary to that provided by other modalities.

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

LEARNING OBJECTIVES

1) To describe the rationale for tissue elasticity imaging. 2) To describe the basic physical approach for MRI-based elasticity imaging. 3) To describe the most common indications for MR elastography of the liver. 4) To describe the basic approach to interpretation of hepatic MR elastography exams. 5) To describe pitfalls in interpretation of hepatic MRE. 6) To describe other potential applications of MRE.

ABSTRACT

Many disease processes cause profound changes in the mechanical properties of tissues. This accounts for the efficacy of palpation for detecting abnormalities and provides motivation for developing practical methods to assess tissue elasticity. Magnetic Resonance Elastography (MRE) is a new commercially-available MRI-based technique that can quantitatively image the mechanical properties of tissue. The most advanced current application of MRE is for diagnosing hepatic fibrosis. Chronic liver disease is serious worldwide problem, and hepatic fibrosis is the most important consequence, which if not detected and treated, eventually leads to cirrhosis which is irreversible and associated with high mortality. MRE can be readily implemented on a standard MRI system. A device is used to generate vibrrations in tissue. The waves are imaged with a special MRI pulse sequence. Acquistion time for liver MRE is approximately 15 seconds. Because the incremental imaging time is so small, MRE can readily added to standard abdominal MR imaging protocols. The data are automatically processed generate quantitative images showing the elasticity of the liver and other tissues in the upper abdomen. Clinical studies by multiple investigators have now established that MRE is an accurate method for diagnosing hepatic fibrosis. MRE-measured hepatic stiffness increases systematically with fibrosis stage. Growing clinical experience indicates that MRE is at least as accurate as liver biopsy for this diagnosis, while also being safer, more comfortable, and less expensive. Human studies have demonstrated that it is feasible to apply MRE to quantitatively assess other tissues and organs such as brain, breast, heart, and kidney. MRE may be helpful in differentiating between benign and malignant neoplasms. New research has shown that MRE is helpful in the preoperative assessment of patients with brain tumors such as menigiomas.

Real-time Interventional US (Hands-on)

Thursday, Dec. 3 4:30PM - 6:00PM Location: E264

US **IR**

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

Participants

Christopher A. Molvar, MD, Maywood, IL (*Moderator*) Nothing to Disclose
Kent T. Sato, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Albert A. Nemcek JR, MD, Chicago, IL (*Presenter*) Consultant, B. Braun Melsungen AG
Robert J. Lewandowski, MD, Chicago, IL, (r-lewandowski@northwestern.edu) (*Presenter*) Advisory Board, BTG International Ltd; Advisory Board, Boston Scientific Corporation; Consultant, Cook Group Incorporated; Consultant, ABK Medical Inc
Ramona Gupta, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Terry D. Wilkin, MD, South Bend, IN (*Presenter*) Nothing to Disclose
Kevin L. Keele, MD, Harvey, IL (*Presenter*) Nothing to Disclose
Michael H. Hamblin, MD, Evanston, IL (*Presenter*) Nothing to Disclose
Terence A. Matalon, MD, Philadelphia, PA, (matalont@einstein.edu) (*Presenter*) Speaker, Koninklijke Philips NV
Elias Hohlastos, MD, Chicago, IL (*Presenter*) Nothing to Disclose
Andrew J. Lipnik, MD, Nashville, TN, (andrew.j.lipnik@vanderbilt.edu) (*Presenter*) Nothing to Disclose
Christopher Baron, MD, Nashville, TN (*Presenter*) Nothing to Disclose
Parag M. Amin, MD, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Acquire the skill to direct a needle to a target for diagnostic or therapeutic purposes with Real-time US-guidance.

ABSTRACT

Participants will have the opportunity to hone their skills in ultrasound guided interventions using phantoms. Experienced practitioners in ultrasound guided intervention will serve as faculty.

Participants

Mark E. Lockhart, MD, Birmingham, AL, (mlockhart@uabmc.edu) (*Coordinator*) Nothing to Disclose
Reena C. Jha, MD, Washington, DC (*Presenter*) Nothing to Disclose
Maitray D. Patel, MD, Phoenix, AZ (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe current best practice recommendations for management of adnexal asymptomatic, incidental, and/or potentially physiologic findings on pelvic US, CT, and MR based on lesion characteristics and patient clinical factors. 2) Understand the reference lines and angles in pelvic MRI that are used in the evaluation of pelvic floor disorders. 3) Understand the typical imaging characteristics of the endometrium and myometrium according to patient age and stage of the reproductive cycle, and review associated benign pathology.

ABSTRACT

This session will present on topics related to pelvic imaging. At the conclusion of the three presentations, the participants should have an improved understanding of imaging characteristics of the ovaries and uterus, including endometrium. Also, the imaging parameters used in evaluation of pelvic floor abnormalities such as organ prolapse and structural abnormalities related to incontinence will be reviewed. In each lecture, the imaging characteristics of a variety of disease processes will be covered.

Active Handout:Maitray D. Patel

http://abstract.rsna.org/uploads/2015/14000842/RC807.pdf

Emergency Ultrasound Pitfalls (An Interactive Session)

Friday, Dec. 4 8:30AM - 10:00AM Location: E353C

| GI | GU | OB | US | ER |

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

Participants

Sub-Events

RC808A   Pitfalls in Right Upper Quadrant Ultrasound

Participants
Mindy M. Horrow, MD, Philadelphia, PA, (horrowm@einstein.edu) (*Presenter*) Spouse, Director, Merck & Co, Inc

LEARNING OBJECTIVES

1) Describe technical factors that may improve visualization of cholelithiasis including appropriate frequency transducer and identification of gallbladder neck. 2) Identify non biliary causes of gallbladder wall thickening. 3) Recognize causes for non-visualization of a fluid filled gallbladder and how to differentiate the gallbladder from other fluid filled structures in the right upper quadrant. 4) Describe situations in which color Doppler is essential to detect renal causes of right upper quadrant pain.

Honored Educators

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Mindy M. Horrow, MD - 2013 Honored Educator

RC808B   Pediatric Abdominal Ultrasound Pitfalls

Participants
Susan D. John, MD, Houston, TX (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Use optimal protocols for performing abdominal US in infants and children. 2) Avoid diagnostic errors in pediatric gastrointestinal US caused by common artifacts and variables in exam performance. 3) Recognize variations in pathology and important secondary findings that are helpful for the diagnosis of acute or emergent conditions in the pediatric abdomen.

ABSTRACT

RC808C   Non-obstetrical Gynecologic Ultrasound Pitfalls

Participants
Ana P. Lourenco, MD, Providence, RI, (alourenco@lifespan.org) (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize commonly encountered gynecological ultrasound pitfalls. 2) Describe strategies to avoid these pitfalls.

ABSTRACT

This session will review common pitfalls encountered in gynecologic ultrasound and highlight strategies for avoiding such pitfalls. Case-based presentations will illustrate the varied presentations of ovarian torsion, non-gynecologic etiologies for acute pelvic pain including ureteral calculi and acute appendicitis, and a variety of uterine, ovarian and adnexal abnormalities. The benefits and limitations of transabdominal and transvaginal imaging, as well as color Doppler, will be highlighted with examples to demonstrate the utility of each technique.

Active Handout:Ana P. Lourenco

http://abstract.rsna.org/uploads/2015/15003351/Active RC808C.pdf

RC808D   First Trimester Ultrasound Pitfalls

Participants
Mariam Moshiri, MD, Seattle, WA (*Presenter*) Consultant, Reed Elsevier; Author, Reed Elsevier

LEARNING OBJECTIVES

1) To review the relatively recent report of the Society of Radiologists in Ultrasound, on new ultrasound criteria for evaluation of first trimester pregnancy. 2) To demonstrate potential pitfalls of sonographic performance and interpretation in the first trimester of pregnancy, and to discuss how to avoid them. 3) To review other relevant, very recent literature on first trimester pregnancy ultrasound performance and interpretation.

Vascular Doppler (An Interactive Session)

Friday, Dec. 4 8:30AM - 10:00AM Location: S402AB

`VA` `US`

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

Participants

Sub-Events

RC810A   Beyond Peak Velocities: Waveform Interpretation in Carotid Doppler

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

LEARNING OBJECTIVES

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

Active Handout:Mark A. Kliewer

http://abstract.rsna.org/uploads/2015/15002014/RC810A.pdf

RC810B   Upper and Lower Extremity Veins

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

LEARNING OBJECTIVES

1) This course will review the US criteria for the diagnosis of acute and chronic DVT, including a discussion of pitfalls in the US diagnosis of DVT. 2) Current controversies in the US evaluation of DVT will be reviewed. 3) The role of US in the diagnosis of alternative causes of leg pain and swelling will be described. 4) US diagnosis of DVT in the upper extremity will also be discussed.

ABSTRACT

This session will discuss the clinical presentation and epidemiology of deep venous thrombosis in the upper and lower extremities. The criteria for and pitfalls in the US the diagnosis of DVT will be discussed with an emphasis on current controversies in the role of US in the work up of patients with clinically suspected DVT. In addition, the role of US in idenitfying alternative causes of extremity pain and swelling will be presented.

Honored Educators

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Leslie M. Scoutt, MD - 2014 Honored Educator

RC810C   Upper and Lower Extremity Arteries

Participants
Michelle L. Robbin, MD, Birmingham, AL, (mrobbin@uabmc.edu) (*Presenter*) Consultant, Koninklijke Philips NV;

LEARNING OBJECTIVES

1) Describe normal anatomy and normal anatomic variants. 2) Demonstrate normal and abnormal waveform patterns. 3) Discuss methods to evaluate stenoses and occlusions, noting pitfalls.

ABSTRACT

Upper and lower extremity arterial ultrasounds are becoming more commonly requested because of concerns regarding expense and toxicity of CT/MRI contrast agents, as well as radiation associated with CT. Indications and standard US evaluation of the upper and lower extremity arteries will be detailed, including high brachial artery bifurcation (a normal variant), palmar arch evaluation prior to radial artery harvesting for CABG, and lower extremity arterial waveform analysis.

Molecular Imaging Beyond PET: MRI and Ultrasound/Photoacoustic Molecular Imaging

Friday, Dec. 4 8:30AM - 10:00AM Location: S504CD

`MI` `MR` `OI` `US`

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

`FDA` Discussions may include off-label uses.

Participants

Fabian Kiessling, MD, Aachen, Germany, (fkiessling@ukaachen.de) (*Moderator*) Advisor, invivoContrast GmbH; Co-owner, invivoContrast GmbH; Advisor, Molecular Targeting Technologies, Inc; Cooperation, Bayer AG; Cooperation, Bracco Group; Cooperation, Merck KgaA; Cooperation, AstraZeneca PLC; Cooperation, Koninklijke Philips NV; Cooperation, FUJIFILM Holdings Corporation

LEARNING OBJECTIVES

1) Attendees will learn the principles and applications of molecular imaging using ultrasound and photoacoustic imaging techniques. 2) Principles and applications of ultrasound molecular imaging will be reviewed. 3) Principles and applications of molecular imaging using photoacoustic imaging techniques will be presented. 4) Ultrasound guided drug delivery approaches will be reviewed. 5) At the end of this course, the attendees will understand the principles and potential clinical applications of ultrasound and optoacoustic molecular imaging as well as of ultrasound guided drug delivery.

Sub-Events

RC817A   Photoacoustic Imaging

Participants
Stanislav Emelianov, PhD, Atlanta, GA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the fundamental principles of photoacoustic imaging and major components of photoacoustic imaging system. 2) Knowing how photoacoustic images are formed and how to interpret photoacoustic images. 3) Understand how imaging contrast agents or imaging probes affect contrast, penetration depth and specificity in photoacoustic imaging. 4) Understand the ability of photoacoustic imaging system to visualize anatomical, functional and molecular properties of imaged tissue. 5) Identify the role of photoacoustic imaging in pre-clinical and clinical applications.

ABSTRACT

Photoacoustic imaging or tomography - a non-ionizing, non-invasive, real-time imaging technique capable of visualizing optical absorption properties of tissue at reasonable depth and high spatial resolution, is a rapidly emerging biomedical and clinical imaging modality. Photoacoustic imaging is regarded for its ability to provide in-vivo morphological and functional information about the tissue. With the recent advent of targeted contrast agents, photoacoustics is capable of in-vivo molecular imaging, thus facilitating further molecular and cellular characterization of tissue. This presentation is designed to provide both a broad overview and a comprehensive understanding of photoacoustic imaging. With a brief historical introduction, we will examine the foundations of photoacoustics, including relevant governing equations, optical/acoustic properties of the tissues, laser-tissue interaction, system hardware and signal/image processing algorithms. Specifically, penetration depth and spatial/temporal resolution of photoacoustic imaging will be anlyzed. Integration of photoacoustic and ultrasound imaging systems will be discussed. Techniques to increase contrast and to differentiate various tissues in photoacoustic imaging will be presented. Furthermore, design, synthesis and optimization of imaging probes (typically, nanoconstructs or dyes) to enable molecular/cellular photoacoustic imaging will be presented. Special emphasis will be placed on contrast agents capable of multiplexed imaging, multi-modal imaging and image-guided therapy including drug delivery and release. The presentation will continue with an overview of several commercially available and clinically-relevant systems capable of photoacoustic imaging. Regulatory aspects of photoacoustic imaging systems and imaging contrast agents will be presented. Finally, current and potential biomedical and clinical applications of photoacoustics will be discussed.

RC817B   Ultrasound Molecular Imaging

Participants
Juergen K. Willmann, MD, Stanford, CA (*Presenter*) Research Consultant, Bracco Group; Research Consultant, Triple Ring Technologies, Inc; Research Grant, Siemens AG; Research Grant, Bracco Group; Research Grant, Koninklijke Philips NV; Research Grant, General Electric Company

LEARNING OBJECTIVES

1) To understand the acquisition and quantification principles of ultrasound molecular imaging. 2) To understand the characteristics and biodistribution of molecularly targeted ultrasound contrast agents. 3) To understand the role of ultrasound molecular imaging in preclinical and clinical applications.

ABSTRACT

Ultrasound imaging is a widely available, relatively inexpensive, and real-time imaging modality that does not expose patients to radiation and which is the first-line imaging modality for assessment of many organs. Through the introduction of ultrasound contrast agents, the sensitivity and specificity of ultrasound for detection and characterization of focal lesions has been substantially improved. Recently, targeted contrast-enhanced ultrasound imaging (ultrasound molecular imaging) has gained great momentum in preclinical research by the introduction of ultrasound contrast agents that are targeted at molecular markers over-expressed on the vasculature of certain diseases. By combining the advantages of ultrasound with the ability to image molecular

signatures of diseases, ultrasound molecular imaging has great potential as a highly sensitive and quantitative method that could be used for various clinical applications, including screening for early stage disease (such as cancer); characterization of focal lesions; quantitative monitoring of disease processes at the molecular level; assisting in image-guided procedures; and, confirming target expression for treatment planning and monitoring. In this refresher course the concepts of ultrasound molecular imaging are reviewed along with a discussion on current applications in preclinical and clinical research.

RC817C   Sonographically-guided Drug Therapy

Participants
Alexander L. Klibanov, PhD, Charlottesville, VA, (sasha@virginia.edu) (*Presenter*) Co-founder, Targeson, Inc; Stockholder, Targeson, Inc; Institutional research collaboration, AstraZeneca PLC;

LEARNING OBJECTIVES

1) To identify the basic principles of ultrasound energy deposition as applied to molecular imaging and image-guided therapeutic interventions. 2) To combine the general physical principles of ultrasound-microbubble interaction, drug-carrier systems pharmacokinetics and ultrasound contrast imaging, apply this knowledge for the development of triggered delivery approaches in the setting of personalized medicine. 3) To understand advantages and disadvantages of ultrasound application in the potential image-guided intervention designs. 4) To identify and compare potential clinical applications of ultrasound-guided drug delivery.

ABSTRACT

The reason of ultrasound use in drug delivery is to enhance drug action specifically in the area of disease. The design of such therapeutic intervention should assure that drug deposition or action enhancement take place only in the disease site, with the general goal to improve the therapeutic index. There are several approaches to ultrasound-assisted drug delivery. The first approach, closest to clinical practice, takes advantage of existing ultrasound contrast agents (intravenous gas microbubbles approved in US for cardiac imaging). When these bubbles are co-injected intravenously with the drugs, and ultrasound energy applied to the areas of disease, localized energy deposition leads to endothelium activation or transient "softening" of blood brain barrier (BBB). Drugs (including antibodies or liposomes) can thus transit BBB and achieve therapeutic action. Ultrasound imaging can be used for targeted focusing of ultrasound energy in the areas of disease. Second approach suggests attaching microbubbles to the drug or a drug carrier (including nucleic acid drugs). Microbubbles can be complexed with drug or gene carrier nanoparticles, so that local action of ultrasound would result in triggered drug release/deposit or transfection in the ultrasound-treated area. Third approach involves targeted microbubble design, as in ultrasound molecular imaging. Combination of targeted microbubbles with drug carrier makes possible unfocused ultrasound use, to act only in the areas of the target receptor expression, where microbubbles adhere and ultrasound energy is then deposited. Lately, formulation moved from microbubbles to smaller nanodroplet drug carriers, to reach interstitium, where drug release could take place upon ultrasound treatment. Overall, combination of ultrasound imaging, including contrast (molecular) imaging, focused ultrasound, and drug carrier systems will lead to novel image-guided therapies, especially applicable in the era of personalized medicine.

RC817D   Magnetic Resonance Molecular Imaging

Participants
Moritz F. Kircher, MD, PhD, New York, NY (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To receive a structured overview of the fundamental principles of generating molecular information with MRI. 2) To understand how each of these principles functions and what unique information it can provide. 3) To understand the current role of molecular MRI in preclinical and clinical applications. 4) To understand what the challenges of new molecular MRI approaches towards translation into humans will be.

ABSTRACT

The field of molecular MRI has exploded in the last decade, with hundreds of different concepts and probe designs developed and tested in vitro and in vivo. This talk will attempt at giving a structured overview over this vast arsenal of potentially useful approaches by focusing on those that have the highest potential for clinical translation. The approaches will be grouped into 6 major categories and their principles explained and illustrated with key examples: 1) Multimodal nanoparticles; 2) Activatable MRI probes; 3) Targeted superparamagnetic iron oxide nanoparticles; 4) non-targeted superparamagnetic iron oxide nanoparticles; 5) MRI-based Radiogenomics; and 6) Hyperpolarized magnetic resonance spectroscopic imaging.

US-guided Interventional Breast Procedures (Hands-on)

Friday, Dec. 4 8:30AM - 10:00AM Location: E264

BR **US**

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

Participants

Gary J. Whitman, MD, Houston, TX (*Moderator*) Book contract, Cambridge University Press
Annamaria Wilhelm, MD, Jacksonville, FL (*Presenter*) Nothing to Disclose
Michael N. Linver, MD, Albuquerque, NM (*Presenter*) Scientific Advisory Board, Hologic, Inc; Scientific Advisory Board, Real Imaging Ltd
Stamatia V. Destounis, MD, Scottsville, NY (*Presenter*) Research Grant, FUJIFILM Holdings Corporation; Research Grant, Hologic, Inc; Research Grant, QT Ultrasound LLC
Anna I. Holbrook, MD, Atlanta, GA (*Presenter*) Nothing to Disclose
Alice S. Rim, MD, Cleveland, OH, (rima@ccf.org) (*Presenter*) Nothing to Disclose
Alda F. Cossi, MD, Boston, MA (*Presenter*) Nothing to Disclose
Eren D. Yeh, MD, Boston, MA, (eyeh@partners.org) (*Presenter*) Nothing to Disclose
Gary W. Swenson, MD, Mason City, IA (*Presenter*) Nothing to Disclose
Catherine W. Piccoli, MD, Voorhees, NJ (*Presenter*) Stockholder, VuCOMP, Inc;
Michael P. McNamara JR, MD, Cleveland, OH, (mpm9@case.edu) (*Presenter*) Nothing to Disclose
Selin Carkaci, MD, Columbus, OH (*Presenter*) Author with royalties, Reed Elsevier
Jean M. Seely, MD, Ottawa, ON (*Presenter*) Nothing to Disclose
Phan T. Huynh, MD, Houston, TX (*Presenter*) Research Grant, Siemens AG; Consultant, Siemens AG
Basak E. Dogan, MD, Houston, TX (*Presenter*) Nothing to Disclose
Jiyon Lee, MD, New York, NY, (jiyon.lee@nyumc.org) (*Presenter*) Nothing to Disclose
Tanya W. Moseley, MD, Houston, TX (*Presenter*) Nothing to Disclose
Michelle D. McDonough, MD, Jacksonville, FL, (McDonough.michelle@mayo.edu) (*Presenter*) Nothing to Disclose
Peter R. Eby, MD, Seattle, WA, (peter.eby@virginiamason.org) (*Presenter*) Consultant, Devicor Medical Products, Inc
William R. Poller, MD, Pittsburgh, PA (*Presenter*) Consultant, Devicor Medical Products, Inc;
Alexis V. Nees, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Describe the equipment needed for ultrasound guided interventional breast procedures. 2) Review the basic principles of ultrasound guidance and performance of minimally invasive breast procedures. 3) Practice hands-on technique for ultrasound guided breast interventional procedures.

ABSTRACT

This course is intended to familiarize the participant with equipment and techniques in the application of US guided breast biopsy and needle localization. Participants will have both basic didactic instruction and hands-on opportunity to practice biopsy techniques on tissue models with sonographic guidance. The course will focus on the understanding and identification of: 1) optimal positioning for biopsy 2) imaging of adequate sampling confirmation 3) various biopsy technologies and techniques 4) potential problems and pitfalls

Honored Educators

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Eren D. Yeh, MD - 2015 Honored Educator