

2013 RSNA (Filtered Schedule)

Sunday, December 01, 2013

- 10:45-12:15 PM • [SSA01](#) • Arie Crown Theater • Breast Imaging (Diagnostic Ultrasound)
10:45-12:15 PM • [SSA21](#) • Room: S405AB • Physics (Ultrasound)
02:00-03:30 PM • [RC110](#) • Room: E450B • Renal Ultrasound and Doppler (An Interactive Session)
02:00-03:30 PM • [RC152](#) • Room: E264 • Techniques for Interventional Sonography and Thermal Ablation (Hands-on Workshop)

Monday, December 02, 2013

- 08:30-10:00 AM • [RC210](#) • Room: S405AB • First Trimester Ultrasound
08:30-10:00 AM • [RC231](#) • Room: E258 • Master Class in Musculoskeletal Ultrasound (How-to Workshop)
08:30-10:00 AM • [RC252](#) • Room: E264 • US-guided Interventional Breast Procedures (Hands-on Workshop)

Tuesday, December 03, 2013

- 07:15-08:15 AM • [SPSC30](#) • Room: E350 • Controversy Session: Fibroid Therapy: UAE vs Focused US
08:30-10:00 AM • [RC310](#) • Room: S405AB • Second and Third Trimester Obstetrical Ultrasound
08:30-10:00 AM • [RC317](#) • Room: S504CD • MR-Guided High Intensity Frequency Ultrasound (HIFU)
08:30-10:00 AM • [RC352](#) • Room: E264 • Doppler US: Visceral, Extremity and Carotid Applications (Hands-on Workshop)
08:30-12:00 PM • [VSMK31](#) • Room: E451B • Musculoskeletal Radiology Series: Ultrasound
10:30-12:00 PM • [MSES32](#) • Room: S100AB • Essentials of Ultrasound
04:30-06:00 PM • [RC410](#) • Room: E353B • Vascular Doppler (An Interactive Session)
04:30-06:00 PM • [RC452](#) • Room: E264 • Real-time Interventional US (Hands-on Workshop)

Wednesday, December 04, 2013

- 08:30-10:00 AM • [RC510](#) • Room: S405AB • Advances in Gynecologic Ultrasound
08:30-10:00 AM • [RC531](#) • Room: E263 • Small Parts Interventional Ultrasound (Hands-on Workshop)
08:30-10:00 AM • [RC552](#) • Room: E264 • Nerve Ultrasound Based on a Regional Approach: Shoulder and Neck (Hands-on Workshop)
01:30-03:00 PM • [MSCU41](#) • Room: S406A • Case-based Review of US (An Interactive Session)
03:00-04:00 PM • [SSM02](#) • Room: E451A • Breast Imaging (Multimodality Breast Imaging)
03:00-04:00 PM • [SSM24](#) • Room: E450B • Vascular/Interventional (Vascular Ultrasound)
03:30-05:00 PM • [MSCU42](#) • Room: S406A • Case-based Review of US (An Interactive Session)

Thursday, December 05, 2013

- 08:30-10:00 AM • [RC607](#) • Room: N228 • GU Ultrasound 2013: The Expert's Update on Kidney, Gynecologic and Testicular US
08:30-10:00 AM • [RC610](#) • Room: S103CD • Abdominal Vasculature: Ultrasound and Doppler
08:30-10:00 AM • [RC615](#) • Room: N227 • Breast US
08:30-10:00 AM • [RC621](#) • Room: S102C • Medical Physics 2.0: Ultrasonography
08:30-10:00 AM • [RC652](#) • Room: E264 • Dynamic Musculoskeletal US of the Lower Extremity (Hands-on Workshop)
10:30-12:00 PM • [SSQ01](#) • Arie Crown Theater • Breast Imaging (Ultrasound Screening)
10:30-12:00 PM • [SSQ05](#) • Room: N226 • Emergency Radiology (Imaging Abdominal Emergencies)
04:30-06:00 PM • [RC710](#) • Room: E353B • Ultrasound of Superficial Structures (An Interactive Session)
04:30-06:00 PM • [RC717](#) • Room: S504CD • Ultrasound/Opto-Acoustic Molecular Imaging
04:30-06:00 PM • [RC752](#) • Room: E264 • Techniques for Interventional Sonography and Thermal Ablation (Hands-on Workshop)

Friday, December 06, 2013

- 08:30-10:00 AM • [RC810](#) • Room: E351 • Right Upper Quadrant Ultrasound
08:30-10:00 AM • [RC825](#) • Room: E263 • Quantitative Imaging: Quantitative Imaging in Ultrasound
08:30-10:00 AM • [RC831](#) • Room: E450B • US for Thyroid Cancer: Diagnosis, Surveillance, and Treatment (How-to Workshop)
08:30-10:00 AM • [RC851](#) • Room: E261 • Pediatric Neurosonography Update: Head, Spine, and Transcranial Doppler Ultrasound (How-to Workshop)
08:30-10:00 AM • [RC852](#) • Room: E264 • US-guided Interventional Breast Procedures (Hands-on Workshop)

Quality Control of Ultrasonography System for Breast Screening

[Back to Top](#)

LL-BRE1146

Norimitsu Shinohara, PhD
Naoki Kamiya, PhD
Takako Morita, MD

PURPOSE/AIM

In order to apply ultrasonography for breast cancer screening, it is essential to maintain QC of the ultrasonography scanner and probe. The phantom for ultrasonography system were produced in 2009. Three targets are in the phantom. The Mass target evaluates LUT, and the Dot target evaluates resolution, and the Cyst target evaluates circle degree.

CONTENT ORGANIZATION

In this paper, we introduce an objective evaluation method using a computer automated analysis for the ultrasonography system. We imaged the phantom images by the movie of 15frames/sec. We made the evaluation image by dividing a movie into each frame. To avoid the influence of a target edge and posterior echoes, the measurement region of the Mass target decided 80% and half the upper part region from an initial outline. As for the other targets, the detection was possible by simple technique.

SUMMARY

The Mass target clarified the relation between the pixel value and impedance. The Dot target clarified the range resolution and the angular resolution. The Cyst target was able to measure the circle degree. All phantom was able to be evaluated as a result of evaluating 100 Phantom by the proposal technique. This technique is effective as the evaluation of universality of a normal system, and because an insufficient adjustment of the ultrasonography system is detected, effective.

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Sonographic Appearance of Ductal Carcinoma In Situ: Correlation with Mammography, Magnetic Resonance Imaging and Pathologic Findings

[Back to Top](#)

LL-BRE1153

Luciana Graziano , MD
Almir Bitencourt , MD
Elvira F Marques
Juliana A Souza
Mirian R Poli , MD
Camila Guatelli
Caroline B Da Silva

PURPOSE/AIM

To summarize the sonographic features of ductal carcinoma in situ (DCIS) detected by ultrasound (US) and correlate them with mammography, magnetic resonance imaging (MRI) and pathologic findings.

CONTENT ORGANIZATION

DCIS: - Pathologic changes - Types of DCIS Sonographic Appearance of DCIS: - Size - Shape - Margins - Echogenicity - Posterior acoustic characteristics Correlation with Mammography: - DCIS with microcalcifications - DCIS without microcalcifications Correlation with MRI: - Enhancement patterns - Second-look US Correlation with pathology: - Architectural pattern (micropapillary, papillary, solid, cribriform, and comedo) - Nuclear grade - Presence of necrosis

SUMMARY

US technique is critical for demonstrating DCIS. The main benefit of identifying a US abnormality in women with suspected DCIS on mammography or MRI is to allow the use of US to guide interventional procedures. Besides, US may be helpful in detecting DCIS without calcifications and in evaluating disease extent in women with dense breasts.

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[Back to Top](#)

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Supporting the Multi-modal Breast Reading Workflow by an Automatic Position Correlation Method for Tomosynthesis and Breast Volume Ultrasound Images

[Back to Top](#)

LL-BRE1163

Joachim Georgii
Fabian Zoehrer
Horst K Hahn , PhD *

PURPOSE/AIM

Tomosynthesis in combination with the 3D breast ultrasound modality ABVS (automated breast volume scanner) has the potential to increase the diagnostic accuracy of breast cancer detection and diagnosis by correlating findings in both modalities. However, the manual position correlation between these differently and highly deformed 3D images is time-expensive and requires complex thinking. We will show how our automatic real-time position correlation method can support the simultaneous navigation of these different datasets.

CONTENT ORGANIZATION

The presented workstation will simultaneously show a patients tomosynthesis and 3D ultrasound image. When the user navigates through one of the images with a cursor position, our method will automatically show the correlated cursor position in the other view. Additionally, the user has the option to deactivate the automatic method, which will illustrate the difficulties of manually correlating corresponding positions in these images.

SUMMARY

We present an automatic real-time position correlation method for tomosynthesis and 3D ultrasound images. We will show how our method supports the reading workflow by position correlation between those highly different modalities.

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[Back to Top](#)

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3D Automated Breast Ultrasound (ABUS): Pictorial Review of Applications and Clinical Utility

[Back to Top](#)

LL-BRE2413

Angels Domingo, MD
Francisca Virginia C Gras, MD
Carmen V Cusido, MD
Xavier Salvador, MD *

PURPOSE/AIM

To review the potential applications of ABUS such as detection and characterization of benign and malignant lesions, evaluation of breast implants and its complications (i.e. rupture), screening of asymptomatic dense-breasted women, amongst others.

CONTENT ORGANIZATION

1. Review of ABUS applications. 2. Illustrative case reviews: *Malign lesions: intraductal, multifocal, tubular and in situ carcinomas. Mammographic correlation. *Benign lesions: fibroadenomas, cysts, post-operative scars, mastopathy, calcifications, lymph nodes. *Breast implants evaluation and its complications (i.e. rupture). 3. ABUS screening in asymptomatic dense-breasted women. Examples of asymptomatic dense-breasted women with normal mammography and pathologic findings in ABUS.

SUMMARY

ABUS represents a potential diagnostic tool, especially in dense-breasted women. It doubles overall cancer detection when combined with screening mammography. It provides additional information in the evaluation of focal lesions with multiplanar reconstructions, increasing diagnostic accuracy and offering visualization of the whole breast. The coronal plane offers an easily understandable representation of the breast's anatomy, specially useful in breast surgery. It guarantees high patient safety as there is no exposure to ionizing radiation and no injection of contrast medium.

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[Back to Top](#)

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Unilateral Breast Enlargement

[Back to Top](#)

LL-BRE2452

Sung Hee Park, MD
Bomi Chung
So Hyun Cho, MD
Seung Joon Choi

PURPOSE/AIM

The purpose of the exhibit are: 1. To illustrate ultrasonographic, mammographic and MR imaging findings of unilateral breast enlargement 2. To discuss the various etiologies that result in unilateral breast enlargement 3. To review the pathophysiology of unilateral breast enlargement in each case 4. To learn characteristic imaging findings of unilateral breast enlargement for differential diagnosis

CONTENT ORGANIZATION

I. Illustration of cases 1. Lymphangioma and lymphangiectasia 2. Chronic inflammation with lymphangiectasia 3. Giant fibroadenoma 4. Interstitial breast edema with right pleural effusion 5. Asymmetric breast enlargement due to unilateral lactation 6. Inflammatory breast cancer II. Review of pathophysiology III. Review of imaging findings in each case IV. Summarize characteristic imaging findings and differential diagnostic points

SUMMARY

The major teaching point of this exhibit are: 1. To aware the various causes of unilateral breast enlargement 2. To understand the pathophysiology of unilateral breast enlargement 3. To learn characteristic imaging findings and differential diagnostic points

Unilateral Breast Enlargement

[Back to Top](#)

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My My My My My Seroma: The Role of the Radiologist in the Evaluation and Management of Postoperative Seromas of the Breast

[Back to Top](#)

LL-BRE2459

Rebecca L Seidel , MD

PURPOSE/AIM

The majority of postoperative seromas are managed solely by the surgeon. In certain circumstances, the radiologist may be consulted. The purpose of this exhibit is to illustrate the role of the radiologist in the management of postoperative seromas of the breast and review proper technique for percutaneous ultrasound guided seroma drainage.

CONTENT ORGANIZATION

1. What is a seroma and how does it form 2. Seromas typically managed by the breast surgeon 3. Seromas in patients with tissue expanders and implants 4. Seromas in patients undergoing radiation therapy planning 5. Evaluation of fluid collections for possible infection 6. Proper technique for percutaneous ultrasound guided aspiration of a fluid collection in the breast, with an emphasis on minimizing risk of damage to implant or expander.

SUMMARY

The radiologist may play an important role in the evaluation and management of postoperative seromas of the breast. This exhibit will improve the radiologist's ability to collaborate with the referring surgeon to appropriately characterize and manage postoperative fluid collections of the breast.

My My My My My Seroma: The Role of the Radiologist in the Evaluation and Management of Postoperative Seromas of the Breast

[Back to Top](#)

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Rebecca L Seidel , MD

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3D Ultrasound Imaging of Axillary Lymph Nodes in Breast Cancer Patients: A Pictorial Atlas

[Back to Top](#)

LL-BRE2461

Beatriu Reig , MD, MPH
Tova C Koenigsberg , MD
Susan J Frank , MD

PURPOSE/AIM

1. Present the spectrum of 3D ultrasound findings in metastatic axillary lymph nodes utilizing both gray scale and color Doppler imaging. 2. Review published literature on 3D ultrasound of lymph nodes, which until now has not included axillary lymph nodes.

CONTENT ORGANIZATION

- ◆ Review importance of axillary lymph node status in breast cancer staging.
- ◆ Summarize the current literature on 3D ultrasound of lymph nodes.
- ◆ Create a pictorial atlas of 3D ultrasound appearance of axillary lymph nodes.
- ◆ Correlate the ultrasound appearance with pathological findings in metastatic lymph nodes.

SUMMARY

Staging of invasive breast cancer requires pathologic evaluation of the ipsilateral axillary lymph nodes. A pre-operative diagnosis of axillary lymph node metastasis obtained via ultrasound guided sampling can allow a patient to skip sentinel node biopsy and move directly to one-stage surgery with axillary node dissection. We present the 3D ultrasound appearance of abnormal axillary lymph nodes. This may complement 2D ultrasound imaging and better guide radiologists in selecting patients who would benefit from pre-surgical biopsy. In addition, this emerging technique in lymph node imaging may prove helpful in imaging lymph nodes in other anatomic sites.

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[Back to Top](#)

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Breast Cancer Screening with Sonography: What the Radiologist Must Know to Improve Performance and Avoid Misinterpretations

[Back to Top](#)

LL-BRE2467

Luciana P Silveira , MD
Barbara H Bresciani , MD
Luciano F Chala , MD
Bruna M Thompson , MD
Marco A Costenaro , MD
Nestor De Barros , MD

PURPOSE/AIM

- To describe the technical errors that can produce false-negative or false-positive interpretations.
- To review the minimal signs suggestive of malignancy and benign lesions beyond the simple cysts.

CONTENT ORGANIZATION

- Summary of the current barriers to widespread use of breast screening sonography - Equipment requirements and examination technique: a brief discussion of key issues - Technical - related errors: sample cases with discussion on how to avoid them. - Illustrate the major and minimal signs of malignancy and benign lesions on sonography beyond simple cyst. - Review common benign lesions that can appear suspicious on sonography and present with typically benign features on mammography and / or clinical correlation. - Conclusions and future directions

SUMMARY

- The main limitations in breast cancer screening sonography include operator dependency, high number of false positives and false negatives, especially in ductal carcinoma in situ, and time-consuming examination. - Prevent errors related to technique, recognize minimal signs of malignancy and know benign lesions beyond the simple cyst is very important to minimize these limitations and to avoid mistakes on use of breast cancer screening sonography

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[Back to Top](#)

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You're in Good Hands with ABVS: Tips and Pitfalls of Automated Breast Volume Scanner

[Back to Top](#)

LL-BRE2470

Hyun Jung Koo , MD
Joo Hee Cha
Hak Hee Kim , MD
Hee Jung Shin , MD
Eun Young Chae

PURPOSE/AIM

To familiarize radiologists with a variety of false positive and false negative findings on automated breast volume scanner (ABVS) for making an accurate diagnosis.

CONTENT ORGANIZATION

1. Introduction

A. Clinical application of ABVS (Automated Breast Volume Scanner)

B. Pros and cons of ABVS

- Diagnostic value compared with hand-held ultrasound **2. Evaluation methods using ABVS**

A. Image acquisition

- Patient factors

- Technical factors

B. Image reconstruction

C. Interpretation methods

- Locate the lesion: directions and diameters **3. Practical cases that radiologists should know**

A. Typical cases

B. Pitfalls

- False positive findings

- False negative findings

C. Tips to deal with BI-RADS category 4 lesions

SUMMARY

Automated breast volume scanner (ABVS) is a rapidly emerging imaging modality with increasing adoption in both the screening and

diagnostic setting. Although image interpretation is in some ways similar to hand-held ultrasound, there remain vast differences and specific training is required for radiologists. The overview of image acquisition techniques and interpretation methods of ABVS would help radiologists to understand and use of ABVS. To make an accurate diagnosis, tips and pitfalls of ABUS with various false positive and false negative cases will be presented.

You're in Good Hands with ABVS: Tips and Pitfalls of Automated Breast Volume Scanner

[Back to Top](#)

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Mammography, Ultrasound and MR Imaging in Breast Disorders Related to Pregnancy and Lactation: Literature Review and Personal Experience

[Back to Top](#)

LL-BRE2475

Sandra Bednarova , MD
Orazio Pennisi
Micaela De Lorenzo Poz , MChir
Viviana Londero , MD
Chiara Zuiani , MD
Massimo Bazzocchi , MD

PURPOSE/AIM

To review imaging findings and management of breast disorders related to pregnancy and lactation.

CONTENT ORGANIZATION

1. Gestational and postgestational changes in human breast

2. Breast disorders during pregnancy and lactation

- Inflammatory and infectious disease

- Benign tumors

- Malignant tumors

3. Imaging findings

- Mammography

- Ultrasonography

- MR Imaging

4. Management

- Diagnostic work-up

- Indications for biopsy

- Issues in radiation protection and Gadolinium-based MR Contrast Agents administration

SUMMARY

Breast can be affected by a variety of breast disorders during pregnancy and lactation, as illustrated in this paper. The diagnostic work-up is based on US because of its greater sensitivity in increased parenchymal density. Mammography and MRI should be reserved for undetermined cases at US and/or for staging malignancy.

Mammography, Ultrasound and MR Imaging in Breast Disorders Related to Pregnancy and Lactation: Literature Review and Personal Experience

[Back to Top](#)

LL-BRE2475

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Orazio Pennisi
Micaela De Lorenzo Poz , MChir
Viviana Londero , MD
Chiara Zuiani , MD
Massimo Bazzocchi , MD

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Translation of Preoperative Breast MRI Findings into the Surgical Field Using Real-time Virtual Sonography

[Back to Top](#)

LL-BRE2482

Hiroko Satake , MD
Satoko Ishigaki , MD
Mariko Kitano
Hisashi Kawai
Shinji Naganawa , MD

PURPOSE/AIM

Real-time virtual sonography (RVS) is a fusion imaging system which displays real-time US images synchronized with the previously acquired MRI volumetric data. Aim of this exhibit is to explain the RVS technique for translating preoperative MRI findings into the surgical field to optimize resection margins in breast conservative therapy (BCT).

CONTENT ORGANIZATION

1. Principles of breast RVS system
2. Preoperative procedure of breast RVS
 - Localization of breast lesions detected by preoperative MRI
 - Three dimensional mapping of tumor extent based on preoperative MRI
3. Case presentations with illustrated images and short videos
 - Patients with negative resection margins
 - Patients with positive resection margins
4. Discussions on the utility and limitation of breast RVS

SUMMARY

In order to maximize the benefits of preoperative MRI, how to translate MRI information of tumor extent into the surgical environment is a key point. RVS can project MRI findings on the surgical field with real-time US guidance, and has a potential to improve the accuracy of surgical excision in BCT.

Translation of Preoperative Breast MRI Findings into the Surgical Field Using Real-time Virtual Sonography

[Back to Top](#)

LL-BRE2482

Hiroko Satake , MD
Satoko Ishigaki , MD
Mariko Kitano
Hisashi Kawai
Shinji Naganawa , MD

PURPOSE/AIM

Real-time virtual sonography (RVS) is a fusion imaging system which displays real-time US images synchronized with the previously acquired MRI volumetric data. Aim of this exhibit is to explain the RVS technique for translating preoperative MRI findings into the surgical field to optimize resection margins in breast conservative therapy (BCT).

CONTENT ORGANIZATION

1. Principles of breast RVS system
2. Preoperative procedure of breast RVS
 - Localization of breast lesions detected by preoperative MRI
 - Three dimensional mapping of tumor extent based on preoperative MRI
3. Case presentations with illustrated images and short videos
 - Patients with negative resection margins
 - Patients with positive resection margins
4. Discussions on the utility and limitation of breast RVS

SUMMARY

In order to maximize the benefits of preoperative MRI, how to translate MRI information of tumor extent into the surgical environment is a key point. RVS can project MRI findings on the surgical field with real-time US guidance, and has a potential to improve the accuracy of surgical excision in BCT.

Ultrasonographic Features with Pathologic Correlation of Ductal Diseases

[Back to Top](#)

LL-BRE2485

Lise P Berner
Christophe Tourasse
Jean Francois Denier
Agnes Coulon

PURPOSE/AIM

Describe, for residents and specialized radiologists, the most common imaging features of normal and abnormal ductal diseases.

CONTENT ORGANIZATION

- Describe the imaging appearance of normal ductal anatomy.
- List the imaging appearance of benign and malignant diseases of the ducts.

SUMMARY

Ductal disease is an important issue in breast imaging, but it is often not well know and difficult to understand. US is becoming the new standard for evaluation of suspected ductal disease. Benign diseases of the ducts include duct ectasia, blocked ducts, inflammatory, infiltrates, periductal mastitis, apocrine metaplasia, intraductal papillomas. Malignant diseases of the ducts include ductal carcinoma in situ, invasive ductal carcinoma, and Paget disease.

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Malignant diseases of the ducts include ductal carcinoma in situ, invasive ductal carcinoma, and Paget disease.

Ultrasound Elastography in Detecting Breast Neoplasms[Back to Top](#)**LL-BRE2505**

Faezeh Sodagari , MD
Pedram Golnari , MD
Hamid R Baradaran , MD, PhD

PURPOSE/AIM

Ultrasound elastography is a newly developed ultrasound method which is based on the degree of tissue distortion in response to an external force. It has been shown to be diagnostic in malignancies, especially in conjunction with the conventional B-mode ultrasound. Both qualitative and quantitative methods of assessments are currently used in clinical and research settings. We present the concept, techniques, equipments, interpreting and technical difficulties that need more caution in clinical use.

CONTENT ORGANIZATION

- Clinical importance of the diagnosis of breast cancer
- Current available modalities used in breast imaging
- Brief introduction of the ultrasound elastography technique
- Quantitative vs. qualitative ultrasound elastography methods in breast imaging
- Summarize advantages and shortcomings of ultrasound elastography
- Addressing the current role of ultrasound elastography in the available diagnosis guidelines and standards
- Reviewing the cost of establishing this modality
- Training courses and the learning curve
- Ultrasound elastography training in the current curriculums of residency and fellowship training

SUMMARY

Ultrasound elastography demonstrates strong potential to become the frontline modality of choice in conjunction with the conventional B-mode ultrasound for detecting malignancy in breast findings.

Ultrasound Elastography in Detecting Breast Neoplasms[Back to Top](#)**LL-BRE2505**

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SUMMARY

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Unveiling the Bewildering Papillary Neoplasm of the Breast: Clues that Radiologists Should Know Beforehand[Back to Top](#)**LL-BRE2507**

Haesung Yoon
Min Jung Kim , MD

PURPOSE/AIM

To aid the understanding of spectrum of papillary lesions in the breast through sonographic and pathological findings with illustrations, presenting the strategy of diagnosis and management before, at, and after the biopsy .

CONTENT ORGANIZATION

1) Introduction

- Understanding lesion with wide spectrum of imaging-pathologic findings
- the difficulty and importance of diagnosis associated with breast malignancy.

2) Before the biopsy: How to suspect breast lesions as papillomas

- Illustration for the spectrum of US findings 3) At the biopsy:

A. Pathologic diagnosis with H-E and immunohistochemistry staining

- Illustration for the spectrum of pathologic diagnosis
 - B. Diagnostic accuracy comparison (14gauge automated core-needle vs vacuum-assisted biopsy): Pros and Cons
 - 4) After the biopsy:
 - A. How to predict the malignancy at surgery when papillary lesion was diagnosed at 14G-automated CNB- clinicopathologic factors associated with the upgrade at surgery.
 - B. Should we recommend further excision or follow-up? Based on the literature.
- SUMMARY**
- Suspecting papillary lesions on breast ultrasound can be challenging and certain US appearances can be useful.
 - For the pathologic diagnosis, the overall area of a lesion should be evaluated and larger sampling can be useful.
 - To predict upgrade at surgery, clinicoradiologic factors can be helpful.

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[Back to Top](#)

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Ultrasound Case of the Day

[Back to Top](#)

LL-EDE3014

Moderator
Jeanne M Horowitz, MD
Lori A Goodhart, MD
Maneesh Gupta, MD, BEng
Ravi Guttikonda
Joseph A Meranda, MD
Nicholas Morley, MD
Meghan F Single, MD

PURPOSE/AIM

- 1) Recognize the diagnosis and differentiate specific conditions using Ultrasound.
- 2) Learn characteristic imaging findings for the diagnosis.
- 3) Learn about clinical implications and treatment of the diagnosis.

Ultrasound Case of the Day

[Back to Top](#)

LL-EDE3014

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Jeanne M Horowitz, MD
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[Back to Top](#)

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- 1) Recognize the diagnosis and differentiate specific conditions using Ultrasound. 2) Learn characteristic imaging findings for the diagnosis.
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Practice Makes Perfect: The Utility of Ultrasound Phantoms for Biopsy and Vascular Access Practice with Review of Available Options

[Back to Top](#)**LL-VIE1277**

Adam DeFoe , MD
Louis Morel , MD
Adam Stibbe , MD

PURPOSE/AIM

1. Recognize the need and utility of ultrasound phantoms for biopsy and vascular access among trainees 2. Review the available options for commercially available and homemade ultrasound phantoms 3. Review the strengths and weaknesses of various phantoms for ultrasound guided procedures

CONTENT ORGANIZATION

Utility of ultrasound phantoms for biopsy and vascular access practice

- Resident survey from our institution, before and after phantom practice, demonstrating improved confidence
- Results from others' similar work in the published literature demonstrating improved confidence and skill

Options for ultrasound phantoms with evaluation of their respective strengths and weaknesses

- Commercially available phantoms
- Homemade phantoms, including gelatin and animal tissue

SUMMARY

Ultrasound guided procedures require practice to gain proficiency. Both skill and confidence can be gained with practice on phantoms, rather than on live patients, as we and others have shown. There are many commercial and homemade phantom options, each with inherent strengths and weaknesses.

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The Thyroid Nodule Conundrum: To Biopsy or to Not Biopsy?

[Back to Top](#)**LL-VIE1284**

Amar M Amin , MD
Pratish A Shah , MD
Eric Chen , MD
Amardeep S Johar , MD
Mary Connell , MD
Dan G Gridley , MD
Michael C Switzer , MD

PURPOSE/AIM

The purpose of this exhibit is: 1. To review the anatomy of the thyroid gland on sonography. 2. To explain which nodules should be biopsied and which ones can be left alone or followed up.

CONTENT ORGANIZATION

1. Anatomy of the thyroid gland and surrounding structures within the neck. 2. Standard sonographic protocol in evaluating the thyroid gland. 3. Review various types of nodules including sonographic characteristics which make nodules more suspicious for malignancy. 4. Discuss technique in performing fine needle aspiration of the thyroid nodule and review which parts of a thyroid nodule should be biopsied in order to provide the pathologist with adequate tissue sample.

SUMMARY

The goal of this presentation is to: 1. Provide a review for the radiologist in recommending which nodules should be closely followed up, which ones can be stated to be benign and which nodules require further evaluation by fine needle aspiration. 2. Discuss and illustrate

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[Back to Top](#)

LL-VIE1284

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The goal of this presentation is to: 1. Provide a review for the radiologist in recommending which nodules should be closely followed up, which ones can be stated to be benign and which nodules require further evaluation by fine needle aspiration. 2. Discuss and illustrate technique in performing fine needle aspiration on a thyroid nodule.

Principles and Applications of Ultrasound Fusion with Other Cross-Sectional Imaging for the Purpose of Biopsy

[Back to Top](#)

LL-VIE2941

Stephanie F Coquia, MD
Katarzyna J Macura, MD, PhD *
Sheila Sheth, MD *
M. Robert Dejong *
Ulrike M Hamper, MD, MBA

PURPOSE/AIM

To discuss practical applications of ultrasound fusion with other cross sectional imaging modalities (CT, MRI, and PET) when performing biopsies of lesions within the chest, abdomen, and pelvis.

CONTENT ORGANIZATION

1. Basic principles and requirements for fusing US to other modalities
2. Clinical applications of fusion in the biopsy of lesions in the chest, abdomen, and pelvis:
 - a. Locating lesion when not initially seen on screening ultrasound
 - b. Identification of a specific target lesion initially detected on other cross-sectional imaging modalities (suspicious prostate lesions on multiparametric MRI)
 - c. Confirmation of the absence of a target lesion visualized on other imaging modalities (resolution of lesion after treatment)
3. Case examples:
 - a. Pleural based lung lesions
 - b. Liver
 - c. Adenopathy-mesenteric, retroperitoneal, pelvic
 - d. Prostate
4. Advantages and limitations of the fusion technique
5. Description of our approach: how to incorporate CT and MR fusion into the biopsy practice

SUMMARY

After reviewing this exhibit, the reader should be able to:

1. Understand the basic principles of cross-sectional imaging-US fusion and what is necessary for its performance.
2. Determine which biopsies may benefit from this technique.

Principles and Applications of Ultrasound Fusion with Other Cross-Sectional Imaging for the Purpose of Biopsy

[Back to Top](#)

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LL-VIE2946

Toshiya Shibata , MD
Minoru Yabuta , MD
Ken Shinozuka
Toyomichi Shibata , MD
Hiroyoshi Isoda , MD
Kaori Togashi , MD, PhD *

PURPOSE/AIM

The specific feature of Sonazoid is that parenchymal imaging of the liver (Kupffer imaging) as well as early vascular imaging can be obtained. Kupffer imaging, lasting over 60 minutes, may be very useful for performing real-time US-guided RFA. Purpose of our exhibition is to demonstrate the effectiveness of Sonazoid-CEUS during RFA for small HCC.

CONTENT ORGANIZATION

Sonazoid-CEUS is superior to B-mode US in: (1) detection of small HCC nodules about 1.0cm in patients with severe liver cirrhosis. Kupffer imaging is especially useful for real-time US-guided RFA. (2) detection of local recurrence after RFA. Local recurrence is clearly depicted at early vascular imaging. Early vascular and Kupffer imaging should be carefully correlated before RFA for the local recurrence. (3) detection of an ablated area and a residual viable lesion. So, we can diagnose whether an additional ablation is needed or not.

Limitations of Sonazoid-CEUS: (1) Some deeply-located nodules are hardly depicted with Sonazoid-CEUS due to the attenuation. (2) Some well-differentiated HCCs are more clearly detected with B-mode US as a hyperechoic nodule.

SUMMARY

Sonazoid-CEUS is useful in RFA for small HCCs and it might be mandatory in some cases.

Sonazoid-CEUS during Radiofrequency (RFA) for Small Hepatocellular Carcinoma (HCC)**LL-VIE2946**

Toshiya Shibata , MD
Minoru Yabuta , MD
Ken Shinozuka
Toyomichi Shibata , MD
Hiroyoshi Isoda , MD
Kaori Togashi , MD, PhD *

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Peer Review of Peripheral Vascular Ultrasound Studies: Analysis of Errors and Strategies for Improving Performance**LL-VIE2957**

Tonguc Pinar , MD
Robert G Sheiman , MD
Peggy Newman
Bettina Siewert , MD
Robert A Kane , MD
Jonathan B Kruskal , MD, PhD *

PURPOSE/AIM

Peer review of radiologist performance is widely performed per regulatory requirements. When optimized, analysis of errors allows for improvement strategies to be introduced. Peripheral vascular ultrasound studies are technically challenging and fraught with potential interpretive pitfalls. Based on over 10 years' experience and 75,000 peer reviewed cases, this exhibit highlights the major categories of vascular ultrasound errors, their potential impact, and illustrates simple strategies for preventing their occurrence.

CONTENT ORGANIZATION

Classification of peer review errors of peripheral vascular US studies: - Perceptual misses and their contributing factors. - Interpretive errors, including false positive (tendon confused with thrombus), false negative (failure to recognize duplicated circulation, and misclassification errors (DVT vs. superficial thrombus). - Errors of information transfer, including input (faulty clinical information), and output (relaying results and acuity). - Technical acquisition errors. Strategies for preventing errors when interpreting peripheral vascular US studies.

SUMMARY

This exhibit will explain how to classify and approach errors detected through peer review, factors contributing to error occurrence and strategies for avoiding errors when performing and interpreting the peripheral vascular ultrasound examination.

Peer Review of Peripheral Vascular Ultrasound Studies: Analysis of Errors and Strategies for Improving Performance**LL-VIE2957**

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Doppler Ultrasonography of Arteriovenous Fistula in Hemodialysis Patients ... Far More than Just a Pure Diagnosis Purpose

[Back to Top](#)

LL-VIE2970

Jose R Fortuno , MD
Anna Alguersuari , MD
Eva Criado
Joan Falco
Carlos Serrano Burgos
Juan Perendreu , MD, PhD
Jordi Branera , MD
Cristina Maria Spinu , MD
Marta Cufi Quintana

PURPOSE/AIM

The Doppler ultrasound (US) is an established technique in the diagnosis of access dysfunction in dialysis patients. The aim of this exhibit is to illustrate that hemodialysis access US can be used not only with a pure diagnosis purpose. An accurate arteriovenous fistula (AV) US examination have great therapeutic and prognostic implications and it is essential in the management of this patients.

CONTENT ORGANIZATION

Pictorial description of ultrasonographic findings and their angiography correlation to illustrate that an access US can be used to:
1.-Monitoring the access. 2.-Diagnosis of dysfunction. 3.-Determination the best therapeutic option (surgical vs endoluminal treatment).
4.-Determination of the optimal puncture site and access (venous retrograde vs anterograde). 5.-Guidance for accessing immature fistulae.
6.-Plannification the procedure (sheath, wire, catheter, angioplasty balloon and stent/stent graft). 7.-Guidance during the procedure alone or in combination with fluoroscopy. 8.- Assessment of outcome in the short and medium term with the evaluation of a morphologic and hemodynamic residual stenosis.

SUMMARY

Doppler US examination of dysfunctional AVF is useful not only in determining the cause of dysfunction, but it also plays a key role in the overall plannification, monitoring and outcome assessment of any intravascular intervention.

Doppler Ultrasonography of Arteriovenous Fistula in Hemodialysis Patients ... Far More than Just a Pure Diagnosis Purpose

[Back to Top](#)

LL-VIE2970

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Applications of Contrast Enhanced Ultrasound for Radiofrequency Ablation of Hepatocellular Carcinoma

[Back to Top](#)

LL-VIE2978

Atul Gera , MD *
Ilya Lekht , MD
Bhushan Desai , MD
Alok B Bhatt , MD
Ajit Vyas , MD
Michael D Katz , MD
Ramon Ter-Oganesyan , MD
John R Daniels , MD
Edward G Grant , MD *

PURPOSE/AIM

1. To understand the technique and scientific basis of contrast enhanced ultrasound (CEUS). 2. To appreciate the uses of CEUS as an imaging modality to assess the efficacy of radiofrequency ablation (RFA) treatment of hepatocellular carcinoma (HCC) immediately after the RFA procedure and in follow up. 3. To learn the potential benefits of CEUS over traditional imaging modalities.

CONTENT ORGANIZATION

A. Background regarding current imaging modalities used in guiding therapy for HCC B. Literature review regarding the role of CEUS in the evaluation of HCC C. Limitations of conventional imaging modalities, such as CT and ultrasound, in guiding therapy for HCC during the RFA procedure D. Applications and advantages of CEUS for the immediate assessment of treatment response after RFA E. Technical factors regarding CEUS for RFA F. Ultrasound contrast agents G. Cases to demonstrate the utility of this technique

SUMMARY

1. CEUS permits assessment of the efficacy of RFA therapy for HCC, immediately after the procedure and during follow up. 2. CEUS constitutes an alternative to contrast enhanced multiphase CT for assessing HCC. Consequently, CEUS use could decrease patient exposure to ionizing radiation and iodinated contrast.

LL-VIE2978

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Ilya Lekht , MD
Bhushan Desai , MD
Alok B Bhatt , MD
Ajit Vyas , MD
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1. CEUS permits assessment of the efficacy of RFA therapy for HCC, immediately after the procedure and during follow up. 2. CEUS constitutes an alternative to contrast enhanced multiphase CT for assessing HCC. Consequently, CEUS use could decrease patient exposure to ionizing radiation and iodinated contrast.

Applications of Contrast Enhanced Ultrasound to Delineate Percutaneous Drainage Catheters and Intra-abdominal Collections**LL-VIE2979**

Anu Obaro , MBBS
Venus Hedayati , MBBS, MRCP
Mohammad Daneshi , MBBS
Dean Y Huang , MBBS, FRCR
Maria E Sellars , MD, FRCR
Paul S Sidhu , MRCP, FRCR *

PURPOSE/AIM

To demonstrate the usefulness of ultrasound contrast agents administered via percutaneous drainage catheters or tubes (CEUS tubogram) to delineate intra-abdominal collections and to confirm tube patency and position.

To present the different applications of CEUS tubograms as a non-ionising modality which can be of benefit for follow-up in specific patient groups.

CONTENT ORGANIZATION

- The method of CEUS tubograms.
- The different clinical scenarios in which CEUS tubograms may be of benefit e.g. in suspected drain occlusion, to confirm drain position or to characterise solid organ abscess cavities.
- The use of CEUS tubograms in conjunction with intravenous CEUS agents to provide additional clinical information about abscess morphology (e.g. multiple loculations) and the superiority over B-mode ultrasound alone.
- The potential advantage of CEUS tubograms in cases that would classically utilise ionising radiation eg. to confirm of nephrostomy position.

SUMMARY

The administration of ultrasound contrast agents directly into percutaneous catheters is a novel technique which can assess drain position, patency and residual abscess cavity size. This provides a safe, real-time evaluation of the drainage catheter and is a valuable problem solving tool in cases that would have otherwise required ionising radiation.

Applications of Contrast Enhanced Ultrasound to Delineate Percutaneous Drainage Catheters and Intra-abdominal Collections**LL-VIE2979**

Anu Obaro , MBBS
Venus Hedayati , MBBS, MRCP
Mohammad Daneshi , MBBS
Dean Y Huang , MBBS, FRCR
Maria E Sellars , MD, FRCR
Paul S Sidhu , MRCP, FRCR *

PURPOSE/AIM

To demonstrate the usefulness of ultrasound contrast agents administered via percutaneous drainage catheters or tubes (CEUS tubogram) to delineate intra-abdominal collections and to confirm tube patency and position.

To present the different applications of CEUS tubograms as a non-ionising modality which can be of benefit for follow-up in specific patient groups.

CONTENT ORGANIZATION

- The method of CEUS tubograms.
- The different clinical scenarios in which CEUS tubograms may be of benefit e.g. in suspected drain occlusion, to confirm drain position or to characterise solid organ abscess cavities.
- The use of CEUS tubograms in conjunction with intravenous CEUS agents to provide additional clinical information about abscess morphology (e.g. multiple loculations) and the superiority over B-mode ultrasound alone.
- The potential advantage of CEUS tubograms in cases that would classically utilise ionising radiation eg. to confirm of nephrostomy position.

SUMMARY

The administration of ultrasound contrast agents directly into percutaneous catheters is a novel technique which can assess drain position, patency and residual abscess cavity size. This provides a safe, real-time evaluation of the drainage catheter and is a valuable problem solving tool in cases that would have otherwise required ionising radiation.

Three-Dimensional Ultrasound for Guiding Abdominal Interventions, Current Stage of Development and Limitations**LL-VIE4012**

Hamid Reza Sadeghi Neshat , MSc
Derek W Cool , MD, PhD *
Matthew Bastian-Jordan , MBBS, BSc
Nirmal Kakani , MD
Aaron Fenster , PhD *

PURPOSE/AIM

To outline available technologies, main advantages and limitations of three-dimensional ultrasound (3D US) imaging for guiding abdominal interventions, and to review current and potential applications of 3D US in practice.

CONTENT ORGANIZATION

Development of 3D US has been active for more than two decades. Currently, 3D and tracked 2D ultrasound imaging technology is available on newer US machines or through external tracking equipment. However, its use in guiding interventional procedures is not widespread. In this presentation, we review available technologies to construct and visualize 3D US images. Each technology will be presented along with its advantages and limitations focusing on abdominal interventions. We present examples from our experience indicating the role of 3D US imaging compared to other modalities in planning and guiding a number of routine clinical and investigational procedures including image-guided biopsies and percutaneous tumor ablation in liver and kidneys.

SUMMARY

Ultrasound remains the main real-time modality to guide abdominal interventions. 3D US imaging possible through different technologies is growing and shown to be increasingly important. Understanding available technologies as well as their advantages and disadvantages can help to select the most efficient tool in current and future applications.

Three-Dimensional Ultrasound for Guiding Abdominal Interventions, Current Stage of Development and Limitations

[Back to Top](#)

LL-VIE4012

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SUMMARY

Ultrasound remains the main real-time modality to guide abdominal interventions. 3D US imaging possible through different technologies is growing and shown to be increasingly important. Understanding available technologies as well as their advantages and disadvantages can help to select the most efficient tool in current and future applications.

Breast Imaging (Diagnostic Ultrasound)

Sunday, 10:45 AM - 12:15 PM • Arie Crown Theater

[Back to Top](#)

US **BR**

SSA01 • AMA PRA Category 1 Credit™:1.5 • **ARRT Category A+ Credit**:1.5

Moderator

Wendie A Berg , MD, PhD *

Moderator

Jung Min Chang , MD

Moderator

Regina J Hooley , MD *

SSA01-01 • Utility of Targeted Ultrasound in the Evaluation of Breast MRI-detected Non-mass Enhancement (NME)

Adrienne R Newburg MD (Presenter) ; **Chloe M Chhor** MD ; **Jiyon Lee** MD ; **Samantha L Heller** MD, PhD ; **Hildegard B Toth** MD ; **Linda Moy** MD

PURPOSE

Prior studies showed the likelihood of identifying an ultrasound (US) correlate for an MRI-detected abnormality depends on lesion type. NME was less likely to be seen on US compared to a mass or focus. Targeted second-look US may result in prolonged work-up time, added expense, and false reassurance in the setting of a negative US. Our study was performed to determine the utility of targeted US and to determine how often a MRI-US discordant lesion was found.

METHOD AND MATERIALS

An IRB-approved retrospective review was performed for breast MRI examinations performed from 2005-2008. Data regarding patient demographics, MRI findings and subsequent sonographic and pathologic results were recorded. Of 2,222 breast MRI exams, 70 (3.2%) NME lesions were identified for which targeted US was recommended. An additional 85 NME lesions went directly to an MRI biopsy because the interpreting radiologist felt it unlikely that an US correlate would be seen. The rate of subsequent malignancy was analyzed.

RESULTS

Targeted US was performed in 59 of 70 (84%) women. In the remaining 11 (16%) cases, targeted US was not performed because 5 women underwent mastectomy or had metastatic disease. MRI-guided biopsy was pursued directly in 2 women and 4 women did not undergo further imaging at our institution. Mean age was 46.7 years, range was 25 to 99 years. In 14 (24%) of 59 sonograms, an US correlate was seen. An US-guided biopsy was performed in 7 (50%) of 14 cases. None yielded cancer. One of 7 (14%) yielded papillomas which were subsequently excised. One of 7 (14%) yielded atypia. Three benign biopsies were discordant with the MRI findings. At subsequent MRI biopsy, one lesion was an invasive ductal carcinoma (IDC). Forty-five of 59 (76.3%) cases had no US correlate; 15 proceeded to MRI-guided biopsy. Two (13%) yielded cancer, 1 IDC and 1 DCIS. An additional 2 (13.3%) cases demonstrated atypia/ADH. In the 11 remaining cases, pathology was benign. The cancer yield for the 85 NME lesions that went directly to MRI biopsy was 12% (12/85); 2 were IDC and 10 were DCIS.

CONCLUSION

The yield for detecting an US correlate for an MRI-detected NME is low (24%) with no detection of malignancy.

CLINICAL RELEVANCE/APPLICATION

Confident MRI-US correlation for an MRI-detected abnormality can be challenging. It may be advisable to forego targeted US and proceed directly to MRI-guided core biopsy.

SSA01-02 • 3D Breast Ultrasound: Diagnostic Yield Compared to MR Imaging and Histopathology

Mathijn D De Jong MD (Presenter) ; Gerrit J Jager MD, PhD ; Ivo Dubelaar MD ; Thomas A Fassaert MD ; Matthieu Rutten MD

PURPOSE

To prospectively assess the performance characteristics of 3D ultrasound (3DUS) for the detection and classification of breast tumors compared to breast magnetic resonance imaging (MRI) and histopathology.

METHOD AND MATERIALS

Two hundred twentyone patients with an indication to undergo breast MRI provided informed consent were enrolled in an institutional review board-approved 3DUS study protocol. Patients underwent 1.5T MRI and 3DUS within 10 days. 3DUS was performed with a 5-14 MHz broadband transducer featuring Harmonic Imaging and compound scanning. The 3D US findings were reviewed by 2 observers independently, who were blinded for histopathological diagnoses and prior imaging findings such as mammography, handheld 2D US and MRI. Histopathological findings or MRI with 12 months clinical follow-up were used as reference standard. Diagnostic yield, sensitivity, specificity, positive (PPV) and negative (NPV) predictive values were determined.

RESULTS

3DUS scanning was technically successful in 220 patients. One patient was excluded due to erroneous data transfer. Each breast was evaluated with 3 to 5 scans. The overall examination time was 15-20 (mean 14) minutes per patient. Mean patient age was 48 years (range 18-78). 194 and 191 benign and 43 and 46 malignant breast tumors were detected with 3D-US and MRI, respectively. In 61 patients 67 histopathological findings were available as reference standard. The sens, spec, PPV and NPV of 3D US was compared to MRI 85, 97, 91, 96, respectively, and compared to the histopathological findings 93, 96, 91, 98, respectively.

CONCLUSION

3D US is a reliable imaging technique for the detection and classification of benign and malignant breast tumors.

CLINICAL RELEVANCE/APPLICATION

3DUS can reliably be used in a clinical setting and can probably be feasible for dense breasts in a screening program.

SSA01-03 • Breast Cancer Detection with CD276-targeted Ultrasound Imaging

Sunitha Bachawal PhD (Presenter) ; Ferdinand Knieling ; Amelie M Lutz MD ; Lu Tian ; Juergen K Willmann MD *

PURPOSE

CD276 has been shown to be differentially expressed in various cancers including human breast cancer. Our goal was to compare the potential of ultrasound (US) molecular imaging using microbubbles (MB) targeted to CD276 with vascular endothelial growth factor receptor type2 (VEGFR2)-targeted MB for assessment of breast tissue progression to early breast cancer in transgenic mice (FVB/N Tg (MMTV/ PyMT634Mul).

METHOD AND MATERIALS

A transgenic mouse model of breast cancer (FVB/N-Tg(MMTV-PyMT634Mul)) was used in this study. The progression of breast tissue from normal to invasive cancer was examined using US molecular imaging (Vevo2100, Visualsonics) with VEGFR2- and CD276- targeted MB in 160 mammary glands. Ex vivo expression levels of VEGFR2 and CD276 were examined using immunofluorescence staining followed by confocal microscopy.

RESULTS

There was a significant (p

CONCLUSION

Combined VEGFR2- and CD276- targeted molecular imaging information can further improve accuracy of US for in vivo assessment of breast tissue progression from normal to breast cancer in this transgenic mouse model

CLINICAL RELEVANCE/APPLICATION

US molecular imaging of tumor angiogenesis using tumor specific endothelial markers in breast cancer may help improve accuracy of US in breast cancer detection in future clinical trials.

SSA01-04 • Sonographic Findings in 691 Pure Ductal Carcinoma in Situ Lesions with Histopathologic and Biologic Correlation

Marion E Scoggins MD (Presenter) ; Gaiane M Rauch MD, PhD ; Patricia S Fox MS ; Ana Paula Benveniste MD ; Henry M Kuerer MD ; Wei T Yang MD ; Young Mi Park MD, PhD ; Sara Lari ; Savitri Krishnamurthy MD

PURPOSE

Sonographic (US) findings in 691 pure ductal carcinoma in situ (DCIS) lesions were retrospectively analyzed by estrogen receptor (ER) status, nuclear grade, and comedonecrosis to evaluate the prognostic value of US as an adjunct to mammography (M).

METHOD AND MATERIALS

An institutional review board approved retrospective single institution database search performed for patients with pure DCIS evaluated from January 1996 to July 2009 who underwent pre-operative M and whole-breast US. Images were reviewed per ACR BI-RADS lexicon. Pathologic features recorded were ER status, nuclear grade, and comedonecrosis. ER+ was defined as nuclear staining in at least 1% of cells. Statistical comparisons were made using t-test, Chi-square, Fisher's exact test, Kruskal-Wallis or Wilcoxon rank-sum test.

RESULTS

There were 1911 pure DCIS patients identified; those with incomplete data (n=5), lacking pre-operative US (n=1214) or M (n=1) were excluded leaving 691 patients for analysis. Of 691 lesions, 304 (44%) were visible on M and US, 315 (46%) visible on M only, 58 (8%) visible on US only, and 14 (2%) visible on neither M nor US. There were 425 (62%) ER+, 104 (15%) ER-, and 162 (23%) lesions with unknown ER. Comedonecrosis was present in 296 (43%) lesions, absent in 395 (57%). There were 334 (48%) non-high grade (nuclear grade I/II) lesions, 353 (51%) high-grade (III), and 4 (1%) of unknown grade. ER- lesions were more frequently visible on US than ER+ lesions (62% vs. 48%, p

CONCLUSION

ER- DCIS is more likely visible on US than ER+ DCIS. A shadowing US mass is more frequently high grade or ER-. While a mass is the most common US finding of DCIS regardless of histopathologic features, nonmass lesions are more likely to be associated with high-grade tumors and comedonecrosis.

CLINICAL RELEVANCE/APPLICATION

A shadowing mass on US should raise suspicion for ER- DCIS which provides imaging-based prognostic and biologic information during cancer diagnosis and work-up.

SSA01-05 • Detectability and Diagnostic Performance of ABVS in Suspicious Calcifications in Comparison with Hand-held US

Eunjeong Kim (Presenter) ; Sung-Hun Kim MD ; Chang Suk Park

PURPOSE

To prospectively evaluate the detectability and performance of automated breast US scanner and compare it with hand held breast US in suspicious calcifications on mammography.

METHOD AND MATERIALS

Forty-two patients with 43 breast lesions, scheduled for US guided or stereotactic biopsy for suspicious calcifications on mammography,

underwent automated breast US and hand-held US examination. Two radiologists reviewed the automated breast US data in consensus. A radiologist who had not performed the hand-held US examination reviewed hand-held US data. Detectability and diagnostic performance of automated breast US and hand-held US were calculated.

RESULTS

Among 43 lesions, 25 (58.1%) were malignant and 18 (41.9%) were benign. Detection on ABVS was more frequent for lesions; malignant vs. benign (96.0% [24/25] vs. 44.4% [8/18], $p=0.002$), of maximal extent more than 10mm (86.7% [26/30] vs. 46.2% [6/13], $p=0.009$), or lesions with fine pleomorphic or fine linear shape vs. round or amorphous or coarse heterogeneous shape (94.7% [18/19] vs. 58.3% [14/24], $p=0.021$) at mammography. No significant difference was found in AUC between automated breast US (0.758, 0.603-0.875) and hand-held US (0.786, 0.634-0.896) ($p=0.571$).

CONCLUSION

Automated breast US detected 96.0% (24/25) of malignant calcifications on mammography. Detection was found to be related to the pathology, to calcification extent, and shape at mammography.

CLINICAL RELEVANCE/APPLICATION

This study is the first study to compare the detectability and diagnostic performance for suspicious microcalcifications between ABVS and HHUS. ABVS showed similar diagnostic performance to HHUS.

SSA01-06 • Clinical Application of Shear Wave Elastography (SWE) in the Differential Diagnosis of Small (≤ 2 cm) Breast Lesions

Kyung Hee Ko (Presenter) ; **Hae Kyoung Jung** MD ; **Jung Hyun Yoon** MD ; **Hye Rin Kim**

PURPOSE

To evaluate the usefulness of SWE for the differential diagnosis of small (≤ 2 cm) breast lesions

METHOD AND MATERIALS

From June 2012 to December 2012, of 215 women who had been performed conventional US and SWE, 165 masses of 155 women (mean age: 44.97 ± 9.54 years, range 22-87 years) who had 2cm and smaller lesions were included in this study. All patients underwent US guided core biopsy or surgical excision. US BI-RADS final assessment and quantitative SWE parameters were recorded. Final assessments of the 165 breast lesions were categorized as follows: category 3 in 23, category 4a in 119, category 4b in 11, category 4c in 8, and category 5 in 4. Histopathologic diagnosis was used as reference standard. Optimal cutoff value for each quantitative SWE parameter was calculated by ROC curve. Calculated cutoff value was used to upgrade BI-RADS 3 lesions to category 4a and downgrade BI-RADS 4a lesions to category 3.

RESULTS

Of the 165 small breast masses, 20 masses (12%) were malignant and 145 masses (88%) were benign. Mean Emax of malignant masses (141.97 ± 98.03 kPa) was significantly higher than that of benign (49.14 ± 39.89 kPa). Emax with a cutoff value of 87.5 kPa had the highest Az value (0.796, sensitivity 75.0%, specificity 85.5%, PPV 41.7%, NPV 96.1%). However, for small masses equal or smaller than 1cm, Az values of all quantitative SWE parameters were lower than 0.6. After adding SWE to conventional US, there was no improvement of diagnostic performance (sensitivity 80%, specificity 95.2%, PPV 69.6%, NPV 97.2%). When applying Emax

CONCLUSION

Small malignant masses ≤ 2 cm were significantly stiffer than small benign lesions. However adding SWE parameters to conventional US showed no improvement of diagnostic performance. SWE could give US BI-RADS some help for reducing benign biopsy rate.

CLINICAL RELEVANCE/APPLICATION

SWE could give conventional US BI-RADS some help on differential diagnosis of small breast masses 2cm or smaller with reducing benign biopsy rate.

SSA01-07 • Indications for Biopsy of Imaging-detected Intramammary and Axillary Lymph Nodes in the Absence of Concurrent Breast Cancer

Christine Westra BS ; **Vandana M Dialani** MD ; **Shambhavi Venkataraman** MD ; **Valerie J Fein-Zachary** MD ; **Alexander Brook** PhD * ; **Tejas S Mehta** MD, MPH (Presenter)

PURPOSE

To evaluate prevalence and identify features predictive of malignancy in imaging-detected lymph nodes (LNs) in women without concurrent cancer.

METHOD AND MATERIALS

Retrospective review of all image-guided LN fine needle aspirations (FNA) and core needle biopsies (CNB) from 1/1/08-12/31/10. LNs in patients without concurrent cancer comprised our study group (SG; $n=80$) and with concurrent breast cancer our control group (CG; $n=66$). FNAs were sent for flow cytometry in addition to cytology at discretion of breast imager. Blinded to cytology/histology, imaging features of LNs including size, loss of fatty hilum, and/or focal/diffuse cortical thickening were recorded. BI-RADS category was assigned by reviewer based on LN appearance.

RESULTS

In 80 SG cases, 63 (78%) had FNA and 17 (22%) had CNB; all in CG had FNA. Of the 80 SG cases, 69 (86%) were negative, 2 (3%) positive, 6 (7%) atypical and 3 (4%) non-diagnostic (ND). Of 8 atypical/positive LNs, 3 had breast cancer, 2 had lymphoma, and 3 negative on excision. Of 66 CG cases, 30 (45%) were negative, 30 (45%) positive, 5 (8%) atypical and 1 (2%) ND. There were 6 false negative FNAs in CG; all atypical/positive LNs in CG were positive for breast cancer on excision. ND LNs were negative on follow up/excision in both groups. Prevalence of malignancy in LNs in SG was 6% (5/80) and in CG 62% (41/66); ≥ 3 mm and/or eccentric/focal cortical thickening were negative and not predictive of malignancy. If BI-RADS 4C/5 were used as threshold to biopsy, the sensitivity, specificity, PPV, and NPV for cancer in SG would have been 100%, 99%, 83% and 100% respectively, higher than CG results of 73%, 92%, 93% and 68% respectively.

CONCLUSION

In the absence of concurrent breast cancer, using loss of fatty hilum as criterion to biopsy image-detected LNs keeps sensitivity of 100% but lowers false positives. FNAs should also be sent for flow cytometry to diagnose lymphoma.

CLINICAL RELEVANCE/APPLICATION

Without concurrent breast cancer, loss of fatty hilum as criterion to biopsy LNs has 100% sensitivity with low false positives. Flow cytometry is also needed in these patients to exclude lymphoma.

SSA01-08 • Are Shear Wave Ultrasound Findings an Independent Predictor of Lymph Node Involvement in Women with Invasive Breast Cancer?

Andrew Evans MRCP, FRCR (Presenter) ; **Patsy Whelehan** MSc * ; **Petra Rauchhaus** ; **Colin Puride** ; **Lee Jordan** ; **Kim Thomson** ; **Sarah J Vinnicombe** MRCP, FRCR

PURPOSE

Shear wave elastography shows promise as an adjunct to greyscale ultrasound in assessing breast masses. In breast cancer, higher lesion stiffness values have been shown to be associated with poor prognostic features. The purpose of this study was to assess whether higher lesion stiffness at shear wave elastography is an independent predictor of lymph node involvement

METHOD AND MATERIALS

Patients with invasive breast cancer treated by primary surgery, who had undergone shear wave elastography examination at the time of

diagnosis, were eligible. Data were retrospectively analysed from 396 consecutive patients meeting these criteria. The mean stiffness values were obtained using the Aixplorer ultrasound machine from SuperSonic Imagine Ltd. Measurements were taken from a region of interest positioned over the area identified via the colour map as the stiffest part of the abnormality. The average of the mean values obtained in each of four projections was used for analysis. Associations between lymph node involvement and mean lesion stiffness in kilopascals, invasive cancer size, histological grade, tumour type, ER and HER-2 receptor status and vascular invasion were assessed using univariate and multivariate logistic regression.

Results

RESULTS

Median age was 62 years, median invasive tumour size was 19 mm and 28% of patients had lymph node involvement. At univariate analysis, invasive size, histological grade, HER-2 status, vascular invasion, tumour type and mean stiffness were significantly associated with nodal involvement. At multivariate analysis, invasive size, tumour type, vascular invasion and mean stiffness maintained independent significance.

CONCLUSION

Mean stiffness at shear wave elastography is an independent predictor of lymph node metastasis in women with invasive breast cancer.

CLINICAL RELEVANCE/APPLICATION

High tumor stiffness at shear wave elastography increases the risk of lymph node metastasis in women with invasive breast cancer.

SSA01-09 • Diagnostic Usefulness of Breast Ultrasonography in the Evaluation of the Patients with Pathologic Nipple Discharge: Comparison with Galactography

Jun Ho Park ; Young Mi Park MD, PhD ; Suk Jung Kim ; Hyun Kyung Jung (Presenter) ; Ji-Hwa Ryu ; Sun Joo Lee MD ; Hye Jung Choo MD ; Young Jun Cho

PURPOSE

The purpose of this study was to evaluate the usefulness of breast ultrasonography (US) for the evaluation of pathologic nipple discharge, as compared with galactography.

METHOD AND MATERIALS

117 cases in 105 patients (all women; mean, 43.2 years; range, 20 - 76years) with pathologic nipple discharge were enrolled in this study, who had underwent US and galactography between 2004 and 2012. Eighty three cases were pathologically proved by surgical excision (n=66), or US-guided core needle biopsy (n=17), and the remaining cases were followed up for mean 24 months by US and mammography. Two radiologists retrospectively reviewed and compared US and galactography images with regard to detectability of lesion and evaluation of disease extent.

RESULTS

The lesions were depicted at galactography in 98 cases (83.8%), at US in 96 cases (82.1%) and both examinations in 85 cases (72.6%). Eight cases (6.8%) showed poor visualization of lesions at both examinations. The lesions were depicted at galatography only in 13 cases (11.1%) and US only in 11 cases (9.4%), of which galactograms were negative (n=1), only ductal dilatations (n=3), or failure of procedure (n=7). In 85 cases which abnormalities were visualized at both examinations, the evaluation of lesion extent was superior at US in 19 cases and superior at galactogram in 12 cases. Of 117 cases, US was superior or equal to galactography in 88 cases (75.2%) with respect to detection of lesion and extent evaluation. Galactography was superior or equal to US in 57 cases (48.7%).

CONCLUSION

Breast US is useful to detect the causes of pathologic nipple discharge and to evaluate the lesion extent exactly. Therefore, in the evaluation of patients with pathologic nipple discharge, we suggest that galactography may be skipped if the lesion is well detected at US.

CLINICAL RELEVANCE/APPLICATION

Galactography may be skipped in the evaluation of patients with pathologic nipple discharge if the lesion is well detected at ultrasonography.

Physics (Ultrasound)

Sunday, 10:45 AM - 12:15 PM • S405AB

PH **US**

[Back to Top](#)

SSA21 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Moderator

Paul L Carson, PhD *

Moderator

Emad S Ebbini, PhD *

SSA21-01 • Simulator-based Comparison of 2D, 3D and Fusion 3D Transrectal Ultrasound (TRUS) Needle Guidance Accuracies for Biopsy (Bx) of Prostate MRI Lesions

Derek W Cool MD, PhD (Presenter) * ; Xuli Zhang BSc ; Cesare Romagnoli MD ; Walter M Romano MD ; Jonathan Izawa ; Aaron Fenster PhD *

PURPOSE

Prostate MRI's high sensitivity to early stage prostate cancer (PCa) permits targeted biopsy as an alternative to the current non-targeted systematic TRUS biopsy. Biopsy needle guidance under TRUS is the most economical option, but spatial correspondence of MRI findings with TRUS is non-trivial. The accuracy of sampling MRI lesions under 2D and 3D TRUS and 3D TRUS fusion is quantified.

METHOD AND MATERIALS

Three experts performed simulated biopsies on 12 patients (Pros. Vol=37±11g, PSA=9.0±5.1ng/ml) with a total of 15 Bx-confirmed PCa MRI lesions (0.8±0.8g) who were selected from 90 patients undergoing MRI-3D TRUS fusion biopsy. Two core-biopsies were targeted at each MR lesion using 2D TRUS, 3D TRUS and MRI-3D TRUS fusion for needle guidance, using a validated Bx simulator. Additional single core-biopsies were directed toward common regional targets defined for all patients. Regions included: left-anterior transition zone (TZ), left mid-gland, right apex and right base. The simulated Bx core locations were compared to the original MRI to evaluate the sampling accuracy.

RESULTS

The 15 PCa tumors were distributed as follows: Base=4, Mid-gland=5, Apex=6, with 7 lesions along the anterior prostate. Only 44±4% and 51±14% of tumors were sampled with 2D and 3D TRUS, respectively, compared to 98±4% with fusion biopsy. Bx sampling rates were not significantly different between anterior and posterior tumors for any modality. The Bx sampling errors for the regional targets were significantly higher (po-90°).

CONCLUSION

Biopsy of prostate MRI lesions under 2D or 3D TRUS without MR-fusion may be inaccurate and lead to a falsely negative biopsy.

CLINICAL RELEVANCE/APPLICATION

Targeting biopsies at suspicious lesions seen on prostate MRI using 2D or 3D TRUS without image fusion is likely not accurate enough to

adequately detect many significant prostate cancers.

SSA21-02 • Quantifying Tendon Damage with Ultrasound (US) Shear Wave Elastography Using a Porcine Flexor Tendon Tear Model

Ryan J DeWall PhD (Presenter) ; **Jingfeng Jiang** ; **John Wilson** MD, MS ; **Kenneth S Lee** MD *

PURPOSE

Shear wave imaging (SWI) is an US elastography technique that measures tissue elasticity, a tissue property that often correlates with pathology. The purpose of this study was to evaluate the ability of SWI to visualize partial tears and quantify damage in porcine flexor tendons.

METHOD AND MATERIALS

Thirty porcine flexor tendons were pre-loaded to 1.25 N and stretched from 0%-2% strain using a Mark-10 (Mark-10 Corp; Copiague, NY) testing system while being imaged using SWI (Aixplorer; Supersonic Imagine; Aix-en-Provence, France). After imaging the normal tendon, the deep portion was cut to 25% (n = 10), 50% (n = 10), and 75% (n = 10) of the tendon thickness and reassessed with SWI. The deep-to-superficial wave speed ratio of the deep third (cut) and superficial third (uncut) of the tendon were compared in regions-of-interest (ROIs) centered on (C), proximal to (P), and distal to (D) to the tear, excluding the area within the tear. Tukey multiple comparisons were used to assess differences between normal and torn tendons.

RESULTS

Shear wave speed (i.e. elasticity) increased significantly with increasing tissue strain in normal and cut tendons, except in the deep third of the 75% tear (0%, 6.7 ± 1.2 m/s; 2%, 7.7 ± 1.4 m/s). The deep-to-superficial wave speed ratio decreased significantly between normal and cut tendons in the 50% tear in ROIs centered on (0%, 0.98 ± 0.06 to 0.91 ± 0.09 ; 1%, 0.97 ± 0.06 to 0.81 ± 0.09 ; 2%, 0.99 ± 0.07 to 0.84 ± 0.10) and distal to (1%, 0.95 ± 0.08 to 0.85 ± 0.08) the tear and in the 75% tear proximal to (1%, 1.00 ± 0.07 to 0.82 ± 0.12 ; 2%, 1.00 ± 0.07 to 0.81 ± 0.16), centered on (0%, 1.03 ± 0.09 to 0.70 ± 0.10 ; 1%, 0.99 ± 0.06 to 0.60 ± 0.11 ; 2%, 0.95 ± 0.10 to 0.61 ± 0.13), and distal to (1%, 0.96 ± 0.15 to 0.79 ± 0.14) the tear.

CONCLUSION

The decrease in deep-to-superficial wave speed ratio in cut tendon relative to normal tendon suggests loading changes in the damaged fibers. SWI demonstrates the potential for assessing tendon damage in partially torn tendons.

CLINICAL RELEVANCE/APPLICATION

SWI has the potential to add quantitative information to validated US outcome measures, providing a powerful tool for future outcomes analysis using US to monitor and assess tendon injuries.

SSA21-03 • Optimizing Microbubble Formulation for Indirect Lymphosonography: Quantitative Comparison of Nanobubbles vs. Standard Microbubbles

Chan Kyo Kim MD, PhD (Presenter) ; **Boem Ha Yi** MD, PhD ; **Omid Yeganeh** MD ; **Wenjin Cui** ; **Christopher Barback** ; **Robert F Mattrey** MD *

PURPOSE

Indirect lymphosonography where microbubbles (MB) are injected subcutaneously within the sentinel lymph nodes (SLN) drainage field was developed to non-invasively detect, mark and possibly stage the SLN pre-operatively. Early clinical data suggest accurate localization but limited characterization. Since entry into the lymph duct (LD) is limited to particles

METHOD AND MATERIALS

10^8 MBs of Definity (1-3 μ m) (Lantheus Medical Imaging) or a new formulation of DSPC/DSPE-PEG and perfluorohexane (0.2-1 μ m) in 0.2ml were injected in either footpad of 6 normal rabbits. The Siemens Sequoia 15L8 probe was fixed over the popliteal node that was imaged with CPS. Immediately after injection, a few MBs entered the LD to place an ROI over the SLN and its afferent LD. The US field was cleared and the footpad massaged for 20 sec. A time-intensity curve (TIC) was constructed in real-time using a prototype Siemens software that analyzes the linearized CPS data but also uses the B-mode data to correct for motion while scanning at low MI and 15 frames/sec. At 20 minutes or when the TIC returned to baseline, the US field was cleared and the 20-sec massage repeated until peak enhancement and the process repeated until no enhancement occurred. The TIC following the 1st massage and the number of massages that refilled the SLN following each injection were recorded.

RESULTS

Both agents enhanced the SLN and LD after massage. NBs caused greater SLN ($p=0.003$) and LD ($p=0.001$) enhancement that lasted for 20min vs. 8 min. The SLN refilled >20 times following a NB dose but only 8 times following a MB dose ($p= 0.001$).

CONCLUSION

NBs not only improve the filling of the duct and SLN, but also provided more functional bubbles at the injection site. We will next compare their ability to characterize nodes.

CLINICAL RELEVANCE/APPLICATION

Nanoscale bubbles increase duct filling and node enhancement and provide more functional bubbles at the injection site to refill the duct and node to improve detection and possibly characterization.

SSA21-04 • Ultrasound Shear Wave Speed Estimation in Elastic Phantoms: Sources and Magnitude of Variability in a QIBA Multicenter Study

Andy Milkowski MS (Presenter) * ; **Timothy J Hall** PhD * ; **Michael P Andre** PhD * ; **Paul L Carson** PhD * ; **Shigao Chen** PhD ; **Claude Cohen-Bacrie** * ; **Stephanie Franchi-Abella** MD ; **Brian S Garra** MD ; **Stephen McAleavey** PhD * ; **Steve Metz** * ; **Kathryn Nightingale** PhD * ; **Mark Palmeri** MD, PhD ; **Anthony E Samir** MD ; **Laurent Sandrin** PhD * ; **Mickael Tanter** PhD *

PURPOSE

To test commercial and research ultrasound SWS systems to identify the sources and magnitude of bias and variability in SWS measurements.

METHOD AND MATERIALS

Eleven phantom pairs were built from stiff and soft batches of Zerdine by CIRS. Larger phantoms were also prepared for correlative testing using magnetic resonance elastography. All phantoms were initially tested by one lab to determine manufacturing variation and were then shipped to 11 different labs for SWS measurements. At each site, 3-5 operators measure each phantom at three times at each of three depths according to a randomized schedule. Each measurement consists of the average of ten valid SWS acquisitions as has been reported in the clinical literature. The data are analyzed using crossed Gage R and R methodology with ANOVA. Bias is estimated by comparing the results with known values of elastic modulus (converted to SWS) from the manufacturer and from mechanical testing performed across a broad range of shear wave frequencies at two sites. Estimates of linearity can also be obtained since stiff and soft phantoms are tested at each site.

RESULTS

Mechanical test results from the two sites performing those measurements were in excellent agreement. Initial analysis of US SWS measurements shows overall variability of 5-7% in SWS mean values for several sites. ANOVA shows that site and measurement depth are the dominant sources of variation with operator variability being a minor component. Variation in SWS for all phantoms was 3-5% on initial testing of all phantoms. A 5-10% depth dependence (lower SWS at deeper depths) was also seen. Also, a small bias in SWS estimates of 5-6% was seen. Similar variability and bias are seen for both stiff and soft phantoms.

CONCLUSION

Initial results show a relatively small amount of variability in SWS estimates and also show that operator variability contributes little to total measurement variation. Phantom variation may be a significant source of the variability in measurements. Given these encouraging results, we will add measurements from additional sites, explore the causes of the depth dependence of SWS, and extend our work to lossy (viscoelastic) phantoms which more closely mimic human liver tissue.

CLINICAL RELEVANCE/APPLICATION

This work by QIBA is the first step in development of a protocol for US SWS measurement that gives accurate and repeatable results across a range of instruments for drug testing, clinical and research use

SSA21-05 • Visualization of Vascularity in Breast Lesions Using US Contrast Enhanced 3D Subharmonic Imaging

Anush Sridharan ; **John R Eisenbrey** PhD ; **Flemming Forsberg** PhD (Presenter) * ; **Priscilla Machado** MD ; **Daniel A Merton** ; **Kirk Wallace** PhD * ; **Carl Chalek** PhD * ; **Kai E Thomenius** PhD *

PURPOSE

To develop a method for improving visualization of vascularity in breast lesions using 3D contrast-enhanced subharmonic imaging (SHI).

METHOD AND MATERIALS

A modified Logiq 9 (GE Healthcare, Milwaukee, WI) scanner with a 4D10L probe was used for 3D harmonic imaging (HI) and SHI of breast lesions in 72 patients after bolus injection of an ultrasound contrast agent (UCA; Definity, Lantheus Medical Imaging, N Billerica, MA; dose: 0.25mL for HI and 20?L/kg for SHI). Fifteen biopsy-proven malignant cases were selected for image processing. A region-of-interest (ROI) corresponding to UCA flow (within the lesion) and tissue in both 3D HI and SHI were selected for each case. A volumetric map of the time-intensity curve for each slice within the volume was generated over time. Slices showing presence of UCA were identified and isolated. To improve visualization of flow a volumetric background template was generated (from baseline) and used to filter out tissue signals. Contrast-to-tissue ratios (CTR \diamond s) were calculated for 3D HI and SHI before and after background subtraction for vessel-tissue ROIs and also compared between the isolated slices and the entire volume.

RESULTS

Both 3D HI and SHI showed significant suppression of tissue signal after background filtering (p

CONCLUSION

3D SHI showed better visualization of vasculature in all cases via increased tissue suppression and sensitivity to UCA flow. The improvement in visualization of vasculature based on isolation of slices demonstrates the importance of 3D imaging to visualize breast cancer flow.

CLINICAL RELEVANCE/APPLICATION

Visualizing the vascular structure of breast lesions may help improve characterization.

SSA21-06 • Quantitative Biomarkers for the Assessment of Fibrosis Using M-Mode US and Shear Wave Elastography

Lauren Rosenblum BSc ; **Priscilla Machado** MD ; **Patrick L O'Kane** MD * ; **Andrej Lyshchik** MD ; **Flemming Forsberg** PhD (Presenter) *

PURPOSE

To determine if M-mode or Shear Wave Elasticity (SWE) imaging (independently or combined) provide quantitative markers of liver fibrosis compared to conventional grayscale ultrasound (US) imaging and pathology (the reference standard).

METHOD AND MATERIALS

Twelve subjects scheduled for an US-guided liver biopsy and 5 healthy volunteers were scanned with a broad bandwidth curvi-linear array using an IU22 (Philips Medical Systems, Bothell, WA; for grayscale and M-mode imaging) and an Aixplorer scanner (SuperSonic Imagine, Aix-en-Provence, France; for SWE imaging). The M-mode images were quantified using the scanners \diamond existing calculation software package and by a novel algorithm (implemented in Matlab; Mathworks, Natick, MA) extracting distances between lines of similar intensities (L2LD) as a quantitative biomarker of liver status. Liver stiffness (in kPa) was recorded from the SWE images, while a radiologist (blinded to the other results) scored the grayscale US for degree of fibrosis (on a 0-4 scale). ANOVA and Wilcoxon \diamond s sign rank tests were used to compare the classification of liver fibrosis by SWE, M-mode (i.e., L2LD) and radiologists scoring with fibrosis determined by pathology as the reference standard.

RESULTS

In this pilot study, the radiologist was correct in 53% of assessments, which was not different from pathology when using a non-parametric test ($p=0.3$). SWE did not differentiate between degrees of fibrosis ($p > 0.71$), while the new L2LD biomarker was able to perform a correct classification ($p = 0.044$). The best differentiation was achieved between normal subjects (fibrosis score = 0) and the subjects with fibrosis scores greater than or equal to 1 (0.30 ± 0.041 vs. 0.43 ± 0.085 ; $p < 0.005$).

CONCLUSION

A new biomarker for noninvasive US evaluation of liver status, based on extracting distances between lines of similar intensities from M-mode images, have been developed. Initial results indicate this parameter can correctly classify degree of fibrosis; albeit based on a limited sample size.

CLINICAL RELEVANCE/APPLICATION

If these results are reproducible in a larger patient population, it may be possible to replace some liver biopsies with evaluations based on noninvasive, quantitative US biomarkers.

SSA21-07 • Dynamic Contrast-enhanced Ultrasound Parametric Maps for the Evaluation of Intratumoral Vasculature: Preclinical Study

Stephanie Pitre-Champagnat ; **Ingrid Leguerney** ; **Jacques Bosq** ; **Fabian Kiessling** MD ; **Benedicte Coiffier** (Presenter) ; **Nathalie B Lassau** MD, PhD *

CONCLUSION

Parametric maps from raw linear data can be performed in short process time with moving average model, and reflect reliably the heterogeneous histological measures within tumor by considering the contribution of the vessel size in the variations of intratumoral blood volume.

Background

Parametric maps from Dynamic Contrast-Enhanced Ultrasonography (DCE-US) appear as a useful tool to describe the intratumoral vasculature and its heterogeneity. This study was designed to identify the best processing of parametric maps from raw data and to compare the results to histologic vascularity measurement.

Evaluation

DCE-US was performed on 17 melanoma-bearing nude mice after a 0.1mL bolus injection of SonoVue \diamond (Bracco, Italy). Parametric maps treated time intensity curves (TIC) from raw linear data to extract pixelwise two parameters related to blood volume that were area under the curve (AUC) and peak intensity (PI). Three mathematical models were compared to fit the TIC in each pixel: a polynomial model used in clinical routine, a moving average model and a combination of two linear regressions. Parametric maps performed from the best fit approach were compared with histology for both region of interest (ROI) of whole tumor and several subROIs of 15mm² within each tumor to reflect intratumoral vascular heterogeneity. As ground truth correlate, microvessel densities (MVD) were determined, and vessels size only for subROIs.

Discussion

The moving average approach was the best compromise between values determination and processing pixelwise time (40m (rAUC=0.90 (p=0.012) ; rPI=0.83 (p=0.041)).

SSA21-08 • Effects of Ultrasound Parameters on Cavitation-assisted Delivery of PLGA-PEG Nanoparticles into Tumors: Phantom Study and Preliminary In Vivo Results

Tzu-Yin Wang (Presenter) ; **Jung Woo Choe** ; **Steven B Machtaler** PhD ; **Rammohan Devulapally** ; **Butrus T Khuri-Yakub** PhD ; **Ramasamy Paulmurugan** PhD ; **Juergen K Willmann** MD *

PURPOSE

Ultrasound(US)-microbubble(MB)-mediated drug delivery is a promising technique for image-guided, targeted cancer therapy. To optimize this technique for clinical translations, we performed a systematic study on effects of various US and MB parameters on cavitation and the corresponding delivery results of an FDA approved drug carrier, poly(D,L-lactide-co-glycolide)-block-poly(ethylene glycol) (PLGA-b-PEG-COOH) nanoparticles (NPs) into tumors.

METHOD AND MATERIALS

Cavitation was induced by exposing lipid shelled, perfluorocarbon encapsulated MBs to 1.8-MHz US pulses. Cavitation was evaluated with passive detection of the inertial cavitation dose (ICD) and active imaging of MB destruction. Effects of peak negative pressure, pulse length, pulse repetition frequency (PRF), MB concentration, and focal scanning strategies, on cavitation were studied in an agar tissue phantom. Preliminary in vivo studies were performed to study the feasibility of delivering PLGA-PEG NPs into hepatocellular tumors in mice.

RESULTS

Passive cavitation detection showed that the ICD increased with pressures increasing from 0.5 to 5MPa, and with PRFs increasing from 10 to 100 Hz (N=6 each). The ICD also increased with increasing MB concentration from 4×10^6 to 1×10^8 bubbles/mL, but saturated at higher concentration (N=6 each). No significant effect was found for pulse lengths below 15 cycles. Active cavitation imaging confirmed more MB destruction with increasing pressures. When the pressure exceeded 3MPa, more violent cavitation was observed as flickering bright spots at the focus of US. Compared to single focus treatment, electronic focal steering over a large target volume resulted in more homogeneous treatment (N=4 each). Preliminary in vivo experiments showed successful delivery of PLGA-PEG NPs to a hepatocellular tumor.

CONCLUSION

The pressure, PRF, MB concentration, and focal scanning strategies, have distinct effects on cavitation, while no significant influence was found for short pulse lengths. Preliminary in vivo results demonstrated the feasibility of delivering PLGA-PEG NPs into tumors for targeted cancer therapy.

CLINICAL RELEVANCE/APPLICATION

This study presents a clinically translatable systematic approach for spatially localized and optimized delivery of large drugs/carriers to target sites based on quantitative measurement of cavitation

SSA21-09 • Comparing Immunohistochemical Markers of Angiogenesis to Subharmonic Imaging of Vascularity in a Murine Breast Cancer Model

Andrew Marshall ; **Jaydev K Dave** PhD, MS ; **Flemming Forsberg** PhD (Presenter) * ; **Valgerdur Halldorsdottir** MSc ; **Anya I Forsberg** ; **Manasi Dahibawkar** BSc ; **Traci B Fox** MS, RT ; **Ji-Bin Liu** MD *

PURPOSE

To compare contrast-enhanced subharmonic ultrasound imaging (SHI) of breast tumor neovascularity to three immunohistochemical markers of angiogenesis in nude rats.

METHOD AND MATERIALS

Seventy athymic, nude, female rats were implanted with 5×10^6 breast cancer cells (MDA-MB-231) in the mammary fat pad. The contrast agent Definity (Lantheus Medical Imaging, N Billerica, MA) was injected in a tail vein (dose: 36 μ l) and fundamental ultrasound imaging as well as pulse-inversion SHI was performed in triplicate with a modified Sonix RP scanner (Ultrasonix Imaging, Richmond, BC, Canada) using a L9-4 linear array (transmitting at 8 MHz and receiving at 4 MHz in SHI mode). Studies were performed 21, 24 and 28 days post implantation (based on our prior experience). After the experiments, specimens were stained for endothelial cells (CD31), vascular endothelial growth factor (VEGF), and cyclooxygenase-2 (COX-2). Fractional tumor vascularity (FV) was calculated from digital images as contrast enhanced pixels over tumor area (for SHI; averaged over the 3 injections) and staining over tumor area (for specimens). Results were compared using a linear regression analysis.

RESULTS

Of the 70 rats implanted 45 (64 %) exhibited tumor growth and 32 were successfully imaged. SHI depicted the tortuous morphology of tumor neovessels and delineated areas of necrosis better than fundamental ultrasound imaging, due to the marked suppression of tissue signals. VEGF varied significantly over time (p

CONCLUSION

Quantitative contrast-enhanced SHI measures of tumor neovascularity in a breast cancer xenograft models appear to provide a noninvasive marker for angiogenesis corresponding to the expression of VEGF; albeit based on a limited sample size.

CLINICAL RELEVANCE/APPLICATION

In the future SHI may be used to monitor response for patients treated with anti-VEGF drug therapies.

Renal Ultrasound and Doppler (An Interactive Session)

Sunday, 02:00 PM - 03:30 PM • E450B

US VA GU

[Back to Top](#)

RC110 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC110A • Masses and Parenchymal Diseases

John J Cronan MD (Presenter)

LEARNING OBJECTIVES

- 1) Optimize the information available from ultrasound related to chronic renal disease.
- 2) Assess the finding related to acute renal injury.
- 3) Define ultrasounds role in assessment of renal masses.

ABSTRACT

Ultrasound is the primary imaging technique to evaluate the kidneys when acute kidney injury occurs (AKI). We will look at techniques to optimize the evaluation of the kidneys and help clinical decision processes. Identification of chronic /irreversible renal signs is critical in patient management.

Renal mass assessment remains simple, cyst vs. non-cyst.

RC110B • Renal Doppler

John S Pellerito MD (Presenter)

LEARNING OBJECTIVES

1) Learn techniques and protocols for Doppler evaluation of the renal arteries. 2) Optimize abdominal Doppler studies. 3) Recognize the role of Doppler in evaluation of renal stents.

ABSTRACT

Evaluation of the renal arteries and kidneys is an integral component of the workup of renal insufficiency and hypertension. Doppler ultrasound examination is proven valuable in the detection of renal artery stenosis and occlusion. Doppler ultrasound has multiple advantages over CT or MR angiography: noninvasive, no radiation and does not require administration of contrast material. This program will discuss the techniques and protocols needed for successful renal artery evaluation with Doppler ultrasound. Tips to optimize the examination will be provided. There will also be a discussion of the evaluation of renal artery stents.

RC110C • Renal Transplants

Deborah J Rubens MD (Presenter)

LEARNING OBJECTIVES

1) Review the normal parenchymal and vascular anatomy of renal transplants including their normal Doppler parameters. 2) Identify the most common causes of renal transplant complications and criteria for their diagnosis. 3) Outline some of the pitfalls in transplant ultrasound imaging and when to use CT, MR and/or angiography in addition to ultrasound.

ABSTRACT

This lecture will review the anatomy and pathophysiology of renal transplants. The role of ultrasound imaging in assessment of acute as well as chronic renal transplant dysfunction will be elucidated. The performance of Doppler ultrasound will be highlighted regarding vascular stenosis and occlusion, parenchymal perfusion, and planning and assessing organ biopsy. 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. Surgical emergencies will be highlighted, and the role of correlative imaging with CT, MR and/or angiography will be addressed.

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

Sunday, 02:00 PM - 03:30 PM • E264

US IR

[Back to Top](#)

RC152 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Stephen C O'Connor, MD
William E Shiels, DO *
Alda F Cossi, MD
Michael V Krasnokutsky, MD
Mark L Lukens, MD
Kenneth S Lee, MD *
Manish N Patel, DO
Hollins P Clark, MD,MS
Mark J Hogan, MD
Carmen Gallego, MD
Neil V Patel, MD
Robert D Lyon, MD
Patrick Warren, MD
Mahesh M Thapa, MD
Kristin M Dittmar, MD

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

First Trimester Ultrasound

Monday, 08:30 AM - 10:00 AM • S405AB

US OB GU

[Back to Top](#)

RC210 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC210A • Diagnosis of Nonviable Pregnancy

Peter M Doubilet MD, PhD (Presenter)

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 viable pregnancy.

ABSTRACT

I. Sonographic Criteria for Diagnosing Pregnancy Failure (Miscarriage) in an Intrauterine Pregnancy of Uncertain Viability [Note: an intrauterine fluid collection with rounded edges in a woman with positive hCG is almost certainly a gestational sac; it is definitely a gestational sac if it contains a yolk sac or embryo.] 1. Criteria for definite miscarriage (i) CRL =2 weeks after a scan that showed a gestational sac without yolk sac; (iv) Absence of embryo with heartbeat >=11 days after a scan that showed a gestational sac with yolk sac 2. Criteria suspicious for miscarriage (i) CRL =6 weeks after LMP; (vi) Empty amnion (amnion seen adjacent to yolk sac, with no visible embryo); (vii) Enlarged yolk sac (>7 mm); (viii) Small gestational sac size in relation to the embryo II. Guidelines Related to the Possibility of a Viable Intrauterine Pregnancy in a Pregnancy of Unknown Location (positive pregnancy test and no intrauterine or ectopic pregnancy seen on ultrasound) 1. A single hCG, regardless of its level, does not reliably distinguish between ectopic and intrauterine pregnancy (viable or nonviable) 2. If a single hCG is =3000 mIU/ml, a viable intrauterine pregnancy is possible but unlikely. However, the most likely diagnosis is nonviable IUP, so it is generally appropriate to get at least one followup hCG before treating for ectopic pregnancy.

RC210B • Diagnosis and Treatment of Ectopic Pregnancy

Hope E Peters MD (Presenter)

LEARNING OBJECTIVES

1) Recognize the spectrum of findings at transvaginal ultrasound in ectopic pregnancy. 2) Report TVUS findings in suspected ectopic pregnancy when a non-specific intrauterine fluid collection is present. 3) Differentiate usual vs. unusual ectopic pregnancies and understand their different treatment algorithms. 4) Understand the limitations of ultrasound related to maternal and technical factors. 5) Assist clinicians with appropriate follow up/management recommendations in excluding and diagnosing ectopic pregnancy.

ABSTRACT

Transvaginal ultrasound is the primary imaging modality to evaluate suspected ectopic pregnancy, performed in patients with a positive pregnancy test and pain or bleeding. The diagnosis is most commonly made when ultrasound demonstrates no intrauterine gestational sac and an extraovarian adnexal mass is found. Ectopic pregnancies occur in the ampulla of the fallopian tube >90% of the time and therapy is well established including systemic methotrexate and/or salpingectomy. When attempting to exclude or diagnose ectopic pregnancy, TVUS may demonstrate a non-specific intrauterine fluid collection. The term pseudogestational sac should not be used to describe an intrauterine fluid collection as this term can be confusing and improperly imply ectopic pregnancy prompting premature treatment. Rather, any intrauterine fluid collection should be regarded as a potential intrauterine pregnancy and reported as such. Ectopic pregnancies may also occur in unusual locations such as: the cervix, a cesarean section scar, the interstitial portion of the fallopian tube, within the ovary or concomitant with an intrauterine pregnancy. These unusual ectopic pregnancies are a unique subset of ectopic pregnancies requiring prompt diagnosis and alternative treatment options. Ultrasound does carry with it some limitations in the diagnosis of ectopic pregnancy related to both maternal and technical factors. Prompt diagnosis of all types of ectopic pregnancy and recognizing potential early intrauterine pregnancies will allow for appropriate follow up, optimal treatment and improve outcomes for these patients.

RC210C • The Fetus in the First Trimester

Carol B Benson MD (Presenter)

LEARNING OBJECTIVES

1) Use ultrasound during the first trimester to confirm the normal development of various fetal structures at specific gestational ages. 2) acquire the correct sonographic image to measure the fetal nuchal translucency between 11 and 14 weeks gestation and recognize when the nuchal translucency is abnormal. 3) use ultrasound to detect certain serious anomalies of the fetal cranium and brain during the latter half of the first trimester. 4) distinguish between normal physiologic herniation of the bowel into the base of the umbilical cord from a ventral wall defect, such as an omphalocele or gastroschisis in the first trimester.

ABSTRACT

As sonographic technology has improved, diagnosticians have gained the ability to visualize more fetal structures during the first trimester than used to be possible with older equipment. Because of this, it is important that practitioners who perform and interpret first trimester ultrasound understand how the fetus develops and recognize the sonographic appearance of fetal structures as they become apparent at different gestational ages during the first trimester. Some fetal structures are only visible in the first trimester fetus, but are no longer apparent after that. These include the nuchal translucency and physiologic bowel herniation. The nuchal translucency is a hypochoic band behind the fetal neck, that, when thickened, is associated with increased risk of aneuploidy and cardiac anomalies. Physiologic bowel herniation is a normal protrusion of bowel into the base of the umbilical cord that can usually be distinguished from abnormal herniations through the ventral wall, such as omphalocele and gastroschisis. The fetal cranium and brain can be evaluated during the latter half of the first trimester, and anomalies such as anencephaly and holoprosencephaly can often be diagnosed. Likewise, other anomalies of the fetus can sometimes be diagnosed during the first trimester, including amniotic band syndrome, posterior urethral valves, and cardiac anomalies. Recognition of these anomalies in the first trimester will assist in early detection of fetal abnormalities, allowing for earlier and improved counseling for patients.

Master Class in Musculoskeletal Ultrasound (How-to Workshop)

Monday, 08:30 AM - 10:00 AM • E258

US MK

[Back to Top](#)

RC231 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Marnix T Van Holsbeeck, MD *

Kenneth S Lee, MD *

Catherine J Brandon, MD *

Michael A Dipietro, MD

Alberto S Tagliafico, MD

Joseph H Introcaso, MD

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.

US-guided Interventional Breast Procedures (Hands-on Workshop)

Monday, 08:30 AM - 10:00 AM • E264

US BR

[Back to Top](#)

RC252 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Gary J Whitman, MD *

Annamaria Wilhelm, MD *

Richard M Chesbrough, MD *

Michael N Linver, MD *

Paula B Gordon, MD *

Stamatia V Destounis, MD

Anna I Holbrook, MD

Alice S Rim, MD

Alda F Cossi, MD

Eren D Yeh, MD

Gary W Swenson, MD

Catherine W Piccoli , MD *
Michael P McNamara , MD *
Selin Carkaci , MD
Jean M Seely , MD
Phan T Huynh , MD *
H. Carisa Le-Petross , MD
Basak E Dogan , MD
Jay A Baker , MD *
Tanya W Stephens , MD
Jiyon Lee , MD

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

Controversy Session: Fibroid Therapy: UAE vs Focused US

Tuesday, 07:15 AM - 08:15 AM • E350

US **IR** **OB** **GU**

[Back to Top](#)

SPSC30 • *AMA PRA Category 1 Credit*™:1 • ARRT Category A+ Credit:1

Moderator

Brian S Funaki , MD
James B Spies , MD
Alan H Matsumoto , MD *

LEARNING OBJECTIVES

1) Describe role of uterine artery embolization in the treatment of symptomatic uterine fibroids. 2) Explain the use of high-intensity focused ultrasound (HIFU) in treatment of uterine fibroids. 3) Describe one pitfall of HIFU in treatment of uterine fibroids.

Second and Third Trimester Obstetrical Ultrasound

Tuesday, 08:30 AM - 10:00 AM • S405AB

US **OB** **GU**

[Back to Top](#)

RC310 • *AMA PRA Category 1 Credit*™:1.5 • ARRT Category A+ Credit:1.5

RC310A • Support Structures

Vickie A Feldstein MD (Presenter)

LEARNING OBJECTIVES

1) Understand normal development and anatomy of the placenta and umbilical cord. 2) Optimize sonographic techniques for correct assessment of the placenta and cord. 3) Enhance knowledge of common and clinically important abnormalities of the placenta and cord to improve skills for accurate detection by ultrasound. 4) Recognize abnormal placentation, detect placenta accreta, placenta previa, and vasa previa in effort to optimize clinical care and management.

ABSTRACT

Normal placental and umbilical cord development and anatomy will be reviewed. Sonographic manifestations of common abnormalities of the placenta and cord will be presented. Ultrasound (US) findings will be demonstrated, highlighted with pathologic correlation. Attention to the placenta, an often-overlooked crucial structure, is important in the optimal performance and interpretation of 2nd and 3rd trimester obstetrical US. Placental thickness, morphology and echotexture will be addressed. Retroplacental hematomas, which may present clinically as abruption, pose risk to the fetus and impact management. Placenta previa, a placenta that overlies or is proximate to the internal cervical os, is the most common cause of bleeding in the 3rd trimester. US detection and suggested terminology regarding previa will be reviewed. Vasa previa is a rare, but clinically important condition related to placenta previa in which umbilical cord and/or fetal vessels are positioned between the presenting fetal part and cervix. Possible consequences of this condition, including hemorrhage and potential fetal exsanguination, are devastating. Improved outcomes depend upon accurate prenatal diagnosis and delivery by cesarean section. Placenta accreta refers to abnormal adherence of the placenta to the uterus with subsequent failure to separate after delivery of the fetus. Careful assessment of at-risk pregnancies is indicated as this condition may lead to massive obstetric hemorrhage. Prenatal diagnosis allows effective delivery management planning to minimize morbidity. Umbilical cord abnormalities can be found and have clinical implications. The most common abnormality of the cord is a single umbilical artery (SUA). Discovery of SUA prompts a search for any other detectable fetal malformation. Velamentous cord insertion, with attachment of the cord beyond the placental edge into the free membranes of the placenta, is associated with increased risk and this too can be detected by US.

RC310B • Fetal Genitourinary Anomalies

Roya Sohaey MD (Presenter) *

LEARNING OBJECTIVES

1) Recognize the appearance of the normal fetal adrenal gland, kidney, bladder and genitalia in the first, second and third trimester. Anomalies of these structures will be shown and strategies for making accurate diagnoses of anomalies will be taught. 2) Current in utero and post natal treatment plans for fetal genitourinary anomalies will be discussed, particularly for prenatal and postnatal workup and evaluation of fetal hydronephrosis. The Society of Fetal Urologists grading system of hydronephrosis will be reviewed and it's utility in clinical practice discussed.

ABSTRACT

Genitourinary (GU) abnormalities are common in fetal life and range in severity from idiopathic, as in most cases of pelviectasis, to lethal, as in renal agenesis. A systematic approach to evaluation of the GU tract is important in order to make an accurate diagnosis. The fetal kidneys should be documented in two orthogonal planes. The adrenal gland can mimic the kidney if only the axial plane is obtained. The fetal bladder should be seen filling and emptying during the study. The adrenal glands are often easily identified and the fetal genitalia should be assessed whenever GU anomalies are seen. The approach to the abnormal urinary tract starts with identifying both kidneys and evaluating renal echogenicity and morphology. If hydronephrosis is present then quantitative and qualitative assessment of the whole collecting system, from calyces to urethra is performed. The anterior-posterior renal pelvis is measured and the SFU grade of hydronephrosis is estimated. If renal cysts are present then the differential diagnosis of multicystic dysplastic kidney vs renal cystic

dyplasia (either primary or secondary) is explored. An abnormal fetal bladder is one which is either consistently 'too small' or 'too large', and the cause can be anatomic or physiologic. Adrenal masses can occur in utero or more often, the adrenal gland may be displaced by a suprarenal mass that is not adrenal in origin, such as an extralobar pulmonary sequestration. Congenital adrenal hyperplasia presents as enlarged adrenal glands and is associated with ambiguous genitalia in female fetuses. Genitalia anomalies can be isolated or associated with syndromes and aneuploidy. Making an accurate diagnosis of fetal GU anomalies results in better prenatal counseling and post natal treatment. Some fetuses with GU anomalies may benefit from in utero intervention as well, such as bladder drainage. Most need prenatal and postnatal surveillance which is often determined by the prenatal findings.

RC310C • Multiple Gestations

Anne M Kennedy MD (Presenter)

LEARNING OBJECTIVES

- 1) Determine chorionicity and amnionicity and understand why it is important to do so in all multiple gestations.
- 2) Understand and diagnose specific complications of monochorionic twinning such as twin to twin transfusion syndrome and twin reversed arterial perfusion.
- 3) Recognize the indications for more frequent surveillance and intervention in complicated twin pregnancies.

ABSTRACT

The prognosis in multiple gestations is dependent on chorionicity therefore it is essential that this be documented in all cases. The easiest time to do this is in the first trimester but we will review tips for diagnosis in the second and third trimesters as well. Specific complications of monochorionic twinning include twin to twin transfusion syndrome (TTTS) in which there is an arteriovenous shunt from the donor twin to the recipient. The donor is oligemic and the recipient is hypovolemic thus there is oligohydramnios in the donor sac and polyhydramnios in the recipient sac. Untreated the outcome is poor but laser ablation of the vascular connections in the placenta has markedly improved prognosis. In twin reversed arterial perfusion (TRAP) there is an artery to artery anastomosis between the pump twin and the malformed co-twin which can become very large. It is important to recognize TRAP sequence early in pregnancy as the abnormalities in the malformed twin are lethal. The pump twin is at risk for hydrops due to the high output state. Early intervention prevents continued growth of the abnormal twin and protects the pump twin such that the patient has a good prognosis for one live birth. Multiple gestations are at risk for growth restriction and discordant growth; the incidence of fetal anomalies and maternal complications of pregnancy is also increased. Because of this multiple gestations are followed more intensively than singletons and, when monochorionic, surveillance for specific complications is increased. The prognosis for TTTS and TRAP is much improved with intervention but there is finite window of opportunity in which interventional procedures can be performed thus appropriate referral is essential. Accurate diagnosis of chorionicity and early recognition of complications in multiple gestations will result in better management and improved outcomes.

MR-Guided High Intensity Frequency Ultrasound (HIFU)

Tuesday, 08:30 AM - 10:00 AM • S504CD



[Back to Top](#)

RC317 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Moderator

Pejman Ghanouni, MD, PhD

RC317A • Palliation of Painful Metastases to Bone

Pejman Ghanouni MD, PhD (Presenter)

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.

RC317B • Technical Considerations when Performing MR-Guided High Intensity Frequency Ultrasound

Kim R Butts Pauly PhD (Presenter) *

LEARNING OBJECTIVES

- 1) To understand the basic physical principles of focused ultrasound and the considerations for clinical treatments.
- 2) To understand the basic physical principles of MR thermometry and thermal dose and the consideration for clinical treatments.

ABSTRACT

Focused ultrasound uses a large area array, typically outside the body, that is geometrically or electronically focused to a point. Such focusing provides amplification of the ultrasound intensity, thereby allowing heating of tissue to the point of coagulation at the focus, without damage to the intervening tissue. Treatment of tissues deep in the body requires image guidance such as MR thermometry. The concept behind MR thermometry is straightforward: changes in hydrogen bonding with temperature result in a change in the proton resonant frequency, seen in the phase of gradient echo images. Temperature standard deviations less than 1°C are readily achievable and thermal dose maps are easily calculated. Considerations for focused ultrasound include patient positioning and target access, good coupling, near field and far field effects, long treatment times for sizable ablation volumes, and, in the case of the brain, phase aberrations from the skull. Considerations for MR thermometry are motion of the target tissue or motion of other organs such as occurs during respiration. In addition, metallic hardware from prior surgeries reduce the visualization on MR temperature maps. Further, there is little visualization of temperature rises in adipose tissue, and in some cases the FUS equipment prevents the use of local coils. Nonetheless, recent developments in MRgFUS are overcoming these challenges.

RC317C • Transcranial MR-guided High Intensity Frequency Ultrasound

Jeff Elias (Presenter)

LEARNING OBJECTIVES

- 1) To understand the issues of transcranial sonication, and the technology available to achieve this.
- 2) To review the current neurological applications for MRI guided focused ultrasound surgery.

ABSTRACT

Recent advances in ultrasound transducer technology have now enabled the precise delivery of acoustic energy to deep regions of the

brain with MRI guidance. The first treatment in humans have demonstrated that MRI-guided FUS is feasible for the treatments in the brain. Clinical trials are currently underway primarily for the treatment of movement disorders, but also for brain tumors, neuropathic pains, and obsessive-compulsive disorder.

RC317D • Body Applications of MR-Guided High Intensity Frequency Ultrasound

Wladyslaw M Gedroyc MBBS, MRCP (Presenter)

LEARNING OBJECTIVES

1) Where Can FUS be applied. 2) Which patients are most suitable for fibroid FUS. 3) What are the potential complications of fibroid FUS. 4) What are the medium-term results of FUS for uterine fibroids. 5) What requirements does a prostate FUS system require for safe and effective application. 6) What are the potential complications of prostate MR guided FUS. 7) What are the technological requirements necessary to improve MR guided focused ultrasound therapy to the liver. 8) What other areas can MR guided focused ultrasound potentially be applied to in the body.

ABSTRACT

The largest area of FUS application has been of uterine fibroids. These benign tumours are extremely common and responsible for huge expenditure each year. FUS can provide a completely non-invasive way of treating women with fibroids in an outpatient manner with negligible complications and very minor post-operative pain. Selecting appropriate patients is vital and will be discussed together with methods of assessing success. Improved technology can now speed up fibroid treatment with ablation spots up to 7 cm in length that can be rapidly moved from one point to another minimizing heating in front of the focal spot whilst treating multiple areas. Current follow-up studies suggest that if a nonperfused volume of greater than 60% is achieved symptomatic response is well over 80% at one year and that the requirement for further fibroid related treatment is 11% at two years. Because of the outpatient non-invasive nature of the procedure FUS becomes highly cost-effective Percutaneous destruction of liver tumours in a completely non-invasive manner would change therapy to the liver radically. FUS holds out such a prospect but the technological improvements required to our current machinery are substantial. The barrier of the FUS absorbing rib cage is hard to overcome and to date MR guided focused ultrasound has only been able to reach lesions that are not covered by ribs. The movement produced by respiration presents a significant problem currently addressed by controlled ventilation during FUS. Technological improvements are slowly being implemented to address these areas. New endorectal MR guided transducers which can ablate areas of the prostate under accurate MR targeting and thermal control are in phase 1 studies treating low risk prostate carcinoma and looking at safety and early efficacy. These results will be discussed. A brief discussion of MR guided focused ultrasound application to the breast and soft tissue tumours will also be presented.

Doppler US: Visceral, Extremity and Carotid Applications (Hands-on Workshop)

Tuesday, 08:30 AM - 10:00 AM • E264

US **VA**

[Back to Top](#)

RC352 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Shweta Bhatt, MD, MBBS
Wui K Chong, MD *
M. Robert Dejong, MD *
Vikram S Dogra, MD *
Corinne Deurdulian, MD
Edward G Grant, MD *
Ulrike M Hamper, MD, MBA
Felix A Hester
Mark E Lockhart, MD
Mani Montazemi
Michelle L Robbin, MD *
Ravinder Sidhu, MD
Leslie M Scoutt, MD *
Sadhna Verma, MD *

LEARNING OBJECTIVES

1) Understand basic concepts associated with abdominal, extremity and carotid Doppler. 2) Describe ultrasound techniques, protocols, and diagnostic criteria for evaluation of the carotid arteries. 3) Gain experience in Doppler techniques through personalized hands-on scanning of models with a variety of ultrasound machines. 4) Describe common pitfalls in Doppler examinations.

ABSTRACT

This hands-on course will focus on the details that constitute good Doppler technique in the evaluation of vascular flow, specifically within the neck, extremities and abdomen. Technical considerations for optimization of Doppler images will be discussed and the concepts will be applied to abnormalities commonly encountered in patients. Initial brief lectures will begin by discussing common pitfalls in vascular imaging and then followed by basic concepts and techniques of renal Doppler. The majority of the session will give participants an opportunity to scan live models to improve technical skills in color and spectral Doppler. Faculty will be available at multiple stations using a variety of ultrasound machines. Participants will be encouraged to inquire about any areas of interest in the neck, abdomen, pelvis, or extremities during the hands-on component of the course.

URL's
umhamper@jhu.edu

Musculoskeletal Radiology Series: Ultrasound

Tuesday, 08:30 AM - 12:00 PM • E451B

US **MK**

[Back to Top](#)

VSMK31 • AMA PRA Category 1 Credit™:3.25 • ARRT Category A+ Credit:3.5

Moderator
Marnix T Van Holsbeeck, MD *
Moderator
Kenneth S Lee, MD *

VSMK31-01 • Shoulder Ultrasound (Demonstration)

Jon A Jacobson MD (Presenter) *

LEARNING OBJECTIVES

1) Be familiar with ultrasound examination and anatomy of the shoulder and common pathology.

VSMK31-02 • Ultrasound Assessment of the Rotator Cable and Correlation with Functional Outcome, Tear Size and Muscle Fatty Atrophy

Etienne Blain Pare MD, FRCPC (Presenter) ; **Karim Basile** MD ; **Nicola Hagemeister** * ; **Patrice Tetreault** MD, MSc ; **Dominique Rouleau** MD, MSc ; **Nathalie J Bureau** MD

PURPOSE

To investigate the relationship between visualization of the rotator cable (RC) on ultrasound (US) and functional outcome, tear size and muscle fatty atrophy in subjects with full-thickness rotator cuff tears (RCT) and asymptomatic volunteers (AV).

METHOD AND MATERIALS

In this cross-sectional study, 52 subjects with full-thickness RCT (32 men; age range 39-67 years; mean 57 years) and 20 (AV) (11 men; age range 35-64 years) were examined prospectively with US by a musculoskeletal radiologist with 17 years of experience. A RC was defined as an articular-sided bundle of fibers perpendicular to the rotator cuff tendons. The length and width of the full-thickness RCT were measured in the frontal and sagittal planes and tear area was calculated. Supraspinatus (SS) muscle atrophy was assessed by calculating the occupation ratio of the SS fossa (Thomazeau 1997). SS and infraspinatus (IS) fatty atrophy was graded by comparing the echogenicity and pennate pattern with that of the trapezius muscle (Khouri 2008). A physiotherapist used the Constant score to measure functional outcome. Statistical analysis was performed using the Student t test and the Fisher exact test.

RESULTS

The RC was visualized in 75% of AV and in 25% of RCT subjects. Non-visualization of the RC in RCT subjects correlated significantly with a larger tear area (612.12 mm^2 vs 247.24 mm^2), $p < 0.0001$, 95% CI (145.83; 528.6). The mean Constant score was significantly higher in AV than in RCT subjects (87.5 vs 51.3), $p < 0.0001$, 95% CI (31.6; 40.7) but it did not correlate with RC visualization in the RCT group ($p = 0.3$) nor in the AV group ($p = 0.11$). There was a significant difference in the severity of muscle fatty replacement of the SS ($p = 0.03$) and the IS ($p = 0.014$), as well as in the severity of SS muscle atrophy ($p = 0.04$) in RCT subjects without a visible RC as compared to those with a visible RC.

CONCLUSION

Non-visualization of the RC on US correlates with larger RCT, higher grades of SS and IS muscle fatty replacement and with SS muscle atrophy. Visualization of the RC in subject with RCT does not appear to correlate with better functional outcomes.

CLINICAL RELEVANCE/APPLICATION

RC visualization on US in subjects with full-thickness RCT may assist orthopedic surgeons in choosing the optimal treatment for their patients (conservative vs surgery).

VSMK31-03 • Dynamic Ultrasonography of the Shoulder: Availability to Diagnose Combined Adhesive Capsulitis with Full-thickness Tear of the Supraspinatus Tendon

Hoseok Lee (Presenter) ; **Jaе Hyuck Yi MD**

PURPOSE

To determine the availability of dynamic ultrasonography of the shoulder to diagnose combined adhesive capsulitis with full-thickness tear of the supraspinatus tendon.

METHOD AND MATERIALS

Since 2010, total 80 patients (M:F = 37:43, mean age: 61.56, age range: 36-82) with full-thickness tear of supraspinatus tendon (SSPT) who performed both dynamic ultrasonography (dUS) and MRI of the shoulder (32 cases of conventional MRI and 48 cases of indirect MR arthroscopy) were included in this retrospective study. 35 patients who showed subacromial gliding limitation (SGL) of the SSPT during dUS were classified into group I, 45 patients who did not show SGL of the SSPT were classified into group II. The dUS score was estimated by severity of SGL (0: none, 1: mild, 2: moderate, 3: severe). MRI was assessed for following 3 findings suggesting adhesive capsulitis; 1)maximal capsular thickness in axillary recess (AR) =4mm, 2)maximal capsular thickness in rotator cuff interval (RI) =7mm, 3)presence of bright signal change of capsule in AR and RI on fat-suppressed T2-weighted image of conventional MRI or capsular enhancement in AR on indirect MR arthroscopy. Each of these findings was given 1 score, and total MRI score of each patients was calculated. Statistic analysis was performed by using Pearson correlation coefficient and Fischer exact test.

RESULTS

The mean value of dUS score and MRI score of total patients were 0.59 ± 0.77 and 1.42 ± 1.13 . The mean thickness in AR and RI were $5.45 \pm 1.37 \text{ mm}$ and $6.81 \pm 1.37 \text{ mm}$ in group I, and $3.20 \pm 0.86 \text{ mm}$ and $6.08 \pm 1.39 \text{ mm}$ in group II. dUS score was significantly correlated with capsular thickness in AR ($r=0.742$, p

CONCLUSION

Subacromial gliding limitation of the supraspinatus tendon during dynamic ultrasonography was significantly correlated with MR findings suggesting adhesive capsulitis. Therefore, dynamic ultrasonography of the shoulder may be useful to diagnose combined adhesive capsulitis with full-thickness tear of the supraspinatus tendon.

CLINICAL RELEVANCE/APPLICATION

Dynamic ultrasonography can demonstrate subacromial gliding limitation of the supraspinatus tendon and this exam is recommended in the evaluation of suspected adhesive capsulitis.

VSMK31-04 • Diagnostic Performance of Conventional Ultrasonography Combined with US Strain Elastography for Differentiation between Benign and Malignant Subcutaneous Soft Tissue Mass Lesions

Tharakeswara Kumar Bathala MD (Presenter) ; **Gaiane M Rauch MD, PhD** ; **Melanie Bass** ; **Deborah Borst** ; **Brian Hobbs PhD** ; **Deepak G Bedi MBCh ***

PURPOSE

To evaluate diagnostic performance of conventional ultrasonography (US) combined with US Strain Elastography (USE) for differentiation between benign and malignant subcutaneous soft tissue mass lesions, with the pathology as reference standard.

METHOD AND MATERIALS

After Institutional IRB approval, we identified 74 patients with a subcutaneous soft tissue mass who had US and USE from January 2009 to May 2012. Three radiologists retrospectively reviewed US and USE images in consensus. Gray scale US imaging features were classified as benign, malignant and indeterminate. USE images were assessed according to tissue elasticity based on color scale and classified as soft, intermediate and hard. Pathological diagnosis obtained either by percutaneous biopsy or surgical excision was used as reference standard. The statistical analysis included evaluation of sensitivity and specificity for US and USE separately, as well as a composite evaluation of US + USE; Bowker's test was used for evaluation of matched US and USE outcomes for symmetry.

RESULTS

Out of 74 lesions, US 37 were classified as benign, 8 indeterminate, 29 malignant. USE found 35 benign, 14 indeterminate, 25 malignant lesions. US+USE classified 40 as benign, 4 indeterminate and 30 malignant. The estimated sensitivity and 95% CI for US, USE and US+USE was 100% (82-100%), 95% (75-100%), and 100% (82-100%) respectively. The specificity for US, USE and US+USE was 71% (57-82%), 67% (53-79%), and 77% (63-87%) respectively. Significant evidence for the lack of agreement among the matched US and Elastography results was not found ($p=0.51$). The data suggest US alone is highly sensitive for detecting and characterization of subcutaneous soft tissue lesions. Only 8 patients resulted in an indeterminate US, all of which had benign lesions on pathology. Among these 8, USE was determinate for only 4, of which 3 were correctly classified as benign and 1 was incorrectly classified as malignant. Thus, estimated specificity is improved for the US+USE.

CONCLUSION

In the presence of an indeterminate result on conventional US, USE may improve specificity for diagnosing subcutaneous soft tissue lesions. Combination of US and USE could provide a better diagnostic performance than conventional US alone.

CLINICAL RELEVANCE/APPLICATION

Addition of USE evaluation to conventional gray scale US imaging improves imaging-based diagnostic information for soft tissue nodule work up.

VSMK31-05 • Value of Real-time Sharewave Elastography in Achilles Tendinopathy: Is the Abnormal Tendon Softer?

Jean-Philippe Nueffer MD (Presenter) ; **Fabio Becce** MD ; **Fabrice Michel** MD, PhD ; **Benoit Barbier-Brion** MD ; **Adrian I Kastler** MD, MSc ; **Sebastien L Aubry** MD, PhD

PURPOSE

To determine if the viscoelastic properties of Achilles tendon assessed by real-time sharewave elastography (SWE) are modified in tendinopathy

METHOD AND MATERIALS

Twenty-six abnormal tendons (16 unilateral and 5 bilateral tendinopathies) from 21 patients with Achilles tendinopathy and 176 normal tendons (from 16 patients and 80 healthy volunteers) were prospectively included and compared. Mean sharewave velocity (V_{mean}) was measured on axial and sagittal SWE images at two degrees of passive ankle flexion (position 1: complete plantar flexion; and position 2: 0 degree flexion). Tendon maximum anteroposterior and lateral diameters, cross sectional area and the presence of tears were also noted

RESULTS

In position 1, the abnormal tendons V_{mean} was significantly lower than for contralateral normal tendons on sagittal ($\Delta=-1.23\text{m/s}$, $p=0.004$) and axial elastograms ($\Delta=-0.68\text{m/s}$, $p=0.03$); and significantly lower than for normal tendons only on axial images ($\Delta=-0.49\text{m/s}$, $p=0.01$). In position 2 and on axial elastograms, the abnormal tendons V_{mean} was 1.14m/s lower than for contralateral normal tendons however without reaching statistical significance ($p=0.07$). In position 2, the abnormal tendons V_{mean} was significantly lower than for normal tendons on sagittal ($\Delta=-1.26\text{m/s}$, p

CONCLUSION

Abnormal Achilles tendons have lower V_{mean} and are therefore softer than normal tendons. There is no SWE signal into tendon tears

CLINICAL RELEVANCE/APPLICATION

Tendon softening, assessed by real-time SWE, is a new helpful tool in the evaluation of Achilles tendinopathy. SWE may also provide quantitative parameters to assess the severity of tendinopathy

VSMK31-06 • Ultrasound-guided Shoulder Injection

Etienne Cardinal MD (Presenter)

LEARNING OBJECTIVES

1) Be familiar with ultrasound examination and anatomy of the hip and common pathology.

VSMK31-07 • Ultrasound-guided (US) Percutaneous Treatment of Rotator Cuff Calcific Tendinitis (RCCT): Randomized Comparison between One- and Two-needle Procedure

Davide Orlandi MD (Presenter) ; **Giulio Ferrero** ; **Francesca Lacelli** MD ; **Enzo Silvestri** MD ; **Giovanni Serafini** MD ; **Luca Maria Sconfienza** MD, PhD

PURPOSE

US-Guided percutaneous treatment of RCCT has been widely demonstrated to be effective using one or two needles, but direct comparison between the two methods has never been performed. Our aim was to compare the technical and one-year clinical outcome of these two different approaches.

METHOD AND MATERIALS

IRB approval and patients' informed consent were obtained. One hundred patients to be treated for RCCT diagnosed with ultrasound (77 females, mean age 46y, range 32-70 years) were randomized into two groups. Group A (50 patients; mean visual analogue scale [VAS]=7.8) was treated using an US-guided 16G double-needle technique (local anesthesia, washing with warm saline, intrabursal steroid), while group B (50 patients; mean VAS=7.4) was treated using a 16G single-needle technique. Calcification appearance at US (fluid, soft, hard), procedure time and ease of calcium dissolution (subjectively scored as easy=1, intermediate=2, difficult=3) were recorded. VAS follow-up was performed at 1,3,6 and 12 months. Complication rate was noted. Mann-Whitney U and Chi-square statistics were used.

RESULTS

CONCLUSION

One- and two-needle procedures are equally effective in treating RCCT with no major complications. Two-needle procedure allows for significantly reducing treatment time and appears to be much easier when dealing with soft and hard calcium deposits.

CLINICAL RELEVANCE/APPLICATION

Two needles US-guided percutaneous treatment of RCCT seems to be the treatment of choice in patients affected by soft and hard calcifications, compared to one needle technique.

VSMK31-08 • Postoperative Monitoring of Local and Free Flaps with Contrast Enhances Ultrasound (CEUS)- Analysis

Ernst Michael Jung MD (Presenter) ; **Janine Rennert** MD ; **Lukas Prantl** MD

PURPOSE

Tissue defects are a common problem in trauma surgery or oncology. Flap transplantation is often the only therapy to cover these extensive wound defects. To date several monitoring systems exist but none has made it to clinical day work. Objective: Aim of this study was to assess perfusion disturbances of local and free flaps using contrast enhanced ultrasound (CEUS).

METHOD AND MATERIALS

112 patients were examined after local or free flap transplantation during the first 72 hours after operation. CEUS was performed by one experienced examiner with a linear transducer (6-9 MHz, LOGIQ E9/GE) after a bolus injection of 2.4 ml sufohexa-fluoride microbubbles (SonoVue, Bracco, Italy). Retrospective vascular perfusion was quantified by evaluating the stored DICOM cine loops using the perfusion software QONTRAST (Bracco, Italy). Over a total penetration depth of 3 cm every centimetre was analysed separately. 27 complications were observed. Complete flap loss was only seen in 4 cases whereas 23 flaps had to undergo minor revisions and survived.

RESULTS

Regarding the complete flap size quantitative analysis showed significant higher perfusion values in patients without complications compared to patients with complications: PEAK 16.5 vs. 10.0 ($p=0.001$), TTP 32.6 vs. 22.2 ($p=0.001$), RBV: 738.8 vs. 246.2 (p

CONCLUSION

CEUS was capable of detecting vascular disturbances after flap transplantation. TTP, RBV and MTT seem to be the most accurately parameters and are very unsusceptible to malfunction during measurement.

CLINICAL RELEVANCE/APPLICATION

CEUS offers an excellent imaging method to detect early reduction of the tissue transplants microvascularization also if MRI is not available or not realizable.

VSMK31-09 • The Effects of US-guided Injection of Platelet-rich-Plasma (PRP) on the Degenerative Disease of the Achilles and Patellar Tendon in Athletes

Alice La Marra MD (Presenter) ; **Lorenzo Maria Gregori** ; **Silvia Mariani** MD ; **Luigi Zugaro** ; **Antonio Barile** ; **Carlo**

Masciocchi

PURPOSE

To evaluate and show the result of injection with Platelet Rich Plasma (PRP) of tendinosis of Achilles and Patellar tendon in athletes.

METHOD AND MATERIALS

In the last three years we evaluated 50 athletes with degenerative tendinosis of Achilles tendon and 30 athletes with degenerative tendinosis of patellar tendon. All the patients were first evaluated through diagnostic testing (MRI and US guided) and then through clinical observations (VAS for pain and VISA-A and VISA-P for functionality). The patients underwent a cycle of platelet rich plasma US-guided infiltrations every 21 days for a total of three treatments. Another MRI was performed 30 days and one year after the last infiltration.

RESULTS

In the patients with tendinosis of Achilles tendon we have found an improved overall by 80% (VAS) and 53%(VISA-A). Relatively to the patellar tendon, the VAS value is increased of 75% (VAS) and 50% (VISA P). We observed partial or complete morphological recovery and normalization of MRI signal in 90%. We observed a reduction of sectional area in the Achilles tendon in 39/50 cases and in the patellar tendon in 18/30 cases. Eight patients with tendinosis of Achilles tendon presented an area increased by 10% and five patients with tendinosis of patellar tendon presented an area increased by 15%. The mean VAS at one year of treatment improved in all cases overall by 70%.

CONCLUSION

Our study showed that in patients who underwent PRP treatments there was an improvement of the functionality, a decrease in pain and a normalization of the signal intensity seen on MRI. Therefore, our experience proves that PRP infiltration may be a good therapeutic alternative for the treatment of Achilles and patellar tendinopathy in athletes.

CLINICAL RELEVANCE/APPLICATION

The US-guided PRP treatment in case of degenerative tendon diseases may increase Achille's and Patellar tendons functionality and reduce recovery times in athletes.

VSMK31-10 • Wrist and Hand Ultrasound (Demonstration)

Marnix T Van Holsbeeck MD (Presenter) *

LEARNING OBJECTIVES

1) Be familiar with ultrasound examination and anatomy of upper extremity nerves and common pathology.

VSMK31-11 • High-resolution Ultrasonography of the Dorsal and Palmar Extrinsic Wrist Ligaments in Correlation with 3T Magnetic Resonance Imaging in 40 Normal Volunteers and 10 Cadaveric Specimens with Surgical Correlation

Mihra S Taljanovic MD (Presenter) ; Dean Holden MD, FRCPC ; Elizabeth A Krupinski PhD ; Joseph E Sheppard MD

PURPOSE

To confirm that high-resolution ultrasonography (HRUS) has comparable results with 3T Magnetic Resonance Imaging (MRI) in visualization of the extrinsic wrist ligaments.

METHOD AND MATERIALS

HRUS and 3T MRI of the extrinsic wrist ligaments were performed on 10 fresh frozen cadaveric wrist specimens and on 40 wrists in normal volunteers. Dorsal radiocarpal-DRCL, dorsal intercarpal-DICL and dorsal ulnotriquetral-DUTL, radioscaphocapitate-RSCL, long radiolunate-LRLL, short radiolunate-SRLL, radioscapolunate-RSLL, palmar ulnolunate-PULL, palmar ulnotriquetral-PUTL, ulnocapitate-UCL, and palmar scaphotriquetral-PSTL ligaments were evaluated. The ligaments were graded by two examiners in consensus, using the following grading system: Grade 1- ligament completely seen, Grade 2- ligament partially seen (< 100 % but > 50% of the ligament clearly seen) and Grade 3- ligament not seen (< 50% of the ligament clearly seen). Visibility on US and 3T MRI was compared using the following grading system: A- ligament equally well seen on US and MRI, B- ligament better seen on MRI, and C- ligament better seen on US. All cadaveric wrists were dissected by an orthopaedic hand surgeon. The results for each of the ligaments were shown in percentages. Differences between the distributions of percentages were tested for significance using the X2 test.

RESULTS

None of the examined 550 ligaments received grade 3. For MRI there was a significant difference in visualization of the ligaments ($X^2 = 143.04$, $p < 0.0001$) with DUTL, RSCL and UCL receiving significantly more scores of Grade 2 than the other ligaments. For US, there was a significant difference in visualization of the ligaments ($X^2 = 143.83$, $p < 0.0001$) with DUTL, PUTL, and PSTL receiving significantly more scores of Grade 2 than the other ligaments. There was a significant difference ($X^2 = 335.72$, $p < 0.0001$) with DUTL, PUTL, and PSTL receiving significantly more B scores than the other ligaments and the other 8 ligaments receiving more C scores. On surgical dissections in 10 cadavers all dorsal and palmar extrinsic wrist ligaments were intact.

CONCLUSION

HRUS enables satisfactory visualization of the extrinsic wrist ligaments with results that are at least comparable to 3T MRI.

CLINICAL RELEVANCE/APPLICATION

High-resolution ultrasonography enables good visualization of the extrinsic wrist ligaments and can be utilized in evaluation of these structures in routine clinical practice and sports medicine.

VSMK31-12 • Ultrasound-guided Percutaneous Injection for De Quervain's Disease Using Three Different Techniques: Preliminary Results of a Randomized Controlled Trial

Luca Maria Sconfienza MD, PhD (Presenter) ; Davide Orlandi MD ; Emanuele Fabbro MD ; Giovanni Mauri MD ; Giovanni Serafini MD ; Francesco Sardanelli MD *

PURPOSE

De Quervain's disease is a painful stenosing tenosynovitis of the first dorsal compartment of the wrist, caused by a thickening of the retinaculum. Ultrasound-guided intracompartmental steroid injections reported pain relief in up to 97% of patients at 6 months follow-up with a rate of symptoms recurrence up to 20%. We compared the efficacy and the outcome at 6 months follow-up of three different ultrasound-guided treatment options for De Quervain's disease.

METHOD AND MATERIALS

RESULTS

No adverse reactions occurred. At 1-month follow-up we found: group 1, mean thickness=0.5mm, mean VAS=1.5, mean quickDASH=22; group 2,0.6,1.4,23; group 3,0.5,1.2,21. At 3-month follow-up: 0.5,1.1,21;0.6,1.2,21;0.4,1.1,21. At 6-month follow-up: 0.8,3.4,32;0.6,2.1,26;0.5,1.0,19. VAS and quickDASH are graphically represented in Figure 1.

CONCLUSION

Ultrasound-guided intracompartment injection of triamcinolone acetonide+sodium hyaluronate seems to represent a promising approach to treat De Quervain's disease, reducing symptoms recurrence up to six months.

CLINICAL RELEVANCE/APPLICATION

Combined injection of steroid and hyaluronic acid is effective to treat De Quervain's disease and prevents symptoms recurrence up to six months.

VSMK31-13 • Ultrasonography of the Radial and Ulnar Collateral Ligaments of the Wrist with Surgical Correlation

Mihra S Taljanovic MD (Presenter) ; Stephen Johnston ; Wynter N Phoenix MD ; Joseph E Sheppard MD

PURPOSE

To re-evaluate the utility of high-resolution sonography (HRUS) in the assessment of collateral ligaments of the wrist.

METHOD AND MATERIALS

HRUS of the radial (RCL) and ulnar (UCL) collateral ligaments of the wrist was performed on 56 cadaveric wrists on the General Electric Logiq 9 ultrasound machine, with a 9-12 MHz linear hockey stick transducer. Both ligaments were primarily scanned in the longitudinal axis using the anatomic landmarks. The visibility of these ligaments was assessed during the sonographic examination by the examiner and additional 3 observers (surgery resident, medical student and ultrasound technologist). The ligaments were classified as well seen, adequately seen or not seen on sonography. Surgical dissections of 12 RCLs and 12 UCLs in 6 cadavers with their surrounding relationships to the extensor tendons and dorsal compartments of the wrist were subsequently performed. The ligaments were classified as present or absent and graded I or II depending on the surgeon's subjective assessment of ligamentous thickness (I- thick, II- thin). HRUS and dissection results were then compared.

RESULTS

The RCLs were seen on sonography in all cadaveric wrists in their anatomic locations between the radial styloid and radial aspect of the scaphoid, dorsal to the radial artery and deep and somewhat dorsal to the 1st extensor compartment. They had an echogenic fibrillar appearance. All UCLs had an appearance of a thick echogenic band and were seen between the ulnar styloid and triquetrum abutting the deep aspect of the 6th extensor compartment. In 9 cadavers, 18 right and left RCLs were well seen and in the remaining 19 cadavers they were adequately seen. In 8 cadavers, 16 right and left UCLs were well seen and in the remaining 20 cadavers they were adequately seen. On sonography, the investigators were uncertain if what they called UCLs represent true ligaments or thickening of the joint capsule. On surgical dissections all RCLs and UCLs were proven to be true ligaments. On dissections, 9 of 12 RCLs were graded I and 3 were graded II. All UCLs were graded I on dissections. All of the dissected ligaments were well seen on sonography.

CONCLUSION

The RCL and UCL of the wrist are true ligaments that can be well seen on HRUS.

CLINICAL RELEVANCE/APPLICATION

The collateral ligaments of the wrist are true ligaments and can be well seen on HRUS which can be utilized in clinical practice in evaluation of these structures.

VSMK31-14 • Prognosis Value of Ultrasonographic Assessment in Muscle Strain Injuries: Longitudinal Study of a 70 Elite Athletes Cohort

Jerome Renoux MD (Presenter) ; Jean-Louis Brasseur ; Philippe Thelen ; Christian Dibie

PURPOSE

To evaluate prognosis value of ultrasonography performed in the first days of muscle strain injuries.

METHOD AND MATERIALS

A prospective cohort study was lead between 2010 and 2012 in the French National Sport Institute. Ultrasonographic assessment of muscle strain lesions was performed between the 2nd and the 8th day. Return to play (total or best clinical recovery) was evaluated with a benefit of a six months hindsight. Correlation between ultrasonographic signs and clinical prognosis was statistically evaluated. Echographic signs included the local semiology (Rodineau and Durey's 5 grades classification system was used) , lesion size, lesion type (myofascial vs. pure fascial), and location of the lesion (muscular group, centromuscular vs. perimuscular, proximal vs. distal). Echographic and clinical follow-up were performed until return to play.

RESULTS

70 patients were recruited. 67% of the lesions were located at the lower limbs, 20% at the upper limbs and 13% at the abdominal or thoracic walls. Mean delay between trauma and ultrasonography was 4,5 days. 3 percents were grade 0 injuries, 33% grade 1, 42% of grade 2, 20% of grade 3 and 2% of grade 4. Return to play time differed between the 5 grades of injuries (respectively 1,2±0,8 ; 3,1±1,2 ; 4,8±1,6 ; 8,5±3,8 ; 18 ± 10 weeks ; p = 0.03). Myofascial lesions were correlated with a better lay-off time compared to pure fascial lesions (4,7 vs. 5,8 weeks ; p= 0.02). Proximal lesions had a poorer prognosis compared to distal lesions (5,2 vs. 3,9 weeks ; p = 0.009). Recurrence occurred in 16%.

CONCLUSION

Ultrasonography has a good prognosis value for muscle strain lesions. For this purpose, ultrasonography has to describe precisely the grade, the lesion type and its precise location.

CLINICAL RELEVANCE/APPLICATION

Ultrasonography can help clinicians to determine prognosis of muscle strain lesions. It helps to distinguish two types of lesions (pure fascial and myofascial) with different treatments.

VSMK31-15 • Interesting Musculoskeletal Ultrasound Cases

Jon A Jacobson MD (Presenter) *

LEARNING OBJECTIVES

1) Be familiar with important topics in musculoskeletal ultrasound.

Essentials of Ultrasound

Tuesday, 10:30 AM - 12:00 PM • S100AB

US

[Back to Top](#)

MSES32 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

MSES32A • US Evaluation of the Aorta

Leslie M Scoutt MD (Presenter) *

LEARNING OBJECTIVES

1) Describe the role of ultrasound in screening for abdominal aortic aneurysms. 2) Discuss the role of ultrasound in the follow up of patients s/p endovascular aortic repair (EVAR). 3) Demonstrate examples of other common and uncommon aortic pathology on ultrasound.

ABSTRACT

This lecture is part of the essentials of radiology series and will focus on reviewing the role of ultrasound in screening for abdominal aortic aneurysms and in the follow up of patients who have undergone endovascular aortic repair (EVAR). The ultrasound appearance of endoleaks will be presented and the ultrasound findings in a range of aortic pathology will be discussed including aortic dissection and

rupture.

MSES32B • US of Multiple Gestations

Peter M Doubilet MD, PhD (Presenter)

LEARNING OBJECTIVES

1) Understand the limitations of determining pregnancy number (singleton, twin, triplet, etc.) in the early first trimester. 2) Understand how to determine chorionicity and amnionity of twins. 3) Diagnose twin-twin transfusion syndrome and other complications of multiple gestations.

ABSTRACT

I. Assessment of Fetal Number (Singleton, Twin, ...)

Pregnancy number before 6 weeks gestational age is determined by counting gestational sacs and yolk sacs. After 6 weeks, pregnancy number is determined by counting embryos/fetuses in the uterus. Pregnancy number diagnosed on the initial ultrasound in the early first trimester may change on subsequent scans, due to two phenomena: 'vanishing twin' and 'appearing twin'. II. Measurements:

1. Gestational age (GA) assignment

(i) Initial sonogram: If the two GA's (determined from measurements as per singleton GA determination) are concordant, assign GA as the average of these two values. If the two GA's are discordant, assign GA as the greater of the two values, and consider the possibility that the smaller twin is abnormal.

(ii) On all subsequent sonograms, GA is assigned as the sum of the GA by first sonogram plus the number of intervening weeks

2. Fetal weight estimation and comparison (=24 weeks): Compute an estimated weight and weight percentile for each fetus, and compare the fetal weights by computing the relative weight difference (difference in estimated weights divided by larger twin's estimated weight). Findings suggesting abnormal growth include: either twin's weight is 1. Chorionicity is determined by membrane thickness, number of placentas, and fetal sex concordance/discordance.

2. Amnionity: diamniotic if intertwin membrane seen; monoamniotic if no membrane visible and cords are intermingled IV. Complications

1. preterm delivery

2. low birth weight

3. twin-twin transfusion syndrome (if monochorionic)

4. acardiac twin (if monochorionic)

5. conjointment

MSES32C • US of the Gallbladder and Biliary Tract

Helen Bungay MBBCh (Presenter)

LEARNING OBJECTIVES

1) To be familiar with the normal ultrasound appearances of the gall bladder and biliary tract, including normal variants. 2) To know the wide differential of causes of abnormalities of the gall bladder wall. 3) To recognize the variety of appearances of common benign and malignant processes involving the gall bladder and biliary tract, especially adenomyomatosis, polyps and carcinoma. 4) To be able to use specific features to aid in the differential diagnosis of abnormalities of the gall bladder. 5) To have a management strategy for gall bladder polyps. 6) To know the ultrasound appearances of acute cholecystitis and the important signs and complications to look for, including perforation, abscess formation, emphysematous cholecystitis, and Mirizzi's syndrome.

ABSTRACT

Ultrasound remains the first line modality for imaging the gall bladder and biliary tract. It is of utmost importance in guiding the clinician in the investigation of jaundice and obstructive liver function tests. Whilst having limitations in demonstrating some causes of biliary obstruction, the presence or absence, and level of obstruction, of dilated ducts dictates further imaging and management choices. With its high spatial resolution, and real time multiplanar capabilities, ultrasound is ideal for examining the gall bladder. This session will review the multiple causes of abnormalities of the gall bladder wall, and clinical and imaging features useful in the differential diagnosis. The imaging appearances of acute cholecystitis, and especially features of particular clinical import, such as emphysematous change, perforation, abscess and Mirizzi's syndrome, will be reviewed. Patients presenting less acutely with abnormalities of the gall bladder wall can be a diagnostic challenge. The typical features of adenomyomatosis and carcinoma will be examined, together with features aiding the differential diagnosis. Gall bladder polyps are common and a management dilemma. Their significance and a strategy for management will be discussed. Apart from the presence or absence of biliary dilatation, the use of ultrasound in evaluation of the bile ducts is limited, with other modalities, such as magnetic resonance cholangiography and endoscopic retrograde cholangiography, presiding. However, the ducts can actually be well seen in patients of appropriate physique. Changes seen in primary sclerosing cholangitis, cholangiocarcinoma, intrahepatic duct calculi, and some unusual and rarer conditions will be demonstrated.

Vascular Doppler (An Interactive Session)

Tuesday, 04:30 PM - 06:00 PM • E353B

US **VA**

[Back to Top](#)

RC410 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC410A • Challenges in Carotid Doppler

Edward G Grant MD (Presenter) *

LEARNING OBJECTIVES

1) Understand the various forms of extracranial pathology affecting the arteries serving the brain and their diagnostic appearance/criteria as seen by the ultrasound examination. 2) Be familiar with the indications for a cerebrovascular examination and its relationship to correlative imaging. 3) Know the criteria set forth by the Society of Radiologists in Ultrasound Consensus Conference for internal carotid artery stenosis and their rationale.

RC410B • Vertebral Artery Ultrasound: A Gateway to the Great Vessels

Mindy M Horrow MD (Presenter) *

LEARNING OBJECTIVES

1) Describe normal anatomy and spectral Doppler of the vertebral arteries. 2) Describe the spectrum of Doppler findings of the subclavian steal phenomenon: pre, partial and complete steal. 3) Detect proximal disease in the innominate vessels and aorta using vertebral artery waveforms in combination with carotid waveforms.

ABSTRACT

RC410C • Ultrasound Evaluation of the Upper and Lower Extremity Veins

Leslie M Scoutt MD (Presenter) *

LEARNING OBJECTIVES

1) Describe the US criteria for diagnosis of DVT in the upper and lower extremities. 2) Discuss common pitfalls in US evaluation of DVT. 3) Discuss current controversies in the US evaluation of DVT such as: acute vs chronic (residual) DVT; use of the D-dimer assay; should the

calf veins be evaluated; is it appropriate to do unilateral exams. 4) Describe the role of US in identifying other causes of extremity pain and swelling.

ABSTRACT

This lecture will describe the technique and diagnostic criteria for the US diagnosis of DVT in the upper and lower extremities. Common pitfalls in sonographic assessment of DVT will be described as well as current clinical questions in US evaluation of patients suspected of harboring DVT such as: what is the importance of pre-test probability?, what is the role of the D-dimer assay?, how to differentiate acute from chronic DVT?, and should the calf veins be routinely examined? In addition, the US appearance of other causes of extremity pain and swelling will be described as US has been shown to be useful in making alternative diagnoses, which are often important for patient management, in up to 10% of cases.

Real-time Interventional US (Hands-on Workshop)

Tuesday, 04:30 PM - 06:00 PM • E264

US IR

[Back to Top](#)

RC452 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Christopher A Molvar, MD

Kent T Sato, MD

Albert A Nemcek, MD *

Robert J Lewandowski, MD *

Ramona Gupta, MD

Terry D Wilkin, MD

Kevin L Keele, MD

Michael H Hamblin, MD

Terence A Matalon, MD

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.

Advances in Gynecologic Ultrasound

Wednesday, 08:30 AM - 10:00 AM • S405AB

US OB GU

[Back to Top](#)

RC510 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC510A • 3D Ultrasound in Gynecology

Beryl R Benacerraf MD (Presenter) *

LEARNING OBJECTIVES

1) To learn about the multiplanar reconstruction technique in scanning the pelvis, including its usefulness of looking at the coronal view of the uterus to evaluate the endometrium for polyps, fibroids and mullerian duct anomalies. 2) To learn to use 3D to determine the position of an IUD in the uterus. 3) To learn how 3D can help on detecting the causes of pelvic pain.

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 gynecology, 3D has allowed visualization of coronal view of the uterus, enabling us to diagnose mullerian duct anomalies without using MRI. We can also easily diagnose malpositioned IUDs (a common cause of pelvic pain and bleeding), polyps, submucous fibroids and other abnormalities related to the uterine cavity. 3D ultrasound also greatly facilitates the correct diagnosis of hydrosalpinges because of the infinite planes in which the tubal areas can be displayed.

RC510B • Ovarian Masses and Cysts

Phyllis Glanc MD (Presenter)

LEARNING OBJECTIVES

1) Analyze ultrasound imaging features of ovarian masses and apply this knowledge to discriminate benign from malignant lesions. 2) Demonstrate some practical tips and hints for problem solving. 3) Apply appropriateness criteria to determine when additional imaging techniques, such as MRI or CT, are indicated.

ABSTRACT

The first line of imaging when an ovarian lesion is suspected is ultrasound. In this session we will review classical imaging features on ultrasound, demonstrate some tips and pitfalls and evaluate some less common findings. We will utilize this information to triage patients into different management strategies. We will incorporate current consensus and appropriateness criteria guidelines into our critical thinking. The role of additional imaging techniques such as MRI, CT and PET will also be discussed.

RC510C • Uterus and Endometrium

Ruth B Goldstein MD (Presenter)

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. 4) Be able to diagnose a Mullerian Duct Anomaly of the uterus.

Small Parts Interventional Ultrasound (Hands-on Workshop)

Wednesday, 08:30 AM - 10:00 AM • E263

US IR

[Back to Top](#)

RC531 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

William E Shiels, DO *

Peter L Cooperberg, MD

Veronica J Rooks, MD

Alda F Cossi , MD
Nathalie J Bureau , MD
Nicholas A Zumberge , MD *
James W Murakami , MD
Paolo Minafra , MD
Paula B Gordon , MD *
Mary M Chiavaras , MD, PhD
Hollins P Clark , MD,MS
Carmen Gallego , MD
Mabel Garcia-Hidalgo Alonso , MD
Michael A Mahlon , DO
Michael A Dipietro , MD
Horacio M Padua , MD
Andrew J Rabe , DO
Robert D Lyon , MD
Stephen C O'Connor , MD

LEARNING OBJECTIVES

1) Identify basic skills, techniques, and pitfalls of freehand invasive sonography, with specific focus on small part applications. 2) Define and discuss technical aspects, rationale, and pitfalls involved in musculoskeletal, breast, head and neck, and pediatric interventional sonographic care procedures. 3) Successfully perform basic portions of hands-on US-guided procedures in a tissue simulation learning model, to include core biopsy, small abscess coaxial catheter drainage, cyst and ganglion aspiration, lymphatic malformation macrocyst access, soft tissue foreign body removal, and intraarticular steroid injection. 4) Incorporate these component skill sets into further life-long learning for expansion of competency and preparation for more advanced interventional sonographic learning op.

ABSTRACT

Nerve Ultrasound Based on a Regional Approach: Shoulder and Neck (Hands-on Workshop)

Wednesday, 08:30 AM - 10:00 AM • E264

[Back to Top](#)

US **NR** **MK**

RC552 • *AMA PRA Category 1 Credit*™:1.5 • *ARRT Category A+* Credit:1.5

Carlo Martinoli , MD
Rachel B Hulen , MD
Humberto G Rosas , MD
J. A Bouffard , MD
Catherine J Brandon , MD *
Etienne Cardinal , MD
Joseph G Craig , MD
David P Fessell , MD
Ghiyath Habra , MD
Marina Kislyakova , MD
Joseph H Introcaso , MD
Matthieu Rutten , MD
Marnix T Van Holsbeeck , MD *
Ximena L Wortsman , MD
Andrea Klauser , MD
Alberto S Tagliafico , MD
Michael A Dipietro , MD
Jon A Jacobson , MD *
Viviane Khoury , BSC,MD
Kenneth S Lee , MD *
Courtney E Scher , DO

LEARNING OBJECTIVES

1) Describe the ultrasound anatomy and scanning technique for examination of neck (i.e. brachial plexus, spinal accessory, long thoracic, phrenic, vagus) and shoulder (i.e. suprascapular, axillary, musculocutaneous) nerves. 2) Illustrate the main anatomic landmarks to identify these nerves. 3) Master technical approaches to nerve ultrasound including the recognition of pitfalls.

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 the examination of small (

Case-based Review of US (An Interactive Session)

Wednesday, 01:30 PM - 03:00 PM • S406A

[Back to Top](#)

US **GI**

MSCU41 • *AMA PRA Category 1 Credit*™:1.5 • *ARRT Category A+* Credit:1.5

Director
Sharlene A Teefey , MD

MSCU41A • Contrast-enhanced Ultrasound of the Liver

Stephanie R Wilson MD (Presenter) *

LEARNING OBJECTIVES

Attendees will recognize the importance of washout and the timing washout oncontrast enhanced ultrasound of the liver allowing for the differentiation of malignant and benign liver masses and differentiation of hepatocyte based malignancy from others.

MSCU41B • Transplant Ultrasound of the Liver, Pancreas and Kidney

Myron A Pozniak MD (Presenter) *

LEARNING OBJECTIVES

1) Several challenging cases of transplant dysfunction will be presented. They will focus on the role of Doppler Ultrasound in making a quick confident diagnosis.

MSCU41C • Peripheral Vascular Ultrasound

LEARNING OBJECTIVES

1) Apply the natural history of abdominal aortic aneurysms to proper reporting of AAA size. 2) Apply the hemodynamics of stenosis to minimizing false positive results. 3) Analyze duplex Doppler of venous disease and apply this knowledge to protocol development, patient management/safety, and cost. 4) Identify the application of pathologic, and physiologic principles to plaque characterization and thrombus aging and clinical significance. 5) Analyze the surgical procedures for common vascular processes to protocol development and interpretation of mapping and post procedural examinations.

ABSTRACT

Duplex Doppler of the peripheral vascular system requires an understanding of how the hemodynamics of normal circulations and of abnormal conditions appear. Duplex interpretation requires integration of gray scale sonography, color Doppler and spectral (waveform) analysis. Some examinations requires more or less of one modality (e.g. lower extremity venous exams are mostly gray scale noncompression and compression scans) while some are more equal (e.g. carotid or upper extremity scans). Understanding the hemodynamics of obstruction is necessary when describing and interpreting arterial and venous exams. For arterial stenosis, there are three spectral images that are generally obtained: waveforms before the stenosis, in the stenosis and beyond the stenosis. Pitfalls may occur when all the typical waveform shapes do not occur or when the gray scale, spectral and color images are discordant. Some arterial circulations use absolute velocity to diagnose conditions while others use ratios. Postoperative conditions such as bypass grafts and stents require specific criteria. Venous thrombosis remains a major disease despite more widespread prophylaxis in hospitalized patients. Protocols to determine safe and effective ways to diagnoses DVT use complete (whole leg) compression ultrasound as well as more limited scan. Differentiating acute, residual and recurrent venous thrombosis are necessary as more patients present with history of venous thromboses in the past.

Breast Imaging (Multimodality Breast Imaging)

Wednesday, 03:00 PM - 04:00 PM • E451A

[Back to Top](#)

US MR DM BR

SSM02 • AMA PRA Category 1 Credit™:1 • ARRT Category A+ Credit:1

Moderator

Sughra Raza, MD

Moderator

Priscilla J Slanetz, MD, MPH *

SSM02-01 • Triple-negative Breast Cancers: Multimodality Imaging Features of Tumors with and without Androgen Receptor Expression

Min Sun Bae MD, PhD (Presenter); Woo Kyung Moon; Won Hwa Kim MD, MS; Su Hyun Lee MD; Jung Min Chang MD; Nariya Cho MD; Hye Ryoung Koo MD; So Yeon Park

PURPOSE

Androgen receptor (AR) is expressed in approximately 15% to 25% of triple-negative breast cancer (TNBC) and emerging data suggests that AR may serve as a therapeutic target for a subset of TNBC. We retrospectively reviewed imaging findings for 102 patients with TNBC on mammogram, ultrasound (US), and MRI to determine if AR-positive and AR-negative tumors have distinguishing imaging features.

METHOD AND MATERIALS

A total of 102 consecutive patients (median age, 52 years; range, 28-81 years) with triple-negative (ER-/PR-/HER2-) invasive breast cancers and immunohistochemical data on AR status were included in this study. Two dedicated breast radiologists (5 and 22 years of breast imaging experience, respectively) reviewed the mammogram, US, and MRI without knowledge of the clinicopathological findings based on the ACR BIRADS lexicon. If different imaging findings were assigned by the two readers, a consensus was reached after the findings were discussed. A cutoff value of 10% was used to define AR positivity. The association of AR status with all imaging features was assessed with Fisher exact test.

RESULTS

Twenty-four (24%) patients had AR-positive TNBC and 78 (76%) patients had AR-negative TNBC. Lesion shape on mammogram (P = .008), US (P = .001), and MRI (P = .001), lesion margins on mammogram (P = .004) and US (P = .003), echo pattern on US (P = .009), calcifications on mammogram (P < .0001), and lesion type on MRI (P = .003) were significantly associated with AR status. AR-positive TNBC was more likely to have irregular masses (88% vs 41%), indistinct margins (84% vs 56%), and non-complex hypoechoic masses (96% vs 65%) and be associated with calcifications (54% vs 12%) or nonmass-like enhancement (17% vs 0%).

CONCLUSION

Our results suggest that AR-positive and AR-negative TNBC have different imaging features.

CLINICAL RELEVANCE/APPLICATION

Understanding the imaging heterogeneity of TNBC may be helpful in identifying a subset of TNBC with AR expression, which has been shown to be associated with increased mortality among TNBC patients.

SSM02-02 • Are Suspicious Breast MRI Lesions with an Ultrasound Correlate Higher Histological Grade Tumors?

Punam Bajaj MD, MBBS (Presenter); Junting Zheng; D. David Dershaw MD; Chaya Moskowitz; Elizabeth A Morris MD

PURPOSE

To determine if suspicious breast MRI lesions proven to represent invasive ductal carcinoma with an ultrasound correlate are of different histological grade compared with ultrasound occult lesions.

METHOD AND MATERIALS

Institutional review board approved retrospective study of 310 MRI examinations performed between 2008 and 2011 yielded 350 suspicious lesions for which biopsy was recommended. Subsequent high resolution targeted ultrasound was performed and histopathological grade of carcinomas was recorded as I (low), II (intermediate) or III (high). Statistical analysis was performed applying the Fisher's exact test, Kruskal-Wallis test and exact Wilcoxon rank sum test.

RESULTS

Targeted ultrasound demonstrated a correlate in 181/350 (52%) suspicious MRI lesions yielding 63/181 (35%) malignant lesions. The remaining 169 (48%) lesions which were sonographically occult, yielded 25/169 (15%) malignant lesions. Sonographic correlates were seen for 72% (63/88) of malignant lesions. Of these, 87% (55/63) were invasive carcinomas and 13% (8/63) were ductal carcinomas in situ.

Histological grade was available for 46 invasive ductal carcinomas with ultrasound correlate (3(6.5%),13(28.3%) and 30(65.2%) were histological grade I,II and III, respectively)and 8 without correlate (4(50%),3(37.5%) and 1(12.5%) were histological grade I,II and III, respectively). There was no statistically significant difference in the size of tumors with or without an ultrasound correlate (p=0.163). In the group with an ultrasound correlate, no significant difference was observed in tumor size between the recorded histological grades (p=0.052). A grade III tumor was more likely to be present in the group with an ultrasound correlate (p

CONCLUSION

When a suspicious breast MRI lesion has an ultrasound correlate, it is more likely to represent invasive carcinoma of higher histological

grade.

CLINICAL RELEVANCE/APPLICATION

The presence of an ultrasound correlate for a suspicious breast MRI lesion may indicate a more aggressive cancer.

SSM02-03 • Breast Cancer Invisible to Ultrasound: What Does the Ultrasound Show? Characteristics of MR Discovered Breast Cancers Not Recognized on Second-look Ultrasound Examination

Phillip B Shaffer MD (Presenter)

PURPOSE

Investigate the US appearance of regions with positive MR scans later proven to be cancer.

METHOD AND MATERIALS

In our experience of 373 total MR directed biopsies, 33 patients were found who 1) had suspicious areas discovered on an MR and 2) had a second look US that was negative and 3) subsequently had a malignant diagnosis as a result of MR biopsy. This patient group is interesting because they were examined with prior knowledge of the precise locality of a suspicious lesion; nevertheless, the ultrasound was negative.

RESULTS

Of the 33 patients, 13 had a final diagnosis of DCIS, MR imaging size range 0.6 to 5.4 cm. 15 had a final diagnosis of invasive ductal carcinoma (IDC), MR imaging size range 0.7 to 12.0 cm. 4 had a final diagnosis of invasive lobular carcinoma (ILC), MR imaging size range 0.6 to 8.4 cm. There was one adenoid cystic carcinoma of 1.0 cm. On US examination by dedicated breast sonographers and experienced radiologists the pattern seen was judged to be not sufficiently suspicious to be certain of correlation with the MR. These were regarded as "negative" US exams. The pattern present on the ultrasound was closely examined in 30 patients (3 sets of images were not available), and divided by appearance into two groups: Group QP: which were in retrospect Questionably Positive, and Group B: Benign. In Group QP, two distinct patterns were observed: low echogenicity area (6 patients) and shadow without mass (8 patients). In Group B, three distinct patterns were seen: Normal tissue (7 pts), Heterogeneous without mass (4 pts), and small mass with benign characteristics (5 pts). When segregated by histology, the following was observed: IDC: Group QP- 10 pts Group B- 4 pts. ILC: Group QP- 2 pts Group B- 2 pts. DCIS: Group Q-2 pts Group B-10 pts.

CONCLUSION

Even when positive MR images direct the radiologist precisely to the area of high suspicion for malignancy, thus eliminating search errors, those malignancies may remain subtle or totally undetectable by the usual US criteria, even for tumors up to 12 cm in size. The ultrasonographic tissue characteristics of these tumors are simply indistinguishable from that of normal breast.

CLINICAL RELEVANCE/APPLICATION

Many breast cancers are unrecognizable on ultrasound. Even a totally normal ultrasound does not rule out breast malignancy.

SSM02-04 • Breast MRI as a Problem-solving Tool in the Evaluation of Mammographically and Ultrasonographically Detected Architectural Distortions: Are There Any Predictive Parameters?

Rubina Noemi Cavallin (Presenter) ; **Claudio Losio MD** ; **Marta Maria Panzeri** ; **Elena Venturini MD** ; **Giulia Cristel MD** ; **Alessandro Del Maschio MD**

PURPOSE

Despite accounting for only 3% of mammographically detected findings, architectural distortion (AD) may be caused by a wide range of benign and malignant breast lesions, and it is the 3rd most common presentation of non palpable breast cancer. Because of its indefinite mammographic and ultrasonographic features, percutaneous or surgical biopsy is mandatory. In our study we evaluated the potential role of dynamic Breast MRI including diffusion-weighted imaging (DWI) as a problem-solving tool in mammographically and ultrasonographically detected AD

METHOD AND MATERIALS

Out of 232 patients undergoing MRI for problem solving, 34 were examined for a mammographic or ultrasonographic AD. MRI (1.5T) included T2-TSE sequences, dynamic study and DWI (b-values: 0, 900 s/mm²). For each lesion detected we evaluated morphology, dynamic and diffusion patterns and final histopathological result. A cut-off ADC value differentiating benign from malignant breast lesions had been previously established in a large population of women. The difference between the mean Apparent Diffusion Coefficient (ADC) values and the mean T2 signal in malignant and benign findings was evaluated with Mann-Whitney U test. Univariate and multivariate analyses of ADC values, T2 signal and time-enhancement curves (T-Ec) were performed for prediction of malignancy.

RESULTS

MRI confirmed all 38 known findings. At histopathology 25 lesions were benign and 13 malignant. The most represented T-Ec in malignant AD were type 3 (n=7) and 2 (n=3), while no benign lesions showed a washout kinetic. Univariate and multivariate analysis showed that T-Ec were significant predictors of malignancy (p

CONCLUSION

Time-enhancement curves were the most predictive MRI feature to distinguish benign from malignant AD. The contribution of DWI to their differential diagnosis is limited due to ADC borderline values. MRI low negative predictive value, however, suggests to avoid MRI to strengthen the diagnosis after a benign core biopsy.

CLINICAL RELEVANCE/APPLICATION

MRI could not replace breast biopsy to confirm the nature of architectural distortions.

SSM02-05 • Evaluation with Digital Mammography (DM), DM Combined with Digital Breast Tomosynthesis (DBT), Ultrasound (US) and Dynamic Breast MRI of Pathological Response after Neoadjuvant Chemotherapy (NC) Treatment of Breast Carcinoma

Giovanna Mariscotti ; **Manuela Durando** (Presenter) ; **Pier Paolo Campanino** ; **Maddalena Rigo** ; **Elisa Regini** ; **Mattia Robella** ; **Laura Bergamasco** ; **Paolo Fonio** ; **Giovanni Gandini MD**

PURPOSE

To evaluate the accuracy of DM, DM combined with DBT, US and MRI in predicting residual tumour size and pathological response after NC for locally advanced breast cancer.

METHOD AND MATERIALS

44 patients (mean age 49.2 years; range 31-71) with locally advanced breast cancer who underwent NC were enrolled in the study. We retrospectively evaluated size and response of tumours to NC by DM, DM combined with DBT, US and MRI before, during and at the end of treatment. We assumed as gold standard the tumour size measured at pathology. Patients were divided into responders (with pathologic complete (pCR) or partial response (pPR)) and non-responders (NR). Measurements were considered concordant if they were ± 10 mm. Tumour size assessments were statistically analyzed with paired t-test, regression line and Pearson's linear correlation coefficient and Bland-Altman Plots; categorical variables were arranged in contingency tables and analyzed with chi square test or Fisher's test; 95% Confidence Intervals were estimated for all percentages.

RESULTS

For pCR patients (16/44), size estimates by all modalities showed an exponential decrease during treatment time (r=0.9; p=0.005). The size agreement with pathology was 29 (95%CI 10-55)% for US, 36(14-62)% for DM, 33(12-62)% for DM+DBT, 54(27-79)% for MRI. For pPR patients (18/44), size estimates by imaging showed a linear decrease during treatment (r=0.9; p=0,008). The size agreement was 69(41-89)% for US, 54(27-79)% for DM, 70(38-92)% for DM+DBT, 87(62-98)% for MRI. For NRs (10/44), US, DM and DM+DBT

overestimated tumour size, while MRI measurements agreed with pathology. For the responders, the agreement between pCR predictions at mid-treatment and pathological responses was 7.1(0.4-90.5)% for both US and DM, 11.1(15.7-65.9)% for DM+DBT, 38.5(15.7-65.9)% for MRI; pPR prediction was 54.5(25.9-81)% for US, DM and DM+DBT, 84.6(57.8-97.3)% for MRI. NR prediction at mid-treatment was 80(47-99)% for US, 80(33-98)% for DM, 82(47-99)% for DM+DBT, 86(47-99)% for MRI.

CONCLUSION

Predictions of response and residual tumour size made on MRI showed a better agreement with pathology than DM, DM+DBT, US. DBT in addition to DM improved conventional imaging in pPR and NR predictions.

CLINICAL RELEVANCE/APPLICATION

Breast MRI can be considered the most reliable imaging modality for pathological response evaluation after neoadjuvant chemotherapy, but the addition of DBT improves conventional imaging performances.

SSM02-06 • Analysis of the Influence of Surrounding Fat Tissue in the Detection Rate of Ultrasound and Digital Breast Tomosynthesis after Normal Mammography

Pedro Slon MD ; Jon Etxano MD (Presenter) ; Maria Paramo Alfaro MD ; Romina Zalazar MD ; Arlette Elizalde ; Luis Pina MD, PhD ; Fernando Martinez Regueira ; Natalia Rodriguez-Spiteri

PURPOSE

To assess the features of the tissue surrounding the additional detected cancers by US and DBT after normal Mammography.

METHOD AND MATERIALS

We retrospectively analyzed 75 histologically confirmed tumors in 55 patients (13 ductal carcinomas in situ and 62 invasive carcinomas). All the patients underwent Digital Mammography, US and Tomosynthesis. The tumors were classified in four categories according to the amount of peritumoral fat (I = >75%, II = 50-75%, III =25-75% and IV = Gold Standard was established with histological study obtained after surgery.

The detection rate of additional tumors by US and DBT was compared regarding to the percentage of peritumoral fat using the McNemar test (SPSS, 15.0)

RESULTS

Out of the 75 tumors, DM detected 42 (56%) and 33 (44%) were detected by additional techniques. The number of additional tumors detected by US was 14 (+18.6%) and by DBT was 17 (+22.6%). Out of these additional tumors, 7 (9.3%) were only detected by US, 4 (5.3%) only detected by DBT and 10 (13.3 %) were detected by both. The remaining 9 tumors were diagnosed with second look US after presurgical MRI. All of the additional tumors were invasive carcinomas. We did not find statistical differences between both techniques in Group I (US= 2 , DBT=2; p=1.00), Group II (US= 5 , DBT= 8; p=0.375) and Group III (US= 3, DBT= 2; p= 1.000). In Group IV (US=7, DBT=2; p=0,06) we found a trend to statistical significance, with 5 tumors detected on US and missed on DBT and no additional tumors diagnosed by DBT not detected by US.

CONCLUSION

Both US and DBT present similar results in the detection of additional breast cancers when they are predominantly surrounded by fat (more than 25%). However, we found that in tumors with less than 25% of peritumoral fat, US seems to be more sensitive than DBT.

CLINICAL RELEVANCE/APPLICATION

This study supports that US seems to be better than DBT in the detection of tumors with a low quantity of surrounding fat, i.e, in dense breast (ACR density pattern IV).

Vascular/Interventional (Vascular Ultrasound)

Wednesday, 03:00 PM - 04:00 PM • E450B

US IR VA

[Back to Top](#)

SSM24 • AMA PRA Category 1 Credit™:1 • ARRT Category A+ Credit:1

Moderator

Christoph A Binkert , MD *

Moderator

Robert A Morgan , MD *

SSM24-01 • Contrast-enhanced Ultrasound Evaluation of Peripheral Microcirculation in Critical Limb ischemia Patients Undergoing Endovascular Revascularization

Costantino Del Giudice MD (Presenter) ; Fabrizio Chegai MD ; Roberto Gandini MD, PhD ; Antonio Orlacchio MD ; Giovanni Simonetti MD

PURPOSE

To evaluate peripheral microcirculation assessed with contrast-enhanced ultrasound (CEUS) in patients with critical limb ischemia undergoing endovascular recanalization in comparison to percutaneous oximetry

METHOD AND MATERIALS

The study population comprised 14 diabetic patients (9 male, age 76±7.5 years old) with critical limb ischemia. Transcutaneous oxygen (TCPO2) and carbon dioxide (TcPCO2) tension was evaluated in the perilesional area. A ultrasound Doppler of the artery directly feeding the ischemic angiosome was performed to confirm the presence of peripheral arteriopathy disease and to evaluate the peak systolic velocity (PSV) and the end diastolic velocity (EDV). Microvascular blood flow in the ischemic angiosome was evaluated with CEUS. The same parameters were evaluated in the contralateral healthy foot as control.

RESULTS

Time- to-peak (TTP) and mean tissue transit time (TTT) were significantly prolonged and derived intensity peak (dIP) was significantly lower in the ischemic foot than the healthy contralateral (TTP 48.76±9.38 s vs. 32.12±6.8 s, p=0.011, A/Ttt 6.81±4.52 s vs. 3.25±3.27 s, p=0.02 and dIP 4.8±2.3 db vs. 8.6±3.1). A significantly good correlation between transcutaneous parameters and CEUS parameters was observed.

CONCLUSION

Peripheral microcirculation may be evaluated with CEUS. TTP, TTT and dIP may be an alternative to percutaneous oximetry parameters to evaluate peripheral microcirculation in critical limb ischemia

CLINICAL RELEVANCE/APPLICATION

Percutaneous oximetry may fails to evaluate peripheral microcirculation. CEUS; may be an useful alternative; in order to assess the degree of critical limb ischemia before endovascular revascularization

SSM24-02 • Measurement of Peripheral Muscle Microperfusion (PMP) and Macroperfusion in an Animal Peripheral Artery Disease (PAD) Model Using Contrast-enhanced Ultrasound (CEUS) and Doppler Flow (DF) Measurement

Claas P Naehle MD (Presenter) * ; Verena A Steinberg ; Gottfried Mommertz ; Dominik Krause ; Hans H Schild MD

PURPOSE

Non-invasive assessment of PMP could improve management of PAD patients and allow for evaluation of new therapies. However, currently only very limited data using outdated/discontinued CEUS technology for assessment of PMP exists.

METHOD AND MATERIALS

In a porcine animal model, PMP of the lower extremity was quantified using CEUS replenishment kinetics (mean transit time (mTT) and wash-in rate (WiR)) of the biceps femoris during i.v. steady-state infusion of an ultrasound contrast agent (INN-sulphur hexafluoride). In addition, macroperfusion was measured at the common femoral artery using a DF probe. PMP and DF measurements were performed bilaterally at rest and under vasodilatation by adenosine stress (infusion rate 70 µg/kg body weight/min.) after unilateral creation of a moderate external iliac artery stenosis (mean gradient 14.4 ± 5.4 mmHg).

RESULTS

In all 10 pigs all measurements could be performed. During adenosine stress and after stenosis creation, PMP decreased significantly compared to baseline measurements (rest vs. adenosine stress: mTT: 7.8 ± 3.3 s vs. 21.2 ± 18.4 s; p < 0.05 - WiR: 58.4 ± 38.1 arbitrary units (AU) vs. 26.2 ± 15.7 AU; p < 0.05 - DF: 122.3 ± 31.4 ml/s vs. 83.6 ± 28.1 ml/s; p < 0.05 | no stenosis vs. stenosis: mTT: 8.1 ± 3.1 s vs. 29.2 ± 18.0 s; p < 0.05 - WiR: 53.0 ± 22.7 AU vs. 13.6 ± 8.5 AU; p < 0.05 - DF: 120.3 ± 19.5 ml/s vs. 65.9 ± 40.0 ml/s; p < 0.05). After stenosis creation, adenosine stress lead to a further decrease of PMP, but had no effect on macroperfusion (stenosis rest vs. stenosis adenosine stress: mTT: 29.2 ± 18.0 s vs. 56.3 ± 38.7 s; p < 0.05 - WiR: 13.6 ± 8.5 AU vs. 6.0 ± 4.1 AU; p < 0.05 - DF: 65.9 ± 40.0 vs. 62.2 ± 33.2, p < 0.05).

CONCLUSION

In a porcine PAD model, CEUS for assessment of PMP is feasible. In addition, using mTT and WiR for quantification of PMP appears to be more sensitive compared to DF measurements.

CLINICAL RELEVANCE/APPLICATION

Measurement of PMP using CEUS may prove to be a useful tool in diagnosis of PAD and for evaluation of new therapies.

SSM24-03 • Non-invasive Prediction of Hepatic Transplant Portal Vein Stenosis - Experience at a Single High Volume Transplant Center

Marie A Vasher MD (Presenter) ; Danny R Lababidi MD ; Kamal Massis MD ; Bruce R Zwiebel MD ; Dana M Poletto MD ; Haydy Rojas RN ; Yougui Wu PhD

PURPOSE

We sought to compare Doppler ultrasound findings to transhepatic catheter portal venogram findings of hepatic transplant main portal vein stenoses, and to determine which Doppler ultrasound criteria are often the best non-invasive measures for diagnosing portal vein stenosis.

METHOD AND MATERIALS

32 post-hepatic transplant transhepatic catheter portal venograms following initial Doppler ultrasound were performed at our institution on 30 patients from November 1, 2004 to May 31, 2012 due to clinical, biochemical, Doppler ultrasound, CT and/or MRI abnormalities. Doppler ultrasounds and catheter portal venograms were retrospectively reviewed. Doppler ultrasound criteria of main portal vein peak velocity, velocity step-up ratio, and change in velocity across the anastomosis were correlated with catheter portal venogram. Narrowing of the main portal vein of at least 50% on portal venogram was considered stenotic. 54 randomly chosen patients without suspicion of hepatic transplant portal anastomotic stenoses were assigned to our control group. Patients who underwent catheter portal venogram without findings of portal vein stenosis were also assigned to our control group.

RESULTS

CONCLUSION

CLINICAL RELEVANCE/APPLICATION

Applying the Doppler ultrasound criteria yielded in our study will result in selecting the most appropriate hepatic transplant patients with main portal vein stenosis for catheter portal venogram.

SSM24-04 • Stenosis Index Is a Specific Secondary Screening Test for Patients with Suspected Transplant Hepatic Arterial Stenosis

Sherwin S Chan MD, PhD (Presenter) * ; Thomas X Le MD ; Michael F McNeely MD ; Manjiri K Dighe MD ; Theodore J Dubinsky MD

PURPOSE

Stenosis Index (SI) is a novel angle-independent quantitative measure that is computed using Fourier analysis of the spectral Doppler waveform. We evaluate the utility of stenosis index (SI) as a secondary measure after resistive index (RI) to increase the accuracy of diagnosing transplant hepatic artery stenosis using Doppler ultrasound (US).

METHOD AND MATERIALS

An institutional anonymized retrospective case-control study was performed. Patients who underwent US for suspected post-transplant hepatic artery stenosis and abdominal angiography within 30 days at a large academic center in 2006-2010 were included. Patients who had no imaging of the transplanted artery on their angiography and patients who did not have complete ultrasound evaluation of their hepatic arteries were excluded. These Spectral Doppler images were imported into MATLAB and SI was calculated for each artery in each patient by obtaining a ratio of the power in high frequency bands to fundamental frequency. Student t-test and receiver operator characteristic (ROC) analyses were used to characterize the performance of SI, with ROC analysis providing the optimal SI threshold for detecting clinically relevant stenoses.

RESULTS

63 patients (20 with clinically relevant stenoses) met the inclusion and exclusion criteria. The mean ± standard deviation SI of the right and left hepatic arteries for stenotic arteries was 1.04 ± 0.22 and normal transplant arteries was 1.18 ± 0.19. The mean SI of these two groups were significantly different (p=0.01). In these patients, area under the ROC curve (AUC) was 0.71 for SI and a cutoff value of SI < 0.95, gave a specificity of 95% and sensitivity of 40%. In comparison, RI AUC = 0.6 and RI < 0.6 had a specificity of 20% and sensitivity of 93% for significant transplant hepatic artery stenosis.

CONCLUSION

In a subset of patients whom appeared suspicious enough on ultrasound to warrant angiography, SI is an excellent screening test for transplant hepatic artery stenosis.

CLINICAL RELEVANCE/APPLICATION

Stenosis Index is an excellent secondary confirmatory test for transplant hepatic artery stenosis and its use can reduce the number of equivocal and false positive cases who proceed to invasive workup

SSM24-05 • Should Ultrasound Be Used as Prophylactic Screening for Venous Thromboembolism in High Risk Patients with Malignancy?

Katherine A Kaproth-Joslin MD, PhD (Presenter) ; Charles Francis MD ; Susan K Hobbs MD, PhD ; Alok Khorana ; Deborah J Rubens MD

PURPOSE

Using the previously described clinical risk score for venous thromboembolism (VTE) (Khorana et al, Blood 2008) to identify high risk patients, this study evaluates the utility of screening for thrombosis in a prospective cohort of initially asymptomatic cancer patients initiating outpatient chemotherapy.

METHOD AND MATERIALS

Asymptomatic cancer patients initiating a new chemotherapy regimen and found to be high-risk for VTE based on a predictive risk model (score =3) were enrolled on an ongoing prospective cohort study with informed consent. Patients were evaluated with a baseline and an every 4 (\pm 1) week serial US study for up to 16 weeks. Additionally, CT scans obtained for restaging purposes were also evaluated for VTE.

RESULTS

Of the 35 high-risk patients enrolled, 8 (23%) were found to have VTE, 5 patients w/ DVT alone (14%), 1 w/ PE alone (3%) and 2 (6%) w/ both. 32 patients underwent a baseline US and 3 asymptomatic DVTs were identified (9%), w/ 1 patient also having an asymptomatic PE detected on staging CT. Subsequent US were performed in 23 patients at week 4 (0DVT), 21 patients at week 8 (0DVT) and 18 patients at week 12 (1 DVT, 6%). An additional 2 patients developed symptomatic DVT between screens. Restaging CT scans identified an asymptomatic PE in a patient at week 6 and an asymptomatic PE in a patient at week 9. Of the patients w/ isolated DVT, 2 had isolated unilateral calf clot, 2 had unilateral calf and thigh clot, and 1 had unilateral upper extremity clot.

CONCLUSION

In this prospective observational study, 23% of cancer outpatients deemed high-risk for VTE developed clot at a rate much higher than found in both normal and acutely ill hospitalized populations (0.5 and 6% respectively). This study confirms the validity of the previously described risk score developed by Khorana et al and makes this model highly predictive of identifying patients at risk for VTE. In addition, these findings suggest that screening US for asymptomatic clot should be considered in high-risk patients based on this risk score. This study highlights the importance of VTE screening in the calf, w/ 50% of patients w/ VTE having calf clot and 25% having isolated unilateral calf clot, indicating that this region should be included in the assessment of DVT.

CLINICAL RELEVANCE/APPLICATION

Screening ultrasonography for asymptomatic thrombosis should be considered in high-risk patients based on this risk score with the goal of reducing the morbidity and mortality associated with VTE.

SSM24-06 • A Comparison between Contrast-enhanced Ultrasound (CEUS) and Multi-slice Computer-tomography (MS-CT) in Detecting and Classifying Endoleaks in the Follow-up after EVAR

Dirk-Andre Clevert MD (Presenter) * ; Verena Guertler ; Wieland H Sommer MD ; Georgios Meimarakis ; Maximilian F Reiser MD

PURPOSE

To compare Contrast-Enhanced-Ultrasound (CEUS) and Multislice-Computed-Tomography (MS-CT) angiography in detecting and classifying endoleaks in the follow-up of patients following Endovascular-Aortic-Aneurysm-Repair (EVAR).

METHOD AND MATERIALS

In this retrospective study a cohort of 171 patients with both CEUS and MS-CT follow-up examinations after EVAR were included. In total 489 CEUS and 421 MS-CT examinations were assessed during the follow-up. B-scan, color Doppler and CEUS were performed in all patients. MS-CT was performed with a 16- up to 128-slice-scanner.

RESULTS

Regarding our inclusion and exclusion criteria we obtained 200 contemporary examination pairs out of the 132 patients of our cohort. MS-CT was used as the preferred examination in determining the presence of an endoleak.

The true positive rate for the detection of endoleaks with CEUS was 42% (84/200), the false positive rate was 4% (8/200), the true negative rate was 52% (105/200), and the false negative rate was 2% (3/200). The sensitivity of CEUS was therefore 97%, and the specificity was 93%. McNemar's test value was 0.227 and kappa coefficient was 0.889.

CONCLUSION

CEUS appears to be as good as MS-CT in the detection of endoleaks in the follow-up after EVAR, with the added advantages of no radiation dose and no nephrotoxicity of the contrast agents. A switch of the preferred examination from MS-CT to CEUS should be considered.

CLINICAL RELEVANCE/APPLICATION

CEUS appears to be as good as MS-CT in the detection of endoleaks in the follow-up after EVAR, with the added advantages of no radiation dose and no nephrotoxicity of the contrast agents.

Case-based Review of US (An Interactive Session)

Wednesday, 03:30 PM - 05:00 PM • S406A

US

[Back to Top](#)

MSCU42 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Director

Sharlene A Teefey, MD

MSCU42A • Ultrasound of Adnexal Pathology

Deborah J Rubens MD (Presenter)

LEARNING OBJECTIVES

1) Review the common causes of acute ovarian pathology including hemorrhagic cysts and their differential diagnoses. 2) Underscore the various features of ovarian torsion including grayscale and Doppler findings and pitfalls. 3) Identify those gynecologic lesions which require surgery vs. clinical or imaging follow-up, either with sequential ultrasound or with another modality.

ABSTRACT

As the medical community is encouraged to rely more upon ultrasound in the diagnosis of pelvic pain, many more women are encountered first for pelvic ultrasound, rather than CT. Frequently, ultrasound can answer the clinical question, saving time, money and

radiation to the patient. Common causes of pain in premenopausal women include hemorrhagic cysts. Cysts measuring 5cm or less and meeting classic criteria of either a fishnet/lacelike appearance or with a retractile clot do not require any follow-up. Atypical cysts or suspected endometriomas of any size, or classic hemorrhagic cysts greater than 5 cm should undergo short term interval follow-up with ultrasound (6-12 weeks). Lesions larger than 7cm usually require alternate imaging based on their size, as ultrasound may not evaluate them in sufficient detail. MRI is usually the next consideration. Torsion, while an uncommon cause of pelvic pain, does represent a surgical emergency. The most reliable signs of torsion are those identified with grayscale imaging: an enlarged, abnormal ovary (>5cm in diameter) and/or an ovary in abnormal midline position either above or below the uterus. Doppler imaging is less reliable, as arterial and/or venous flow may be present even in the setting of torsion. Other Doppler features including a twisted pedicle or a tarvus/parvus waveform may aid in the diagnosis. A third group of patients are those who have ovarian mass lesions suggestive of neoplasm. These patients may present acutely as well, sometimes due to torsion, other times due to rupture or pain or pressure. Features which are concerning for neoplasm include thick septations and nodules. Lesion vascularity is especially concerning for malignancy. These patients usually are referred for surgical evaluation rather than imaging follow-up. However if the mass is indeterminate and malignant features are absent, short term ultrasound follow-up and/or alternative imaging with CT or MR; may be helpful for diagnosis and management

MSCU42B • Musculoskeletal US

Nirvikar Dahiya MD (Presenter)

LEARNING OBJECTIVES

1) Learn to identify normal Sonographic anatomy of the musculoskeletal system. 2) Learn to recognize the abnormal sonographic appearance of the musculoskeletal system in disease. 3) Learn the correct Sonographic technique and pitfalls for optimal scan results.

ABSTRACT

Cases have been chosen for this refresher course keeping in mind their instructive and educational value. The discussion will include diseases associated with the rotator cuff, wrist joint, Hip, knee and ankle. Ultrasound images and cine clips will be used to highlight the salient features of musculoskeletal disorders. Examples will be shown to demonstrate the advantage of using dynamic evaluation as a problem solving aspect of musculoskeletal sonography.

MSCU42C • Ultrasound of Thyroid

Sharlene A Teehey MD (Presenter)

LEARNING OBJECTIVES

1) Discuss the incidence, different histologic subtypes of thyroid carcinoma. 2) Review the sonographic features of the different subtypes of thyroid carcinoma and the sonographic appearance of benign nodules and how to differentiate the two. 3) Discuss thyroid lymphoma including subtypes and sonographic features. 4) To discuss other thyroid pathologies including thyroiditis, and Grave's disease.

ABSTRACT

Thyroid carcinoma has an incidence between 9.2 and 13%. There are several subtypes of carcinoma including papillary carcinoma that accounts for 75-80% of the cases. Less common types include follicular carcinoma, medullary carcinoma and anaplastic carcinoma. Grey scale sonographic features that are suggestive of papillary carcinoma include a solid, very hypoechoic lesion with micro or eggshell calcifications, lobulation, and a focal bulge. Follicular lesions are solid and iso/hyperechoic with a thin hypoechoic halo and central cystic spaces. Most of these lesions are adenomas though ultrasound cannot differentiate between a follicular carcinoma and adenoma. Carcinomas tend to occur in older males and are solid hypoechoic lesions. Benign thyroid nodules, in particular nodular hyperplasia have a spongy appearance and inspissated colloid. Anaplastic carcinoma is rare but very aggressive locally invading structures in the neck. Distant metastases are present in 20-50% of patients at presentation. At ultrasound, anaplastic carcinomas are solid and hypoechoic but may contain cystic spaces and amorphous calcification. Lymphoma of the thyroid is rare and may be aggressive or indolent (MALT lymphoma). It is typically heterogeneous and can invade surrounding tissues. Thyroiditis can be acute, subacute, and chronic. Subacute thyroiditis is a post viral disorder. At ultrasound, focal hypoechoic area(s) may be seen that are ill defined and have little if any vascularity. Hashimoto's thyroiditis is an autoimmune disorder causing gland enlargement with characteristic hypoechoic micronodules and echogenic septae. Vascularity may be increased, normal, or decreased. Grave's disease is also an autoimmune disease. Ultrasound shows a heterogeneously enlarged gland and diffuse increased vascularity and increased PSV in the thyroidal arteries.

GU Ultrasound 2013: The Expert's Update on Kidney, Gynecologic and Testicular US

Thursday, 08:30 AM - 10:00 AM • N228

[US](#) [OB](#) [GU](#)

[Back to Top](#)

RC607 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Coordinator

John J Cronan , MD

Mindy M Horrow , MD *

Paula J Woodward , MD *

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.

Abdominal Vasculature: Ultrasound and Doppler

Thursday, 08:30 AM - 10:00 AM • S103CD

[US](#) [VA](#) [GI](#)

[Back to Top](#)

RC610 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC610A • Liver Doppler

Kathryn A Robinson MD (Presenter)

LEARNING OBJECTIVES

1) Identify normal hepatic hemodynamics. 2) Identify hemodynamic alterations in portal hypertension. 3) Identify portal and hepatic vein thrombosis. 4) Identify normal sonographic and Doppler findings as well as complications of Transjugular Intrahepatic Portosystemic Shunt (TIPS).

ABSTRACT

RC610B • Contrast Ultrasound in the Abdomen

Hans-Peter Weskott MD (Presenter) *

LEARNING OBJECTIVES

1) Understanding the indications of contrast enhanced ultrasound (CEUS) in different abdominal organs. 2) Learning about the importance of the three contrast phases and how CEUS performs in detecting and characterizing focal liver lesions. 3) Learning the potential value as well as the limitations of CEUS in renal disorders. 4) Learning how CEUS performs in diseases of other solid organs including the intestine and major abdominal vessels.

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 a high temporal resolution, even a short 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 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. **Pancreas:** CEUS can be used to reliably image necrosis in acute pancreatitis. It helps to differentiate neuroendocrine tumors from ductal adenocarcinoma. **Kidney:** CEUS adds great value in detecting and characterizing complicated cysts and is believed to be more accurate than CECT. However, its value in differentiating solid renal tumors is limited. **Parenchymal changes** due to infectious diseases can be diagnosed by using CEUS. It is highly sensitive in detecting organ infarctions as well. **Intestine:** CEUS is of great value in characterizing inflammatory diseases and especially in imaging complications. CEUS improves visualization of abdominal vascular disorders

RC610C • Aorta and Its Branches

Mary C Frates MD (Presenter)

LEARNING OBJECTIVES

1) Understand the gray scale and Doppler techniques useful for evaluating the aorta and its branches. 2) Recognize the presence of vascular stenosis, aneurysm and malformations. 3) Understand the challenges in the sonographic evaluation of aortic stent grafts.

ABSTRACT

Breast US

Thursday, 08:30 AM - 10:00 AM • N227

US BR

[Back to Top](#)

RC615 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC615A • High-Quality Breast US

Janice S Sung MD (Presenter)

LEARNING OBJECTIVES

1) To review basic ultrasound principles used to create high quality images. 2) To understand appropriate breast ultrasound technique and documentation. 3) To improve knowledge regarding breast ultrasound accreditation, including image evaluation and biopsy case assessment.

RC615B • Whole Breast US Screening

Stuart S Kaplan MD (Presenter) *

LEARNING OBJECTIVES

1) To understand the rationale for the use of breast ultrasound as a supplementary screening modality for women with dense breasts. 2) To review results of screening ultrasound studies such as cancer detection rates, stage at detection, and false positive biopsy rates. 3) To discuss implementation issues such as performance and interpretation time, reimbursement, and automated whole breast ultrasound.

ABSTRACT

RC615C • US Evaluation of Lymph Nodes

Robert A Schmidt MD (Presenter) *

LEARNING OBJECTIVES

1) How the anatomy of a lymph node affects its sonographic appearance. 2) How metastases alter the sonographic appearance of a lymph node. 3) Several methods of distinguishing whether an abnormal node is more likely metastatic or a benign reactive lymph node. 4) The landmarks that define the axillary lymph node levels, how to assess axillary lymph node levels, and breast cancer metastases spread from level to level in most cases. 5) How to assess a lymph node for peri-nodal invasion and how to perform a biopsy to prove its presence. 6) The various methods of performing biopsy of axillary lymph nodes and how ultrasound guided biopsy of axillary lymph nodes affect management of the breast cancer patient. 7) How ultrasound contrast agents could help assess axillary nodes.

Medical Physics 2.0: Ultrasonography

Thursday, 08:30 AM - 10:00 AM • S102C

PH US

[Back to Top](#)

RC621 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Co-Director

Ehsan Samei , PhD *

Co-Director

Douglas E Pfeiffer , MS *

RC621A • Ultrasonography Perspective

Paul L Carson PhD (Presenter) *

LEARNING OBJECTIVES

- 1) Understand the roles of medical physicists and other providers of ultrasound system QC, and 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. Hangiandreou's 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.

RC621B • Ultrasonography 1.0

Zheng Feng Lu PhD (Presenter)

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.

RC621C • Ultrasonography 2.0

Nicholas J Hangiandreou PhD (Presenter)

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.

Dynamic Musculoskeletal US of the Lower Extremity (Hands-on Workshop)

Thursday, 08:30 AM - 10:00 AM • E264

US MK

[Back to Top](#)

RC652 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Viviane Khoury, BSC, MD

Etienne Cardinal, MD

Jon A Jacobson, MD *

Carlo Martinoli, MD

J. A Bouffard, MD

Ruth Y Ceulemans, MD

Joseph G Craig, MD

David P Fessell, MD

Ghiyath Habra, MD

Joseph H Introcaso, MD

Marnix T Van Holsbeeck, MD *

Ximena L Wortsman, MD

Kenneth S Lee, MD *

Thomas Moser, MD *

Humberto G Rosas, MD

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.

Breast Imaging (Ultrasound Screening)

Thursday, 10:30 AM - 12:00 PM • Arie Crown Theater

US OI BR

[Back to Top](#)

SSQ01 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Moderator

Ellen B Mendelson, MD *

Moderator

Paula B Gordon, MD *

SSQ01-01 • Initial Experience of Technologist Performed Whole Breast Screening Ultrasound

Glenys Da Costa MBBS (Presenter) ; **Janice S Sung** MD ; **Christopher E Comstock** MD ; **D. David Dershaw** MD ; **Elizabeth A Morris** MD

PURPOSE

To evaluate the added cancer detection and false positive rate of a technologist-performed handheld screening breast ultrasound program

METHOD AND MATERIALS

IRB approved retrospective review was performed on 890 consecutive women who underwent screening hand held high resolution breast ultrasound performed by a breast ultrasound technologist between October 2011-February 2013. Radiologist performed targeted ultrasound only in cases if a solid or indeterminate lesion was identified by the sonographer. Clearly benign findings, such as simple and complicated cysts, were neither recorded nor re-evaluated by the radiologist. 63 probably benign or suspicious lesions were identified.

RESULTS

Of the 890 women, 299 (34%) were pre-menopausal and 591 (66%) peri/post-menopausal. 288 (32%) had a personal history of breast cancer, 67(8%) a prior biopsy proven high-risk lesion, and 592(67%) a family history of breast cancer. 769/875(88%) patients had a mammogram within 6 months of the ultrasound. Breast density was predominantly fatty in 31 (3%), scattered fibroglandular densities in 171 (20%), heterogeneously dense in 521 (60%), and extremely dense in 152(17%). 837 (94%) studies were assessed as BI-RADS 1 or 2, 20 (2%) as BI-RADS 3, and 43 (5%) as either BI-RADS 4 or 5. Biopsy was performed for 39/43 suspicious lesions, yielding malignancy in 3/39 (PPV 8%). The cancers were all solid masses between 1.0-1.3 cm in size in heterogeneously dense breasts. Of the 3 women with cancers, 2 had a personal history of breast cancer and the other had no additional risk factor. 2 had a negative mammogram within 5 weeks of the ultrasound and the third within 7 months. The overall cancer detection rate was 3.4 cancers per 1000 women.

CONCLUSION

Technologist performed handheld screening breast ultrasound demonstrates a cancer detection rate (3.4/1000) and PPV (8%) of biopsy similar to that reported for physician performed ultrasound screening.

CLINICAL RELEVANCE/APPLICATION

Screening breast ultrasound performed by technologists is a feasible alternative to physician performed ultrasound screening, reducing radiologists time and cost.

SSQ01-02 • Comparison of an Automated Breast Volume Scanner and a Hand-held Ultrasound in the Detection of Breast Cancer: An Analysis of 5576 Patient Evaluations

Woo Jung Choi MD (Presenter) ; **Seonah Jang** ; **Joo Hee Cha** ; **Hak Hee Kim** MD ; **Hee Jung Shin** MD ; **Hyunji Kim** MD ; **Eun Young Chae** ; **Sun Hye Jeong** MD

PURPOSE

To retrospectively compare the accuracy and effectiveness of automated breast volume scanning (ABVS) and hand-held ultrasound (HHUS) in the detection of breast cancer in a large population group with a long-term follow-up, and to investigate whether different ultrasound systems may influence the estimation of cancer detection.

METHOD AND MATERIALS

A total of 1870 ABVS and 3706 HHUS participants, who underwent these procedures at our institute between September 2010 and August 2011, were included in this study. Cancers occurring during the study and subsequent follow-up were evaluated. The reference standard was a combination of histology and follow-up imaging (=12 months). The diagnostic accuracy, sensitivity, specificity, and positive (PPV) and negative (NPV) predictive values were calculated with exact 95% confidence intervals.

RESULTS

CONCLUSION

ABVS shows a comparable diagnostic performance to HHUS. We thus find that ABVS as an effective supplemental tool for mammography in breast cancer detection in a large population.

CLINICAL RELEVANCE/APPLICATION

In this study, ABVS shows comparable diagnostic performance when compared with HHUS in the detection of breast cancer in a large population group with a long-term follow-up.

SSQ01-03 • Impact of Radiologists' Professional and Practice Characteristics on Breast Cancer Detection in Women with Dense Breasts; A Reader Study Combining Mammography and Automated Breast Ultrasound

Karen Drukker PhD (Presenter) * ; **Maryellen L Giger** PhD *

PURPOSE

Evaluate variability in the clinical assessment of breast images, and its dependence on radiologists' professional and practice characteristics, in a retrospective reader study combining X-ray mammography (XRM) and 3D automated breast ultrasound (ABUS) for breast cancer detection in women with dense breasts.

METHOD AND MATERIALS

The study involved 17 breast radiologists of which 7 came from academic radiology practices, 6 from private practice, and 4 from community clinics. A sequential study design was employed with readers first interpreting XRM alone followed by an interpretation of the combined XRM+ABUS, with each interpretation including a forced BI-RADS scale and a likelihood that the woman had breast cancer. The analysis included 164 asymptomatic patients, including 31 breast cancer patients, with dense breasts and a negative screening XRM. Of interest were inter-reader variability in scoring for XRM alone, XRM+ABUS, and the dependence on reader experience, fellowship training, and type of practice. Performance analysis included Receiver Operating Characteristic (ROC), percentile, Kappa statistics, correlative, and Bland-Altman analyses. The statistical significance of the impact of consecutive reads was assessed for the kappa statistics using bootstrapping.

RESULTS

The median change in area under the ROC curve after ABUS interpretation was 0.12 (range 0.04-0.19). Reader agreement was fair with the median inter-reader kappa being 0.26 (0.05-0.48) for XRM alone and 0.34 (0.11-0.55) for XRM+ABUS (95% confidence interval for the difference in kappa [0.06;0.11]). The only factor that appeared to have a substantial effect on reader performance was the type of clinical radiology practice, with the increase in area under the ROC curve the largest for the 3 radiologists from academic practices, with changes of 0.18, 0.19, and 0.19 respectively.

CONCLUSION

A modest, but statistically significant, increase in inter-reader agreement was observed after interpretation of ABUS, while radiologists from academic practice seemed to benefit the most from ABUS interpretation.

CLINICAL RELEVANCE/APPLICATION

Understanding reader variability and factors such as training and clinical practice will yield informed decisions on the use of multimodality imaging in breast cancer screening.

SSQ01-04 • Whole Breast Ultrasound: Comparison of the Visibility of Suspicious Lesions with Automated Breast Volumetric Scanning versus Hand-held Breast Ultrasound

Cherie M Kuzmiak DO (Presenter) * ; **Eun Young Ko** MD, PhD ; **Laura Tuttle** ; **Doreen Steed** ARRT * ; **Donglin Zeng** PhD

PURPOSE

To assess how well radiologists visualize relevant features of lesions seen with automated breast volumetric scanning in comparison to hand-held breast ultrasound in population of women going to biopsy.

METHOD AND MATERIALS

Twenty-five patients were consecutively recruited from women who were scheduled to undergo a breast biopsy for at least one BIRADS 4 or 5 lesion identified in a diagnostic setting in this IRB approved study. The enrolled subjects subsequently underwent imaging of the breast(s) of concern using a dedicated FDA-approved ultrasound system that allowed both a hand-held breast ultrasound (HHBUS) and automated breast volumetric scanning (ABVS) to be performed with the same imaging parameters. Five experienced breast imaging radiologists reviewed the randomized cases in a reader study. Each reader was asked to compare side-by-side the breast ABVS exam to the HHBUS exam, including the lesion recommended for biopsy. Each reader was asked to specify the lesion type, size and imaging features, BIRADS score, probability of malignancy for each lesion for each modality and then they were asked to compare the lesion characteristics of shape and margins between the two modalities using a seven-point confidence scale for two sets of modality comparisons.

RESULTS

There were thirty biopsied lesions in this study. All were masses. Seven (23.3%) masses were malignant and 23 (76.4%) were benign. Across all lesions regardless of size or final pathology, there was no significant difference between the two modalities in the readers' BIRADS classification, probability of malignancy, sensitivity or specificity ($P > 0.15$). For malignant lesions, the reader visualization confidence scores between the two ultrasound modalities were not significantly different ($P > 0.1$). However, analysis for non-malignant cases showed a statistically significant increase in reader visualization confidence in lesion shape and margins with ABVS ($P < 0.001$).

CONCLUSION

Radiologists showed equal confidence in visualization of suspicious masses with automated breast volumetric scanning in comparison to hand-held breast ultrasound mammography and increased confidence in visualization of non-malignant lesions with automated breast volumetric scanning.

CLINICAL RELEVANCE/APPLICATION

Dedicated automated whole breast ultrasound is a novel imaging technology that has the potential application for decreasing hand-held breast imaging use in a busy diagnostic clinic.

SSQ01-05 • Comparison of Transverse versus Coronal View of Automated Breast Ultrasound in Lesion Detection

Sun Young Lee MD (Presenter) ; Joo Hee Cha ; Eun Young Chae ; Hak Hee Kim MD ; Hee Jung Shin MD ; Hyunji Kim MD

PURPOSE

To compare the performance of coronal view of automated breast ultrasound (ABUS) with that of transverse view in the lesion detection

METHOD AND MATERIALS

Three breast radiologists independently interpreted the ABUS images from 113 women, 14 with negative findings and 99 with known breast lesions (99 benign and 53 malignant findings). The readers were asked to detect the presence or absence of the abnormalities using transverse and coronal view in the different reading session. If a lesion was detected, we evaluated the location, characteristics of lesions. Intra-class correlation coefficients and kappa statistics were used for statistical analysis. Time to review and interpret an examination was also evaluated.

RESULTS

The detection rate of malignant lesions was 95.6% and 87.4% for transverse and coronal view ($p=0.0089$). The detection rate of benign lesions was 72.4% and 56.6% for transverse and coronal view ($p=0.0001$). Larger lesions are more consistently detected by coronal view: detection rates were 7.4% at 5 mm or smaller; 48.4% at 6-10 mm; 80.1% at 11-15 mm; 89.1% for lesions larger than 15 mm (p)

CONCLUSION

The detection rate of coronal view was significantly lower than that of transverse view for both benign and malignant lesions.

CLINICAL RELEVANCE/APPLICATION

Coronal view can be used as an additional method to transverse view. However, the role of coronal view by ABUS is not yet established, which needs to undergo further studies.

SSQ01-06 • Performance of Whole Breast Ultrasound in Women with Dense Breasts Following 3D Tomosynthesis Mammography

Regina J Hooley MD (Presenter) * ; Jaime L Geisel MD ; Madhavi Raghu MD * ; Melissa A Durand MD ; Cary P Gross MD ; Susan H Busch ; Liane E Philpotts MD *

PURPOSE

Both whole breast ultrasound (WBUS) and 3D tomosynthesis (DBT) mammograms are being more widely utilized in the United States and both modalities can detect cancers not visualized on conventional digital mammography. The purpose of this study is to determine the performance of WBUS in women with a recent prior normal DBT mammogram.

METHOD AND MATERIALS

A retrospective chart review was performed on 1039 consecutive women who underwent handheld WBUS between 10/1/2011 and 9/20/2012 and who had a prior normal DBT mammogram performed within 12 months before the WBUS examination. All WBUS exams were performed by a breast ultrasound technologist and were immediately reviewed and interpreted by a radiologist.

RESULTS

The average patient age was 52.3 years (S.D. +/- 9.5 years, range 27-94). The average time between the mammogram and WBUS was 32 days (639 patients had both exams on the same day). Of the 1039 WBUS exams, 599 were prevalence screenings and 440 were incidence screenings. 906 (87.2%) were BI-RADS 1 or 2, 102 (9.8%) were BI-RADS 3 and 31 (3.0%) were BI-RADS 4. There were no BI-RADS 5 lesions. Ultrasound guided aspiration or biopsy was performed in 38 women, including 10 BI-RADS 3 and 30 BI-RADS 4 lesions. Two BI-RADS 4 lesions were malignant infiltrating ductal carcinomas. Both cancers were found on a prevalence WBUS and both were not seen on DBT, even in retrospect. The overall positive predictive value of BI-RADS 4 lesions was 6.5%. The cancer detection rate was 1.9/1000.

CONCLUSION

Supplemental WBUS performed in addition to DBT can detect mammographically occult breast cancers, although the rate is lower than previous studies of WBUS performed in addition to conventional mammography

CLINICAL RELEVANCE/APPLICATION

Multiple studies have demonstrated that supplemental WBUS has a cancer detection rate of 3-5/1000, although the performance of WBUS as a supplement to DBT mammography has yet to be determined.

SSQ01-07 • Supplemental Ultrasound (US) Screening in Patients with a History of Lobular Neoplasia (LN)

Kanchan Phalak MD (Presenter) ; Basak E Dogan MD ; Denai Milton MS ; Therese Bevers MD ; Wei T Yang MD

PURPOSE

To investigate the role of US screening as an adjunct to annual mammography (M) in breast cancer detection in women with a history of LN

METHOD AND MATERIALS

A retrospective review was performed of the clinicopathology database at a single institution between 11/2004 and 11/2011 and yielded 195 women with biopsy proven lobular carcinoma in situ (LCIS) and/or atypical lobular hyperplasia (ALH) who underwent screening M, screening US, and/or screening MR. Patients with a concurrent diagnosis of breast cancer or those lost to follow-up were excluded. M, US, and when available, MRI findings were reviewed. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and cancer detection rate of each screening test was determined.

RESULTS

A total of 138 patients who had mammography, US, or MR available for review and were included in the study. Mean patient age was 53 years (range 30-83). All 138 patients underwent a mean of 3.0 years of screening with M, 115 (83%) a mean of 2.7 years of screening with US, and 30 (20%) patients a mean of 1.9 rounds of screening with MRI. Eleven (8.0%) patients were diagnosed with cancer. Of 115 patients who received both M and US, 10 (8.7%) were diagnosed with cancer. Mammographic cancer detection rate 2.6%. US cancer detection rate was 2.6%, and all these cancers were mammographically occult. A subgroup of 30 patients with LN and lifetime risk >20% received supplemental MRI screening; 5 (16.7%) of whom were diagnosed with cancer. US did not detect any of these 5 cancers, M detected 1 (3%) and MRI detected 2 (6.7%) while remaining 2 were detected clinically. The sensitivity (95% CI) of screening US was 30% (7%-65%), specificity (95% CI), PPV (95% CI), and NPV (95% CI) were 100% (97%-100%), 100% (29%-100%), and 94% (88%-97%), respectively. The sensitivity (95% CI) of screening M was 27% (6%-67%), specificity (95% CI), PPV (95% CI), and NPV (95% CI) were 100% (97%-100%), 100% (29%-100%), and 94% (89%-97%), respectively. The sensitivity of screening MRI was 50% [95% CI: 12%-88%], while NPV was 89% [95% CI: 71%-98%].

CONCLUSION

Annual screening US as a supplement to screening M resulted in an incremental cancer detection rate of 2.6% in patients with a history of LN

CLINICAL RELEVANCE/APPLICATION

Supplemental US screening in patients with LN who do not fulfill the American Cancer Society criteria for high risk MRI screening may help detect mammographically occult malignancy

SSQ01-08 • Reassessment and Follow-up Results of BI-RADS Category 3 Lesions Detected on Screening Breast US

Jung Lim Yoo MD (Presenter) ; Joo Hee Cha ; Eun Young Chae ; Hak Hee Kim MD ; Hee Jung Shin MD ; Hyunji Kim MD

PURPOSE

To determine the frequency and the malignancy rate of BI-RADS category 3 lesions detected on screening breast ultrasound and reassess whether they satisfied the ACRIN 6666 protocol.

METHOD AND MATERIALS

During two years, 28,796 asymptomatic women underwent screening mammography. Among them, 8359 women underwent additional breast ultrasound as part of a screening examination. Radiologists analyzed US lesion features and provided a final BI-RADS assessment. We retrospectively reviewed the initial US images with BI-RADS category 3 lesions and their mammography as well. We also investigated the outcome of these lesions. The reference standard was a combination of pathology and clinical follow-up for at least 24 months.

RESULTS

The frequency of category 3 lesions detected on breast US was 16.8% (1403/8359). Of 941 patients with follow up for at least 24 months or biopsy, six eventually proved to be malignant (0.6%). The malignancy rate was 1.5% (4/805) for patients with abnormal mammogram and 0.5% (2/136) for those with negative mammogram. When the ACRIN (American College of Radiology Imaging Network) 6666 protocol were strictly applied, 147 (15.6%) were retrospectively recategorized as BI-RADS 4 (n=7) or BI-RADS 2 (n=140).

CONCLUSION

The malignancy rate of BI-RADS category 3 lesions is very low, especially with negative mammogram.

CLINICAL RELEVANCE/APPLICATION

With BI-RADS category 3, careful assessment is needed to avoid unnecessary biopsy or short-interval follow-up.

SSQ01-09 • Review of Interval Cancers in a Mammographic Screening Programme: What Can We Learn? Are We Being Too Hard on Ourselves?

Katerina Lekanidi MRCP, MBBCh (Presenter) ; Phillip Dilks ; Tamara Suaris MBBS ; Hema N Purushothaman

PURPOSE

To determine the features of interval breast cancers considered to be detectable on previous screening.

METHOD AND MATERIALS

This study was approved by the clinical governance committee. As a requirement of the national breast screening programme, the previous screening mammograms for all interval breast cancers are reviewed and classified as: no signs, minimal signs or suspicious appearances. Patients with interval breast cancer over a period of 21 years were included in this study if minimal or suspicious signs were seen on most recent screening mammogram. 3 radiologists, individually and blinded to the site of interval cancer, reviewed the mammograms and documented the presence, site, characteristics and BIRADS classification of any abnormality. Findings were compared with the appearances of the subsequent symptomatic mammogram.

RESULTS

111/590 interval cancers documented in the study period fulfilled the study inclusion criteria. The mean age at the time of screening mammogram was 59.04 (range 51- 75). The mean interval to the diagnosis of breast cancer was 17.30 months (range 1- 36). 61.3% of cases were considered as "minimal signs" and 38.7% as suspicious. In 17.1% of the cases none of the readers identified a relevant abnormality on the screening mammogram. In 21.6% of the cases 1/3 readers identified the abnormality, 27.6 % of cases 2/3 readers and 33.3% all 3 readers identified the abnormality. In 50% of one-reader recalls, the mammographic abnormality was an asymmetric density, followed by ill-defined mass (20.8%) and architectural distortion (20.8%). In three-reader recalls, microcalcification was the most common finding (35.1%), followed by asymmetric density (27%) and an ill-defined mass (24.3%). Overall, the most common abnormality was asymmetric density (36%), followed by ill-defined mass (15.3%) and microcalcification with or without a mass (15.3%).

CONCLUSION

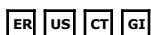
The most common retrospectively and unanimously identified sign of breast cancer is microcalcification and the most common subtle sign is asymmetric density. Interval cancer mammographic review not blinded to the position of subsequent cancer overestimates the percentage of "minimal signs " cases.

CLINICAL RELEVANCE/APPLICATION

Review of interval breast cancers is a valuable learning tool in breast screening programmes and is more valid if done initially blinded to the position of the subsequent breast cancer.

Emergency Radiology (Imaging Abdominal Emergencies)

Thursday, 10:30 AM - 12:00 PM • N226



[Back to Top](#)

Moderator
Douglas S Katz, MD
Moderator
Jamlik-Omari Johnson, MD

SSQ05-01 • Sonography of the Borderline Appendix: A Closer Look

Jason D Oppenheimer MD (Presenter) ; **Rupesh H Kalthia** MD ; **Eric W Olcott** MD ; **R. Brooke Jeffrey** MD *

PURPOSE

Some authorities diagnose appendicitis on ultrasound with an outer diameter criterion of >6 mm while others use a criterion of >7 mm. We evaluated the potential utility of secondary findings including hyperemia and hyperechoic fat in the diagnosis of patients whose appendices measured between 6 and 7 mm and thus were considered borderline by size criteria.

METHOD AND MATERIALS

We retrospectively reviewed 3,506 consecutive ultrasound examinations for suspected appendicitis in patients who presented to the emergency department at a tertiary care center over a 5-year period, with HIPAA and IRB compliance. Three radiologists blinded to final diagnoses identified 98 sonograms with non-compressible 6 to 7 mm diameter appendices and evaluated them for secondary findings of appendicitis including hyperemia, hyperechoic fat, loss of the submucosal layer echo, periappendiceal fluid and appendicoliths. Hyperechoic fat was defined as increased periappendiceal echogenicity greater than 1cm in diameter. Fisher's exact test and linear regression were used to compare secondary findings with final diagnoses made by surgical pathologic examination.

RESULTS

From 2007-2012, 98 ultrasounds demonstrated appendices with diameters between 6 and 7 mm of which only 51 (52%) had appendicitis by surgical pathologic examination. Of the secondary signs in the 98 patients, hyperechoic fat had the highest individual positive predictive value and specificity for appendicitis (78% and 83%, respectively), which increased with the addition of hyperemia to 80% and 89%, respectively. Statistical modeling showed a linear direct correlation between the number of secondary signs present and both positive predictive value and specificity ($R=0.963$ and $R^2=0.949$, respectively), values that increased to 100% in the presence of four secondary signs.

CONCLUSION

Hyperechoic fat and hyperemia increase the positive predictive value and specificity of sonography for appendicitis in patients with noncompressible appendices of diameters between 6 and 7 mm. Without secondary signs, a conservative approach should be followed as approximately half of such patients with borderline diameter appendices do not have appendicitis.

CLINICAL RELEVANCE/APPLICATION

Ultrasound reliably predicts appendicitis in borderline 6 to 7 mm diameter appendices when secondary characteristics are assessed.

SSQ05-02 • Does Inclusion of Imaging in the Work Up of Patients with Clinically Suspected Appendicitis Reduce the Rate of Unnecessary Surgical Procedures?

Max Lahaye MD, PhD (Presenter) ; **Doenja M Lambregts** MD, PhD ; **Eveline Mutsaers** ; **Alfons Kessels** ; **Stephanie Breukink** ; **Regina G Beets-Tan** MD, PhD

PURPOSE

Since February 2010 new Dutch guidelines have been implemented recommending the use of US or CT to confirm or refute clinically suspected appendicitis before (laparoscopic) surgery. For equivocal cases with US additional imaging (CT/MRI) is recommended. This study aimed to see whether these new guidelines lowered the percentage appendix sana.

METHOD AND MATERIALS

This retrospective study included all consecutive patients operated for clinically suspected appendicitis at our hospital from 2006 until 2013. The use of imaging (none versus US, CT and/or MRI) and its findings were recorded. Surgical and histopathological findings -where available- were notified. The primary study endpoint was the number of appendix sana before and after the guideline implementation.

RESULTS

745 patients were included, of which 475 were collected before the implementation of the guidelines and 270 after. During the pre-implementation period, 22.3% (106/475) of the patients received imaging focussed on the appendix. Post-implementation, 98.9% (267/270) of the patients received imaging before surgery. The average percentage of an appendix sana before the guidelines was 25% (119/475). After implementation, this average percentage dropped significantly to 5.9% (16/270, p

CONCLUSION

Use of preoperative imaging in all patients with suspected clinically appendicitis resulted in a significant reduction in the percentage of appendix sana. This suggests that the implementation of imaging in the work up of these patients could be an effective strategy to reduce the number of unnecessary surgeries.

CLINICAL RELEVANCE/APPLICATION

Preoperative imaging results in a significant reduction of unnecessary surgery and should thus be recommended for all patients clinically suspected for appendicitis.

SSQ05-03 • The Alvarado Score as a Method for Potentially Reducing the Number of Unnecessary CT Scans for Appendicitis When Appendiceal Ultrasound Fails to Visualize the Appendix

Robert Jones MD (Presenter) ; **R. Brooke Jeffrey** MD * ; **Terry S Desser** MD * ; **Eric W Olcott** MD

PURPOSE

To evaluate the Alvarado score as a means to reduce referrals to CT when ultrasound fails to visualize the appendix but is otherwise normal.

METHOD AND MATERIALS

With IRB and HIPAA compliance, 1241 consecutive appendiceal sonograms for suspected appendicitis were reviewed to yield 247 patients whose studies did not visualize the appendix but were otherwise normal and had CT within 48 hours. Of the 247 patients, 86 had Alvarado scores of 3 or less.

RESULTS

The incidence of appendicitis was 15.4% (38/247) for all 247 patients but less among the 86 with Alvarado scores of 3 or less, whether considering all 86 (2/86, 2.3%; $p=0.001$), females (0/59, 0%; P

CONCLUSION

Patients with non-visualization of the appendix and an Alvarado score of 3 or less are at particularly low risk for acute appendicitis and low risk for disorders requiring emergent surgery. Active clinical observation should be considered for them rather than direct referral to CT.

CLINICAL RELEVANCE/APPLICATION

Patients with non-visualization of the appendix but an otherwise normal ultrasound and an Alvarado score of 3 or less should be considered for active clinical observation rather than direct CT.

SSQ05-04 • Diagnosing Acute Appendicitis Using a Non-oral Contrast CT Protocol in Patients with a BMI of Less than 25

Vijay Ramalingam MD (Presenter) ; **Jennifer W Uyeda** MD ; **David D Bates** MD ; **Kathy Zhao** ; **Marisa Roberts** ; **Lindsey**

Storer ; Jorge A Soto MD * ; Stephan W Anderson MD

PURPOSE

Evaluate the diagnostic accuracy and repeat CT scan rate for the diagnosis of appendicitis after the implementation of a non-oral contrast protocol in the Emergency Department setting in patients with a BMI of less than 25.

METHOD AND MATERIALS

This IRB approved study included 736 adult patients with a BMI of less than 25 over two 6 month time periods (August 2012- January 2013 and June 2008- November 2008) presenting to the ED with acute abdominal pain and a clinical suspicion of acute appendicitis. The earlier cohort underwent CT imaging with oral and intravenous contrast, per departmental protocol. The later cohort was imaged solely with intravenous contrast, per a modified departmental protocol. The electronic medical record was reviewed, recording the results of imaging reports, clinical outcomes, and surgical pathology results.

RESULTS

A total of 364 patients received a CT scan with the use of oral and intravenous contrast; there were 40 true positive cases of appendicitis and 1 false positive case. The sensitivity, specificity, PPV, and NPV for the diagnosis of appendicitis with both oral and intravenous contrast was 100 %, 99.7 %, 99.6 %, and 100 %, respectively.

A total of 372 patients received the non-oral contrast, positive intravenous contrast protocol; there were 39 true positive cases of appendicitis and 1 false positive case of appendicitis resulting in a sensitivity, specificity, PPV, and NPV of 100 %, 99.7 %, 97.5 %, and 100 %, respectively. One scan was repeated with the use of oral contrast due to inadequate visualization of the appendix which was subsequently found to be negative for appendicitis.

CONCLUSION

Implementation of a non-oral contrast CT protocol in patients with a BMI of less than 25 demonstrates similar accuracy to a positive oral contrast protocol in patients with a BMI of less than 25 for the diagnosis of appendicitis.

CLINICAL RELEVANCE/APPLICATION

As ordering clinicians and emergency departments continue to seek ways to increase throughput, the continuing use of oral contrast in patients with smaller BMIs may no longer be needed.

SSQ05-05 • Improving the Role of CT in Diagnosing Complicated Appendicitis: Are there Occult Signs?

Mustafa Al Sultan MD (Presenter) ; Tarek Hegazi MBBS ; Caroline Reinhold MD, MSc ; Lawrence A Stein MD

PURPOSE

Retrospectively evaluate the accuracy of focal appendiceal wall enhancing defect and intra-luminal gas in predicting gangrenous and / or perforated appendicitis when not apparent on imaging in relation to surgical and pathological results.

METHOD AND MATERIALS

Patients with surgical / pathology-proven appendicitis who underwent preoperative IV contrast CT within 24 hours of surgical intervention over a 4-year period (n=187) were retrospectively reviewed. Variable clinical data and length of admission for each patient were also assessed. Two radiologists who were blinded from the clinical data and final surgical / pathology results assessed each scan for: diameter of appendix, intra- and extra-luminal appendicolith, intra- and extra-luminal gas, phlegmon, abscess, and focal enhancing wall defect. The results were compared against surgical and pathology findings and divided into 3 groups (perforated, gangrenous and simple). The perforated group was subsequently divided into 2 subgroups whether there was presence or absence of classic CT findings of perforated hollow viscus (i.e either / or abscess, extra-luminal gas, or extra-luminal appendicolith). Statistical significance, sensitivity and specificity for each finding were calculated. Interobserver agreement using kappa index was used for focal enhancing wall defect.

RESULTS

Simple, gangrenous and perforated appendicitis were present in 65.8%, 16% and 18.2% of the study cohort respectively. There was a good interobserver agreement (kappa = 0.78) for focal wall enhancing defect. Sensitivity and specificity of focal wall defect for diagnosing perforated appendicitis was 81.8% and 92.8% respectively, PPV = 71.0%, NPV = 95.9%. Sensitivity and specificity for Intraluminal gas was 45.3 % and 91.1% respectively, PPV = 72.5%, NPV = 76.2%.

CONCLUSION

'Classic CT signs' have been well-documented for diagnosis of perforated appendicitis, however, recognition of occult signs, as focal enhancing wall defect or intra-luminal gas in otherwise uncomplicated appendicitis at imaging increases suspicion of suggesting a perforated or gangrenous acute appendicitis.

CLINICAL RELEVANCE/APPLICATION

Focal wall defect and intra-luminal gas add more sensitive interpretation value in the diagnosis of image-occult complicated appendicitis and is recommended in routine evaluation of these cases

SSQ05-06 • Low-tube-voltage High-pitch Dual-source Computed Tomography with Sonogram Affirmed Iterative Reconstruction Algorithm of the Abdomen and Pelvis: Initial Clinical Experience

Hao Sun MD (Presenter) ; Huadan Xue MD ; Zhengyu Jin MD ; Xuan Wang MD ; Yu Chen MD ; Yonglan He MD

PURPOSE

To investigate the image quality, radiation dose and diagnostic performance of the low-tube-voltage high-pitch dual- source computer tomography (DSCT) with sonogram affirmed iterative reconstruction (SAFIRE) for routine abdominal and pelvic scans.

METHOD AND MATERIALS

This institutional review board-approved prospective study included 64 patients who gave written informed consent for acquisition of additional abdominal and pelvic images on DSCT. The patients underwent standard CT scans (protocol 1) (tube voltage of 120kVp/pitch of 0.9/filter back projection [FBP] reconstruction) followed by high-pitch CT scans (protocol 2) (100kVp/3.0/SAFIRE). The total scan time, mean CT number, signal to noise ratio (SNR), image quality, lesion detectability and radiation dose were compared between two protocols.

RESULTS

The total scan time of protocol 2 was less than that of protocol 1 (P0.05). SNR on images of protocol 2 was higher than that of protocol 1 (all P

CONCLUSION

The high-pitch DSCT with SAFIRE can reduce scan time and radiation dose while preserving image quality in abdominal and pelvic scans.

CLINICAL RELEVANCE/APPLICATION

The low-tube-voltage high-pitch DSCT with SAFIRE preserves good image quality, less scan time and radiation dose in routine abdominal and pelvic scans, especially useful in emergent patients.

SSQ05-07 • Simple or Solid? Prospective Clinical Evaluation of Iterative Reconstruction Using Dual-source Single-detector Reconstruction to Compare Renal Cyst Density on 50% Dose Images

Kristy Lee MD (Presenter) ; Patrick McLaughlin FFRCSI ; Rekha Raju ; Shamir Rai BSc ; Sarah A Barrett MBBCh ; Charlotte J Yong-Hing MD, FRCPC ; Alison C Harris MBChB ; John R Mayo MD * ; Savvas Nicolaou MD

PURPOSE

Many studies now demonstrate the utility of iterative reconstruction (IR) algorithms to generate acceptable abdominal CT images at lower

radiation exposures than filtered back projection (FBP). In comparison there is a clear deficiency robust clinical studies examining the changes in appearance, density and conspicuity of pathology on low dose CT reconstructed with FBP and IR. The purpose of this study was to determine if the internal characteristics of renal hypodensities differed between 100% and 50% dose images generated using a dual source imaging protocol using FBP and IR.

METHOD AND MATERIALS

81 consecutive patients underwent contrast enhanced CT abdomen using a dual source 128-slice CT system (Definition FLASH; Siemens Healthcare, Germany). RAW data from detector A of the dual source (A+B) datasets was reconstructed to yield half dose images (AP50) using a validated technique. All images were reconstructed using FBP and a raw data based IR algorithm (SAFIRE). The size and mean Hounsfield unit (HU) of renal hypodensities measuring greater than 1 cm was recorded on AP100-FBP, AP100-IR, AP50FBP and AP100-IR datasets. Hypodensities >20 HU were classified as solid and those between -20 HU and 20 HU was considered simple. AP100-IR images were chosen as the reference standard for the purposes of sensitivity and specificity analysis.

RESULTS

CONCLUSION

When compared to our chosen reference standard, 50% dose images reconstructed with FBP showed superior sensitivity and specificity to those reconstructed with IR for the correct classification of renal hypodensities.

CLINICAL RELEVANCE/APPLICATION

Approximately 20% of renal hypodensities are mischaracterized on the half dose images

SSQ05-08 • Frequency of Previously Reported Ovarian Torsion Findings on Both Ultrasound and Computed Tomography

Radiav W Swenson MD (Presenter) ; Ana P Lourenco MD ; David J Grand MD

PURPOSE

Evaluate the frequency of imaging findings for ovarian torsion on ultrasound (US) and computed tomography (CT) studies performed in the emergency department (ED).

METHOD AND MATERIALS

20 adult females with surgically proven ovarian torsion underwent both pelvic US and CT between 3/1/2006 and 5/31/2010. Two radiologists reviewed all US and CT studies in consensus, measuring each torsed ovary in 3 axes, and grading each study for the presence or absence of the following previously described findings of torsion: (1) ovarian width >5cm, (2) ovarian volume > 20 mL, (3) ovarian stromal edema or marked heterogeneity, (4) numerous small peripheral follicles, (5) a twisted vascular pedicle or swirl sign, (6) small free fluid in the pelvis, (7) abnormal Doppler waveforms (US only), (8) para-ovarian fatty stranding (CT only), and (9) uterine deviation toward the torsed ovary.

RESULTS

Of the 20 torsed ovaries, 55% were on the right and 45% on the left. An underlying mass was identified in 60%. Mean torsed ovarian diameter was 7.4 cm (range, 5.0-20.0 cm). Mean volume was 416 mL (range, 29-1842 mL). Thus 100% of torsed ovaries met previously published size criteria for concern, namely a single measurement >5 cm, and volume > 20 mL. Stromal edema/heterogeneity was identified in 40% of torsed ovaries by US (vs. 60% by CT), peripheral follicles in 40% by US (vs. 5% on CT), a twisted vascular pedicle in 10% by US (vs. 60% on CT), small free fluid in 55% by US (vs 45% on CT), and abnormal Doppler waveforms in 40% by US (vs. NA for CT). Para-ovarian fatty stranding and uterine deviation towards the torsed ovary were each present on 40% of CT studies.

CONCLUSION

An abnormally enlarged ovary is the most common finding of ovarian torsion on both US and CT. While US is often considered the optimal imaging modality for identifying torsion, in our series, CT was equal to or more successful than US in demonstrating most of the previously reported ancillary findings of torsion.

CLINICAL RELEVANCE/APPLICATION

Pelvic US is often described as the best imaging modality for evaluating ovarian torsion, however, CT may provide comparable diagnostic value and may be underappreciated in this regard.

SSQ05-09 • Diagnosing Acute Pancreatitis Using Attenuation Values in Patients with Unexplained Abdominal Pain, Apparently Normal CT Scans and Normal Serum Levels of Pancreatic Enzymes

Mahmood A Al Bahhar MD (Presenter) ; Soumia Senouci ; Puskar Pattanayak MBBS, FRCR ; Caroline Reinhold MD, MSc

PURPOSE

To evaluate the ability of pancreas CT attenuation values to diagnose acute pancreatitis in patients presenting with abdominal pain, normal serum levels of pancreatic enzymes, and no apparent CT scan finding to explain the patients' pain.

METHOD AND MATERIALS

Out of 124 patients reviewed. 31 patients satisfied the inclusion criteria, including documented clinical suspicious of pancreatitis, three folds elevation of pancreatic enzymes and grade A or B pancreatitis by CT scan. Another 31 normal CT scans for trauma were included in the control group. The attenuation values, measured in Hounsfield Units (H.U), of the spleen, aorta, portal vein and head, body and tail of the pancreas were measured in both arterial and portovenous phases for both cases and control groups. The threshold of the pancreatic attenuation and the pancreatic-splenic attenuation ratios for predicting acute pancreatitis were assessed with receiver operating characteristic curve analysis.

RESULTS

In both arterial and portovenous phases, there was statistically significant differences between the cases and control groups in regards to the attenuation values of the head and body of the pancreas. No such difference was seen in the tail. The mean HU of the pancreas was 76.04 HU in cases of pancreatitis, whereas in control cases it was 86.47 HU (p=0.05) ON PV phase. When considering the ratio between the pancreas and the spleen, the mean was 0.77 for patients and 0.88 for controls (p=0.02). A pancreatic-splenic ratio of 0.77 in the portovenous phase has a 76% positive predictive value (PPV) in diagnosing acute pancreatitis with a 85% specificity.

CONCLUSION

Our study demonstrates that when a patient presents with abdominal pain, normal pancreatic enzymes and no CT findings to explain the patient's pain, a pancreatic-splenic attenuation ratio in the portovenous phase of 0.77 has a 76% PPV with a 85% specificity for diagnosis acute pancreatitis. These findings may allow a diagnosis of acute pancreatitis to be made in cases were early clinical and morphological imaging findings are non-diagnostic. This will help explain the cause of abdominal pain in some of patients and reduce the number of negative emergency CT scans.

CLINICAL RELEVANCE/APPLICATION

This finding may allow a diagnosis of acute pancreatitis to be made where early clinical, laboratory and morphological imaging findings are non-diagnostic, which could explain patient's symptoms.

Ultrasound of Superficial Structures (An Interactive Session)

Thursday, 04:30 PM - 06:00 PM • E353B

[Back to Top](#)

RC710 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC710A • Scrotum

Paul S Sidhu MRCP, FRCR (Presenter) *

LEARNING OBJECTIVES

1) To recognize the various intra- and extra testicular lesions seen on a sonographic examination. 2) To understand the variety of predominantly benign extra-testicular lesions seen in adult men. 3) To recognize the variety of intra-testicular lesions seen and to understand the malignant composition of the majority of these lesions. 4) To understand the role of sonography in acute scrotal pain. 5) To understand the role of application of color Doppler to the examination. 6) To appreciate the possible role of the new imaging techniques of contrast-enhanced sonography and tissue elastography.

ABSTRACT

Ultrasonography remains the ideal imaging method for examining the scrotal contents, with high inherent resolution of the technique and the superficial position of the scrotal contents helping. Any abnormalities present may be divided into extra- and intra-testicular lesions; the majority of lesions outside the testis in the adult likely to be benign and the majority within the testes likely to be malignant; in the pediatric population an extra-testicular lesion may be malignant; a rhabdomyosarcoma likely. The assessment of the extra-testicular space will identify cysts (spermatoceles) hydroceles, varicoceles and the solid tumors of adenomatoid or lipoma origin. Within the testes the focal lesion is likely a primary germ cell tumor; seminoma or a mixed germ cell tumor of different cell lines. Rarely a benign entity may be encountered; epidermoid cyst, segmental infarction or a Leydig cell tumor. The differentiation of malignant from benign may be dependent on the presence of vascularity on color Doppler sonography. Rare intra-testicular lesions such as sarcoidosis or adrenal rest cells may cause difficulty. The presentation with acute testicular pain may be problematic but age is important; a pubescent boy may have spermatic cord torsion, the older man inflammatory disease. Color Doppler sonography may help in the differentiation but beware the sonographic diagnosis of torsion; this is essentially a clinical diagnosis. The presence of testicular microlithiasis has associated risk factors, and sonographic surveillance is controversial. Macrocalcification may also have implications for the patient. The issue of testicular sparing surgery for benign disease may be realized with the advent of the newer techniques. Contrast-enhanced sonography confirming the absence of vascularity indicating the lesion is benign and tissue elastography confirms the lesion is hard indicating malignancy.

RC710B • Thyroid

Jill E Langer MD (Presenter) *

LEARNING OBJECTIVES

1) Recognize the sonographic features of thyroid nodules that are most predictive of malignant nodules. 2) Recognize the sonographic features of thyroid nodules that are most predictive of benign nodules. 3) Discuss different recommendations and indications for performing FNA of thyroid nodules.

ABSTRACT

Thyroid nodules are commonly noted in the thyroid gland of adults when examined by sonography. The sonographic features of thyroid nodules have been recognized to be the most important feature of thyroid nodule assessment with respect to the risk of malignancy. The optimal management of an incidentally-detected thyroid nodule depends on a working knowledge of which sonographic features raise suspicion for malignancy as contrasted which those features present in the much more common, benign nodule. This talk will review those sonographic features as well as discuss the rationale for the recommendations from both the Endocrinology and the Radiology literature concerning which nodules should undergo fine-needle aspiration (FNA).

RC710C • Lumps, Bumps, and Hernias

Gandikota Girish MBBS (Presenter)

LEARNING OBJECTIVES

1) Understanding the sonographic appearance of lipomas in the subcutaneous tissues. 2) Differentiating lipomas from liposarcomas. 3) Understanding some of the common pitfalls when using sonography to evaluate patients for inguinal hernias.

ABSTRACT

Sonography is a useful tool for evaluating superficial lumps and bumps in the adult patient. Lipomas are one of the more common superficial lumps, and sonographic evaluation can demonstrate compressibility, vascularity, homogeneity and overall appearances similar to adjacent adipose tissue. However a clinical history of the presence of pain, a recent increase in size and a sonographic finding of a soft tissue component may suggest a more aggressive etiology. Inguinal hernias are a common clinical condition which may present with inguinal discomfort, and Ultrasound is a useful means for making a definite diagnosis. However, there are a number of concepts which help the practitioner maximize the utility of the technique, including understanding the keyhole effect, treating the inguinal canal as a vessel, understanding the relationship between the deep ring and the inferior epigastric artery, and being aware of the 'thin man' pitfall and the normal movement of the spermatic cord, to name a few.

Ultrasound/Opto-Acoustic Molecular Imaging

Thursday, 04:30 PM - 06:00 PM • S504CD

RC717 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Moderator

Juergen K Willmann, MD *

LEARNING OBJECTIVES

In this course, attendees will learn the principles and applications of molecular imaging using ultrasound and photoacoustic imaging techniques. In the first part, principles and applications of ultrasound molecular imaging will be reviewed. In the second part, principles and applications of molecular imaging using photoacoustic imaging techniques will be presented. In the third part, ultrasound guided drug delivery approaches will be reviewed. 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.

RC717A • Photoacoustic Imaging

Stanislav Emelianov PhD (Presenter) *

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 analyzed. 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.

RC717B • Ultrasound Molecular Imaging

Juergen K Willmann MD (Presenter) *

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.

RC717C • Sonographically-guided Drug Therapy

Alexander L Klibanov PhD (Presenter) *

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.

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

Thursday, 04:30 PM - 06:00 PM • E264

US IR

[Back to Top](#)

RC752 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Andrew J Rabe, DO
William E Shiels, DO *
Howard T Harcke, MD
Veronica J Rooks, MD
John M Racadio, MD *
John D Lane, MD
Corrie M Yablon, MD
James S Donaldson, MD
Linda J Warren, MD
Hisham A Tchelepi, MD
Neil T Specht, MD
Mahesh M Thapa, MD
Kristin M Dittmar, MD
Nicholas A Zumberge, MD *
James W Murakami, MD
Neil D Johnson, MD *
Stephen C O'Connor, MD

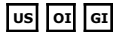
LEARNING OBJECTIVES

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

Right Upper Quadrant Ultrasound

Friday, 08:30 AM - 10:00 AM • E351



[Back to Top](#)

RC810 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

RC810A • Sonography of Focal Liver Lesions

Mitchell E Tublin MD (Presenter)

LEARNING OBJECTIVES

1) Describe a practical approach for the characterization of liver lesions at ultrasound. 2) Illustrate useful imaging features of typical and atypical hemangiomas. 3) Demonstrate the potential use of ultrasound contrast agents for liver mass characterization.

ABSTRACT

Despite improvements in ultrasound technology, the approach to characterization of liver lesions at ultrasound has changed little over the past thirty years. A recommendation for further evaluation by either MRI or CECT is typically given, though in many cases, the ultrasound features (in combination with clinical history) are sufficient for diagnosis. Microbubble contrast agents may improve ultrasound diagnostic specificity in the near future.

RC810B • Liver Elastography

Thomas H Grant DO (Presenter)

LEARNING OBJECTIVES

1) What are these techniques. 2) When should they be used. 3) How effective are they. 4) Future innovations.

ABSTRACT

Noninvasive assessment of liver fibrosis is challenging given that chronic liver disease affects hundreds of million patients worldwide. Fibrosis is reversible with effective intervention. Therefore an effective, relatively fast method to detect fibrosis is essential.

RC810C • Gallbladder and Biliary Disease

Anthony E Hanbidge MBBCh (Presenter)

LEARNING OBJECTIVES

1) Discuss the value of ultrasound when evaluating the gallbladder and bile ducts. 2) Identify the imaging features of acute conditions of these structures and complications. 3) Recognize common pitfalls to avoid misinterpretation. 4) Describe other conditions of the gallbladder and bile ducts including adenomyomatosis, sclerosing cholangitis, gallbladder cancer and cholangiocarcinoma.

Quantitative Imaging: Quantitative Imaging in Ultrasound

Friday, 08:30 AM - 10:00 AM • E263



[Back to Top](#)

RC825 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Director

Michael F McNitt-Gray, PhD *

RC825A • Elasticity and Backscatter Related Measures

Timothy J Hall PhD (Presenter) *

LEARNING OBJECTIVES

1) Describe the various approaches and history of Quantitative Ultrasound. 2) Understand the difference in system-dependent and system-independent backscatter parameters. 3) Understand the benefits of system-independent backscatter parameters. 4) Describe the state of the art in elasticity imaging and quantitative ultrasound from backscattered echoes.

ABSTRACT

There is a long history of attempts to use the backscattered echo signals from medical ultrasound to describe disease conditions of various tissue types. For example, from the initial application of ultrasound in breasts, the investigators attempted to differentiate benign from malignant disease based on characteristics of the echo signals. Along the way, there have been substantial successes. For example, it was only 30yrs ago that we debated how to estimate blood flow based on ultrasound echo signals and how to interpret that data. Just over 20yrs ago we began to display flow dynamics with color flow imaging. More recently, elasticity imaging methods, which also began in the tissue characterization or quantitative ultrasound community, have become commercially viable products with clear diagnostic potential. These were tissue characterization methods in their early days. Now they are recognized as specific procedures with quantifiable diagnostic merit. Numerous other quantitative ultrasound (QUS) methods have been proposed, developed, tested and have demonstrated varying degrees of success. Many of these methods are still under development. This presentation will discuss quantitative ultrasound methods based on backscattered echo signals focusing on the most recent techniques that are either commercially available or that show the greatest potential as diagnostic tools.

RC825B • Volume Flow and Measures From Contrast Agents

Oliver D Kripfgans (Presenter) *

LEARNING OBJECTIVES

1) Understand the pitfalls of ultrasound based blood flow acquisition, analysis, and interpretation. 2) Become familiar with current approaches of quantitative estimation of blood flow and learn how to minimize associated errors. 3) Obtain an overview of current commercial ultrasound contrast agents as well as their availability in the US. 4) Learn about contrast agent enhanced measurements in a clinical setting.

ABSTRACT

Clinical ultrasound scanners typically offer three methods of blood flow acquisition, namely pulse wave, color flow and power Doppler. While real-time blood flow visualization is one of the perks of ultrasound, standardized quantitative methods are still unavailable to the radiologist. Pulse wave offers volumetric flow computation based on assumptions that are often violated. Color flow has never been directly quantitative as no angle correction can be dialed-in. The advent of 2D ultrasound arrays (electronic or mechanically swept) has enabled color flow and power Doppler acquisition in the coronal plane thus yielding Doppler angle as well as geometry independent flow

information for direct quantification of in situ real-time volumetric flow. Ultrasound contrast agents have been approved for many clinical applications in Europe, Asia and Canada. The FDA has limited the use of ultrasound contrast agents in the US and essentially only cleared ultrasound contrast agents for cardiac applications. However, off-label application is practiced in the US. Its extend and benefits will be discussed in this course along with current approaches for ultrasound contrast agents based clinical measurements.

URL's
www.ultrasound.med.umich.edu/ODK/RSNA2012

RC825C • Ultrasound Measurements and FDA Criteria for Display of New Quantitative Measures

Brian S Garra MD (Presenter)

LEARNING OBJECTIVES

1) Review the main types of quantification of Ultrasound images. 2) Review some recent examples exploring sources of error in ultrasound morphometric quantification. 3) Summarize new ultrasound based parameters that might be displayed. 4) Discuss the formation of the Ultrasound QIBA Technical Committee and its objectives. 5) Review recent changes in FDA policy regarding display of quantitative features on ultrasound images.

ABSTRACT

Ultrasound images are probably the most frequently measured images and extensive literature on a wide variety of ultrasound image measurements exists going back to the 1960's. Most morphometric and Doppler measurements are well documented and are at a mature stage. Automated measurements of volume and structures such as arterial intimal medial thickness are also finding increasing clinical application but each method of image segmentation and quantification has its own characteristic problems and sources of error. Some newer measurements including measurement of tissue strain (elastography) and strain rate and one of the newest, shear wave speed, are the subject of considerable research activity and the sources of error and bias are just now being identified and quantified. The RSNA Quantitative Imaging Biomarker Alliance (QIBA) has recently undertaken the task of developing standardized protocols for measurement of ultrasound related parameters. The first project of the US QIBA technical committee is to develop a profile for measurement of shear wave speed in tissue using ultrasound. The FDA has long allowed many types of measurements to be displayed as part of the ultrasound image. A demonstration of reasonable accuracy and precision important for obtaining clearance to display a new measurement. Display of measurement accuracy may also be required and users should be informed of situations where the measurement may be inaccurate. The efforts of the QIBA may provide data that in the future will help to speed up FDA clearance for display of new types of measurements.

US for Thyroid Cancer: Diagnosis, Surveillance, and Treatment (How-to Workshop)

Friday, 08:30 AM - 10:00 AM • E450B

[US](#) [OI](#) [NR](#) [HN](#)

[Back to Top](#)

RC831 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Jill E Langer, MD *
Kathryn A Robinson, MD
Sheila Sheth, MD *

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 thyroidectomy 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.

Pediatric Neurosonography Update: Head, Spine, and Transcranial Doppler Ultrasound (How-to Workshop)

Friday, 08:30 AM - 10:00 AM • E261

[PD](#) [US](#) [NR](#)

[Back to Top](#)

RC851 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

M. Beth McCarville, MD *
Geetika Khanna, MD,MS
Kristin A Fickenschler, MD

LEARNING OBJECTIVES

1) Describe advances in neurosonography that can be applied on a local level to improve daily practice of neonatal neurosonography. 2) Review indications for neonatal spine sonography, identify normal variants/pitfalls that can simulate disease, and recognise the sonographic features of spinal anomalies. 3) Review the role of transcranial Doppler ultrasound with imaging (duplex) and without imaging (non-duplex), in assigning stroke risk to children with sickle cell disease.

ABSTRACT

URL's
<http://www.umkcradres.org/education/peds/neuro/index.htm>

US-guided Interventional Breast Procedures (Hands-on Workshop)

Friday, 08:30 AM - 10:00 AM • E264

[US](#) [BR](#)

[Back to Top](#)

RC852 • AMA PRA Category 1 Credit™:1.5 • ARRT Category A+ Credit:1.5

Jocelyn A Rapelyea, MD
Priscilla J Slanetz, MD, MPH *
Shambhavi Venkataraman, MD

Liane E Philpotts , MD *
Ermelinda Bonaccio , MD
Stephen J Seiler , MD
Bruno D Fornage , MD
Rachel F Brem , MD *
William R Poller , MD *
Margaret M Szabunio , MD

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

Disclosure Index

A

Andre, M. P. - Research Consultant, Almen Laboratories, Inc

B

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Berg, W. A. - Consultant, Naviscan, Inc
Binkert, C. A. - Consultant, Merit Medical Systems, Inc Consultant, Johnson & Johnson
Brandon, C. J. - Stock options, VuCOMP, Inc
Brem, R. F. - 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
Brook, A. - Spouse, Research Grant, Guerbet SA
Butts Pauly, K. R. - Research Grant, General Electric Company Research Grant, InSightec Ltd

C

Carson, P. L. - Research collaboration, General Electric Company Research collaboration, Sonetics Ultrasound, Inc Research collaboration, ZONARE Medical Systems, Inc Research collaboration, Light Age, Inc
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