EDE006-b
Genitourinary Case of the Day

Education Exhibits
Location: NA

Participants
Moderator
Frederico Ferreira Souza MD: Nothing to Disclose
Corey Seth Orton MD: Nothing to Disclose
Timothy James Ragland MD: Nothing to Disclose
Katherine Leigh Ragland MD: Nothing to Disclose
Keith Perry Russell MD: Nothing to Disclose
Cyrillo Rodrigues Araujo MD: Nothing to Disclose
Scott A Prechter MD, Pharm D: Nothing to Disclose

Corey Seth Orton MD:
Research Grant, Pfizer Inc President, Radiostics LLC President, Liver Nodularity LLC President, Color Enhanced Detection LLC President, Color Enhanced Detection LLC Pending patent, Radiostics LLC Pending patent, Liver Nodularity LLC Pending patent, Color Enhanced Detection LLC

Manohar Roda MD: Nothing to Disclose
Erik Daniel Weiss MD: Nothing to Disclose

Andrew Dennis Smith MD, PhD: Research Grant, Pfizer Inc President, Radiostics LLC President, Liver Nodularity LLC President, Color Enhanced Detection LLC Pending patent, Radiostics LLC Pending patent, Liver Nodularity LLC Pending patent, Color Enhanced Detection LLC

MSE107
Blast from the Past: Multimodality Imaging of Small Cell Carcinoma from Head to Toe

Education Exhibits
Location: MS Community, Learning Center

Participants
Tatiana Kelil MD (Presenter): Nothing to Disclose
Sreeharsha Tirumani MBBS, MD: Nothing to Disclose
Michael Hayden Rosenthal MD, PhD: Nothing to Disclose
Nikhil H. Ramaiya MD: Nothing to Disclose
Monica J. Wood BS: Nothing to Disclose
Stephanie A. Howard MD: Nothing to Disclose

TEACHING POINTS
1. The revised 2010 WHO classification of neuroendocrine tumors (NET) classifies small cell carcinoma (SCC) as grade 3 neuroendocrine carcinoma based on mitotic count and proliferation index. 2. SCC most commonly occurs in the lung and uncommonly in extrapulmonary sites (2-5%). 3. Extrapulmonary SCC most commonly occurs in GI (particularly esophagus) and GU (particularly cervix and bladder) tracts. 4. SCC is characterized by mutations in p53, loss of retinoblastoma gene (RB1) and telomerase function and activation of c-KIT, MYC and PARP1. 5. SCC of the lung has striking early response to chemoradiation with high relapse rates and unusual metastasis. 6. Relapsed SCC is extremely difficult to treat, though some respond to temozolomide, particularly in the setting of brain metastases. 7. Novel molecular targeted therapies (MTTs) in SCC include Aurora kinase (MYC) and PARP inhibitors.

MSE109
BRCA Associated Tumors—Not Just Breast and Ovarian Cancer

Education Exhibits
Location: MS Community, Learning Center

Participants
Aparna Balachandran MD (Presenter): Nothing to Disclose
Priya Ranjit Bhosale MD: Nothing to Disclose
Ajaykumar Chandralal Morani MD: Nothing to Disclose
Tara Lynn Sagebiel MD: Nothing to Disclose
Catherine Ellen Devine MD: Nothing to Disclose
Christine G. Menias MD: Nothing to Disclose
Vikas Kundra MD, PhD: License agreement, Introgen Therapeutics Inc

TEACHING POINTS
The proteins encoded by BRCA genes are tumor suppressors involved in DNA damage repair. With mutations of the BRCA gene, the ability to repair DNA damage is impaired, which can result in tumor development. Although breast and ovarian cancer are classically thought to be associated with BRCA mutations, other tumors may also contain such mutations like pancreatic,
prostate and peritoneal cancer. Knowledge of BRCA mutations have started to affect approaches to treatment strategies.

In this exhibit, we will discuss and demonstrate
1. BRCA genes and their function.
2. Epidemiology and the radiographic appearance of tumors such as breast, ovarian, prostate and pancreatic cancer, which can be seen in the setting of BRCA mutations.

**TABLE OF CONTENTS/OUTLINE**

1. BRCA gene product function and genetic testing
2. Epidemiology
3. Tumors associated with BRCA mutations
   a. Breast cancer
   b. Ovarian cancer
   c. Pancreatic cancer
   d. Fallopian tube cancer
   e. Peritoneal cancer
   f. Prostate cancer
4. Emerging therapy strategies in BRCA mutations

**URE001-b**

**From Seeds to Sequences: A Step by Step Approach to Magnetic Resonance (MR) Treatment Planning for Radiotherapy (RT) in Prostatic Carcinoma**

**Education Exhibits**

**Location:** NA

**Participants**

Christopher Lim MD : Nothing to Disclose  
Leonard Avruch MD : Nothing to Disclose  
Shawn C Malone MD : Nothing to Disclose  
Nicola Schieda MD (Presenter): Nothing to Disclose

**TEACHING POINTS**

After viewing this exhibit, the viewer will understand:

a) different RT methods to treat prostatic carcinoma,  
b) the importance of MR for RT treatment planning and,  
c) how to optimize treatment planning studies.

**TABLE OF CONTENTS/OUTLINE**

1. Review RT methods in prostate cancer including: brachytherapy and image guided (intensity modulated, stereotactic radiosurgery, proton) RT (IGRT) techniques.  
2. Review advantages of MR for depiction of regional anatomy discussing anatomic pulse sequences including 2D and 3D Fast Spin Echo.  
3. Discuss the role of primary tumor localization with multi-parametric MR to boost areas of dominant tumor potentially improve outcomes.  
4. Review types of implanted devices, discussing the advantage of using platinum (rather than gold) fiducials for planning of IGRT.  
5. Review available pulse sequences and introduce the novel application of multi-echo gradient recalled echo for improved localization of seeds and fiducial markers facilitating RT planning.

**URE003-b**

**All that Glitters Is Not Gold: Multi-parametric (mp) MRI – Pathologic Correlation in False Positive Cases of Prostate Cancer Diagnosed in the Setting of Active Surveillance and Rising PSA with Negative Biopsy**

**Education Exhibits**

**Location:** NA

**Participants**

Jeffrey Quon MD : Nothing to Disclose  
Trevor A. Flood MD, FRCPC : Nothing to Disclose  
Nicola Schieda MD (Presenter): Nothing to Disclose

**TEACHING POINTS**

After viewing this exhibit, the viewer will:

a) appreciate common causes of false positive diagnoses at mp-MRI of the prostate and their histologic correlates,  
b) understand helpful imaging features to avoid these pitfalls of interpretation in active surveillance patients and those with negative biopsies and rising PSA.

**TABLE OF CONTENTS/OUTLINE**

1. Review normal anatomic structures that can mimic prostate cancer at mp-MRI including the "central zone" and the anterior fibromuscular stroma.  
2. Briefly review the concept of mp-MRI and recently proposed MR scoring systems, discussing the importance of diffusion weighted imaging (DWI) and dynamic contrast enhancement (DCE).  
3. Demonstrate how DCE is a source of false positive diagnoses in glandular benign prostatic hyperplasia (BPH), illustrate the importance of T2W and DWI for evaluation of glandular BPH.  
4. Discuss the concept of "T2 blackhole effect" on DWI and how low T2 signal intensity structures can mimic tumor on apparent diffusion coefficient (ADC) map and the importance of the trace echo-planar images.  
5. Demonstrate examples of stromal BPH mimicking cancer and helpful differentiating features at mp-MRI.  
6. Demonstrate examples of both acute (bacterial and granulomatous) and chronic prostatitis mimicking cancer at mp-MRI.

**URE004-b**

**Focally Targeted Magnetic Resonance Imaging Guided Transrectal Ultrasound Biopsy of the Prostate with an Ultrasound Machine That Has Electromagnetic Tracking Fusion**

**Education Exhibits**

**Location:** NA

**Participants**

Wendy Van De Ven MSc : Nothing to Disclose  
Michiel Sedelaar MD, PhD : Nothing to Disclose  
Jurgen J. Futterer MD, PhD : Nothing to Disclose  
Henkjan Huisman PhD (Presenter): Stockholder, QView Medical, Inc
TEACHING POINTS

Focally targeted magnetic resonance imaging (MRI) guided trans rectal ultrasound (TRUS) biopsy of the prostate with a commercially available ultrasound machine that has electromagnetic tracking (EM) fusion:

1. is less accurate than MR guided biopsy, but non-inferior for targets larger than 9 mm,
2. can optimize accuracy using focal landmarks near the target location,
3. can be performed within 10 minutes.

TABLE OF CONTENTS/OUTLINE

Prostate anatomy deformation differs between MRI and TRUS. EM tracking, rigid fusion cannot compensate for this, resulting in a low overall fusion accuracy. Focal structures are visible in both MR and TRUS, when used landmarks, they can enhance accuracy near the target.

Prostate cancer lesions are often heterogenous. The most aggressive part of the lesion should be targeted. MRI can localize these aggressive areas. T2w MRI is sent to the US machine that can synchronously visualize it with the live ultrasound. Using fusion landmarks near the target the biopsy accuracy can be optimized.

We are currently evaluating this MR-TRUS biopsy method in comparison to MR guided biopsy. We include targets larger than 9 mm. The procedure has been successfully performed in 5 patients. This cost-effective biopsy method seems non-inferior to MR guided biopsy for targets of sufficient size.

URE005-b

Probing the Adrenals: Ultrasound Evaluation of Adrenal Masses

Education Exhibits
Location: NA

Participants
Akshya Gupta MD (Presenter): Nothing to Disclose
Joel P. Thompson MD : Nothing to Disclose
Shweta Bhatt MD, MBBS : Nothing to Disclose

TEACHING POINTS

1. Review sonographic findings of adrenal masses with CT and MRI correlation when possible. 2. Review the key imaging and clinical findings required in forming a differential diagnosis. 3. Illustrate the role of ultrasound in evaluating adrenal masses.

TABLE OF CONTENTS/OUTLINE

Introduction Review the normal adrenal appearance on ultrasound Present a wide range of adrenal pathology focusing on ultrasound imaging characteristics of each lesion. Cases include adenoma, hemorrhage, myelolipoma, metastatic disease including metastatic leiomyosarcoma, phaeochromocytoma, ganglioneuroma, ganglioneuroblastoma, and neuroblastoma. Review the scope of ultrasound as an imaging modality for adrenal masses. Traditionally CT and MRI better characterize adrenal pathology. However with certain imaging characteristics and the appropriate clinical context, ultrasound can be an effective tool even outside the pediatric population.

URE006-b

Don't Take Out That Testes — It's Not a Tumor!

Education Exhibits
Location: NA

Cum Laude

Participants
Akshya Gupta MD (Presenter): Nothing to Disclose
Mary Barrett : Nothing to Disclose
Sachica Cheris : Nothing to Disclose
Bing Ren MD : Nothing to Disclose
Shweta Bhatt MD, MBBS : Nothing to Disclose
Deborah J. Rubens MD : Nothing to Disclose
Vikram Singh Dogra MD : Editor, Reed Elsevier

TEACHING POINTS

Ultrasound remains the modality of choice for initial evaluation of the testes. The purpose of this exhibit is to: 1. Review common and uncommon benign testicular and extra-testicular masses, with emphasis on ultrasound diagnosis, pathologic correlation and clinical presentation. 2. Highlight distinguishing imaging features that guide management decisions including follow-up imaging versus surgical intervention.

TABLE OF CONTENTS/OUTLINE

Introduction Review of normal sonographic testicular anatomy Case presentations include, but are not limited to, adrenal rests, Sertoli and Leydig cell tumors, Leydig cell hyperplasia, leiomyoma, epidermoid cyst, fibrous pseudotumor, sarcoïdosis, incompletely polymorphous, spontaneous testicular hemorrhage, and intratesticular arteriovenous malformation. Radiologic appearance based on pathology will be emphasized. Management recommendations based on ultrasound findings including when patients can be followed conservatively to ensure resolution or stability, as opposed to requiring surgical management due to neoplastic potential will be presented.

URE007-b

Contrast Enhanced Ultrasound in the Scrotum and Penis: How to Do It — What to Expect of It

Education Exhibits
Location: NA
Participants
Demosthenes D. Cokkinos MD (Presenter): Nothing to Disclose
Eleftheria Antypa: Nothing to Disclose
Maria G. Skilakaki MD: Nothing to Disclose
Popy Ioannidi MD: Nothing to Disclose
Stavroula Athanasopoulou: Nothing to Disclose
Ploutarhos A Piperopoulos MD, PhD: Nothing to Disclose

TEACHING POINTS
Principles, indications, technique, safety and limitations for performing Contrast Enhanced Ultrasound (CEUS) in the scrotum and penis. Images of CEUS examinations with abnormal findings in the scrotum and penis in comparison to baseline non-enhanced US.

TABLE OF CONTENTS/OUTLINE
Review of basic principles and physics of US contrast agents. Tips on drug preparation and machine settings in order to perform a CEUS examination. Review of the commonest CEUS indications in the scrotum and penis including infection and abscess, tumours, torsion, trauma and infarct. Comparison between CEUS and baseline non-enhanced US and study of the diagnostic information added post contrast injection. Assessment of the role of CEUS in this field according to current international imaging guidelines.

URE008-b
Sonographic Evaluation of Transplanted Kidney: Things to Check, to Confirm That all is Well — What to Look Out for When It Is Not

Education Exhibits
Location: NA

Participants
Demosthenes D. Cokkinos MD (Presenter): Nothing to Disclose
Eleftheria Antypa: Nothing to Disclose
Panagiotis Tserotas MD: Nothing to Disclose
Evangelos Baltas MD: Nothing to Disclose
Dimitrios Exarchos MD: Nothing to Disclose
Ploutarhos A Piperopoulos MD, PhD: Nothing to Disclose

TEACHING POINTS
To set an ultrasound (US) examination standard protocol for examining transplant kidneys in various periods after the operation. To recognise normal transplant kidney findings on B-mode, Colour and Spectral Doppler US. To assess the use of US contrast agents. To identify common post-transplantation complications.

TABLE OF CONTENTS/OUTLINE
Different chapters of the presentation include:
Operation technique review
Examination protocol with B-mode, colour-spectral Doppler and US contrast agents
Normal transplant US images (kidney length, cortical thickness, morphology, vascular anastomoses, main/intrarenal arteries waveforms, resistive index, peak systolic velocity).
Common complications images (acute tubular necrosis, acute/chronic rejection, infection, renal artery/vein stenosis or thrombosis, infarction, obstruction, arteriovenous malformations and pseudoaneurysms, fluid collections).
Description of a detailed examination protocol that guarantees inclusion of all parameters that should be evaluated during sonographic examination of transplant kidneys.

URE009-b
Role of Imaging in Active Surveillance of Small Renal Masses: A Systematic Review of the Literature

Education Exhibits
Location: NA

Participants
Megha Nayyar BA (Presenter): Nothing to Disclose
Bhushan Desai MBBS, MS: Nothing to Disclose
Vinay Anant Duddalwar MD, FRCR: Research Grant, General Electric Company

TEACHING POINTS
The objective is to systematically summarize the current literature in the field of active surveillance for small renal masses (SRMs), with focus on the role of imaging (contrast enhanced CT, MRI and Ultrasound) in the primary decision making, subsequent follow-up during active surveillance and future research needs.
1. Summary data generated from this systematic literature review will answer questions related to patient selection and imaging approach and guide us in the design of a larger prospective clinical imaging trial for active surveillance of SRMs.
2. Highlight the limitations of current approach as well as recommendations for creating a cost-effective model for active surveillance of SRMs thus guiding clinical-decision making process.
TABLE OF CONTENTS/OUTLINE

I. Commentary on pre-existing literature reviews and meta-analyses
II. American Urological Association (AUA) guidelines regarding active surveillance of SRMs
III. Evidence Acquisition: Article selection workflow, data extraction procedure and decision tree
IV. Evidence Synthesis: Summarize all the included studies in a narrative form, as well as in summary tables that condense the important features of the study populations, design, imaging modality, and outcomes.
V. Meta-analyses results: using random effects model.

URE010-b
Clinical Challenges and Images of Incidental Renal Masses: How Much Do You Know Regarding Renal Tumors Other than Renal Cell Carcinoma?

Education Exhibits
Location: NA
Certificate of Merit
Selected for RadioGraphics

Participants
Suk Hee Heo MD (Presenter): Nothing to Disclose
Jin Woong Kim MD : Nothing to Disclose
Sang Soo Shin MD : Nothing to Disclose
Hyo Soon Lim MD : Nothing to Disclose
Yong-Soon Jeong MD : Nothing to Disclose
Heoung-Keun Kang MD : Nothing to Disclose

TEACHING POINTS
1. To overview imaging findings of various incidental renal tumors other than renal cell carcinoma (RCC) 2. To illustrate radiologic-pathologic correlation in various incidental renal tumors 3. To discuss differential points to help discriminate between RCC and other renal tumors

TABLE OF CONTENTS/OUTLINE


URE011-b
Unsuspected Urinary Bladder Neoplasms: CT Imaging, Cystoscopic and Pathologic Correlation

Education Exhibits
Location: NA

Participants
Yong-Soo Kim MD, PhD (Presenter): Nothing to Disclose
Tae-Yoon Kim MD : Nothing to Disclose
Seunghun Lee MD : Nothing to Disclose

TEACHING POINTS
1. To review of incidence and pathophysiology of urinary bladder neoplasms 2. To know the unusual urinary bladder neoplasms correlated with pathologic findings

TABLE OF CONTENTS/OUTLINE


URE012-b
What Lurks Beneath? An Update on Submucosal Bladder Lesions with Radiologic-Pathologic Correlation

Education Exhibits
Location: NA

Participants
Andrew Chung MD : Nothing to Disclose
Nicola Schieda MD (Presenter): Nothing to Disclose
Ania Zofia Kielar MD : Nothing to Disclose
Matthew Donald Fernand McInnes MD, FRCPC : Nothing to Disclose
Evan Spencer Siegelman MD : Consultant, BioClinica, Inc Consultant, ICON plc Consultant, ACR Image Metrix
Trevor A. Flood MD, FRCPC : Nothing to Disclose

TEACHING POINTS
After viewing this exhibit, the viewer will understand the normal anatomy and histology of the urinary bladder wall (emphasizing the submucosa) and develop an imaging approach to disease processes which can mimic urothelial lesions arising within the bladder submucosa or from extrinsic sites that secondarily involve the bladder wall.
**URE013-b**

**Dual-energy CT Characterization of Urinary Calculi: Basic Principles, Applications and Limitations**

**Education Exhibits**

**Location:** NA

**Participants**

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<thead>
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<th>Name</th>
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<tbody>
<tr>
<td>Shima Aran MD</td>
<td>Nothing to Disclose</td>
</tr>
<tr>
<td>Khalid Walid Shaqdan</td>
<td>Nothing to Disclose</td>
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<td>Avinash Ranesh</td>
<td>Nothing to Disclose</td>
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<td>Elmira Hassanzadeh MD</td>
<td>Nothing to Disclose</td>
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<tr>
<td>Efren Jesus Flores MD</td>
<td>Nothing to Disclose</td>
</tr>
<tr>
<td>Hani Abujudeh MD</td>
<td>Research Grant, Bracco Group Consultant, RCG HealthCare Consulting Author, Oxford University Press</td>
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**TEACHING POINTS**

Dual-energy CT (DECT) adds many exciting new applications to single-energy MDCT as the imaging modality of choice for detecting renal calculi. DECT allows characterization of renal stone composition which is clinically important as it allows selection of targeted preventive approaches and stone-specific treatment options. Also using DECT, calculi are detectable on nephrographic phase imaging or in contrast-filled collecting systems using the iodine subtraction techniques. Calculation of water content using spectral imaging is useful to diagnose urinary obstruction. We plan to expose radiologists to a series of challenging cases to understand how this unique and clinically relevant modality can facilitate diagnosis and management of renal calculi.

**TABLE OF CONTENTS/OUTLINE**

1. Basic principles of DECT on the basis of photoelectric and Compton interactions as well as material decomposition. 2. Available techniques of DE data acquisition, for example, dual source CT scanners, fast kilovoltage switching and sandwich detector techniques. 3. Image processing and reconstruction of DECT data. 4. Clinical application of DECT for diagnosis and management of renal calculi. 5. Sample cases. 6. Limitations of DECT such as the effects on image quality, and radiation dose.

**URE014-b**

**MRI Findings and Staging of Penile Squamous Cell Carcinoma: A Case-based Review**

**Education Exhibits**

**Location:** NA

**Participants**

<table>
<thead>
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<th>Name</th>
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<tbody>
<tr>
<td>Jeeban-Paul Das MBBS, MRCPI</td>
<td>Nothing to Disclose</td>
</tr>
<tr>
<td>Barry Hutchinson MBCh, MRCS</td>
<td>Nothing to Disclose</td>
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<tr>
<td>Clare Jane Roche MBCh</td>
<td>Nothing to Disclose</td>
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<tr>
<td>Joseph Anthony Sheehan MD, MBA</td>
<td>Nothing to Disclose</td>
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<tr>
<td>Peter A. McCarthy MD</td>
<td>Nothing to Disclose</td>
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**TEACHING POINTS**

Penile neoplasia is a rarely encountered cancer in the developed world. Squamous Cell Carcinoma (SCC) is the most common primary malignancy of the penis accounting for 95% of all such cases. Staging with MRI is the most sensitive method of predicting tumour size and local nodal metastasis. MR imaging can also aid in the planning for surgical resection and assessing for local recurrence. The aims of this exhibit are to: 1. Use a case-based approach to illustrate the MRI findings of penile SCC 2. Outline how MR imaging can assist in the staging of penile SCC.

**TABLE OF CONTENTS/OUTLINE**


**URE015-b**

**Pitfalls in Imaging of Recurrent Retroperitoneal Liposarcoma: Subtle Findings Not to be Missed**

**Education Exhibits**

**Location:** NA

**Participants**

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<th>Name</th>
<th>Disclosures</th>
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<tbody>
<tr>
<td>Sailaja Reddy MBBS, FRCR</td>
<td>Nothing to Disclose</td>
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<tr>
<td>Bella Huasen MBCh, MRCS</td>
<td>Nothing to Disclose</td>
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<td>Ayeshah Nasrullah</td>
<td>Nothing to Disclose</td>
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<td>Alaa Jaly MBBS</td>
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</tr>
<tr>
<td>Ben Taylor MBCh, FCR</td>
<td>Nothing to Disclose</td>
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**TEACHING POINTS**
1. Retroperitoneal liposarcoma recurrence can be extremely subtle; by viewing this exhibit the reader will increase their awareness of early signs of recurrence. It may present as separation of bowel loops, displacement of solid viscera or widening tissue interfaces. 3. Serial computed tomography may show only very slow enlargement of soft tissue nodules or increase in soft tissue stranding which can be missed unless all historic examinations are reviewed. 4. We discuss the common post operative findings, which if stable over the follow up period, are considered to be benign post surgical changes.

**TABLE OF CONTENTS/OUTLINE**

1. Background of retroperitoneal liposarcoma 2. Our experience: We are a large supra regional oncology centre, with extensive experience in the surgical management of retroperitoneal liposarcoma. We present our experience of imaging follow up of 112 cases of retroperitoneal liposarcoma over a 7 year period. 3. Imaging Serial CT is the mainstay of follow up after initial radical surgery, with an aim of early identification of recurrences to allow further curative surgery. We provide examples of subtle recurrences and highlight the teaching points in each case. 4. Summary

**URE100**

Adrenal Gland: Catching the Usual Imaging Features of Unusual and Rare Lesions

*Location: NA*

**Participants**

- Amine Ayed MD (Presenter): Nothing to Disclose
- Cecile Ghander MD: Nothing to Disclose
- Christophe Tresallet PhD: Nothing to Disclose
- Isabelle Huynh-Charlier MD: Nothing to Disclose
- Sophie Egels: Nothing to Disclose
- Frederique Tissier MD: Nothing to Disclose
- Olivier Lucidarme MD: Consultant, Bracco Group Consultant, F. Hoffmann-La Roche Ltd Consultant, Boehringer Ingelheim GmbH

**TEACHING POINTS**

Imaging plays a key role in the diagnosis of adrenal lesions especially in differentiating between benign and malignant conditions. Unusual and rare adrenal lesions are significantly challenging. This exhibit is an overview of a wide spectrum of rare adrenal lesions that can be challenging and will emphasize on the key radiologic features of a wide variety of rare and uncommon adrenal lesions. Upon review of this exhibit, the reader will be able to recognize the typical key radiologic features that characterize those conditions.

**TABLE OF CONTENTS/OUTLINE**

1. Brief review of normal adrenal anatomy 2. Unusual tumorous benign and malignant lesions (including macronodular adrenal hyperplasia, ganglioneuroma, hemangioma, fibrous solitary tumor, rare metastases) 3. Unusual non tumorous lesions (including TB, granulomatosis, cysts, hematomas, congenital adrenal hyperplasia, chronic adrenal insufficiency, adrenal infarction)

**URE101**

Chemical Shift Imaging of the Adrenal Gland: The Key Sequence When Interpreted Correctly

*Location: NA*

- Selected for RadioGraphics

**Participants**

- Sharon Zahava Adam MD (Presenter): Nothing to Disclose
- Paul Nikolaidis MD: Nothing to Disclose
- Jeanne Miriam Horowitz MD: Nothing to Disclose
- Helena Gabriel MD: Nothing to Disclose
- Nancy A. Hammond MD: Nothing to Disclose
- Tanvi Patel MD: Nothing to Disclose
- Vahid Yaghmai MD: Nothing to Disclose
- Frank H. Miller MD: Nothing to Disclose

**TEACHING POINTS**

1. Utility of chemical shift imaging to diagnose typical and atypical adenomas 2. Other unusual lesions will be illustrated and should be considered

**TABLE OF CONTENTS/OUTLINE**


**URE102**

Imaging Characterization of Adrenal and Retroperitoneal Ganglioneuromas with Pathologic Correlation

*Location: NA*
Participants
Sanaz Javadi MD: Nothing to Disclose
Hassan Shawa: Nothing to Disclose
Ajaykumar Chandralal Morani MD: Nothing to Disclose
Mouhammed Amir Habra: Nothing to Disclose
Abdelhameed M Nienaa: Nothing to Disclose
Khaled M. Elsayes MD (Presenter): Nothing to Disclose

TEACHING POINTS
- Review imaging characteristics of adrenal and retroperitoneal Ganglioneuromas.
- Discuss pertinent imaging findings of these tumors, focusing on distinguishing features.
- Correlate cross-sectional imaging of these masses with clinical and pathologic findings.

TABLE OF CONTENTS/OUTLINE
- Introduction
- Imaging techniques
- Imaging characteristics of Ganglioneuromas
- Review of pattern based approach
- Correlate imaging findings with pathologic features

SUMMARY
Ganglioneuroma is a benign and rare entity and represents a diagnostic challenge. Familiarity with imaging characteristics of these tumors helps to increase the index of suspicion for diagnosis. Certain imaging features, associated findings, clinical presentation and laboratory findings may help differentiate these benign lesions from malignant adrenal and retroperitoneal masses. Based on a comprehensive review of 22 pathologically proven cases presented to our institution, we demonstrate the clinical, pathological and imaging features of this uncommon lesion.

URE103
Urachal Anomalies from Cradle to Grave

Education Exhibits
Location: NA

Participants
Terrence Constant Demos MD (Presenter): Nothing to Disclose
Anita Nagamine MD: Nothing to Disclose
Harold Victor Posniak MD: Nothing to Disclose
David Hatch MD: Nothing to Disclose
Richard H. Burke MD: Nothing to Disclose

TEACHING POINTS
- Present incidence, embryology and anatomy of urachus and anomalies
- Illustrate and discuss imaging of patent urachus, umbilico-urachal sinus, urachal cyst and vesico-urachal diverticulum including sonography, CT and MR imaging in the fetus, children and adults
- Discuss current recommendations for treatment and follow up of symptomatic and asymptomatic adults and children with these anomalies.
- Illustrate imaging, and discuss presentation and treatment of complicating infections and neoplasms.

TABLE OF CONTENTS/OUTLINE
- Introduction
- Umbilico-urachal sinus
- Patent urachus
- Urachal cyst
- Vesico-urachal diverticulum
- Infection
- Neoplasms
- Unusual complications
- Conclusion (Presentation and Treatment of each anomaly and complications are discussed in addition to Imaging)

URE104
Beyond Standard CT Urography — Current and Novel Imaging Technologies and Strategies for Reducing Radiation Exposure and Contrast Medium Load

Education Exhibits
Location: NA

Participants
Xiaochao Guo MD (Presenter): Nothing to Disclose
Juan Hu: Nothing to Disclose
Xiaoying Wang MD: Nothing to Disclose
He Wang MD: Research Grant, General Electric Company
Rui Wang PhD: Nothing to Disclose
Kai Zhao MD: Nothing to Disclose
Huihui Wang: Nothing to Disclose

TEACHING POINTS
- To review current imaging technology and its limitations in CT urography
- To illustrate novel imaging technologies for reducing radiation exposure and contrast medium load in CT urography
- To learn optimal strategies using these current and novel technologies by presenting experimental data and clinical images

TABLE OF CONTENTS/OUTLINE
1) Standard imaging technology and its limitations
2) Current and novel imaging technologies
- Single-bolus triple phases (unenhanced, nephrographic and excretory phase)
- Image quality, radiation exposure, contrast medium (CM)
3) Optimal strategies using these technologies

URE105
CT Urography (CTU) Using New CT Technologies: Clinical Advantages of a Proposed Scan and Contrast Injection Protocol

Education Exhibits
Location: NA
Participants

Yukiko Honda MD (Presenter): Nothing to Disclose
Toru Higaki PhD: Nothing to Disclose
Yoko Kachii: Nothing to Disclose
Chihiro Tani MD: Nothing to Disclose
Akira Taniuchi RT: Employee, Toshiba Corporation
Kazuo Awai MD: Research Grant, Toshiba Corporation Research Grant, Hitachi Ltd Research Grant, Bayer AG Research Consultant, DAIICHI SANKYO Group Research Grant, Eisai Co, Ltd
Daisuke Komoto MD: Nothing to Disclose

TEACHING POINTS

We focus on a new CTU method that uses split bolus injection and dual-energy CT (DECT) technology. It facilitates the simultaneous acquisition of nephrographic- and excretory-phase scans and helps to reduce radiation exposure. Applying DECT techniques to split bolus injection allows a further radiation dose reduction at CTU by generating virtual non-enhanced images and save actual non-enhanced scan. Virtual monochromatic CT images generated from DECT can reduce beam hardening artifacts induced by iodinated urine and may help to identify subtle enhancements or small tumors in the ureter wall.

TABLE OF CONTENTS/OUTLINE

1. Current scan- and contrast injection protocol for CTU
2. New technologies for CTU
   a) Dual energy CT (DECT) - Principles of DECT - Utility and limitations of DECT for diagnosing ureter calculi and tumors
   b) Iterative reconstruction (IR) - Principles of IR - Improvement of CTU image quality by IR - Radiation dose reduction at CTU
3. Proposed CTU protocol using new technologies - CTU using split bolus injection and DE technology
4. Future perspective of CTU

URE106

Thickening of the Ureter and/or Renal Pelvis: Spectrum of CT Findings

Education Exhibits

Location: NA

Participants

David Coll MD (Presenter): Nothing to Disclose
C Yanguas: Nothing to Disclose
Anna Soldevila MD: Nothing to Disclose
M. J. Diaz: Nothing to Disclose
O Valencoso: Nothing to Disclose
Josep M Badal: Nothing to Disclose
J Trullas: Nothing to Disclose

TEACHING POINTS

- how to perform CT of the urinary tract
- to identify false causes of ureter and renal pelvis wall thickening
- to illustrate the differences in appearances of ureteral and/or renal pelvis thickening: mucosal or submucosal thickening
- to discuss the different etiologies of ureter and/or renal pelvis thickening correlated with clinical evolution, analytical results or pathology

TABLE OF CONTENTS/OUTLINE

The clinical presentation of the thickening of the ureter and/or the renal pelvis is highly variable. It may be asymptomatic; alternatively it may cause colicky pain or haematuria or it may present clinical and analytical signs of sepsis. Treatment options vary depending on the aetiology which may be A) inflammatory (pyelitis or pyeloureteritis related or not to kidney stones), B) catheter-related or idiopathic; C) infectious (related to tuberculosis or bacterial infection); or D) neoplastic (related to urothelial carcinoma or lymphoma). Knowledge of the different radiological manifestations of the aetiologies of thickening of the ureter and/or renal pelvis is the key to correct diagnosis and to the selection of optimal treatment.

URE107

Urinary Diversion: A MDCT Technical Challenge — How to Establish the Most Accurate Procedure in Order to Assess the Main Post-surgical Complications

Education Exhibits

Location: NA

Participants

Violeta Gonzalez Mendez MD (Presenter): Nothing to Disclose
Alicia Merina MD: Nothing to Disclose
Virginia Navarro Cutillas: Nothing to Disclose
Alberto Arnaiz Martinez MD: Research Consultant, Novartis AG
Elena Martinez Chamorro: Nothing to Disclose

TEACHING POINTS

The main purpose of this study is to describe the best MDCT technique in order to evaluate the various complications found in early and late follow-up of patients who previously underwent urinary diversion.

Other minor goals are to describe the main diversion procedures and to analyze the major complications.

TABLE OF CONTENTS/OUTLINE

Introduction Approach to the three most common types of urinary diversion. Overview of the MDCT technical procedure: Do we need a phase without contrast injection? When do we need it? When is oral contrast material needed? Could and under what circumstances we do benefit from the split-bolus injection? How can we achieve an optimal excretory phase? Classification of...
complications according to the time of onset, highlighting the possible peculiarities in MDCT technique depending on the type of complication suspected. Early (< 30 days after surgery): Bowel: adynamic ileus, mechanical obstruction, anastomotic leak. Infectious: pyelonephritis. Postsurgical fluid collections. Urinary tract complications (anastomotic leak, obstruction, fistulas) Stomal / conduit ischemia. Wound Late Infection Calculi Ureteral stenosis Tumor recurrence Stomal / conduit : retraction, prolapse, stenosis. Herniation

URE108

All about Renal Involvement of IgG4-Related Sclerosing Disease

Education Exhibits

Location: NA

Participants

Nien Seo MD (Presenter): Nothing to Disclose
Jin Hee Kim MD : Nothing to Disclose
Jae Ho Byun MD : Nothing to Disclose
Seung Soo Lee MD : Nothing to Disclose
Hyung Jung Kim MD : Nothing to Disclose
Myung-Hwan Kim : Nothing to Disclose
Moon-Gyu Lee MD : Nothing to Disclose

TEACHING POINTS

1. To outline the current concept in IgG4-related sclerosing disease (IgG4-SD)
2. To present imaging atlas of renal involvement of IgG4-related sclerosing disease with clinical features and pathogenesis
3. To emphasize the importance of renal involvement in diagnosing IgG4-SD in various clinical settings

TABLE OF CONTENTS/OUTLINE

1. Clinical characteristics
   A. Frequency
   B. Serological findings
   C. Various clinical manifestations (isolated form/combination with other organs)
2. Morphological classification
3. Image findings at CT, MRI with DWI, US, and PET
   A. Typical/atypical findings
   B. Potential mimickers (benign/malignant diseases)
   C. Post-treatment changes and patterns of relapse
4. Pathological characteristics
5. Importance of renal involvement in diagnosing IgG4-SD in various clinical settings

URE109

Beyond Uncomplicated Cystitis: Cross-sectional Imaging Spectrum of Lower Genitourinary Tract Infections — Usual and the Unusual Suspects

Education Exhibits

Location: NA

Participants

Vijayanadh Ojili MD (Presenter): Nothing to Disclose
Sandhya Vinu-Nair : Nothing to Disclose
Arpit M. Nagar MBBS : Nothing to Disclose

TEACHING POINTS

The purpose of this exhibit is:
1. To review the cross-sectional imaging findings of usual and unusual lower genitourinary tract infections.
2. To discuss the role of imaging and image-guided interventions in the management of these patients.

TABLE OF CONTENTS/OUTLINE

1. Introduction, etiopathogenesis and clinical presentation.
2. Role of cross-sectional imaging modalities (particularly CT).
3. Imaging spectrum of usual and unusual lower genitourinary tract infections (mycetoma of the urinary bladder, emphysematous cystitis/prostatitis, prostatic abscess/tuberculosis, postpartum endometritis, gas gangrene of the uterus etc).

URE110

Does Renal Tuberculosis Confuse You A Lot?

Education Exhibits

Location: NA

Participants

Kai Zhao MD (Presenter): Nothing to Disclose
Xiaoying Wang MD : Nothing to Disclose

TEACHING POINTS

There are some clinical features and statistical figures about renal tuberculosis that do not accord with what we take for granted. This exhibit will explain the confused questions about renal tuberculosis. The purpose of this exhibit is to help radiologists to understand the pathogenesis and development of renal tuberculosis, as well as to improve the radiologist’s diagnostic accuracy of renal tuberculosis.

TABLE OF CONTENTS/OUTLINE

The exhibit will be presented in a quiz format. Key points will be highlighted in the answer of each question. The list of questions includes:
1. Renal tuberculosis (TB) is the most common in urogenital system tuberculosis. But where do TB bacilli come from? 2. Since most renal TB spread from pulmonary tuberculosis, why there is still 7% extrapulmonary patients have only urogenital system tuberculosis without pulmonary tuberculosis? 3. Why hydronephrosis always happens in the contralateral kidney? 4. Why hydroureter is always happens in the contralateral kidney? 5. What’s the mechanism behind autonephrectomy?
Genital Complications of Crohn Disease: Imaging Features and Implications of Management

**Participants**

Steven Edward Kammann MD : Nothing to Disclose  
Christine O. Menias MD (Presenter): Nothing to Disclose  
Amy Kiyo Hara MD : Nothing to Disclose  
Mariam Moshiri MD : Consultant, Reed Elsevier Author, Reed Elsevier  
Akram Mohamed Shaaban MBCh : Contributor, Amirsys, Inc  
Kumaresan Sandrasegaran MD : Nothing to Disclose  
Venkateswar Rao Surabhi MD : Nothing to Disclose  
Cary Lynn Siegel MD : Nothing to Disclose  
Steven Brandes MD : Nothing to Disclose  

**TEACHING POINTS**

Review the imaging features of genital complications in crohn patients on fluoroscopy, and cross-sectional imaging Discuss the epidemiology, clinical presentation and management of genital complications of Crohn Disease (CD) Review other disease entities that can mimic Genital CD.

**TABLE OF CONTENTS/OUTLINE**

1. Imaging features of genital CD at fluoroscopy, US, CT and MRI will be discussed: A. Rectovaginal fistula B. Anovaginal/aginal-vulvar fistula C. Enterovaginal Fistula D. Recto-urethral Fistula E. PID/TOA F. Labial/Scrotal edema G. Perineal involvement of CD 2. Other disease entities that can simulate genital CD 3. Management and therapeutic options

**SUMMARY**

Crohn disease (CD) is a chronic relapsing, granulomatous, and inflammatory bowel disorder characterized by transmural bowel inflammation and a tendency to form fistulas with adjacent structures. Genital complications of CD are not uncommon; however are often clinically masked by dominant intestinal or systemic symptoms. The usual mechanism is direct extension of fistulizing transmural intestinal disease to the pelvic organs, and rarely due to "metastatic" CD involving the perineum and external genitalia separated from the bowel. Recognition of their manifestations and imaging appearances is crucial so that appropriate medical or surgical intervention is accomplished.

URE112

Multimodality Imaging of Non-neoplastic Renal Disease: Clinical Features and Differential Diagnosis

**Participants**

Masayo Ogawa (Presenter): Nothing to Disclose  
Nagaaki Marugami : Nothing to Disclose  
Junko Takahama MD : Nothing to Disclose  
Kimihiko Kichikawa MD : Nothing to Disclose  
Aki Takahashi MD : Nothing to Disclose  
Takahiro Itoho : Nothing to Disclose  

**TEACHING POINTS**

1) To understand the multimodality imaging approach to non-neoplastic renal disease.  
2) To differentiate non-neoplastic renal disease from neoplastic disease showed similar image along with the clinical history.

**TABLE OF CONTENTS/OUTLINE**

1) Presentation of non-neoplastic renal disease compared with neoplastic mimickers  
2) Clinico-radiological key findings in differential diagnosis.  
3) Summary  
Although some non-neoplastic renal disease show similar image to neoplastic disease, clinicoradiological key findings may help us to lead correct diagnosis.

URE113

Evaluation and Follow-up of the Complications of Partial Nephrectomy: CT Patterns

**Participants**

Gianpiero Cardone MD (Presenter): Nothing to Disclose  
Maurizio Papa MD : Nothing to Disclose  
Paola Mangili PhD : Nothing to Disclose  
Giorgio Guazzoni MD : Nothing to Disclose  
Giuseppe Balconi : Nothing to Disclose  

**TEACHING POINTS**

1) Presentation of non-neoplastic renal disease compared with neoplastic mimickers  
2) Clinico-radiological key findings in differential diagnosis.  
3) Summary  
Although some non-neoplastic renal disease show similar image to neoplastic disease, clinicoradiological key findings may help us to lead correct diagnosis.
TEACHING POINTS

1) To illustrate the most frequent CT imaging appearance of the treated kidney, after conventional or robotic assisted partial nephrectomy. 2) To review the most common CT patterns of the complications of renal partial nephrectomy. 3) To evaluate the most effective CT imaging examination techniques in the treated kidney evaluation.

TABLE OF CONTENTS/OUTLINE


URE114

Contrast-enhanced Ultrasound of Papillary Renal Masses: A Radiologic Review

Education Exhibits
Location: NA

Participants
Michael Roth MD (Presenter): Nothing to Disclose
Jeffery Robert Bird MD: Nothing to Disclose
Neal E Row MD: Nothing to Disclose
Patrick Luke MD: Nothing to Disclose
Cesare Romagnoli MD: Consultant, Profound Medical Inc

TEACHING POINTS

The aim of this educational exhibit is: 1. Outline the characteristics of papillary renal carcinomas (RCC) on Contrast Enhanced Ultrasound (CEUS) using data from pathologically confirmed solid renal masses. 2. To compare utility of CEUS for diagnosing papillary RCC versus other imaging modalities, such CT and MR. 3. Highlight clinical applicability of CEUS for diagnosis of solid renal masses in patients with renal failure.

TABLE OF CONTENTS/OUTLINE

Description of the CEUS technique used in assessing renal masses, including the indications and contraindications of CEUS for assessing renal masses. Imaging characteristics of papillary renal cell carcinomas (RCC) with CEUS, including own imaging data from seven pathologically confirmed cases. Illustrative sample cases of CEUS in papillary RCCs. Comparison of utility of CEUS for diagnosis of papillary renal carcinomas versus other imaging modalities. Discussion of CEUS in setting of patient with renal failure: highlighting safety vs other imaging modalities; increased incidence of papillary RCC in end stage renal failure. Summary with take-home points.

URE115

Cross Sectional Imaging of the Kidney: Classic Signs and Pitfalls

Education Exhibits
Location: NA
Certificate of Merit

Participants
Khaled M. Elsayes MD (Presenter): Nothing to Disclose
Christine O. Menias MD: Nothing to Disclose
Kumaresan Sandrasegaran MD: Nothing to Disclose
Ahmed MK Zaki MBBCh: Nothing to Disclose
Sadhna Verma MD: Nothing to Disclose
Akram Mohamed Shaaban MBBCh: Contributor, Amirsys, Inc

TEACHING POINTS

- Describe most commonly encountered classic signs pathognomonic for specific renal pathologies. - Illustrate various imaging pitfalls of the kidney that can lead to erroneous diagnoses. - Describe relevant technical background, pathophysiology and hemodynamics of these pitfalls.

TABLE OF CONTENTS/OUTLINE


URE116

CT and MR Imaging after Radiofrequency and Cryoablation of Renal Tumors

Education Exhibits
Location: NA

Participants
Xavier Buy MD (Presenter): Proctor, Galil Medical Ltd
Julien Garnon MD: Nothing to Disclose
Catherine Roy MD: Nothing to Disclose
Jean Palussiere MD: Travel support, Bracco Group
Afshin Gangi MD, PhD: Proctor, Galil Medical Ltd

TEACHING POINTS
To know the physical and biological principles of radiofrequency and cryoablation
To standardize imaging follow-up protocols after radiofrequency and renal tumor ablation
To know the typical and atypical imaging features and the sequential changes after renal thermal ablation
To know the major differences between post-radiofrequency and post-cryoablation imaging

**TABLE OF CONTENTS/OUTLINE**
A. Principles of RFA and CRA
B. Biological effects of RFA and CRA
C. Imaging follow-up protocols after renal ablation
D. Typical imaging features after complete and incomplete ablation
E. Atypical imaging features and pitfalls
F. Imaging of complications after renal ablation
G. Strategy in doubtful cases

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**URE117**

**Metastatoc Renal Cell Carcinoma and Targeted Antiangiogenic Therapy: Old Illness, New Concerns**

*Education Exhibits*
*Location: NA*
*Certificate of Merit*

**Participants**
- Mariano Facundo Werner Reyes (Presenter): Nothing to Disclose
- Carmen Sebastia Cerqueda MD: Nothing to Disclose
- Blanca Pano Brufau MD: Nothing to Disclose
- Begona Mellado: Nothing to Disclose
- Oscar Reig: Nothing to Disclose
- Carlos Nicolau MD: Nothing to Disclose

**TEACHING POINTS**
- To review the new treatment algorithms based on targeted antiangiogenic therapy for metastatic renal cell carcinoma (mRCC).
- To describe specific radiological findings of side effects resulting from these new treatments.
- To depict typical and atypical responses and relapse patterns in follow-up by means of CT and MR, including functional techniques.

**TABLE OF CONTENTS/OUTLINE**
1- Targeted angiogenic therapies in mRCC; specific pathways.
2- Targeted mRCC antiangiogenic therapies, guidelines and clinical trial reviews.
3- Secondary effects of targeted antiangiogenic therapies; review of each specific therapy with radiological examples.
4- Pitfalls of RECIST in the monitoring of mRCC targeted antiangiogenic therapy.
5- New criteria assessment of therapeutic response of these therapies based on density and perfusion. Review of qualitative signs and quantitative parameters.
6- Does diffusion play a role in the monitoring of these new therapies?
7- Positive and negative prognosis of radiological findings in baseline and follow-up studies.
8- Patterns of response, typical and atypical (based on size, density and perfusion parameters)
9- Patterns of relapse

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**URE118**

**Quantitative and Qualitative Discrimination of Renal Cell Carcinoma Subtypes and Benign Mimics with MR Imaging: A Pictorial and Evidence Based Review**

*Education Exhibits*
*Location: NA*

**Participants**
- Nisha Alle MD (Presenter): Nothing to Disclose
- Nelly Tan MD: Nothing to Disclose
- Jonathan R. Young MD: Nothing to Disclose
- Steven Satish Raman MD: Consultant, Bayer AG Consultant, Covidien AG

**TEACHING POINTS**
The purpose of this exhibit is:
1. To review the background on renal cell carcinoma (RCC) and mimics.
2. To discuss the appropriate quantitative and qualitative MR protocols for characterization of T1a renal tumors including analysis of characteristic time-signal intensity curves.
3. To review MR imaging characteristics of RCC subtypes and benign mimics (oncocytoma, minimal fat angiomyolipoma) on T1, T2, DWI, DCE, and Arterial Spin Labelling.
4. To describe the role of percutaneous renal biopsy and immunostains in guiding diagnosis among renal masses

**TABLE OF CONTENTS/OUTLINE**
Background of RCC - Epidemiology - Role of MRI in imaging of small renal masses
Contemporary qualitative and quantitative MRI techniques for staging T1a RCC subtypes and benign mimics (oncocytoma, minimal fat angiomyolipoma) on T1, T2, DWI, DCE, and Arterial Spin Labelling.
Time signal intensity curves MRI characteristics of RCC subtypes - Clear cell - Papillary - Chromophobe - Others MRI characteristics of benign mimics - Oncocytoma - Minimal fat angiomyolipoma - Others Role of percutaneous renal mass biopsy - Technique - Diagnostic accuracy - Role of immunohistochemical studies in RCC subtype categorization - Pathological features of RCC subtypes - Common immunostains - Rate of diagnostic accuracy in malignancy

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**URE119**

**Radiological and Histo-pathological Correlation of Renal Cell Carcinoma using MDCT: A Teaching Atlas**

*Education Exhibits*
*Location: NA*

**Participants**
- Ankur Shah MD (Presenter): Nothing to Disclose
- Hemant Tribhovandas Patel MD: Nothing to Disclose
- Megha Sanghvi MD: Nothing to Disclose
- Drushi Vatsal Patel MBBS, MD: Nothing to Disclose
- Mrugesh Doctor: Nothing to Disclose
TEACHING POINTS
1. To review the role of MDCT in diagnosing renal cell carcinoma.
2. To evaluate most effective CT examination technique for delineation of tumor enhancement.
3. To predict the histo-pathological subtype of the lesion using various CT features and enhancement patterns.

TABLE OF CONTENTS/OUTLINE
- MDCT technique for evaluation of renal cell carcinoma
- CT findings in renal cell carcinoma
- Different enhancement patterns in various histo-pathological subtypes of renal cell carcinoma
- Staging of renal cell carcinoma
- Predicting the prognosis using CT features as a guide to histological subtype and staging
- Sample cases
- Renal cell carcinoma mimics

URE120
Renal Angiomyolipomas (AML) with Minimal Fat: CT and MR Imaging Patterns

Participants
Gianpiero Cardone MD (Presenter): Nothing to Disclose
Maurizio Papa MD: Nothing to Disclose
Paola Mangili PhD: Nothing to Disclose
Giorgio Guazzoni MD: Nothing to Disclose
Giuseppe Balconi: Nothing to Disclose

TEACHING POINTS
1) To describe the most frequent CT and MR patterns of renal AML with minimal fat. 
2) To calculate the fat content in renal AML with minimal fat, using Chemical-Shift MR Imaging.
3) To describe the usefulness of MR Imaging in the characterization of renal AML with minimal fat.

TABLE OF CONTENTS/OUTLINE
1) Morphologic and pathologic characteristics of AML with minimal fat
2) CT and MR patterns of AML with minimal fat
3) Quantitative measurement of intratumoral fat content using Chemical-Shift MR imaging technique (quantitative measurement of fat content using Chemical-Shift GRE MR acquisition (Signal intensity (SI) index > 25% was considered typical for AML).

URE121
Renal Masses Treated with Percutaneous and Laparoscopic Cryoablation: Computed Tomography (CT) and Magnetic Resonance (MR) Recurrence Patterns

Participants
Gianpiero Cardone MD (Presenter): Nothing to Disclose
Maurizio Papa MD: Nothing to Disclose
Andrea Losa MD: Nothing to Disclose
Massimo Lazzari MD: Nothing to Disclose
Paola Mangili PhD: Nothing to Disclose
Giorgio Guazzoni MD: Nothing to Disclose
Giuseppe Balconi: Nothing to Disclose

TEACHING POINTS
1) To illustrate the most frequent CT and MR imaging appearance of the kidney, after percutaneous and laparoscopic cryoablation of renal masses.
2) To review the most common CT and MR recurrence patterns after percutaneous and laparoscopic cryoablation of renal masses.
3) To evaluate the most effective CT and MR imaging examination techniques in the evaluation of the kidney after percutaneous and laparoscopic cryoablation.

TABLE OF CONTENTS/OUTLINE
1) Percutaneous and laparoscopic renal cryoablation techniques
2) CT and MR imaging techniques in the follow-up of renal cryotherapy
3) The most effective techniques were multiphase acquisition (CT) and TSE T2w and dynamic ce-FS-GRE T1w sequences, evaluated before and after digital subtraction procedure (MR). 
4) Renal parenchymal changes after Cryo ablation
5) Renal parenchymal changes after Cryo ablation
6) The most frequent CT and MR recurrence patterns:
   a) morphology
   b) densitometry (CT) and signal intensity (MR)
   c) contrast enhancement patterns
   d) CT and MR patterns of recurrence in patients treated with renal cryoablation were the increase in size and vascularization of the treated areas, with the presence of an enhancing nodule within the ablation-induced lesion.

URE122
Separating the Subtypes: A Radiologic and Histopathologic Review of the Most Common Subtypes of Renal Cell Carcinoma (RCC) and Oncocytoma, a Benign Mimic of RCC

Participants
Jonathan R. Young MD (Presenter): Nothing to Disclose
Jocelyn A. Young: Nothing to Disclose
Daniel Jason Aaron Margolis MD: Research Grant, Siemens AG
Jiaoti Huang: Nothing to Disclose
Steven Satish Raman MD: Consultant, Bayer AG Consultant, Coviden AG

TEACHING POINTS
1. Quantitative imaging features, namely the magnitude of enhancement on multiphasic MDCT, can assist in discriminating the most common subtypes of renal cell carcinoma (clear cell, papillary, and chromophobe) and oncocytoma, a benign mimic of RCC. 2. Qualitative imaging features, such as pattern of enhancement, neovascularity, calcification, and contour, can also assist in discriminating clear cell RCC, papillary RCC, chromophobe RCC, and oncocytoma. 3. Because clear cell RCC, papillary RCC, chromophobe RCC, and oncocytoma have differing prognoses, a non-invasive means of discriminating between these entities can be of great clinical value and can thus guide further management.

**TABLE OF CONTENTS/OVERSE**
1. Epidemiology of clear cell RCC, papillary RCC, chromophobe RCC, and oncocytoma
2. Prognoses of clear cell RCC, papillary RCC, chromophobe RCC, and oncocytoma
3. Multiphasic enhancement of clear cell RCC, papillary RCC, chromophobe RCC, and oncocytoma
4. Qualitative imaging features, including pattern of enhancement, neovascularity, calcification, and contour, of clear cell RCC, papillary RCC, chromophobe RCC, and oncocytoma
5. Histopathologic features of clear cell RCC, papillary RCC, chromophobe RCC, and oncocytoma

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**URE123**

**The Nefarious Nephron: Pitfalls in Renal Imaging**

**Education Exhibits**

**Location: NA**

**Participants**

- Mittul Gulati MD : Nothing to Disclose
- Vinay Anant Duddalwar MD, FRCR : Research Grant, General Electric Company
- Phillip Ming-Da Cheng MD, MS : Nothing to Disclose
- Miriam Romero MD (Presenter): Nothing to Disclose

**TEACHING POINTS**

1. Demonstrate common sources of error in renal imaging on US, CT and MRI
2. Familiarize the reader with a variety of mimics of inflammatory and neoplastic renal disease
3. Emphasize the importance of technique in accurately characterizing lesions

**TABLE OF CONTENTS/OVERSE**
1. Post treatment appearance of the kidney: partial nephrectomy, inflammatory pseudotumor, local recurrence
5. Technique matters: measuring enhancement and sources of artifact
6. Technique matters: MRI subtraction
7. Problem solving with contrast ultrasound
8. Summary

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**URE124**

**The Treated Kidney: Computed Tomography (CT) and Magnetic Resonance (MR) Recurrence Patterns**

**Education Exhibits**

**Location: NA**

**Participants**

- Gianpiero Cardone MD (Presenter): Nothing to Disclose
- Maurizio Papa MD : Nothing to Disclose
- Paola Mangili PhD : Nothing to Disclose
- Giorgio Guazzoni MD : Nothing to Disclose
- Giuseppe Balconi : Nothing to Disclose

**TEACHING POINTS**

1) To illustrate the most frequent CT and MR imaging appearance of the treated kidney, after surgical and ablative treatments.
2) To review the most common CT and MR recurrence patterns after renal surgical and ablative treatments.
3) To evaluate the most effective CT and MR imaging examination techniques in the treated kidney evaluation.

**TABLE OF CONTENTS/OVERSE**
1) Renal masses: surgical and ablative treatments: a) total nephrectomy b) partial nephrectomy c) radiofrequency ablation d) cryoablation
2) CT and MR imaging techniques: The most effective technique was multiphasic acquisition (CT) and TSE T2w and dynamic ce-FS-GRE T1w sequences, evaluated before and after digital subtraction procedure (MR).
3) The most frequent CT and MR recurrence patterns: a) morphology b) densitometry (CT) and signal intensity (MR) c) contrast enhancement patterns
4) The most important CT and MR parameters in the evaluation of recurrence after renal surgical and ablative treatments were the presence of enhancing mass in the surgical site or the increase in size and vascularization of the treated areas.

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**URE125**

**Tubulocystic Renal Cell Carcinoma: A New Recognized Epithelial Tumor**

**Education Exhibits**

**Location: NA**

**Participants**

- Rafael Andres Vicens-Rodriguez MD (Presenter): Nothing to Disclose
- Raghunandan Vikram MBBS, FRCR : Nothing to Disclose
- Pheroze Tamboli MD : Nothing to Disclose
- Naveen Garg MD : Consultant, Document Storage Systems, Inc CEO, Garglet LLC
- Srinivasa R. Prasad MD : Nothing to Disclose
- Christopher G. Wood MD : Consultant, Pfizer Inc Investigator, Pfizer Inc Speaker, Pfizer Inc Consultant, Argos Therapeutics, Inc Investigator, Argos Therapeutics, Inc Investigator, GliaxoSmithKline plc

**TEACHING POINTS**

1. After viewing this exhibit, the learner will know the background, pathology and multimodality imaging features of this new
type of renal cell carcinoma. Additionally, the learner will distinguish the imaging differences between tubulocystic renal cell carcinoma and other types of RCC.

TABLE OF CONTENTS/OUTLINE
- Background - Genetics and Pathology. - Multimodality imaging features (US, CT, MRI). --> Retrospective cohort (N=10). - Imaging differences from other types of RCC. - Conclusion.

URE126

Atypical Extra-hepatic Fat-Containing Masses in the Abdomen and Pelvis

Education Exhibits

Location: NA

Participants
Andreu F. Costa MD, MSc (Presenter): Nothing to Disclose
Seng Thipphavong MD: Nothing to Disclose

TEACHING POINTS
A wide variety of routine and unusual fat-containing masses can arise in the abdomen and pelvis. Identifying fat within a lesion is critical to narrowing the differential diagnosis, and CT and MRI are essential to characterizing these masses, and can often allow for a specific diagnosis or narrow differential diagnosis.

TABLE OF CONTENTS/OUTLINE
- Learning Objectives
- Disclaimer
- Mesentery: Lipoma causing midgut volvulus; Lipoma causing intussusception
- Adrenal Gland: Teratoma; Giant Myelolipoma; Adrenal Adenoma; Adrenal Cortical Cell Carcinoma
- Renal: Angiomyolipoma; Renal Cell Carcinoma
- Ovarian: Dermoid; Monodermal Teratoma; Malignant Teratoma; Broad Ligament Liposarcoma
- Pelvis: Liposarcoma; Extra-medullary Hematopoiesis; Extra-adrenal Myelolipoma
- Summary
- References
- Contact Information

URE127

Imaging Features of Urinary Tract Leiomyomas and Leiomyosarcomas

Education Exhibits

Location: NA

Certificate of Merit

Participants
Anil Shashikant Bhavsar MD (Presenter): Nothing to Disclose
Sadina Verma MD: Nothing to Disclose
Christine O. Menias MD: Nothing to Disclose
Kumaresan Sandrasegaran MD: Nothing to Disclose
Khaled M. Elsayes MD: Nothing to Disclose
Kalpesh K. Panchal MD: Nothing to Disclose
Thomas Francis Qualter MD: Nothing to Disclose
Xiaopei Chen MD: Nothing to Disclose

TEACHING POINTS
• Provide background/epidemiologic information regarding GU leiomyomas and leiomyosarcomas • Describe typical imaging findings of urinary tract leiomyomas/leiomyosarcomas and their differential diagnosis as such tumors may present a diagnostic dilemma due to their appearance • Discuss imaging modalities commonly used for diagnosis with emphasis on MRI findings • Provide several case examples of leiomyomas throughout the urinary tract, including leiomyosarcomas • Discuss various treatment options

TABLE OF CONTENTS/OUTLINE
• Introduction o Background - Pathogenesis and epidemiologic information regarding leiomyomas and leiomyosarcomas within the urinary tract/retroperitoneum. Case examples will then ensue with a multi-modality approach; differential diagnoses will also be elaborated upon. • Bladder Leiomyoma • Background information o Case example (5) • Bladder leiomyosarcoma o Background information o Case example (1) • Urethral Leiomyoma o Background information o Case example (1) • Renal Leiomyoma o Background information o Case example (1) • Renal leiomyosarcoma o Background information o Case example (1) • Retroperitoneal and peri-urethral leiomyomas/leiomyosarcomas o Background information o Case example • Broad Ligament leiomyoma o Background information o Case examples • Conclusion

URE128

The Anatomical and Imaging Features of Urachal Anomalies

Education Exhibits

Location: NA

Participants
Priya Krishnarao MD (Presenter): Nothing to Disclose
Benjamin Boun-Ming Chou MD: Nothing to Disclose
Shawn Renee Van Bockel MD: Nothing to Disclose

TEACHING POINTS
1. To review the embryological development that gives rise to congenital urachal anomalies. 2. To understand the classification of urachal anomalies based on anatomical location. 3. To review CT and US imaging features of congenital anomalies and acquired urachal remnant diseases. 4. To identify associated complications of urachal anomalies and its implications for management.

TABLE OF CONTENTS/OUTLINE
• Introduction o Pathogenesis o Epidemiologic information regarding urachal anomalies. o Case examples will then ensue with a multi-modality approach; differential diagnoses will also be elaborated upon. o Bladder anomalies o Background information o Case example (5) o Bladder neoplasms o Background information o Case example (1) o Urethral anomalies o Background information o Case example (1) o Renal anomalies o Background information o Case example (1) o Urachal anomalies o Background information o Case example (1) o Retroperitoneal and peri-urethral anomalies o Background information o Case example • Conclusion

URE129

Transitional Cell Carcinoma: Non-contrast CT Findings

Education Exhibits

Location: NA

Participants

Christopher Ravi Bailey BA : Nothing to Disclose
Pamela Tecce Johnson MD (Presenter): Research funded, Becton, Dickinson and Company

TEACHING POINTS

Noncontrast CT for is a commonly performed exam for patients with flank pain and hematuria. The diagnosis of alternative renal pathology is markedly limited without IV contrast. In some cases, however, a transitional cell carcinoma may be apparent on a noncontrast CT. The purpose of this exhibit is to

1. Illustrate the noncontrast CT findings in upper tract, ureteral and bladder transitional cell carcinomas
2. Demonstrate the importance of a high contrast window and coronal MPRs to facilitate the diagnosis

TABLE OF CONTENTS/OUTLINE

Background Rising utilization of noncontrast CT in patients with flank pain and hematuria Literature review with respect to utility for identifying alternative renal pathology Technique High contrast window to increase conspicuity of soft tissue lesions against background of fluid Case series of TCC findings on noncontrast CT Calyces Pelvis Ureter Bladder Bladder diverticulum

URE131

Common Imaging Pitfalls in Multiparametric 3T MRI of the Prostate Gland

Education Exhibits

Location: NA

Participants

Robert Villani MD (Presenter): Nothing to Disclose
Pnina Herskovits MD : Nothing to Disclose
Erin Lindsay McLaughlin MD : Nothing to Disclose
Eran Ben-Levi MD : Nothing to Disclose
Ardeshir R Rastinehad DO : Nothing to Disclose

TEACHING POINTS

The teaching points to be made are as follows: 1. Familiarize the reader with the typical appearance of non malignant prostate tissue on MRI 2. Discuss the typical appearance of prostate malignancy. 3. Describe the variety of benign findings in the prostate that mimic neoplastic processes on MRI 4. Discuss techniques to avoid imaging pitfalls

TABLE OF CONTENTS/OUTLINE


URE132

Current and Emerging Role of Multiparametric Prostate MRI in the Setting of MR-guided Interventions and Focal Therapies

Education Exhibits

Location: NA

Participants

Varaha Tammisetti MD (Presenter): Nothing to Disclose
Eric Michael Walser MD : Nothing to Disclose
David Arthur Woodrum MD, PhD : Nothing to Disclose
Robert J. Amato : Nothing to Disclose

TEACHING POINTS

1. To discuss the utility of multiparametric approach to prostate MRI in the setting of MR guided interventions and focal therapies including localization, detection. 2. Understand the importance of structured and standardized interpretation criteria such as PIRADS and Likert scale. 3. To discuss the emerging role of prostate MRI in identifying ‘index tumor’ and predicting ‘aggressiveness’ 4. Also discuss the role of prostate MRI in each of the clinical scenarios related to MR guided interventions.

TABLE OF CONTENTS/OUTLINE

1. Introduction including the limitations of Transrectal biopsies and PSA 2. Multiparametric approach to prostate MRI in the setting of MR guided interventions and focal therapies including localization, detection. 3. Example case 4. Structured and standardized interpretation criteria such as PIRADS and Likert scale. 5. Role of prostate MRI in identifying ‘index tumor’ and...

**URE133**

**How Contemporary MRI Influences the Management of Prostate Cancer Patients**

*Education Exhibits*

*Location: NA*

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**Participants**

- Anwar Roshanali Padhani MD (Presenter): Advisory Board, Acuitas Medical Ltd Advisory Board, Siemens AG Speakers Bureau, Siemens AG Researcher, Siemens AG Speakers Bureau, Johnson & Johnson
- Giuseppe Petralia MD: Nothing to Disclose
- Heminder Kaur Sohi MRCS, FRCR: Nothing to Disclose
- Francesco Sanguedolce PhD, MD: Nothing to Disclose
- Andrew Gogbashian MD, FRCR: Nothing to Disclose
- Roberto Alonzi MD: Nothing to Disclose
- Nicola Anyamene: Nothing to Disclose
- Giles Hellawell MD, MRCS: Nothing to Disclose

**TEACHING POINTS**

- Multimetric MRI (mpMRI) aids management of suspected/proven prostate cancer, but its clinical utility depends on the mpMRI approach, image quality and reporter expertise • mpMRI shows clinically significant disease (CSD), but will also miss cancer; thus interpretation should be aligned with clinical management priorities • Judicious use of mpMRI with clinical parameters reduces under treatment of significant disease and over-diagnosis/treatment of insignificant cancers

**TABLE OF CONTENTS/OUTLINE**

- Overview individual mpMRI components (T2, diffusion, dynamic contrast enhancement, spectroscopy) with tumor biologic correlates and literature reviews of ability to detect CSD • Tumor detection using a disease prevalence approach and ability of mpMRI to rule in/out CSD • Demonstrate how prebiopsy mpMRI informs on biopsy technique choice improving precision of diagnosis • Show that surgical priorities and approaches are altered by risk group, index lesion locations and extracapsular disease • In low risk disease, show that mpMRI improves precision of patient selection at initial triage for active surveillance • In intermediate risk disease, show how mpMRI sub-groups enables patient selection for duration of androgen deprivation after radiotherapy • In high risk disease, imaging emphasis changes to local and nodal staging, tumor volume and metastatic disease assessments

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**URE134**

**Mimics of Prostate Carcinoma: MRI Imaging Features and Histopathological Correlation**

*Education Exhibits*

*Location: NA*

- Certificate of Merit
- Selected for RadioGraphics

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**Participants**

- Yu Xuan Kitzing MBBS: Nothing to Disclose
- Adilson Prando MD: Nothing to Disclose
- Celi Varol: Nothing to Disclose
- Gregory Stanislaus Karczmar PhD: Nothing to Disclose
- Fiona Maclean: Nothing to Disclose
- Aytekin Oto MD (Presenter): Research Grant, Koninklijke Philips NV Consultant, Guerbet SA

**TEACHING POINTS**

The purpose of this exhibit is: 1. To review the range of mimics of prostate carcinoma on multiparametric MRI. 2. To discuss the histopathological findings of the mimics through pathology-proven case series. 3. To compare and contrast the multiparametric MRI findings between the mimics and prostate carcinoma. 4. To understand the potential association between the underlying histopathology and the appearance of the mimics on T2, diffusion weighted imaging and dynamic contrast enhanced sequences.

**TABLE OF CONTENTS/OUTLINE**


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**URE135**

**Modern Imaging Techniques for Metastatic Prostate Cancer: Is the Bone Scan Dead?**

*Education Exhibits*

*Location: NA*

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**Participants**

- Amish Lakhani MBBS, MA (Presenter): Nothing to Disclose
- Anwar Roshanali Padhani MD: Advisory Board, Acuitas Medical Ltd Advisory Board, Siemens AG Speakers Bureau, Siemens AG Researcher, Siemens AG Speakers Bureau, Johnson & Johnson
- Andrew Gogbashian MD, FRCR: Nothing to Disclose
- Roberto Alonzi MD: Nothing to Disclose
- Nicola Anyamene MD, FACR: Nothing to Disclose

**TEACHING POINTS**
1) Modern imaging techniques such as Choline/NaF PET-CT and whole body MRI can detect bone metastases with increased sensitivity before bone scans; early detection and therapy has been shown to result in survival benefits. 2) Functional imaging methods are able to positively assess therapy response compared to bone scans which can only identify tumor progression; these more accurate assessments of therapy response aids the rational use of targeted therapy for metastatic disease.

TABLE OF CONTENTS/OUTLINE

1) Overview of the current methods and challenges of assessing the presence and response of metastatic prostate cancer to bone. 2) Review the relative performance of planar bone scans compared to modern techniques for detecting bone disease using published meta-analyses. 3) Discuss DW-MRI as a new viable sequence for metastases detection, outlining its added value to standard sequences in whole body (WB) examinations. 4) Provide examples of how WB-DWI overcomes the limitations of morphologic sequences for disease detection and response assessment to standard and targeted therapies. 5) Illustrate the indications for WB-MRI imaging in routine clinical practice from our database of >2500 WB-MRI examinations, with supportive literature data. 6) Teaching points and future directions.

URE137

MR Imaging before and after Transcatheter Embolizatión in Benign Prostatic Hyperplasia: What the Radiologist Needs to Know

Education Exhibits
Location: NA

Cum Laude

Participants
Jorge Alberto Ocantas MD (Presenter): Nothing to Disclose
Nestor Hugo Kisilevzky : Nothing to Disclose
Julio Ramón Coronil MD : Nothing to Disclose
Andres Kohan MD : Fellowship funded, Koninklijke Philips NV
Ignacio Ardanaz : Nothing to Disclose
Pablo Francisco Martinez : Nothing to Disclose
Oscar Peralta : Nothing to Disclose
Oscar Hector Damiia : Nothing to Disclose
Ricardo D. Garcia-Monaco MD, PhD : Research Consultant, Siemens AG Research Consultant, BTG International Ltd

TEACHING POINTS

To describe prostate normal anatomy, pathophysiology, changes of the gland observed in BPH, clinical manifestations, and treatment options for benign prostatic hyperplasia (BPH). To review technique, indications, contraindications and potential complications of prostatic arterial embolization (PAE). To describe prostatic MR imaging technique. To review MR findings before and after embolization (prostate volume determination, tissue characteristics, ischemic changes and relation central and periferical gland)

TABLE OF CONTENTS/OUTLINE

MR Prostate anatomy: Normal and changes in benign prostatic hyperplasia.
BPH: Pathophysiology and clinical manifestations.
BPH: Treatment options and review of prostatic arterial embolization in particular.
MR Protocol and technique.
MR findings before and after PAE in benign prostatic hyperplasia.
Conclusion and future perspective of MR Imaging before and after PAE.

URE138

Multi-Parametric MRI Findings of Post-Treatment Changes in the Prostate Gland

Education Exhibits
Location: NA

Certificate of Merit
Selected for RadioGraphics

Participants
Berrend Gustian Muller MD (Presenter): Nothing to Disclose
Sandeep Sankineni MD : Nothing to Disclose
Osama Elbuluk : Nothing to Disclose
Kinzya Bernice Grant MD : Nothing to Disclose
Soroush Raiss-Bahrami MD : Nothing to Disclose
Annerleim Walton-Diaz : Nothing to Disclose
Harsh Agarwal : Employee, Koninklijke Philips NV
Marcelino Bernardo BS : Nothing to Disclose

TEACHING POINTS

Multi-parametric MRI (MP-MRI) has an important role in the management of prostate cancer. The technology has several clinical indications such as lesion detection, biopsy guidance and focal therapy. During the last decade, MP-MRI has been increasingly used in post-treatment follow up of prostate cancer and sometimes in treatment of benign prostatic hyperplasia. Given the large spectrum of treatment approaches (e.g. prostatectomy, focal laser ablation, radiotherapy, hormonal therapy, proton-beam therapy etc.), it is challenging for the interpreting radiologist to accurately evaluate the MP-MRI in the setting of treatment-related changes. The purpose of this exhibit is to present prostate MP-MRI findings of post-treatment patients and to provide tips to aid in the accurate evaluation of such cases.
Case presentations will cover representative examples of prostate MP-MRI from patients who underwent various treatments for cancer and BPH, along with a discussion of the key MRI features. The list of cases includes:

1. Simple prostatectomy
2. Radical prostatectomy
3. Radiotherapy (external beam and brachytherapy)
4. Hormone therapy
5. Focal laser ablation
6. Cryoablation
7. Proton beam therapy
8. HIFU
9. Vaccine-Immunotherapy

### URE139

**Post-treated Prostate Cancer: Normal Findings and Signs of Local Relapse on Multiparametric Magnetic Resonance Imaging**

**Education Exhibits**  
Location: NA

**Participants**

- Joao Lopes Dias MEd (Presenter): Nothing to Disclose
- Rita Nobre Lucas MD: Nothing to Disclose
- Nuno Vasco Costa: Nothing to Disclose
- Cecilia Isabel Leal: Nothing to Disclose
- Tiago Bilhim MD: Research Consultant, Cook Group Incorporated
- Rui Mateus Marques: Nothing to Disclose

**TEACHING POINTS**

The authors provide a pictorial review of (1) the normal findings and (2) the signs of local tumor relapse after radical prostatectomy, brachytherapy, external beam radiotherapy and hormonal therapy.

### URE140

**Prostate 3D MR Spectroscopy at 3 Tesla: Technical Challenges and Step-by-Step Evaluation**

**Education Exhibits**  
Location: NA

**Participants**

- Sharad Maheshwari MD (Presenter): Nothing to Disclose
- Abhijit A. Raut MD: Nothing to Disclose
- Pankaj Chhatrala MBBS: Nothing to Disclose
- Tejas Harish Kapadia MBBS: Nothing to Disclose
- Yogini Nilkantha Sawant MBBS: Nothing to Disclose
- Harshad Wankhedkar DMRD: Nothing to Disclose
- Jigar Aiya MBBS, DMRD: Nothing to Disclose
- Charul Goyal MBBS: Nothing to Disclose

**TEACHING POINTS**

The exhibit aims to discuss the technical challenges associated while doing 3D MR Spectroscopy of prostate at 3T MRI. Optimal shimming and placement of saturation bands is critical. Equally challenging is review of MR Spectroscopy data for the entire prostate gland. A step-by-step guide has been provided making it easy for a radiologist.

### URE141

**Prostate Imaging Reporting and Data System (PIRADS) for Multiparameteric Prostate MRI (MP-MRI) Interpretation: Radiologic-Pathologic Correlation**

**Education Exhibits**  
Location: NA

**Participants**

- Derek William Cool MD, PhD (Presenter): Patent agreement, Eigen
- Eli Gibson MSc: Nothing to Disclose
- Mena Gaed MD: Nothing to Disclose
- Jose A. Gomez: Nothing to Disclose
- Madeleine Moussa: Nothing to Disclose
- Aaron D. Ward PhD: Nothing to Disclose
- Aaron Fenster PhD: License agreement, Eigen
- Stephen E. Pautler MD: Nothing to Disclose
- Joseph Chin MD: Nothing to Disclose
TEACHING POINTS

This educational exhibit discusses the European Society of Urogenital Radiology (ESUR) PIRADS framework for MP-MRI interpretation through rad-path correlation. All rad-path correlation was achieved through fiducial-based MRI-to-histology registration post-prostatectomy or through MRI-TRUS fusion biopsy.

1. Non-malignant lesions, such as prostatitis, BPH nodules or prostatic intraepithelial neoplasia (PIN), can mimic prostate adenocarcinoma (PCa) on MP-MRI.
2. PIRADS has been developed to standardize and improve MP-MRI interpretation by providing an estimate of malignancy from 1-5.
3. MP-MRI interpretation within the peripheral zone of the prostate differs from interpretation of the central/transitional zone of the prostate. Low ADC is the most reliable predictor of malignancy in the peripheral zone. T2 is the most reliable for differentiating malignancy from BPH nodules in the transitional zone.
4. Low ADC values on DWI are associated with higher-grade malignancy.

TABLE OF CONTENTS/OUTLINE

PCa and pathologic Gleason grading system
Prostate MRI Sequences
- T2
- DWI/ADC
- Dynamic contrast enhancement (DCE)
- MR Spectroscopy
MP-MRI appearance of PCa and mimics
- PCa
- PIN
- Prostatitis
ESUR-PIRADS interpretation scheme
- T2
- DWI/ADC
- DCE
- MR Spectroscopy
- Composite PIRADS Score
Rad-Path Case illustrations

URE142

Prostate Treated for Prostatic Carcinoma: Multiparametric Magnetic Resonance (MR) Imaging Recurrence Patterns

Education Exhibits
Location: NA

Participants
Gianpiero Cardone MD (Presenter): Nothing to Disclose
Antonella Messina MD: Nothing to Disclose
Maurizio Papa MD: Nothing to Disclose
Andrea Losa MD: Nothing to Disclose
Massimo Lazzeri MD: Nothing to Disclose
Paola Mangili PhD: Nothing to Disclose
Pietro Panizza MD: Nothing to Disclose
Giorgio Guazzoni MD: Nothing to Disclose
Giuseppe Balconi: Nothing to Disclose

TEACHING POINTS

To illustrate the most frequent Multiparametric MR imaging appearance of the prostate treated for prostate cancer, after surgical and ablative treatments. To review the most frequent recurrence patterns after prostate surgical and ablative treatments. To evaluate the most effective MR imaging examination techniques.

TABLE OF CONTENTS/OUTLINE


URE143

Rare Prostate Tumors: Beyond Adenocarcinoma

Education Exhibits
Location: NA

Participants
Maria Diez Blanco (Presenter): Nothing to Disclose
Alejandro Fernandez Florez: Nothing to Disclose
Sara Sanchez Bernal MD: Nothing to Disclose
Marta Drake Perez: Nothing to Disclose
Jose Maria Navasa-Qmeiado: Nothing to Disclose
Gerardo Lopez R asines MD: Nothing to Disclose

TEACHING POINTS
To know the different types of neoplasm in the prostate, both frequent and rare. To present the essential imaging diagnostic attributes of these variants. To emphasize the clinical significance of these variants, when different from usual acinar adenocarcinoma, including clinical presentation and outcome.

TABLE OF CONTENTS/OUTLINE

URE146
Utility of Advanced Imaging for Lymph Node Staging in Prostate Cancer

Participants
Osama Elbuluk (Presenter) : Nothing to Disclose
Linda Johnson : Nothing to Disclose
Kinzya Bernice Grant MD : Nothing to Disclose
Sandeep Sankineni MD : Nothing to Disclose
Maria Lindenberg MD : Nothing to Disclose
Karen Ann Kurzdriel MD : Researcher, General Electric Company Researcher, Siemens AG Researcher, Koninklijke Philips NV
Peter Pinto : Nothing to Disclose
Peter L. Choyke MD : Researcher, Koninklijke Philips NV Researcher, General Electric Company Researcher, Siemens AG Researcher, iCAD, Inc Researcher, Aspyrian Therapeutics, Inc Researcher, ImaginAb, Inc Researcher, Aura
Baris Turkbey MD : Nothing to Disclose

TEACHING POINTS
Proper management of prostate cancer is directly tied to correct staging of disease, in particular, accurate lymph node staging. Additionally, every patient’s prognosis is highly dependent upon the ability to accurately detect metastatic disease. Unfortunately, the current gold standard for lymph node staging, surgical pelvic lymph node dissection, can result in significant complications. Pre-operative imaging attempts to provide a non-invasive alternative without sacrificing the reliability of a tissue diagnosis. The purpose of this exhibit is to present the utility of current and experimental imaging modalities available for lymph node staging of prostate cancer.

TABLE OF CONTENTS/OUTLINE
Case presentations will cover representative examples of each of the following modalities from patients with confirmed prostate cancer and lymph node metastases, along with a discussion of the key features and shortcomings of each modality. The list of modalities includes: 1. Conventional CT and MRI 2. PET (FDG, C11-acetate, FACBC) 3. Advanced MRI (ADC and high b DWI) 4. Iron Oxide Imaging 5. Sentinel Node Imaging

URE148
Abnormal Gas in the Genitourinary System on CT: What the Radiologist Needs to Know

Participants
Takehiko Gokan MD (Presenter) : Nothing to Disclose
Nobuyuki Takeyama MD : Nothing to Disclose
Yoshimitsu Ohgiya MD : Nothing to Disclose
Masanori Hirose MD : Nothing to Disclose
Jiro Munechika : Nothing to Disclose

TEACHING POINTS
To review common and important causes of the abnormal gas in the urinary system, which are discussed and appropriate clinical cases are presented. To understand the presence of gas in urinary system is associated with serious clinical disease. To be familiar with the number of causes of abnormal gas on CT will allow the radiologist to provide the appropriate diagnosis and management.

TABLE OF CONTENTS/OUTLINE
The cases will be presented in a quiz format. Key differential diagnostic points, pitfalls, and therapeutic management will be highlighted in the discussion of each case. The cases will include - emphysematous pyelonephritis - emphysematous pyelitis - emphysematous cystitis - renal abscess - Fournier’s gangrene - enterovesical fistula - perforation of the duodenum into perirenal space - traumatic disease - iatrogenic disease

URE150
Benign Disease – but Malignant Manifestation: Pelvis Lipomatosis

Participants
Kai Zhao MD (Presenter) : Nothing to Disclose
Xiaoying Wang MD : Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To review the etiological factor and epidemiology of Pelvis Lipomatosis (PL) 2. To review the clinical characteristics of PL 3. To explain radiologists’ role in the diagnosis of PL 4. To introduce the utility of MRI and scan scheme of patient who is suspected of PL 5. To introduce some important prepare tips before scan 6. To explain some key signs and parameters in the diagnosis, such as bladder morphological index and bladder seminal vesicle angle 7. To introduce treatment and follow-up of patient with PL

TABLE OF CONTENTS/OUTLINE
Etiological factor of PL Epidemiology of PL Clinical characteristics of PL Radiologists’ role in the diagnosis of PL Imaging findings IVU CT MRI MR scan scheme Key signs and parameters New MR sequence sample cases and mimics Treatment and follow-up of patients with PL

URE151
Call the Plumber! A Review of Non-calculous Causes of Urinary Obstruction

Education Exhibits
Location: NA

Participants
Joanna Kee-Sampson MD (Presenter): Nothing to Disclose
Jonathan Schiavi MD : Nothing to Disclose

TEACHING POINTS
At the end of this exhibit, the viewer will be able to: 1. Discuss differential diagnoses for causes of urinary obstruction other than urinary calculi. 2. Differentiate the imaging appearances of various urinary pathologies which can lead to urinary obstruction.

TABLE OF CONTENTS/OUTLINE
1. Neoplasm a. Urologic • Transitional cell carcinoma • RCC b. Non-urologic • Lymphoma • Pelvic malignancies 2. Iatrogenic a. Ureteral injury • C-section • Ureteral-enteric fistula s/p aortic repair 3. Inflammatory • Retroperitoneal fibrosis 4. Congenital/developmental • Posterior urethral valves • Duplication • Ureteropelvic junction obstruction 5. Bladder outlet obstruction • BPH There will also be a brief discussion of intervention/ appropriate follow-up for each case if applicable.

URE152
Contrast-induced Nephropathy: Identifying the Risks and Reviewing Effective Prevention and Management Methods

Education Exhibits
Location: NA

Participants
Khalid Walid Shaqdan MD (Presenter): Nothing to Disclose
Shima Aran MD : Nothing to Disclose
Elmira Hassanzadeh MD : Nothing to Disclose
Hani H. Abujudeh MD, MBA : Research Grant, Bracco Group Consultant, RCG HealthCare Consulting Author, Oxford University Press

TEACHING POINTS
• Contrast induced nephropathy (CIN) is associated with high risk of in-hospital and 1-year mortality • A survey found that less than half of physicians were aware of potential risk factors • Therefore, identifying patients at risk and taking appropriate measures are key in the prevention of contrast induced nephropathy. • The aim of this exhibit is to enhance the radiologists understanding of CIN through a literature review of the most recent guidelines and other sources

TABLE OF CONTENTS/OUTLINE
• Background/literature review o Contrast-induced nephropathy (CIN) Definition Incidence and pathogenesis Clinical features Most recent CIN guidelines according to: • American College of Radiology • Canadian Association of Radiologist • Identifying the predisposing risk factors o Underlying health issues o Renal function markers o CIN Risk scoring system • Choice of contrast agent o Ionic and nonionic agents o Meta-analysis of benefits • Treatment and preventative strategies o Protecting renal function o Fluid Loading o Medications N-acetylcysteine Calcium Channel blockers Theophylline Other o Special considerations • Recent clinical research o Unique formulation Deferiprone o Renal Guard system • Addressing controversial issues
CTA Angiography with 3D Mapping of the Renal Arteries: Normal Anatomy, Pathology and Pitfalls — What the Radiologist Needs to Know

**Participants**
- Pamela Tecce Johnson MD: Research funded, Becton, Dickinson and Company
- Siva P. Raman MD: Nothing to Disclose

**TEACHING POINTS**
1. what are the major pathologies that involve the renal artery and what is their typical CT appearance 2. what is the role of CTA and 3D imaging in detection of renal artery pathology 3. how to interpret CTA of the renal arteries and understanding the range of pathologies involved 4. understand the potential pitfalls in lesion detection and in arriving at the correct diagnosis

**TABLE OF CONTENTS/OUTLINE**
The exhibit will cover a range of topics with discussion of key facts and potential errors in diagnosis. Case studies will be provided to enhance the learning experience. Topics will be addressed from specific imaging categories to specific clinical scenarios Renal Artery Categories a. normal anatomy and anatomic variations b. renal artery stenosis c. renal artery aneurysms including bleed d. renal artery dissection e. AV fistulae Clinical Applications a. renal transplant donor b. renal artery evaluation in tumor staging c. renal artery involvement in trauma d. causes in hypertension e. UPJ evaluation f. Hematuria evaluation g. endovascular stent planning Miscellaneous: Pearls and Pitfalls a. basic scan protocols b. injection protocols and pitfalls c. role of MPR, MIP and VRT protocols

URE155

Development of Diagnostic Ultrasound in Urology — beyond Ultrasound Screening

**Participants**
- Nagaaki Marugami (Presenter): Nothing to Disclose
- Toshiko Hirai MD: Nothing to Disclose
- Junko Takahama MD: Nothing to Disclose
- Aki Takahashi MD: Nothing to Disclose
- Kimihiko Kichikawa MD: Nothing to Disclose

**TEACHING POINTS**
1. To understand the development of ultrasound (US) soft- and hardware in urology: high-frequency transducer (9-18MHz), 3D image, flow image, elastography and contrast-enhanced ultrasound (CE-US). 2. To demonstrate the utility of diagnostic ultrasound in diagnosis of urologic disorders: comparison with multimodality imaging.

**TABLE OF CONTENTS/OUTLINE**

URE156

Follow the Stream: Imaging of Urinary Diversions

**Participants**
- Lauren Moomjian MD (Presenter): Nothing to Disclose
- Laura R. Carucci MD: Nothing to Disclose
- Adam Klausner: Nothing to Disclose
- George Guruli MD: Nothing to Disclose

**TEACHING POINTS**
• A variety of surgical techniques to reroute the urine stream have been performed and are often encountered on imaging studies • Diagnosis of complications relies upon first determining the procedure performed and the alterations made to the GU and GI tract • Knowledge of expected postoperative anatomy, examination techniques and potential complications is essential for accurate diagnosis Purpose/Aim: 1. Review methods of urinary diversion and expected postoperative anatomy. 2. Discuss the indications for imaging following urinary diversion and examination techniques. 3. Review imaging findings of early and late postoperative complications
TABLE OF CONTENTS/OUTLINE
Content Organization: • Indications for Urinary Diversion • Methods of Urinary Diversion and Expected postoperative anatomy- including continent and incontinent diversion Cutaneous Reservoir, Ileal Conduit, Continent Pouch with Stoma, Neobladder • Indications for Imaging and examination techniques CT, MRI, Pouchography, IVP, US • Early postoperative complications Leak (GU or GI), Fistula, Abcess, GI or GU obstruction • Late postoperative complications Stomal stenosis, Strictures, Stones, Fistula, Infection, Hernia, Recurrent tumor

URE157
Go with the Flow: A Pictorial Review of Non-traumatic Male Genitourinary Emergencies

Education Exhibits
Location: NA
Cum Laude

Participants
Abigail Victoria Berniker MD (Presenter): Nothing to Disclose
Oleg Teytelboym MD : Nothing to Disclose
Stanley Uy Chan MD : Nothing to Disclose
Justin Edward Mackey MD : Nothing to Disclose

TEACHING POINTS
1. A host of non-traumatic conditions can afflict the male genitourinary (GU) system, many of which require prompt diagnoses to facilitate timely treatment and preserve organ function. 2. Radiologists should be familiar with these entities and feel confident providing accurate diagnoses and appropriate management recommendations.

TABLE OF CONTENTS/OUTLINE
Goals - Show the spectrum of emergent, non-traumatic conditions afflicting the male GU system through a case-based pictorial format - Classify entities by etiology (infectious, vascular, miscellaneous) - Review appropriate management Overview Case-based pictorial review Upper GU tract - Infect: pyelonephritis; perirenal abscess - Vasc: renal vascular thrombosis/infarct - Misc: radiation nephritis; contrast-induced nephropathy; fornical rupture Lower GU tract Infect: epididymoorchitis; pyocele; scrotal abscess - Vasc: testicular torsion/infarct, penile thrombosis Misc: malpositioned penile prosthesis, VP shunt, and Foley catheter Summary Males can develop a host of non-traumatic GU conditions that require timely diagnoses and treatment to prevent permanent, often devastating outcomes. Radiologists play an integral role in the workup of these patients; accurate imaging interpretation is essential to expedite treatment and preserve organ function.

URE159

Education Exhibits
Location: NA

Participants
Gary Garlup Tse MD (Presenter): Nothing to Disclose
Ghaneh Fananapazir MD : Nothing to Disclose
Michael Thomas Corwin MD : Nothing to Disclose
John P. McGahan MD : Patent agreement, Roper Industries, Inc
Christoph Troppmann MD : Nothing to Disclose

TEACHING POINTS
1. Review the epidemiology and imaging anatomy of pediatric en bloc transplantation. 2. Learn the normal radiographic appearance of en bloc renal transplants, as seen on ultrasound, CT, MRI, nuclear medicine studies, and angiography. 3. Multimodality case review of en-bloc transplant complications as seen on ultrasound, CT, MRI, and nuclear medicine studies.

TABLE OF CONTENTS/OUTLINE
Epidemiology of pediatric en bloc kidney transplantation Common surgical approaches to pediatric en bloc transplantation backbench transplant preparation arterial and venous anastomoses ureteral anastomoses approaches to variant anatomy Pediatric en bloc normal imaging anatomy Ultrasound MRI CT Angiography Nuclear medicine Multimodality case review of en-bloc transplant complications which can affect either one or both transplanted kidneys (ultrasound, CT, MRI, nuclear medicine, angiography). Vascular renal artery stenosis renal artery thrombosis renal vein thrombosis others Ureters strictures calculi stent migration Peritransplant fluid collections lymphoceles urinomas hematomas others

URE160
Incidental Findings on CT Angiograms for Renal Donors

Education Exhibits
Location: NA

Participants
Shari Friedman MD (Presenter): Nothing to Disclose
Liise Kayler MD : Nothing to Disclose
Robert G. Berkenblit MD : Speaker, Novartis AG

TEACHING POINTS
1) CTA allows for detailed assessment of renal vascular anatomy which is crucial in pre-operative planning prior to renal transplant 2) CTA can detect conditions that may affect a patient’s ability to donate a kidney or alter which kidney is ultimately harvested.

TABLE OF CONTENTS/OUTLINE
Review imaging technique for performing CTA prior to kidney donation Illustrate variant renal vascular anatomy and discuss
those that affect which kidney is harvested or exclude the patient from transplant: -multiple renal arteries -multiple renal veins -early arterial branching -renal artery stenosis -significant atherosclerotic disease -left renal vein narrowing/nutcracker syndrome

Present a pictorial atlas of varied incidental imaging findings both inside and outside the kidney that excluded patients from renal donation -renal calculi -evidence of portal venous hypertension -papillary necrosis -renal cysts -renal cell carcinoma -pancreatic nodules

**URE161**

**MDCT of the Bladder: Spectrum of Disease**

*Education Exhibits*

*Location: NA*

**Participants**

Elie Portnoy, MD: Nothing to Disclose
Stanley S. Siegelman, MD: Nothing to Disclose
Elliot K. Fishman, MD: Research support, Siemens AG Advisory Board, Siemens AG Research support, General Electric Company Advisory Board, General Electric Company Co-founder, HipGraphics, Inc
Pamela Tecce Johnson, MD (Presenter): Research funded, Becton, Dickinson and Company

**TEACHING POINTS**

A range of bladder pathology may be identified on MDCT, either as the etiology of the patient’s clinical presentation or as an incidental finding. Inspection of the bladder with multiplanar display tools is essential to diagnosing and characterizing tumors and non-neoplastic pathology in the bladder. This exhibit reviews a wide range of disease processes that affect the bladder, with the MDCT imaging features demonstrated through case review.

**TABLE OF CONTENTS/OUTLINE**

Infection cystitis hemorrhagic cystitis emphysematous cystitis schistosomiasis Inflammation Crohn’s disease colovesical fistula Tumor Subtle and incidental transitional cell carcinoma (TCC) TCC in bladder diverticulum Adenocarcinoma in urachal remnant Prostate cancer invading bladder Lymphoma Metastasis to bladder Melanoma Paraganglioma

**URE162**

**Name the Muscle! Pelvic Floor Muscles Made Easy — An Interactive Case-based Approach**

*Education Exhibits*

*Location: NA*

**Participants**

Fritz Hofmann, MD (Presenter): Nothing to Disclose
Juan Eugenio Cosme, MD: Nothing to Disclose
Anamari Perochena, MD: Nothing to Disclose
Pamela Cerdio, MD: Nothing to Disclose
Marco Antonio Sarmiento, MD: Nothing to Disclose
Natalia Montoya, MD: Nothing to Disclose
Sandra Ortiz: Nothing to Disclose
Antonio Hernandez Villegas, MD: Nothing to Disclose

**TEACHING POINTS**

The purpose of this exhibit is to: Review the anatomy of the muscles of the pelvic floor. Provide fluency and expertise in multimodality imaging appearance of the pelvic floor muscles using sagittal, coronal and axial reconstructions. Understand the importance of pathologic pelvic floor involvement.

**TABLE OF CONTENTS/OUTLINE**

Schematic diagram of the pelvic floor muscles
Correlation with axial, coronal and sagittal pelvic CT scans.
Interactive clinical cases and quizzes will be presented to emphasized the exhibit teaching points
Summary

**URE163**

**Nephrostomies, Nephrectomies and Neoplasms: Upper Genitourinary Tract Interventions and Complications**

*Education Exhibits*

*Location: NA*

Certificate of Merit

**Participants**

Shaden F. Mohammad, MD (Presenter): Nothing to Disclose
Luyao Shen, MD: Nothing to Disclose
Daniel Jason Aaron Margolis, MD: Research Grant, Siemens AG
Anokh Pahwa, MD: Nothing to Disclose
Monica Dhemukh, MD: Nothing to Disclose
Maitraya K. Patel, MD: Nothing to Disclose

**TEACHING POINTS**

Renal and ureteral pathology are commonly encountered on abdominal CT, many of which require urologic intervention. The interventions of the upper tract of the GU system include nephrectomy, nephroureterectomy, extracorporeal shock wave lithotripsy, percutaneous nephrolithotomy and procedures requiring percutaneous renal or ureteral access. Understanding the
clinical indications for these procedures, the key preoperative findings relevant to the Urologist, and the expected postoperative changes is essential for patient management and appropriate diagnosis. The purpose of this exhibit is to: 1. Describe the most commonly encountered interventions of the upper GU tract and their indications. 2. Discuss the relevant preoperative radiologic findings important to the Urologists. 3. Review the normal and abnormal post-operative imaging appearance of these interventions.

TABLE OF CONTENTS/OPTLINE

URE164
New Dimensions in Renal Transplant Sonography: Applications of 3-D Ultrasound

Education Exhibits
Location: NA

Participants
William Walter MD (Presenter): Nothing to Disclose
Susan Judith Frank MD: Nothing to Disclose
Mordecai Koenigsberg MD: Nothing to Disclose

TEACHING POINTS
1. Familiarize the learner with normal findings on 3D US of the renal transplant and the 3D US appearance of pathological conditions
2. Demonstrate the usefulness of 3D US in evaluation of renal transplants

TABLE OF CONTENTS/OPTLINE
1. Review of literature on 3D US for renal transplant evaluation
2. Review of applications for 3D US in evaluating various clinical indications post-transplant
   a. Evaluating: pain, graft failure, hypertension, fever
   b. Demonstrating information added by 3D US and comparison with standard modalities (2D US, CTA, MRA)
3. Review of normal 3D US findings of renal transplants
4. Review of 3D US appearance of various renal transplant pathology
   a. Evaluate vascular findings with surface-rendered color Doppler: renal artery tortuosity, renal artery stenosis, renal artery/vein thrombosis, AV fistula
   b. Clarify the usefulness of 3D US in assessing and following perigraft collections: lymphocele, abscess, and hematoma
   c. Imaging of collecting system and ureteral pathology: hydroureteronephrosis, urothelial thickening, ureteral stricture
   d. Evaluation of the urinary bladder: ureteral jets, bladder wall thickening, post-void residual
   e. Correlation of findings with 2D US, CTA, MRA if available

URE165
Penile Color Doppler Sonography: Anatomy, Procedure, Interpretation and Complication

Education Exhibits
Location: NA

Participants
Rohit Kr Khandelwal MD (Presenter): Nothing to Disclose
Chandan Jyoti Das MD: Nothing to Disclose
Sanjay Sharma MD: Nothing to Disclose
Sonia Sandip MD: Nothing to Disclose
Devasenathipathy Kandasamy: Nothing to Disclose

TEACHING POINTS
1. Describe anatomy and procedure of penile color Doppler with emphasis on interpretation. 2. Discuss complication of Papaverine injection and management.

TABLE OF CONTENTS/OPTLINE
Penile erection is a complex phenomenon, which includes coordinated interaction of the nervous, arterial, venous and sinusoidal systems. A defect in any of these systems may result in erectile dysfunction. Penile color Doppler is used to determine the integrity of the vascular mechanism. The exhibit will include the following points- 1. Anatomy 2. Physiology of erection 3. Procedure 4. Interpretation 5. Complication of Papaverine injection and management.

URE166
Pericatheter Cystourethrography after Urethroplasty: How We Do It and What Does the Urologist Want to Know

Education Exhibits
Location: NA

Participants
Ana Tapia Guerrero (Presenter): Nothing to Disclose
Lydia Rojo Carmona: Nothing to Disclose
Marta Atencia Ballesteros MD: Nothing to Disclose
Vicente Munoz Sanchez: Nothing to Disclose
Francisco Javier Machuca Santa-Cruz: Nothing to Disclose
TEACHING POINTS

The purpose of this exhibit is to review the urethral strictures, their treatment and the imaging findings in pericatheter cystourethrography after surgery. Radiologists has to answer the questions that urologist needs to know before to removal urethral catheter.

TABLE OF CONTENTS/OUTLINE

Anatomy Review of urethral strictures and their treatment Pericatheter cystourethrography: how we do it Imaging findings in pericatheter cystourethrography after urethroplasty: what does urologist want to know Summary

URE167

Renal Manifestations of Hematologic Disorders: A Pictorial Review

Education Exhibits

Location: NA

Magna Cum Laude

Selected for RadioGraphics

Participants

Andrei S. Purysko MD (Presenter): Nothing to Disclose
Hilton M. Leao Filho MD : Nothing to Disclose
Antonio C. Westphalen MD : Nothing to Disclose
Christopher Peter Coppa MD : Nothing to Disclose
Erick Marc Remer MD : Nothing to Disclose

TEACHING POINTS

After viewing this exhib viewers should be able to - List various hematologic conditions that can have renal involvement - Recognize patterns of renal involvement on imaging that can help narrow their differential diagnosis

TABLE OF CONTENTS/OUTLINE


URE168

Role of FDG-PET/CT in Urological Oncology: Staging and Post-treatment Evaluation

Education Exhibits

Location: NA

Certificate of Merit

Participants

Masahiro Okada MD (Presenter): Nothing to Disclose
Itaru Chiba : Nothing to Disclose
Gyou Iida : Nothing to Disclose
Yukiko? Nishikuramori : Nothing to Disclose
Yuko Iraha : Nothing to Disclose
Sadayuki Murayama MD, PhD : Nothing to Disclose
KIMEI AZAMA : Nothing to Disclose

TEACHING POINTS

1. To define the utility of urological malignancies on advanced PET/CT scanner. 2. To introduce a new quantitative parameter of peak standardized uptake value (SUVpeak) in addition to conventional parameters of SUVmax and SUVmean. 3. To know the advantage of PET/CT in the evaluation after treatment. 4. To recognize pitfalls of urological malignancies on PET/CT.

TABLE OF CONTENTS/OUTLINE

1. Advanced PET/CT imaging a) spatial resolution b) quantification to molecular imaging c) characterize and monitor the tiniest cancer lesions 2. Utility at pre-treatment a) Staging of urological malignancies (prostate, urinary bladder, kidney and testis) b) TNM classification 3. Utility at post-treatment a) To detect recurrence and metastasis after surgery b) To evaluate residual viability of cancer after radiotherapy c) To evaluate residual viability of cancer after chemotherapy 4. Pitfalls of PET/CT to diagnose urological malignancies

URE169

Role of the Preoperative CT Analysis in Pelvic Organ Prolapse (POP)

Education Exhibits

Location: NA

Participants

Yukiko Honda MD (Presenter): Nothing to Disclose
Wataru Fukumoto : Nothing to Disclose
Daisuke Komoto MD : Nothing to Disclose
Keizo Tanitame MD : Nothing to Disclose
Shuji Date : Nothing to Disclose
Kazuo Awai MD : Research Grant, Toshiba Corporation Research Grant, Hitachi Ltd Research Grant, Bayer AG Research Consultant, DAIICHI SANKYO Group Research Grant, Eisai Co, Ltd
TEACHING POINTS
In the TVM procedure, by touch only the urologists make a puncture in the sacrospinous ligament with reference to the ischial spine for mesh fixation. The injury to the internal pudendal artery (IPA) is a complication of TVM. Therefore, we must know the precise anatomy around the ischial spine and sacrospinous ligament; particularly the identification of the IPA is very important. The IPA can be easily identified with CT as opposed to MRI.

TABLE OF CONTENTS/OUTLINE
A. Anatomy necessary for understanding POP - Show the precise anatomy around the ischial spine and sacrospinous ligament - Demonstrate visually a common surgical procedure (the tension-free vaginal mesh: TVM) B. The classification and grading of POP C. What we should know to improve surgical safety during the TVM procedure - Accurate identification of the internal pudendal artery - Presence of incidental uterine tumor

URE170
Sonography of the Inguinal Canal: A Comprehensive Review of Pathologic Processes with CT and MR Correlation

Education Exhibits
Location: NA
Certificate of Merit
Selected for RadioGraphics

Participants
Devrim Ersahin MD (Presenter): Nothing to Disclose
Margarita V. Revzin MD : Nothing to Disclose
Jonathan D. Kirsch MD : Nothing to Disclose
Mahan Mathur MD : Nothing to Disclose
Deborah J. Rubens MD : Nothing to Disclose
Leslie M. Scott MD : Consultant, Koninklijke Philips NV

TEACHING POINTS
The embryology and normal anatomy of the inguinal canal will be discussed, followed by a review of multiple pathologic conditions. Emphasis will be made on the significant role that gray-scale and Doppler US play in the clinical assessment and management of patients with inguinal pathology.

TABLE OF CONTENTS/OUTLINE
1. Brief summary of inguinal canal embryology. 2. Review of inguinal canal anatomy. 3. Ultrasound protocol for evaluation of the inguinal canal and its contents, optimization of US imaging technique including Doppler 4. Different pathological processes affecting the inguinal canal will be divided into 6 categories and sonographic characteristics of each of the processes will be reviewed: 1. congenital anomalies of the inguinal canal and its contents (hernias, undescended testes, varicocele, patent processus vaginalis, epididymal cyst, spermatic cord hydrocele) 2. inguinal canal post-surgical complications, such as hematoma, seroma, abscess. 3. neoplasms originating in the inguinal canal or extending from the scrotum (liposarcoma, seminoma, lymphoma, spermatic cord cystadenoma). 4. trauma (testicular retraction, testicular rupture) 5. infectious processes (spermatic cord inflammation with epididymitis/orchitis). 6. vascular compromise (spermatic cord inflammation, infarct)

URE171
Sonography of the Penis: A How-to Review

Education Exhibits
Location: NA

Participants
Javier Azpeitia Arman MD (Presenter): Nothing to Disclose
Rosa M. Lorente-Ramos MD, PhD : Nothing to Disclose
Nuria Santamaria Guinea : Nothing to Disclose
Juan Gredilla : Nothing to Disclose
Jose Manuel Garcia Gomez MD : Nothing to Disclose
Javier Amalia Feltes Ochoa : Nothing to Disclose

TEACHING POINTS
1.To review the study protocol of US of the penis, in order to learn how to perform the exam. 2.To describe diagrammatic and US anatomy of the penis. 3.To illustrate the spectrum of lesions involving the penis, reviewing sonographic appearances of the most prevalent pathologic disorders with correlation with other imaging techniques (MR). 4.To emphasize pitfalls, diagnostic difficulties and differential diagnosis

TABLE OF CONTENTS/OUTLINE
Penis sonography is a widely available imaging technique, which may be helpful in different conditions. Both technique and imaging findings in different entities are presented, highlighting distinguishing features that may aid in detection of lesions and differential diagnosis. We present: 1.US Technique and study protocol 2.Penis Anatomy - Diagrammatic -US correlation 3.Pathology: - Trauma: hematoma, fracture. - Inflammatory. Peyronie - Tumors: primary, metastases - Surgery: prosthesis, granuloma - Vascular: Mondor's disease, priapism, impotence

URE172
State-of-the-art Cross Sectional Imaging of Lymph Nodes in Common Genitourinary Malignancies: A Current Comprehensive Update

Education Exhibits
Participants

Arti Rama Iyer MD (Presenter): Nothing to Disclose
Sreeharsha Tirumani MBBS, MD : Nothing to Disclose
Raghunandan Vikram MBBS, FRCR : Nothing to Disclose
Alampady Krishna Prasad Shanbhogue MD, MBBS : Nothing to Disclose

TEACHING POINTS

1. To review the patterns of nodal spread in select genitourinary malignancies including renal cell carcinoma, upper and lower urinary tract transitional cell carcinoma, endometrial, cervical and ovarian carcinoma, prostate carcinoma and testicular carcinoma. 2. To briefly review the nodal staging and its implications on prognosis and treatment. 3. To provide a current comprehensive update on the role of State-of-the-art cross sectional imaging (MDCT, MRI and FDG-PET) in lymph node staging of these malignancies.

TABLE OF CONTENTS/OUTLINE

Graphical illustration of major nodal stations and major pathways of lymphatic spread, with imaging correlation. Brief overview of Nodal Staging (as per TNM classification), with discussion on its implications on prognosis and treatment. A comprehensive review of literature on the role of MDCT, MRI and 18F-FDG-PET/CT in the evaluation of lymph node metastases. Brief discussion on potential applications of novel imaging techniques such as MR lymphangiography.

URE173

The Female Urethra: An Imaging Review

Education Exhibits

Location: NA

Participants

Katie St. Germain Mason MD (Presenter): Nothing to Disclose
Aarti Sekhar MD : Nothing to Disclose

TEACHING POINTS

1. Though only 4 cm long, the female urethra can present with a wide range of pathology, which is most easily recognized on MR imaging. 2. Urethral diverticula: important to describe location of neck to facilitate transvaginal resection; also recognize complications such as stones, infection and malignancy 3. Skene's gland cysts: classic distal periurethral location and recognize that they can get infected 4. Distal urethral tumors are more likely to be squamous cell carcinoma and have a better prognosis. Entire urethral tumors tend to be urothelial carcinoma or adenocarcinoma and have a high rate of invasion and pelvic nodal metastases. 5. Stress urinary incontinence affects 50% of women over the age of 65. Management techniques include mid-urethral slings and bulking agents. These interventions have varying imaging appearance depending on time from injection and their composition.

TABLE OF CONTENTS/OUTLINE


URE175

When Diagnostic Workup Is Needed: Hematospermia at Magnetic Resonance Imaging

Education Exhibits

Location: NA

Participants

Pardeep Kumar Mittal MD (Presenter): Nothing to Disclose
Juan Camilo Camacho : Nothing to Disclose
Nima Kokabi MD : Nothing to Disclose
William C. Small MD, PhD : Nothing to Disclose
Kiran Kumar Maddu MBBS : Nothing to Disclose
Courtney Ann Coursey Moreno MD : Nothing to Disclose

TEACHING POINTS

1. To demonstrate hematospermia (HS) is an idiopathic and self-limiting anxiety provoking condition but MRI plays an important role in the diagnostic workup of men with persistent HS and to discuss potential etiologies. 2. To review image appearance of associated pathologies and role of MRI in evaluating conditions causing hematospermia

TABLE OF CONTENTS/OUTLINE

Pathophysiology of hematospermia: Etiologies of HS: • Congenital (seminal vesicle cyst, mullerian duct /ejaculatory duct cyst) • Infection/inflammation (cystitis, prostatitis, epididymo-orchitis) • Neoplasm (bladder, prostate, testicular and urethral cancer) • Iatrogenic (biopsy, radiation, instrumentation, etc.) • Trauma MRI is the modality of choice for diagnosing HS due to its superior contrast resolution , multiplanar imaging capabilities, and ability to resolve small caliber structures (such as ejaculatory ducts, vasa deferentia, internal architecture of prostate, etc). SUMMARY MR plays an important role in the diagnostic workup of patients with persistent HS and associated signs and symptoms of the disease. In addition, there is no ionizing radiation involved with MR imaging. Attendees will gain an appreciation for the wide variety of conditions encountered in HS at imaging.

URE176

X-ray Scatter Correction Technology with 2D Anti-scatter Grid: Is Removing X-ray Scatter Able to Correct the Hounsfield Unit of Renal Cyst?
Participants
Tamaki Mineyama: Nothing to Disclose
Keiichi Honda: Nothing to Disclose
Yasuyuki Kobayashi MD, PhD: Nothing to Disclose
Koji Sasaki RT: Nothing to Disclose
Kaname Ameda: Nothing to Disclose
Shinichi Tokuyasu RT (Presenter): Employee, Koninklijke Philips NV
Soji Miyashita RT: Nothing to Disclose

TEACHING POINTS
1. Category of renal cyst location and the effect of high attenuation material in Z-direction on x-ray scatter
2. X-ray scatter is part of the reason for pseudo enhancement.
3. 2D slit-scatter grid is an essential technology as countermeasure of pseudo enhancement on MDCT.

TABLE OF CONTENTS/OUTLINE
Impact of scattered x-ray on image quality X-ray scatter fundamentals and its effect on CT Hounsfield unit measurement
Phantom setup to observe irregularity CT Hounsfield unit on X-ray scatter The phantom design of simulating simple cyst in enhancement/ non-enhancement renal Approaches of scatter correction Influence with longitudinal coverage of CT scanners
Comparison of shifted CT Hounsfield unit by the location of high attenuation material Comparison of 2D anti-scatter grid and 1D anti-scatter grid Clinical impact of pseudo enhancement Statical analysis of the shift in Hounsfield unit measurements on the renal cyst location Statical analysis of the shift in Hounsfield unit measurements in 600 clinical cases of different CT scanner (Aquilion CXL; Toshiba Medical Systems, Brilliance iCT; Philips Healthcare)

URE177
Abnormalities of the Perinephric Space: A Pictorial Review

Participants
Jessica Schreiber-Zinaman MD (Presenter): Nothing to Disclose
Gregory Michael Grimaldi MD: Nothing to Disclose
Priya Kumar Shah MD: Nothing to Disclose

TEACHING POINTS
1. To review the anatomy of the perinephric space 2. To discuss intrinsic and extrinsic disease processes involving the perinephric space 3. To describe imaging characteristics of each perinephric process

TABLE OF CONTENTS/OUTLINE

URE179
Fat-containing Retroperitoneal Lesions: Imaging Characteristics, Localization and Differential Diagnosis

Participants
Akram Mohamed Shaaban MBCh (Presenter): Contributor, Amirsys, Inc
Maryam Rezvani MD: Nothing to Disclose
Marc Tubay MD: Royalties, Amirsys Inc
Khaled M. Elsayes MD: Nothing to Disclose
Christine G. Menias MD: Nothing to Disclose

TEACHING POINTS
1. The learner should be able to differentiate between primary and secondary retroperitoneal masses 2. The learner should be able to list fat-containing lesions occurring in the retroperitoneal, both primary and secondary. 3. The learner should be able to compile a short differential diagnosis based on the location, imaging features and clinical presentation.

TABLE OF CONTENTS/OUTLINE
1. Imaging features of fat on different imaging modalities
2. Differentiation between primary and secondary retroperitoneal masses
3. Causes and differential diagnosis of fat containing retroperitoneal lesion
   A. Renal
   1- Angiomyolipoma
2- Lipoma
3- Liposarcoma
4- Replacement lipomatosis

B. Adrenal
1- Myelolipoma
2- Adrenal carcinoma
3- Pheochromocytoma
4- Neurogenic tumors
Primary retroperitoneal lesions
1- Lipoma
2- Liposarcoma
3- Lipomatosis
4- Myelolipoma
5- Primary and metastatic malignant germ cell tumors
6- Dermoid
7- Neurogenic tumors
8- Fat necrosis

URE183

A Private Investigation: Radiologic-pathologic Correlation of Testicular Tumors

Education Exhibits
Location: NA

Participants
- Arash Bedayat MD (Presenter): Nothing to Disclose
- Larry Z. Zheng MD: Nothing to Disclose
- Byron Y. Chen MD: Nothing to Disclose
- Morris Hayim MD: Nothing to Disclose
- Staci Gagne MD: Nothing to Disclose
- Lacey McIntosh DO, MPH: Nothing to Disclose
- Hao Steven Lo MD: Nothing to Disclose

TEACHING POINTS
1. Review sonographic findings of seminoma and nonseminomatous tumors of the testis, as well as less common tumors including lymphoma, epidermoid cyst and gonadal stromal tumor. 2. Direct comparison of sonographic findings with gross and histologic pathology findings. 3. Discuss pearls and pitfalls in accurately diagnosing testicular tumors.

TABLE OF CONTENTS/OUTLINE
Classification of testicular tumors. Describe the ultrasound features of testicular tumors and their pathologic correlates. Identify the imaging and non-imaging features of each of these tumors that may allow differentiation from others. Discuss the mimics, diagnostic pitfalls and management of testicular tumors.

URE184

Elastography of Small Testicular Masses: Not all Hard Lesions Are Malignant Nor Benign Lumps are Always Soft, and Some Change Consistency

Education Exhibits
Location: NA

Participants
- Michele Bertolotto MD (Presenter): Nothing to Disclose
- Paul Singh Sidhu MRCP, FRCR: Speaker, Bracco Group Speaker, Siemens AG Speaker, Hitachi, Ltd
- Lorenzo Egildo Derchi MD: Nothing to Disclose
- Rossana Bussani MD: Nothing to Disclose
- Eleni Konstantatou MD, MSc: Nothing to Disclose
- Maria Assunta Cova MD: Nothing to Disclose
- Francesca Cacciato: Nothing to Disclose
- Massimo Valentino MD: Nothing to Disclose

TEACHING POINTS
To illustrate the predominant elastographic features of different small testicular lesions focusing on those with atypical appearance or change their consistency over time. To illustrate the imaging features that allow differential diagnosis between benign and malignant lesions irrespective of elastographic appearance.

TABLE OF CONTENTS/OUTLINE
Real time elastography is an emerging technique in imaging scrotal pathologies. In general, cancers are harder than the surrounding parenchyma and benign condition are soft. However, exceptions exist to this rule. Moreover, lesions can change consistency over time depending on their evolution. Multiparametric imaging and other diagnostic information, such as the patient history and tumor markers, are very useful elements in determining a correct diagnosis. We present a spectrum of benign and malignant small focal testicular lesions presenting with atypical appearance at elastography of which changed in consistency over time. Among them: seminoma, leydigoma, circumscribed fibrotic changes, epidermoid cyst, adenomatoid tumor, lipoma, intratesticular hematoma, inflammatory changes, sarcoidosis, segmental testicular infarction.
Focal Testicular Lesions: Use of Contrast-enhanced Ultrasound (CEUS) and Real-time Tissue Elastography (RTE) as Adjuvant Sonographic Techniques in Determining Clinical Management

Education Exhibits
Location: NA

Participants
- Eleni Konstantatou MD, MSc (Presenter): Nothing to Disclose
- Dean Yi-Hsiang Huang MBBS, FRCR: Nothing to Disclose
- Lorenzo Egido Derchi MD: Nothing to Disclose
- Michele Bertolotto MD: Nothing to Disclose
- Massimo Valentino MD: Nothing to Disclose
- Paul Singh Sidhu MRCP, FRCR: Speaker, Bracco Group Speaker, Siemens AG Speaker, Hitachi, Ltd

TEACHING POINTS
To demonstrate the usefulness of combination of the new techniques of CEUS and RTE as adjuvant methods to normal routine testicular sonography with B-Mode and Color Doppler methods, when assessing abnormalities associated with the acute scrotum or a palpable mass. Judicious use of CEUS and RTE may aid in improving the strategy of appropriate patient management, avoiding an unnecessary orchidectomy.

TABLE OF CONTENTS/OUTLINE
We present the spectrum of the benign and malignant focal testicular lesions with indications for CEUS and RTE utilization. We will demonstrate intra-testicular abnormalities including sex-cord stromal tumours, germ cell tumors, sarcomas, segmental infarcts, abscesses, focal scars, TB granulomas and sarcoidosis. Enhancement patterns of focal lesions in CEUS and RTE patterns will be discussed, with comment on accuracy, and the ability to alter surgical management. RTE color map and visual grading of the lesions will be analyzed. The combination of the standard sonographic techniques with the use of CEUS and RTE are superior to B-Mode and color Doppler alone as it may facilitate a more accurate diagnosis and appropriate clinical management, discriminating the benign from the malignant pathology.

Lesions without Borders: Scrotal Lesions That Involve Both the Intratesticular and Extratesticular Regions

Education Exhibits
Location: NA
Certificate of Merit

Participants
- Helena Gabriel MD (Presenter): Nothing to Disclose
- Nancy A. Hammond MD: Nothing to Disclose
- Paul Nikolaidis MD: Nothing to Disclose
- Massihullah Hamidi MD: Nothing to Disclose
- Frank H. Miller MD: Nothing to Disclose

TEACHING POINTS
The purpose of this exhibit is: 1. To demonstrate that some disease processes defy conventional intratesticular and extratesticular designations and instead, involve both regions 2. To discuss those disease entities that can affect both the intra- and extratesticular areas and fully describe their typical and atypical imaging features 3. To illustrate that the involvement of both regions can help narrow the differential diagnosis and be a clue to the correct pathology

TABLE OF CONTENTS/OUTLINE
Typical and atypical imaging features of disease processes that can concomitantly involve the intratesticular and extratesticular regions will be illustrated. These disease processes include: Epididymo-orchitis Trauma Tubular ectasia Granulomatous infection, TB Sarcoidosis Lymphoma/Leukemia Vascular processes including varicocele Unusual lesions/ tumors including rete cystadenoma, adenomatoid tumor, and others

Rare Scrotal Neoplasms; Imaging Features and Pathological Correlation with Impact on Management in the Era of Targeted Therapy

Education Exhibits
Location: NA

Participants
- Deborah Borst: Nothing to Disclose
- Kaiyan Kang: Nothing to Disclose
- Rhoda Reading BS, BA: Nothing to Disclose
- Ott Le MD: Research support, Lantheus Medical Imaging, Inc
- Shiva Gupta MD: Nothing to Disclose
- Khaled M. Elsayes MD (Presenter): Nothing to Disclose
- Deepak G. Bedi MBBCh: Consultant, Koninklijke Philips NV

TEACHING POINTS
- To discuss various rare testicular neoplasms.
- To describe the diagnostic workup and imaging features of these neoplasms.
-
To correlate imaging features with pathological findings and explain the impact of these manifestations on management.

TABLE OF CONTENTS/OUTLINE

- Introduction. - Pathological Classification of rare testicular neoplasms. - Epidemiology. - Laboratory evidences and correlation. - Imaging Manifestations of these rare neoplasms - Impact of imaging manifestations on management. SUMMARY Various rare benign and malignant neoplasms can involve the scrotum and its contents. Examples of these malignancies include Neurofibromatosis, Lymphoma/Leukemia, Teratoma, mixed non-seminomatous germ cell tumor, Metastatic Prostatic Adenocarcinoma, Plasmacytoma, spermatic cord liposarcoma and spermatic cord myeloma. Although rare, radiologist's familiarity with imaging and clinical features helps in guiding proper management.

URE189
Sonography of the Adult Male Pelvis and Scrotum: Pearls and Pitfalls

Participants
Fernanda Samara Mazzariol MD (Presenter): Nothing to Disclose
Zina Joan Ricci MD: Nothing to Disclose
Sarah Kyung Oh MD: Nothing to Disclose
Mordecai Koenigsberg MD: Nothing to Disclose
Jeffrey Harmon Roberts MD: Nothing to Disclose
Marjorie Werner Stein MD: Nothing to Disclose

TEACHING POINTS

Review common pitfalls in the interpretation of adult male scrotal and pelvic sonograms: 1. Artifacts, normal anatomic structures and benign pathology may mimic bladder tumors. 2. Bladder and bowel tumors may mimic prostatic neoplasia. 3. Penile prosthesis reservoir can mimic pelvic cystic masses or fluid collections. 4. Not all testicular masses are cancer. 5. Not all serpiginous tubules in the scrotum are varicoceles.

TABLE OF CONTENTS/OUTLINE


URE190
Spectrum of Seminoma within the Male Genitourinary System: Clinical-Radiologic-Pathologic Correlation

Participants
Jamie Marko MD (Presenter): Nothing to Disclose
Darcy Jennifer Wolfman MD: Nothing to Disclose
Charles Frank Gould MD: Nothing to Disclose
Claire Widule: Nothing to Disclose
Grant E. Lattin MD: Nothing to Disclose

TEACHING POINTS

1. Seminoma is the most common pure germ cell tumor of the testis, accounting for 35-50% of all germ cell tumors. A rare subtype of seminomas, spermatocytic seminoma, affects an older patient population than classic seminoma. 2. The typical sonographic appearance of testicular seminoma is a hypoechoic mass with vascular flow. As seminomas enlarge, the hypoechoic mass can take on a nodular appearance with intervening echogenic septations. 3. Testicular seminoma commonly spreads via the lymphatics to the retroperitoneal lymph nodes. The lymphadenopathy may be homogeneous in appearance or may show necrosis, calcification and even result in hydronephrosis or vascular invasion. 4. Supernumerary and undescended testes are at increased risk of developing a seminoma. Masses within the inguinal canal or pelvis in a male patient should prompt the reader to examine the scrotum for bilateral spermatic cords.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Multimodality imaging of seminoma and rare variants with gross and histologic radiologic pathologic correlation. 3. Imaging of the variable appearances of seminoma-related lymphadenopathy, with gross and histologic radiologic pathologic correlation. 4. Imaging of seminomas arising in supernumerary and undescended testes.

URE191
MR Imaging of Penile Fracture – A Pictorial Review with Clinical Correlation

Participants
Divya Santosh MBBS (Presenter): Nothing to Disclose
Aslam Zeeshan MBBS: Nothing to Disclose
Dave - Fleming MRCP, FRCR: Nothing to Disclose
Mark Robinson MBBS, FRCR: Nothing to Disclose

TEACHING POINTS
To illustrate the Magnetic Resonance Imaging (MRI) features of this uncommon but acute penile pathology, with clinical and surgical correlation in a case series from our institution over 6 years.

We highlight the perils and pitfalls of MRI in the diagnosis of penile fractures.

**TABLE OF CONTENTS/OUTLINE**

1. MR anatomy of Penis with an overview of our local imaging protocol for penile fracture. We discuss the MRI findings and clinical management, in 10 patients who presented with a clinical suspicion of penis fracture. 6 patients had tunical and corporal tear on imaging. 3. We review the available literature and summarise the typical imaging findings with surgical correlation. The management of penile fracture on the basis of clinical diagnosis alone is limited to certain extent due to the difficulty in examination and also lack of experience. This exhibit will enable a general radiologist to confidently diagnose this rare penile pathology. Our cases will illustrate to the readers that imaging is an important adjuvant to clinicians in the appropriate management of penile fractures.

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**URE192**

**Observation vs Emergent Surgery: A Radiologist’s Guide to Renal Trauma**

**Education Exhibits**

**Location:** NA

**Participants**

- Daniel F. Hadland MD (Presenter): Nothing to Disclose
- Rastain Lee Morgan MD, MS: Nothing to Disclose
- Jacqueline Hill MPH: Nothing to Disclose
- Ryan Michael Ash MD: Nothing to Disclose

**TEACHING POINTS**

A strong understanding of kidney anatomy and clinical presentation of patients with renal trauma severe as a foundation for accurate radiologic assessment. The purpose of this exhibit is to review methods for accurately grade renal trauma. Through this exhibit, we aim to improve radiologists' ability to make accurate assessments of renal trauma to improve patient management and clinical outcomes. This will be achieved by reviewing renal anatomy, mechanisms of injury, and clinical presentation associated with renal trauma. We will also include a discussion on the strengths and limitations, as well as a pictorial review demonstrating key imaging features of different modalities for assessing renal trauma.

**TABLE OF CONTENTS/OUTLINE**

- Review renal anatomy, specifically focusing how it relates to renal trauma and mechanisms of injury
- Discuss clinical presentation of renal trauma, including:
  - Common presentations of renal trauma
  - Pathophysiology related to systemic effects of renal trauma
- Provide a pictorial review of the following key points:
  - The American Association for the Surgery of Trauma Renal Grading System
  - Limitations and benefits of different imaging modalities for assessing renal trauma

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**URE193**

**The Role of Ultrasonography in Evaluating Patients with Suspected Penile Fracture**

**Education Exhibits**

**Location:** NA

**Participants**

- Ferekh Salim MBChB, MRCP (Presenter): Nothing to Disclose

**TEACHING POINTS**

The penile corpora and tunica albuginea are well visualised using a high frequency linear array probe. Penile trauma often occurs as an injury sustained during sexual intercourse. Although the diagnosis is usually obvious on the basis of clinical history and clinical signs, the diagnosis is not always straightforward. Sonographic signs of penile fracture include discontinuity of the tunica albuginea indicating a tear, there is often an associated overlying haematoma. Prompt surgical repair is indicated in patients with tears of the tunica albuginea. Ultrasound provides a quick, non-invasive and inexpensive method of assessing patients with suspected penile injury.

**TABLE OF CONTENTS/OUTLINE**

- Discussion of normal sonographic appearances of the penile corpora
- Clinical signs and mechanism of injury leading to penile fracture
- Sonographic technique used to evaluate the penile corpora
- Discussion of sonographic appearances of fracture of penile corpora
- Illustrated examples of cases of patients seen at our institution with fractured corpora

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**URE194**

**Traumatic Posterior Urethral Injuries: Imaging Findings, Classification, and the Radiologist’s Potential Role in Primary Urethral Realignment**

**Education Exhibits**

**Location:** NA

**Participants**

- Kai Z. Kinder MD (Presenter): Nothing to Disclose
- Arthur Adrian Lee MD: Nothing to Disclose
- Stuart E. Braverman MD: Nothing to Disclose
TEACHING POINTS
The purpose of this educational exhibit is: 1. To review traumatic posterior urethral injuries, including etiology, clinical signs/symptoms, and clinical significance. 2. To review urethral anatomy and injury classification systems. 3. To provide indications for urethrography and an image-based approach to findings of posterior urethral injuries on CT and urethrography. 4. To discuss clinical management and outcomes. 5. To highlight the radiologist's potential role in primary urethral realignment and illustrate related fluoroscopic-guided techniques.

TABLE OF CONTENTS/OUTLINE
Etiology, risk factors, clinical findings, and significance of posterior urethral injuries Urethral anatomy and urethral injury classification Imaging review: -Urethrography indications, techniques, and findings -CT findings Clinical management: -Surgical vs. fluoroscopic-guided primary urethral realignment -Illustrate fluoroscopic-guided techniques Sample cases Summary and conclusions

SPSP01
Nuevos Horizontes en Diagnostico por Imagen Desde el CIR: Sesión del Colegio Interamericano de Radiología (CIR) en Español/New Horizons in Diagnostic Imaging from CIR: Session of the Interamerican College of Radiology (CIR) in Spanish

Special Courses

LEARNING OBJECTIVES
1) To review advances or new horizons in imaging in major subspecialties from experts from different CIR (Interamerican College of Radiology) countries. 2) To use a practical approach including case-based learning. 3) To seek audience participation with presentation of unknown clinical examples related to the organ system presentations.

Sub-Events

SPSP01A Introducción/Opening Remarks
Gloria Soto Giordani MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.

SPSP01B Primera Parte/Part 1
Moderator Pablo Riera Ros MD, PhD : Medical Advisory Board, Koninklijke Philips NV Medical Advisory Board, KLAS Enterprises LLC Medical Advisory Committee, Oakstone Publishing Departmental Research Grant, Siemens AG Departmental Research Grant, Koninklijke Philips NV Departmental Research Grant, Sectra AB Departmental Research Grant, Toshiba Corporation

LEARNING OBJECTIVES
View learning objectives under main course title.

SPSP01C Sistema Nervioso Central: Correlación Entre Marcadores Genéticos e Imágenes en Astrocitomas/Central Nervous System: Imaging—Genetic Markers Correlation in Astrocytomas
Mauricio Castillo MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) To become familiar with the traditional biochemical/genetic markers of astrocytomas and how their presence or absence correlate with imaging findings. 2) To understand the biological changes, as reflected by MR advanced imaging techniques, that astrocytomas go through when malignant transformation occurs.

ABSTRACT
In this lecture we will use advanced MR imaging techniques, perfusion (both contrast enhanced and arterial spin labelled), permeability, diffusion, and spectroscopy to understand the biological behavior of astrocytomas. Low grade astrocytomas may not show high choline on MRS but show high myoinositol which correlates with low perfusion values. Anaplastic astrocytomas produce metalloproteinases and thus VEGF and PDGF can stimulate angiogenesis resulting in high perfusion with gadolinium and ASL. Lastly, hypoxia induces formation of permeability factors leading to edema and contrast enhancement in glioblastomas. Necrosis, seen as lipids on MRS is a marker of glioblastoma. Presence of MGMT promoter and alterations in the IDH1 gene (present in most secondary glioblastomas) confer a better survival pattern to glioblastoma patients and these findings are seen predominantly in temporal and deep tumors and in those with little contrast enhancement and high signal on T2 and DWI images. Thus, the initial transformation in all low grade astrocytomas is ischemia that can be seen as the presence of lactate on MRS, while markers of higher grades such as angiogenesis, permeability, and necrosis can be identified with perfusion, K-trans maps, and MR spectroscopy. Lack of myoinositol on MRS indicates its consumption for production of metalloproteinases and thus it is also an early marker of angiogenesis.
Many of these changes occur before anatomical images may suggest them.

**URL**

https://sites.google.com/site/castilloneuroradiology/

**Active Handout**

http://media.rsna.org/media/abstract/2014/14002958/SPSP01C sec.pdf

**SPSP01D Cardiovascular: Cambios Desde el TAC y RM Hacia la Imagen Funcional y Molecular/Cardiovascular: CT and MRI Changes towards Functional and Molecular Imaging**

Antonio Luna MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Revisar las indicaciones actuales del TC y RM en el diagnóstico cardiovascular. 2) Ensalzar las nuevas aproximaciones técnicas en TC y RM del sistema cardiovascular. 3) Esbozar el papel potencial de la imagen funcional y molecular en enfermedades cardiovasculares. 1) Review the current clinical indications of CT and MRI in cardiovascular diagnosis. 2) Highlight the new technical approaches in CT and MRI of the cardiovascular system. 3) Outline the potential role of functional and molecular imaging in the management of cardiovascular diseases.

**SPSP01E Mama: Integración de Medicina Nuclear en las Imágenes Diagnósticas de Mama/Breast: Nuclear Medicine Integration in Breast Imaging**

Maria Victoria Velasquez MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Present the current indications for Molecular Breast Imaging and Positron Emission Mammography. 2) Describe imaging protocols, radiation exposure and benefits for both techniques. 3) Outline the most common findings of benign and malignant breast lesion on MBI and PEM with correlation with other breast imaging studies. 4) Navigate through the different steps of PEM guided biopsy. 5) Describe alternative management and follow up with these techniques.

**ABSTRACT**

Integration of Nuclear Medicine in Breast Imaging In the last decade the introduction of Nuclear medicine as Molecular imaging of the breast had a significant development in the diagnosis of breast abnormalities. Positron Emission Mammography (PEM) and Molecular Breast Imaging (MBI) have been successful in the detection of benign, atypical and malignant breast conditions. PEM have been proven to represent a very helpful staging tool in patients with contraindications to breast MRI. MBI is a valuable technique for screening of high risk patients and as for problem solving for patients with inconclusive clinical or imaging findings. This presentation will review the main indications of these Nuclear Medicine studies and will detail the findings and the correlation with conventional breast imaging. The breast imager will have a better understanding of the anatomic, functional and molecular breast imaging techniques.

**SPSP01F Tórax: Hallazgos de la Resonancia Magnética en Enfermedades del Parénquima/Chest: Magnetic Resonance Findings in Lung Parenchymal Disease**

Arthur Soares Souza MD, PhD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) To show the value of thoracic MRI for assessment of parenchymal lung disease. 2) To demonstrate the value of diffusion weighted MRI (DWI) for differentiating benign from malignant lung neoplasms.

**ABSTRACT**

In this lecture we will show the clinical ability of thoracic MRI to depict the most common patterns of parenchymal lung diseases, and do the correlation with CT findings. MRI seems to be a valuable tool, without radiation exposure, for management of parenchymal lung disease. We will, also, address the importance of diffusion weighted MRI (DWI) for differentiating benign from malignant lung lesions.

**URL**

http://www.ultrax.com.br/chest

**SPSP01G Conferencia del Colegio Interamericano de Radiología/Interamerican College of Radiology Lecture**

Dante R. Casale Menier MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.
SPSP01H  Segunda Parte/Part II
Moderator Miguel E. Stoopen MD : Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.

ABSTRACT
N/a

URL
www.webcir.org

SPSP01I  Musculoesqueletico: Imágenes Avanzadas del Cartílago Articular y "Chemichal Shift" de Médula Ósea/Musculoskeletal: Advanced Imaging of the Articular Cartilage and Bone Marrow Chemical Shift Imaging
Gonzalo Javier Delgado MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.

SPSP01J  Abdomen e Hígado: Contrastes Hepatoespecíficos y Elastografia por Resonancia Magnética/Abdomen and Liver: Liver Specific Contrast Agents and Hepatic MR Elastography
Luis Antonio Sosa MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.

SPSP01K  Próstata: Resonancia Magnética de 3T y PET/CT con Colina/Prostate: 3T MRI and Choline PET/CT
Daniela Stoisa MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.

Handout:Daniela Stoisa
http://media.rsna.org/media/abstract/2014/14002966/cap chicago 2014.ppt

SPSP01M  Clausura/Closing Remarks
Dante R. Casale Menier MD (Presenter): Nothing to Disclose , Pablo Riera Ros MD, PhD (Presenter): Medical Advisory Board, Koninklijke Philips NV Medical Advisory Board, KLAS Enterprises LLC Medical Advisory Committee, Oakstone Publishing Departmental Research Grant, Siemens AG Departmental Research Grant, Koninklijke Philips NV Departmental Research Grant, Sectra AB Departmental Research Grant, Toshiba Corporation , Miguel E. Stoopen MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
View learning objectives under main course title.
Sub-Events

SSA09-01

Usefulness of Contrast-enhanced Ultrasound in the Characterization of Renal Nodules Indeterminate on Computed Tomography

Carlos Nicolau MD (Presenter): Nothing to Disclose, Laura Bunesch Villalba MD: Nothing to Disclose, Blanca Pano Brufau MD: Nothing to Disclose, Rafael Salvador Izquierdo MD: Nothing to Disclose, Carmen Sebastia Cerqueda MD: Nothing to Disclose, Laura Oleaga: Nothing to Disclose

PURPOSE

The aim of this study was to assess the accuracy of contrast-enhanced ultrasound (CEUS) in the characterization of renal nodules indeterminate on CT by identifying benign cystic lesions not requiring histological diagnosis.

METHOD AND MATERIALS

72 patients with 83 indeterminate renal nodules on CT underwent baseline US and CEUS that classify lesions as benign (Bosniak I, II or IIF cysts) or potentially malignant (Bosniak III or IV cysts, solid nodules). The reasons to consider a nodule as indeterminate include: A. Study with only an unenhanced phase with a nodule > 20HU; 10 nodules. B. Study without an unenhanced phase; 40 nodules; C. Study with an unenhanced and at least 1 enhanced phase with a nodule > 20HU and a difference of enhancement <20HU between the unenhanced and enhanced phases; 33 nodules. The accuracy of US and CEUS in the differentiation between benign cysts and potentially malignant nodules was analyzed and compared with the final diagnosis obtained by histology or follow-up of at least 18 months with CEUS +/- a conclusive CT/MR study.

RESULTS

Final diagnoses comprised 50 benign complex cysts (44 Bosniak I-II and 6 Bosniak IIF), 1 focal nephritis, 1 multilocular cystic nephroma, 3 oncocytomas, 1 transitional cell carcinoma and 27 renal cell carcinomas. CEUS correctly classified 48 out of 50 (96%) nodules as benign complex cysts with a final diagnosis of Bosniak I-II or IIF cysts and 31 out of 33 (93.9%) nodules as potentially malignant with a final diagnosis of Bosniak III, IV or solid lesions, with a sensitivity of 96%, specificity of 93.9%, positive predictive value of 96%, negative predictive value of 93.9% and accuracy of 95.2%. The accuracy of CEUS was significantly better than that of US (95.2% vs. 45%).

CONCLUSION

CEUS is very useful in the differentiation between benign complex cysts and other lesions that require further investigation in non-conclusive renal nodules detected on CT.

CLINICAL RELEVANCE/APPLICATION

The use of CEUS to differentiate benign cystic lesions that do not require immediate further investigation (Bosniak I-II-IIF cysts) from other potentially malignant solid lesions and complex Bosniak III or IV cysts that usually require histology to achieve a final diagnosis facilitates the management of indeterminate renal masses with the advantage of its price and absence of radiation and nephrotoxicity.

SSA09-02

Apparent Diffusion Co-efficient as a Predictor of Recurrence after Nephrectomy in Localized Renal Cell Carcinoma

Akihiro Nishie MD (Presenter): Nothing to Disclose, Daisuke Kakihara: Nothing to Disclose, Yoshiki Asayama MD : Nothing to Disclose, Yasuhiro Ushijima MD: Nothing to Disclose, Yukihisa Takayama MD: Research Grant, FUJIFILM Holdings Corporation, Hiroshi Honda MD: Nothing to Disclose, Daisuke Okamoto MD : Nothing to Disclose, Nobuhiko Fujiyama, PhD: Nothing to Disclose, Koichiro Morita : Nothing to Disclose, Yuichiro Kubo MD : Nothing to Disclose, Junichi Inokuchi : Nothing to Disclose

PURPOSE

To elucidate whether apparent diffusion coefficient (ADC) of a tumor is a predictor of recurrence after nephrectomy in localized renal cell carcinoma (RCC)

METHOD AND MATERIALS

We retrospectively studied 49 patients with localized RCC who underwent magnetic resonance imaging including diffusion-weighted imaging preoperatively. Fifteen patients developed recurrence during follow-up periods of 89 to 1837 days, while the remaining 34 showed no recurrence during follow-up periods of 1209 to 4822 days. ADC was measured by placing a region-of-interest in each tumor on ADC map, as avoiding necrosis and hemorrhage. Mean ADC was calculated by averaging ADC values obtained from three images, and minimum ADC was defined as the lowest ADC value among the three. The correlations between clinicopathological variables that could affect recurrence (age, gender, tumor size, tumor stage, growth/invasion pattern, Fuhrman's grade, histology, venous invasion, average ADC and minimum ADC) and disease free survival were analyzed.
using Cox proportional hazards model.

RESULTS

In univariate analysis, tumor size, venous invasion, mean ADC and minimum ADC showed significant correlations with disease free survival (p < 0.05). In multivariate analysis, only venous invasion and minimum ADC revealed significance (p < 0.05).

CONCLUSION

Minimum ADC of a tumor, as well as venous invasion, was an independent predictor of recurrence after nephrectomy in localized RCC.

CLINICAL RELEVANCE/APPLICATION

Because a localized RCC showing low minimum ADC may recur in the early stage, we can propose the necessity of adjuvant therapy and shortening of the follow-up interval by imaging after surgery for such a tumor.

Quantitative CT Texture Analysis: Can It Differentiate between Minimal Fat Renal Angiomyolipoma (mfAML) and Renal Cell Carcinoma on Non-contrast Enhanced Computed Tomography (NECT)?

Taryn Hodgdon MD (Presenter): Nothing to Disclose, Rebecca Thornhill: Nothing to Disclose, Matthew Donald Fernand McInnes MD, FRCP: Nothing to Disclose, Nicola Schieda MD: Nothing to Disclose, Leslie Lamb MD, MSc: Nothing to Disclose, Trevor A. Flood MD, FRCP: Nothing to Disclose

PURPOSE

To evaluate the accuracy of texture analysis to differentiate mfAML from RCC on non-enhanced computed tomography (NECT), using histopathologic diagnosis of surgically resected renal lesions as the reference standard.

METHOD AND MATERIALS

A retrospective case-control study was approved by the institutional review board. Patients with AML and RCC were obtained from the pathology database of surgically resected specimens from January 2002 to August 2013. The study included 16 patients with mfAML and 68 patients with RCC. mfAML was defined by the absence of visible fat on NECT. Preoperative NECTs were reviewed, and texture analysis was performed on 3 axial images of each renal lesion. The most discriminative features were used to generate a support vector machine (SVM) classifier. Accuracy of the SVM was then determined by 10-fold cross validation. The NECT for each patient was also independently reviewed by two blinded radiologists who subjectively graded lesion heterogeneity. The diagnostic performance of textural classifiers was compared with radiologist ratings using McNemar tests.

RESULTS

CT texture features related to lesion homogeneity and entropy were evaluated. There was significantly lower lesion homogeneity and higher lesion entropy in RCC compared to mfAML (p

CONCLUSION

CT texture analysis may be useful for differentiating mfAML from RCC on NECT.

CLINICAL RELEVANCE/APPLICATION

CT texture analysis features related to lesion homogeneity and entropy may be useful for differentiating mfAML from RCC on NECT.

Frequency of Minimally Enhancing Small RCC on Contrast-enhanced CT

Naoki Takahashi MD (Presenter): Nothing to Disclose, Kohei Sasaguri MD: Nothing to Disclose, Mitsuru Takeuchi MD, PhD: Nothing to Disclose, Akira Kawashima MD: Nothing to Disclose

PURPOSE

To evaluate the frequency of minimally enhancing small RCC on contrast-enhanced CT.

METHOD AND MATERIALS

130 patients 148 with pathologically proven small RCC (<4cm) (mean age 61; 78 male, 52 female; 98 cc-RCC, 36 pap-RCC, and 14 other subtypes of RCC, mean size 25 mm) who underwent both unenhanced (NC) and contrast-enhanced (CE)-CT were included. CT attenuation of renal mass was measured on NC and CE-CT by placing a largest possible ROI. Renal mass with enhancement <20 HU (attenuation difference between CE-CT and NC-CT) was categorized as minimally enhancing mass. CT and clinical history of these patients were reviewed by 2 radiologists. The difficulty of making prospective diagnosis of solid mass was categorized using 4-point scale based CT imaging features.

RESULTS

Of 148 RCC, 14 RCC (3 cc-RCC, 11 pap-RCC, mean size: 21 mm) were categorized as minimally enhancing (enhancement: 1-19 HU, mean 12 HU, mean unenhanced CT value: 32HU). Concomitant RCC (either minimally enhancing or enhancing (>20HU) mass) were common (9/14), 3 pap-RCC were categorized as difficult to diagnose; 2 were homogeneous and showed enhancement ≤5HU but ultrasound confirmed solid nature, 1 lesion was difficult to detect but found at the time of surgery for other RCC. 3 pap-RCCs were categorized as somewhat difficult; all were minimally heterogeneous and showed enhancement >15 HU and ultrasound confirmed solid nature. 5 RCCs (1 cc, 4 pap) were categorized as somewhat easy to diagnose; all were mildly heterogeneous with enhancement between 5-19 HU. 3 RCCs (2 cc, 1 pap) were categorized as easy to diagnose; all were moderately heterogeneous with higher degree of enhancement at the periphery the mass.
CONCLUSION

Minimally enhancing RCC represented 14/130 of small RCC. 6/14 (all pap-RCC) were relatively difficult to diagnose by CT, and required ultrasound for confirmation. 8/14 could be diagnosed relatively easily by CT imaging features.

CLINICAL RELEVANCE/APPLICATION

Minimally enhancing RCC is uncommon, but the diagnosis is challenging when the tumor is homogenous.

SSA09-05

Dual Energy MDCT in Renal Cysts: Effect of Virtual Monochromatic Imaging on Pseudoenhancement in an In-Vitro and In-Vivo Study


PURPOSE

To investigate, in a phantom experiment and a clinical study, the impact of dual energy MDCT with virtual monochromatic imaging on renal cysts pseudoenhancement.

METHOD AND MATERIALS

Four renal compartments inserted into torso phantoms were filled with both saline and iodinated solutions to simulate the noncontrast state and three different levels of renal parenchymal enhancement (+140, +180, and +240 HU). Saline-filled spheres simulating renal cysts (15-mm, 18-mm) were serially suspended in the renal compartments and imaged with both dual-energy MDCT and single-energy MDCT at four polychromatic energy levels (80, 100, 120, and 140 kVp). Twenty-eight patients (mean age, 66±10 years; mean BMI, 31.3±6.2 kg/m2) with 34 renal cysts underwent dual-energy MDCT. Virtual monochromatic images were reconstructed at energy levels ranging from 40 to 140 keV at 10 keV increments.

RESULTS

In the phantom experiment, all polychromatic datasets demonstrated pseudoenhancement in all investigated conditions, which was inversely proportional to cyst size (P <0.0001), proportional to depth of intraparenchymal location (P =0.0001), and proportional to the renal background attenuation level (P <0.0001). Virtual monochromatic images at energy levels ranging from 80 to 140 keV did not show pseudoenhancement, with the lowest attenuation increase (mean, 6.1±1.6 HU; range, 1.6-7.7 HU) at 80 keV. In patients, pseudoenhancement did not occur on virtual monochromatic images at energy levels ranging from 90 to 140 keV. Patient’s body size had a significant proportionate effect (P =0.0070) on the optimal monochromatic energy level.

CONCLUSION

Dual energy MDCT with reconstruction of optimal energy virtual monochromatic images can overcome renal cyst pseudoenhancement.

CLINICAL RELEVANCE/APPLICATION

Optimal energy virtual monochromatic images may enable the unequivocal diagnosis of simple renal cysts, eliminating the need of additional work-up.

SSA09-06

Role of Unenhanced CT in Undiagnosed Renal Cell Carcinoma (RCC)

Munazza Anis MD (Presenter): Nothing to Disclose, Nancy S. Curry MD: Nothing to Disclose

PURPOSE

To investigate the incidence of RCC with low attenuation values (<20 HU) in our patient population on unenhanced CT

METHOD AND MATERIALS

Retrospective, IRB approved study Search of pathology archives of 600+ nephrectomies performed at MUSC from 2008-2013 191 patients with renal cell carcinoma 91 patients with 97 tumors had unenhanced MDCT within 6 months (120 kVp and slice thickness 3-5 mm) The lesions were identified by pathology reports and compared with enhanced CT or MR 81/91 patients with unenhanced CT’s were excluded: Tumors smaller than 1.5 cm, >7 cm Signs of obvious solid renal tumor on unenhanced CT (e.g., lobulated margins, heterogeneity, internal calcification) Patients with > 2 masses/ resected kidney Polycystic kidneys Tumors > 20 HU Study population of 10/91 (11%) pts with 11 homogeneous tumors with attenuation < 20 HU ROI measurements of the lesions (at PACS review station) from middle of lesion on axial scan and/or coronal scan, sampling at least half the lesion volume; soft tissue window settings (350 width, 50 level) Renal parenchymal ROI and water attenuation standards were also measured (gallbladder or urinary bladder) when possible.

RESULTS
10/91 patients (11%) with 11 low attenuation (< 20 HU), homogeneous RCC: 10 clear cell RCC (9 Gr II, pT1a; 2 pT3a) 1 pap RCC Gr III Size: 1.7 - 3.9 cm (mean 2.9 cm, median 3.2 cm) ROI: 7 HU - 19 HU (mean 14.7, median 15 HU) 2 tumors w necrosis (1 ccRCC, 1 pap RCC) One showed adjacent calcified cyst Only two of the 10 showed avid hypervascularity

CONCLUSION
Low attenuation tumors on unenhanced CT are uncommon but were found in 10/91 patients (11%) with RCC, averaging 15 HU. (Regional areas of minimum attenuation less than 20 HU and maximum attenuation greater than 70 HU were seen in 24.9% (48/193) and 2.1% (4/193) of RCCs, respectively) All but one were clear cell subtype, none were cystic tumors; only two showed necrosis.

CLINICAL RELEVANCE/APPLICATION
Short of continuous sampling which is not clinically applicable, it may be advisable to check tumor ROI against water attenuation standards and renal HU measurement. ? Revise the "safe" lower level to < 15 HU. Further study needed.

SSA09-07
MRI Features of Renal Cell Carcinoma that Predict Favorable Outcomes
Ankur Doshi  MD (Presenter):  Nothing to Disclose , William C. Huang MD :  Nothing to Disclose , Nicholas Donin :  Nothing to Disclose , James S. Babb PhD :  Nothing to Disclose , Hersh Chandarana MD :  Research support, Siemens AG

PURPOSE
To determine MRI features of renal cell carcinoma (RCC) that are associated with lower histological grade, stage and favorable outcomes following resection.

METHOD AND MATERIALS
This IRB-approved, retrospective study included 241 RCCs in 230 patients who had a preoperative contrast enhanced MRI, pathology results from surgically excised tumor, and at least 3 months of follow-up. A Board certified radiologist (abdominal radiology fellow), blinded to the pathology and clinical outcome, assessed tumor features on MRI, including pre-contrast T1 signal relative to renal cortex and percent of solid enhancing components. The electronic medical record and/or follow-up imaging were reviewed to assess for development of local recurrence or metastases. Statistical analysis was performed using Fisher’s exact test.

RESULTS
RCC subtypes included clear cell (n=144), papillary (n=59), chromophobe (n=21) and unclassified/other (n=17). On a patient level, the following tumor features were observed: solid component ≤25% (n=28), solid component >25% (n=202), T1 hypointensity (n=93) and T1 intermediate/hyperintensity (n=137). Mean follow-up time was 34 months (range 3 - 98). Local recurrence /metastases were observed in 14 patients (11 clear cell, 3 unclassified/other). RCC with T1 hypointensity and ≤25% solid component (n=14) showed no recurrence or metastases on follow-up. This group had lower stage (p<0.05) and clear cell grade (p<0.05) compared to tumors that wereT1 intermediate/hyperintense and >25% solid component (n=123). In a 24-month follow-up period, T1 hypointense signal alone was associated with decreased recurrence/metastases (p=0.05).

CONCLUSION
RCCs which are T1 hypointense and also have ≤25% solid enhancing component on MRI are associated with lower stage and nuclear grade. No recurrence or metastases were observed in this group.

CLINICAL RELEVANCE/APPLICATION
Assessment of T1 signal and solid component on MRI can provide important prognostic information related to RCC tumor grade, stage and clinical outcome.

SSA09-08
MR Imaging of Papillary Renal Cell Carcinoma: Does Intracellular Lipid Content Correlate with T2 Weighted (T2W) Imaging Characteristics?
Christian Balthasar Van Der Pol MD (Presenter):  Nothing to Disclose , Matthew Donald Fernand McInnes MD, FRCP:  Nothing to Disclose , Bardia Moosavi MD :  Nothing to Disclose , Trevor A. Flood MD, FRCP:  Nothing to Disclose , Nicola Schieda MD :  Nothing to Disclose

PURPOSE
The purpose of this study was to validate the recent observation that papillary renal cell carcinoma (pRCC) may contain intracellular lipid at chemical shift (CS) MRI, and to determine if this finding is associated with T2 weighted (T2W) imaging characteristics.

METHOD AND MATERIALS
With IRB approval, 77 consecutive patients were identified over an 11 year period who underwent MRI prior to surgery with a histologic diagnosis of pRCC. Two abdominal radiologists independently assessed each tumor for the presence of intracellular lipid on CS-MRI. T2W images were evaluated for tumor homogeneity and signal intensity (SI) relative to renal cortex and paraspinal muscle. Inter-observer agreement was calculated using the Kappa coefficient. Discordant cases at CS-MRI were reviewed in tandem to establish consensus. T2 SI ratios (SI.tumor/SI.muscle), CS-SI index (SI.IP-SI.OP)/SI.IP x 100 and tumor-to-spleen SI ratios ((SI.tumor.OP - SI.spleen.OP) /(SI.tumor.IP - SI.spleen.IP)-1) x 100, were measured. Associations between intracellular lipid and T2W characteristics were assessed using chi square test and correlations of parametric data were performed using the Pearson correlation coefficient.
RESULTS

After consensus review, 17% of pRCC contained intracellular lipid, with moderate inter-observer agreement (K=0.41). Homogenous T2 SI was observed in 24.2-33.3% of tumors (K=0.63). 56.1-71.2% were hypointense to renal cortex (K=0.43) and 9.1-21.2% were hyperintense to muscle on T2. There was an association between T2 heterogeneity and intracellular lipid (p=0.01-0.04). No tumor with intracellular lipid was homogeneous on T2 and 92% of tumors were hyperintense to muscle on T2. There was no correlation between T2 SI ratio and tumor-to-spleen SI ratio (B=-0.14, p=0.30) or CS-SI index (B=0.24, p=0.054).

CONCLUSION

Intracellular lipid is detected in a minority of papillary RCC but does not occur in tumors with homogeneously low T2 signal intensity tumors; findings which may help discriminate pRCC from minimal fat angiomyolipoma.

CLINICAL RELEVANCE/APPLICATION

Minimal fat AML are homogeneously low on T2, overlapping with pRCC; and both may demonstrate intracellular lipid. This study shows that pRCC with intracellular lipid are heterogeneously bright on T2.

SSA09-09

Virtual Non-contrast Spectral Imaging for Evaluation of Renal Masses-A Preliminary Study

Jinghong Liu (Presenter): Nothing to Disclose, Ailian Liu MD: Nothing to Disclose, Shifeng Tian: Nothing to Disclose, He Qing Wang MSc: Nothing to Disclose, Haitao Wang : Nothing to Disclose, Zibin Tong : Nothing to Disclose, Chen Anliang : Nothing to Disclose, Chen Lihua : Nothing to Disclose

PURPOSE

To qualitatively and quantitatively evaluate the feasibility of CT virtual non-contrast (VNC) spectral imaging in renal masses.

METHOD AND MATERIALS

Sixty-two patients with histopathologically proven renal masses underwent gemstone spectral imaging (GSI) including noncontrast(TNC), arterial, cortex and medullary phase acquisitions. The triphasic GSI dataset was sent to workstation and 3 sets of VNC images (including VNCa, VNCc, VNCm) were obtained by subtract iodine from iodine-water images in the triphasic enhanced GSI images, respectively. The quality of VNCs and TNC images was evaluated on a five-point scale. Interobserver agreement with regard to image quality was assessed using Cohen’s kappa, and four groups of image quality was compared with ANOVA analysis. The contrast-to-noise ratio (CNR) of mass-to-kidney in the TNC and VNCs images was calculated, and difference between these four datasets was compared with ANOVA analysis. Using appearance of masses on triphasic images as a standard, the masses detection ratio of four groups was calculated and compared with chi-square test.

RESULTS

Interobserver agreement with regard to image quality was excellent (k>0.600). There was no significant difference among the image quality of TNC, VNCa and VNCc. The image quality of VNCe was significant worse than that of other three groups. VNCa significant higher than that of TNC (P<0.05). No statistically significant difference was observed among VNCc, VNCe and TNC(P>0.05); there was no statistically significant difference was observed among TNC, VNCa, VNCc and VNCe.

CONCLUSION

VNC images obtain from arterial phase may be a surrogate for conventional non-contrast scan in renal masses diagnosis.

CLINICAL RELEVANCE/APPLICATION

VNC images obtain from arterial phase may be a surrogate for conventional noncontrast scan in renal masses diagnosis.
Gadolinium Chelate Contrast in Pregnancy: Fetal Biodistribution in the Nonhuman Primate

Karen Y. Oh MD (Presenter): Nothing to Disclose, Victoria Roberts PhD: Nothing to Disclose, Matthias C. Schabel PhD: Nothing to Disclose, Kevin L. Grove PhD: Nothing to Disclose, Mark Woods PhD: Nothing to Disclose, Antonio E. Frias MD: Nothing to Disclose

PURPOSE

To determine whether gadolinium chelate is found in the nonhuman primate fetal tissues and amniotic fluid after maternal injection of intravenous gadoteridol.

METHOD AND MATERIALS

Gravid macaques (n=12) were maintained on a control diet (14% calories from fat, n=4) or a high fat diet (36% calories from fat, n = 8). On gestational day 129, the macaques were injected with ProHance gadolinium contrast for placental imaging (equivalent to the third trimester). Gadolinium dose was varied based on maternal weight, using 0.1 mmol/kg dosing. Fetuses were delivered via cesarean section within 24 hours of maternal injection (range 19-21 hours). Gadolinium concentration in the placenta, fetal tissues (bone, liver, brain, kidney) and amniotic fluid was obtained by inductively coupled plasma mass spectrometry.

RESULTS

Gadolinium chelate crosses the placenta from the maternal circulation. The levels of residual ProHance in fetal tissue after 19-21 hours following maternal injection expressed as percent dose per gram (%ID/g) or percent dose per organ (%ID/organ). Highest concentrations are present in the amniotic fluid and placenta (0.126 and 0.087 %ID/organ respectively). Per gram of tissue, highest concentrations were found in the fetal kidneys (0.0151 %ID/g). Overall amounts of gadolinium were minimal compared to the injected maternal dose. No difference in concentrations was found between those primates fed the high fat or Western diet (n=8) and the control diet (n=4).

CONCLUSION

Minimal residual gadoteridol gadolinium chelate is found in primate fetal tissues and amniotic fluid by 24 hours following maternal injection of weight-based clinical doses of gadolinium in the third trimester. Given the similarities between human and nonhuman primate placentas, we suggest there is relatively little deposition in human fetal tissues following maternal ProHance injection. While there will likely be continued debate whether gadolinium administration during pregnancy is justified, our study provides information that may alleviate some uncertainty regarding the potential for gadolinium free ion toxicity to the fetus following maternal dosing.

CLINICAL RELEVANCE/APPLICATION

After injection of gadoteridol in the gravid primate, minimal amounts of this gadolinium chelate is found in fetal tissues and amniotic fluid within 24 hours after injection. Our results may have implications for the safety of contrast-enhanced magnetic resonance imaging in pregnancy.

Can Diffusion-weighted MR Images of the Uterine Cervix Predict Impending Preterm Delivery?

Gabriele Masselli MD (Presenter): Nothing to Disclose, Maria Giulia Bernieri MD: Nothing to Disclose, Roberto Brunelli: Nothing to Disclose, Saadi Sollaku: Nothing to Disclose, Elisabetta Polettini: Nothing to Disclose, Gian Franco Gualdi MD: Nothing to Disclose

PURPOSE

To determine whether the analysis of the apparent diffusion coefficient (ADC) maps of the subglandular area of the cervical canal helps to predict a forthcoming delivery when dealing with an asymptomatic patient presenting with a sonographic short cervix (SCX) below 15mm and with positive fetal fibronectin (FN) at 22-26 weeks of gestation.

METHOD AND MATERIALS

The institutional review board approved this prospective, hypotheses-generating study and waived the informed consent requirement. Our study population comprised 30 pregnant women (mean age : 29 (20-39) with a mean gestational age at the diagnosis of 24 weeks (22-26) who underwent underwent pelvic MR on a 1.5-T scanner. Sagittal diffusion-weighted were obtained by using a single-shot spin-echo type echo-planar imaging sequence with fat suppression using two b values: 0, 800 s/mm2; ADC map was calculated for each patient. ADC subglandular, ADC stromal and Δ ADCs (ADC subglandular - ADC stromal) were calculated. Student t test for both unpaired and paired data and Bravais-Pearson linear correlation, as well as ROC curve analysis were performed using the MedCalc software.

RESULTS

8/30 patients ultimately delivered within 7 days after admission (impeding delivery group) while 22 patients delivered after at least 7 days after admission (between 7-63 days; mean 32 days) and entered the late delivery group. The subglandular ADC and Δ ADCs were significantly higher in patients with impending delivery than in patients with late delivery (p <0.0001 for both parameters). The ROC curve analysis classified the subglandular ADC as an extremely accurate parameter to predict impending delivery (AUC = 1.000, p
<0.0001), with an overall sensitivity (95% CI: 63.1% - 100%) and a specificity (95% CI: 63.1% - 100%) of 100%. The ADCs of cervical stromal did not help to differentiate the two groups.

CONCLUSION
When considering a diagnosis of impending preterm delivery, ADC maps targeted to the subglandular area of the uterine cervix greatly increase the PPV granted by the combined findings of a short cervix and positive cervico-vaginal fibronectin.

CLINICAL RELEVANCE/APPLICATION
The ADC maps of the subglandular area of the uterine cervix can predict impending preterm delivery. This result cannot be obtained with other techniques and can be particularly useful in the acute management of patients presenting with SCX and positive FN in the late second trimester of pregnancy.

### SSA10-03

**Assessing Accuracy of Detecting Post-traumatic Placental Abruption on Contrast-enhanced CT in Pregnant Women and Strategies for Optimizing Imaging of the Placenta**

**Purpose**
To evaluate detection of post-traumatic placental abruption in pregnant patients on contrast enhanced CT (CECT). Detection of placental abruption with CT vs US was compared. Strategies for optimizing detection of placental abruption on CT are discussed.

**Method and Materials**
Our Level 1 trauma center's PACS data was searched using keywords pregnancy, trauma and/or placental abruption over 10 years' duration. Exclusion criteria were non-contrast imaging only. CT findings were compared to US if performed within 24-hour interval. Total 36 patients, 1 with twin gestation, underwent CECT. Of these, 27 had US performed within 24 hours. 2 subspecialty-trained readers blindly reviewed CT and US images. Pregnancy outcome and placental features on delivery were used as reference standard. Lack of adverse pregnancy/fetal outcome was treated as absence of abruption.

**Results**
There were 3 cases of complete and 8 cases of partial abruption. Both reviewers identified all partial and complete abruptions on CT. Sensitivity was 100% for both reviewers and specificity was 54.5% and 56.7%. Low specificity could partially be explained by small number of patients and contrast timing. Most of false positive reads were from normal placental structures such as cotyledons, venous lakes, age-related infarcts and marginal sinus of the placenta, misinterpreted as abruption. None of these had adverse fetal outcome. Placenta was most optimally evaluated on delayed phase imaging. On US, fetal demise was noted in all cases of complete abruption. No localized abruption demonstrated in cases of both partial and complete abruption.

**Conclusion**
Abruption is accurately identified on CECT with high sensitivity but low specificity. It's crucial to avoid pitfalls from normal structures of cotyledons, venous lakes, age-related infarcts and marginal sinus, mimicking abruption. Contrast timing is important, with most optimal evaluation on delayed phases. If there is diagnostic dilemma on routine imaging and/or fetal monitoring abnormalities, low dose delayed imaging can be performed, with iterative reconstruction techniques, such as ASIR, while theoretically keeping the total radiation dose similar. US is a widely accepted but limited modality markedly underdiagnosing abruption.

**Clinical Relevance/Application**
CT has much higher sensitivity for detecting placental abruption than US. In cases of diagnostic dilemma, low dose (iterative reconstruction, e.g. ASIR) delayed phase imaging may be employed.

### SSA10-04

**Chorionic Bump in Pregnant Patients and Associated Live Birth Rate: A Systematic Review and Meta-Analysis**

**Purpose**
Chorionic bump, a convex bulge from the choriodecidual surface into the gestational sac on first trimester ultrasound, has been considered a risk factor for non-viability in pregnant patients with this rare finding, though the strength of this association has recently been questioned. We performed a systematic review and meta-analysis to summarize the association between chorionic bump and non-viability.

**Method and Materials**
A comprehensive literature search was performed. We included all studies except case reports. A meta-analysis was performed using a random-effects model.

**Results**
After screening five studies, two studies with a total of 67 patients met inclusion criteria. This was combined with one study (N=52) from our institution (submitted for publication to JUM) of 52 patients, for a total of 119 unique patients. Overall, the live birth rate (LBR) was 62% (74/119). 51 chorionic bump pregnancies were otherwise normal (i.e., pregnancies in which a gestational sac, yolk sac and embryo with heartbeat was seen at some point), and in this subset, LBR was 83% (42/51). There was no significant relationship found between vaginal bleeding and live birth (p=0.857); no significant difference in bump volume between live birth and no live birth (p=0.19); and for subset analysis of pooled odds ratio for the relationship between live birth and history of infertility, there was no significant relationship found (p=0.186).

CONCLUSION
Chorionic bump remains a risk factor for non-viability in pregnancy, however if the pregnancy is otherwise normal, then the majority result in live birth.

CLINICAL RELEVANCE/APPLICATION
If a first-trimester ultrasound demonstrates a chorionic bump, then the results of this meta-analysis suggest that if the pregnancy is otherwise normal, the majority will result in live birth.

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Amniotic Fluid Volume Estimation by MR Hydrography

Nicholas Hilliard MBChir (Presenter): Nothing to Disclose, Rebecca Baker: Nothing to Disclose, Andrew Patterson PhD: Nothing to Disclose, Martin John Graves BA: Nothing to Disclose, Christoph Lees: Nothing to Disclose, Patricia Ai Khoon Set MBBS: Nothing to Disclose, David John Lomas MD: Nothing to Disclose

PURPOSE
Hypothesis:
Hydrographic MR imaging can provide a rapid non-invasive in-vivo estimate of amniotic fluid volume (AFV).
Background:
Current ultrasound based methods, such as amniotic fluid index and single deepest vertical pocket, are indirect measures of AFV and are known to have limitations, making their use in routine management and research controversial.

METHOD AND MATERIALS
23 women with healthy singleton pregnancies between 28 and 32 weeks gestation were consented for MR examinations of the gravid uterus using a 1.5T MRI system. Two breath-hold techniques were used: (1) 2D 5mm thick section FIESTA, surface array coil (2) 2D 200mm thick section FSE TE 800ms, integrated volume body coil. A reference fluid volume of 50mls normal saline was positioned anterior to the abdominal wall and within the field of view of (2). Manual planimetry was used to outline all of the amniotic fluid demonstrated on each 5 mm section of (1), which were summed to provide the reference standard for AFV. Manual regions of interest were used to outline the reference volume and amniotic fluid sac on (2). Using the signal area product, the volume of the amniotic fluid was estimated. The maximum values from the 5 acquisitions were compared with the reference planimetry results using a non-parametric Spearman's rank correlation.

RESULTS
Fluid volumes between 146 and 884 mls were found on planimetry. High inter-rater agreement was noted for both the methods (ICC=0.961 and 0.997). The rank order correlation between the planimetry and the hydrographic method was highly significant (r=0.864, p<0.001). A linear fit equation of y=0.6083 + 163.05mls was obtained, with planimetry defined as the independent variable. This relationship suggests that the inclusion of fetal fluid structures is likely to bias the results positively at lower AFV, and the inhomogeneity of B1 excitation is likely to bias the results negatively at larger AFV.

CONCLUSION
This initial study indicates that it is possible to estimate AFV with MRI using a rapid hydrographic technique, based on single thick slab acquisitions. Further optimisation for fetal fluid structures, RF inhomogeneity, as well as data at different gestational ages will be required.

CLINICAL RELEVANCE/APPLICATION
A rapid MR hydrographic based estimate of amniotic fluid volume may allow for improved pregnancy management, and new research into fetal outcomes.

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The Ups and Downs of CT Utilization in Pregnancy

Joseph Steven Konrad MD (Presenter): Nothing to Disclose, Ana P. Lourenco MD: Nothing to Disclose, Elizabeth Lazarus MD: Nothing to Disclose

PURPOSE
To review CT utilization in pregnant women from 2006-2013 and to evaluate for an interval decrease as concerns over radiation exposure from medical imaging have increased.

METHOD AND MATERIALS
This IRB approved, HIPAA compliant retrospective review of the radiology database at a large academic women's hospital was conducted to identify all CT examinations performed in pregnant females from January 1, 2006 - December 31, 2013. Patient age, gestational age at the time of CT, indications for the study, final impression, radiation dose and additional imaging exams performed within one week for the same complaint were recorded.

**RESULTS**

There were a total of 440 CT examinations performed in pregnant patients during the study period. There were 69,508 deliveries during the study period. 24 patients had 2 CT exams during the same pregnancy. Average patient age was 27 (range 15-40 yrs). Average gestational age at time of CT was 27 weeks (range 5 to 40 weeks). The majority of CTs were performed in the third trimester, 56% (246/440). The most common CT examination performed over the 8 year span was a CT Pulmonary Embolus 44% (194/440) followed by a CT of the abdomen and pelvis 33% (144/440). The most common indication for a CT exam was shortness of breath 33% (144/440). Positive, acute findings were identified in 21% (91/440) of exams. There were a total of 301 additional imaging studies performed on this patient cohort, with chest X-ray being the most common 35% (106/301). CT utilization per 1000 deliveries in 2006/2007 was 6.1, increasing 33% to 8.1 in 2008/2009. Utilization decreased 50% from peak utilization in 2008/2009 to 4.1 in 2012/2013. The average overall CT acquired radiation dose for all patients was 27.63 mGy.

**CONCLUSION**

CT utilization in pregnant patients has declined 50% over the past 4 years.

**CLINICAL RELEVANCE/APPLICATION**

CT utilization in pregnancy has declined over the past 4 years as awareness of radiation related to medical imaging has increased among both patients and providers.

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**SSA10-07**

**Three-dimensional Visualization of the Placental Arterial and Venous Vasculatures ex vivo by 64-spiral CT**

Meizhi Li : Nothing to Disclose , Xiaoling Zhang (Presenter): Nothing to Disclose , Jian Guan MD : Nothing to Disclose , Shurong Li : Nothing to Disclose , Mingjuan Liu MMEd : Nothing to Disclose , Chenyu Gou : Nothing to Disclose , Yan Guo MD : Nothing to Disclose

**PURPOSE**

The purpose of this study is for the first time to investigate the three-dimensional visualization of the placental arterial and venous vasculatures ex vivo on 64 spiral CT angiography by injecting two different concentrations of contrast agent into arteries and veins.

**METHOD AND MATERIALS**

The placentas from 25 healthy singleton pregnancies were injected with two different concentrations of color dyed non-ionic iodinated contrast medium in umbilical arteries and veins (red solution with 150 mg of iodine per milliliter for chorionic arteries paired with blue solution with 30mg of iodine per milliliter for chorionic veins in each placenta, respectively). Computed tomography angiography was employed by 64 spiral CT and reconstructed using Vital Images’ Vitrea® medical imaging software, allowing for the three-dimensional configuration of placental vascular tree with chorionic arteries and veins in different densities or colors. The branches of the intraplacental villous vascular trees were observed, and the diameters of each branches of arteries and veins were measured on digital photograph.

**RESULTS**

The 3D visualization of placental vascular tree was delineated with arteries and veins in different densities or colors. The CT angiography showed the vessels starting with the chorionic vessels branching off into 5-6th generation blood vessels in arteries and 4-5 generation blood vessels in vein, of which some in the placental parenchyma. The blood vessels with the smallest diameter of 0.6mm was delineated.

**CONCLUSION**

Placental arteries and veins could be differentiated in one CT angiography by injecting different concentrations of contrast agent. The deep blood vessels in the placental parenchyma could be delineated.

**CLINICAL RELEVANCE/APPLICATION**

Ex vivo CT angiography of the placental arteries and veins can demonstrate deep blood vessels in the parenchyma and is recommended in the investigation of deep arterio-venous anastomoses within twin or triplets placentas.

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**SSA10-08**

**Automatic Differentiation of Functional Placental Compartments for Perfusion Analysis in the Mouse Using the Time-to-peak Model at 7T**

Chressen Catharina Remus MD (Presenter): Nothing to Disclose , Nils Daniel Forkert : Nothing to Disclose , Jan Sedlacik : Nothing to Disclose , Gerhard B. Adam MD : Nothing to Disclose , Petra Arck : Nothing to Disclose , Fabian Kording : Nothing to Disclose

**PURPOSE**

The purpose of this study is to investigate the differentiation of functional placental compartments for perfusion analysis in the mouse using the time-to-peak model at 7T.
DCE MRI is a commonly applied imaging technique for perfusion quantification and is frequently used in experimental setups for perfusion analysis in the mouse placenta. To date, placental perfusion analysis is commonly performed by determining the average perfusion value for the entire placenta without taking the different functional placental compartments into account. The purpose of this work was to develop an automatic differentiation of the two functional placenta zones in a mouse model based on bolus arrival times for a detailed and reproducible perfusion assessment.

**METHOD AND MATERIALS**

Ten pregnant BALB/c mice at gestation day 16.5 were examined at 7T. Coronal dual-echo 3D T1-weighted gradient-echo sequences were acquired after application of contrast agent for dynamic MR-imaging. An adapted gamma variate function was fitted to the concentration time curves to evaluate the effect of noise on perfusion and segmentation results. Maps of the bolus arrival time were calculated based on discrete and fitted curves and used to classify each voxel into a high-flow and low-flow compartment based on k-mean clustering. Segmentation results were evaluated based on the DICE coefficient with manually delineated compartments from two independent observers. Perfusion analysis was performed on discrete and fitted curves using the steepest slope model.

**RESULTS**

Manually delineated high-flow and low-flow compartments agreed with automatic segmented compartments for discrete (D=0.76/0.75; D=0.76/0.79) and fitted (D=0.80/0.80; D=0.81/0.82) concentration time curves. Mean perfusion values of discrete and fitted curves ranged in the high flow compartment from 134 to 142 ml/min/100ml (discrete) vs. 138 to 143 ml/min/100ml (fitted) and in the low-flow compartment from 91 to 94 ml/min/100ml (discrete) vs. 74 to 82 ml/min/100ml (fitted).

**CONCLUSION**

Functional perfusion compartments can be automatically differentiated using bolus arrival times with a high agreement to manual differentiations. Fitting of the gamma variate function improves segmentation results. The proposed method may overcome reported limitations in perfusion analyses by eliminating the subjective choice of regions of interest.

**CLINICAL RELEVANCE/APPLICATION**

The heterogeneity within the placenta with its two functional compartments generates the need for separate compartment analysis to enable a more detailed and reproducible understanding of placenta perfusion.

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**DCE MRI of the Placenta Reveals Alterations of Placenta Perfusion after a Stress Challenge during Pregnancy in Mice**

Chressen Catharina Remus MD (Presenter): Nothing to Disclose, Fabian Kording: Nothing to Disclose, Nils Daniel Forkert: Nothing to Disclose, Jan Sedlacik: Nothing to Disclose, Emilia Solano: Nothing to Disclose, Gerhard B. Adam MD: Nothing to Disclose, Petra Arck: Nothing to Disclose

**PURPOSE**

Stress during pregnancy is known to have a negative effect on fetal outcome, possibly via placenta mediated pathways. The purpose of this study was to examine alterations in placental perfusion upon a stress challenge during pregnancy in mice.

**METHOD AND MATERIALS**

MRI was performed on a 7Tesla scanner (ClinScan, Bruker, Germany) on 20 pregnant Balb/c mice on gestation day (gd) 16.5. 10 damns were exposed to an established model of acoustic stress challenge, 10 damns served as controls. For DCE-MRI, a contrast enhanced 3D T1-weighted gradient-echo sequence was used. Placental perfusion was calculated based on the steepest slope model in 2 placentas per damm. The two functional placental compartments, the highly vascularized labyrinth and the endocrine junctional zone, were assessed seperately. Immunohistochemistry, including staining for neoangiogenesis, was performed on placentas after imaging.

**RESULTS**

Perfusion increased significantly upon a stress challenge, compared to the control group (192± 51 ml/ml/min vs. 141± 28ml/ml/min ) (p< 0.001) in the highly vascularized labyrinth - the zone of oxygen and nutrition exchange of the placenta. This observation was supported by immunohistochemistry of the placentas, demonstrating an increased expression of the angiogenesis biomarker CD31 (p ≤ 0.01) and an increased count of small and medium vessels in the placental labyrinth of the stress challenged group (p ≤ 0.01).

**CONCLUSION**

Placental perfusion increases upon a stress challenge during pregnancy, possibly by neoangiogenesis of small and medium size vessels.

**CLINICAL RELEVANCE/APPLICATION**

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**SSA10-09**
Stress has a profound impact on fetal outcome and health conditioning, yet the underlying mechanisms remain unknown. Studying placental vascular alteration may help to understand these pathways.

### SSA12

**Molecular Imaging (GYN/Breast Cancer)**

**Scientific Papers**

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

**Participants**

**Moderator**
- Zaver Murzban Bhujwalla PhD : Nothing to Disclose
- Kathryn A. Morton MD : Nothing to Disclose

**Sub-Events**

**SSA12-01**

- **Tumor Detection with Activatable Cell Penetrating Peptide Dendrimers (ACPPD-Gd) versus Conventional Gadolinium Chelates at 3 Tesla**

  **Christopher Devin Malone MD (Presenter):** Nothing to Disclose, **Emilia Sue Olson MD, PhD :** Nothing to Disclose, **Robert Frederick Mattrey MD :** Nothing to Disclose, **Nadia Nashi :** Nothing to Disclose, **Tao Jiang PhD :** Nothing to Disclose, **Leslie Elies :** Nothing to Disclose, **Roger Y. Tsien MD :** Research Consultant, Avelas Biosciences, Inc Stockholder, **Quyen Nguyen :** Nothing to Disclose

  **Purpose**

  Matrix metalloproteinases-2 and -9 (MMP-2/-9) are upregulated in many aggressive tumors. We aimed to compare the tumor detection performance of a standard Gd-chelate to that of Gd-loaded MMP-2/-9 activatable cell-penetrating peptide dendrimers (ACPPD-Gd) using a murine tumor model representative of aggressive triple-negative breast cancer with 3T MR.

  **Method and Materials**

  Using a protocol approved by the Institutional Animal Care and Use Committee, 2 of 4 inguinal breast fat pads of 16 albino C57BL/6 mice were inoculated with Py8119 cells and the other 2 with saline at random. MR at 3T was performed on 8 mice before and 2-3 minutes after 0.1mmol/kg gadobutrol and on 8 mice 24-hours after 0.036mmol/kg Gd of ACPPD-Gd on days 4, 9, and 14 after inoculation. T1w tumor signal was normalized to adjacent muscle and compared between agents and the non-contrast groups using analysis-of-variance. Experienced and trainee blinded readers assessed for the presence of tumor in each of the 4 breast regions. ROC curves were constructed and the area-under-the-ROC curve (AUC) calculated.

  **Results**

  Mouse mammary tumors imaged by MR at 3T 24 hours after ACPPD-Gd showed significantly greater T1w signal compared to tumors imaged 2-3 minutes after gadobutrol (1.57±0.2 vs. 1.25±0.13, p<0.001), and more so for the trainee (0.86 vs. 0.69, p=0.04).

  **Conclusion**

  ACPPD-Gd results in significantly more T1w signal in tumors compared to gadobutrol at 3T, resulting in increased conspicuity and improved detection for experienced and more so less experienced observers.

  **Clinical Relevance/Application**

  ACPPD-Gd improves tumor conspicuity, the performance of the less experienced observers, and may highlight early stage tumors that could be missed on T1w MR imaging at clinically relevant fields strengths and scan times.

**SSA12-03**

- **Amino Acid Transport Imaging of Breast Carcinoma via Anti-3-[18F] FACBC PET-CT: A Pilot Study**

  **Funmilayo Tade MD, MPH (Presenter):** Nothing to Disclose, **Oluwaseun Odewole MD, MPH :** Nothing to Disclose, **Oyeladun Oyenuga MD, MPH :** Nothing to Disclose, **Michael A. Cohen MD :** Nothing to Disclose, **Anna Irene Holbrook MD :** Nothing to Disclose, **Mary S. Newell MD :** Nothing to Disclose, **Bital Savir-Baruch MD :** Nothing to Disclose, **Toncred Styblo MD, MS :** Nothing to Disclose, **Mark M. Goodman PhD :** Royalties, Nihon Medi-Physics Co, Ltd Expert Advisory Committee, AIM Specialty Health

  **Purpose**

  Amino acid transport is upregulated in breast carcinoma. Anti-1-amino-3-[18F]fluorocyclobutane-1-carboxylic acid (anti-3-[18F]FACBC) is a synthetic amino acid analog positron emission tomography (PET) radiotracer which is transported primarily via system ASCT2 and LAT1 amino acid transporters. The purpose of this exploratory study is to characterize anti-3-[18F] FACBC uptake in benign and malignant breast lesions.
METHOD AND MATERIALS

Four women with histologic confirmation of breast carcinoma or about to undergo biopsy for suspected breast carcinoma not currently undergoing therapy underwent 45 minute dynamic anti-3-[18F]FACBC PET-CT. Standardized uptake values (SUVs) within malignant and benign breast lesions as well as the contra-lateral normal breast were recorded at 5-8mins, 17-21mins, 29-32mins and 41-44mins time frames. Findings were validated by histologic and imaging correlation. T-tests were used to examine the significance of difference in the mean SUVmax of benign to malignant lesions as well as to normal breast tissue.

RESULTS

Average age ±SD was 64.25 ± 11.2 years. Average dose ±SD of anti-3-[18F] FACBC injected was 9.8mci ±0.3. There were 7 breast lesions characterized in 4 patients; 3 benign and 4 malignant (Figure 1A and B). Malignant lesions had significantly higher SUVmax compared to benign lesions and normal contra-lateral breast tissue at all time points (Figure 1C). There was no significant difference in the mean SUVmax of benign breast lesions and normal contra-lateral breast at any time point (Figure 1).

CONCLUSION

Anti-3-[18F] FACBC shows promise in delineating malignant from benign breast lesions and normal breast tissue. Our result may guide the design of larger studies examining its utility in breast cancer detection, staging and restaging.

CLINICAL RELEVANCE/APPLICATION

Anti-3-[18F] FACBC characterization of amino acid transport upregulation may be useful for the diagnosis of breast cancer and to differentiate malignant from benign lesions.
Fulvestrant, an estrogen receptor degrader, is now widely used in management of breast cancer (BrCa). Currently, there are no methods to optimize treatment dosing of fulvestrant. This study assesses the utility of pharmacodynamic imaging using 16Α-[18F]-fluoroestradiol (18F-FES) in dose optimization of fulvestrant in a preclinical model of ER+ BrCa.

**METHOD AND MATERIALS**
MCF7 cells (ER+) were incubated with different doses of fulvestrant for 24 h. Retention of 18F-FES was measured and compared to ERA protein expression (ELISA) and ESR1 mRNA transcription (qPCR). MCF7 tumors were grown in ovariectomized nude mice. The mice were randomly assigned to vehicle, low- (0.05mg), medium- (0.45mg) or high-dose (5mg) treatment groups (n=5-7). Two days after fulvestrant treatment, PET/CT was performed using 18F-FES and 18F-FDG. ER expression was assayed by immunohistochemistry (IHC), ELISA, and qPCR on xenografts. Tumor proliferation was assessed using Ki-67 IHC.

**RESULTS**
In vitro, fulvestrant was equipotent at reducing 18F-FES uptake as ER protein expression, despite stimulating mRNA transcription severalfold. In xenografts, ER expression significantly decreased with fulvestrant treatment in a dose-dependent manner both in ELISA of tumor lysates and IHC staining, despite similar mRNA expression. No difference in Ki-67 staining was observed among the treatment groups. We observed a significant dose-dependent reduction of 18F-FES PET SUVmean with fulvestrant treatment, but no significant difference among the treatment groups in 18F-FDG PET parameters.

**CONCLUSION**
We demonstrated that 18F-FES uptake mirrors the dose-dependent changes in functional ER expression with fulvestrant treatment which precedes the changes in tumor metabolism and proliferation. Pharmacodynamic imaging of estrogen receptor may be useful for tracking early efficacy of ER degradation and guiding ER-targeted therapy dosing in BrCa patients.

**CLINICAL RELEVANCE/APPLICATION**
Precise anti-ER dosing in individual patients using pharmacodynamic imaging of ER may improve therapy response.
A Novel PET Probe for Imaging HER3 Receptor Status

Eric Wehrenberg-Klee MD (Presenter): Nothing to Disclose, Nafize Selcan Turker PhD: Nothing to Disclose, Pedram Heidari MD: Nothing to Disclose, Umar Mahmood MD, PhD: Research Grant, Sabik Medical Inc, Bryan Chang: Nothing to Disclose

PURPOSE
HER3 is a surface receptor tyrosine kinase that plays an important role in pro-oncogenic signaling pathways. The receptor is expressed at low-copy number, which is potentially limiting for PET probe development. We developed an antibody-based PET probe specific for HER3, characterized it in vitro, and successfully image HER3 expressing xenografts. We demonstrate that the ability to image this low-expression surface protein is time-dependent, and is related to internalization of receptor-probe complex

METHOD AND MATERIALS
64Cu-DOTA-HER3 F(ab’)2 was prepared from whole HER3 monoclonal antibody with F(ab’)2 fragmentation and chelator conjugation, and its affinity for HER3 assessed using radio-labeled binding studies. HER3 surface-expression on multiple cell lines was confirmed using fluorescent-activated cell sorting (FACS). Probe internalization kinetics were determined by conducting cell uptake studies at both 4°C and 37°C. Results of cell uptake studies were correlated with geometric mean FITC signal obtained from FACS. In vivo PET/CT imaging with 64Cu-DOTA-HER3 F(ab’)2 was conducted using mouse xenografts of MDA-MB 468 and HCC 70 tumors (n=3 for both groups).

RESULTS
The HER3 PET probe demonstrates a HER3 Kd of 6.8 nM. FACS confirmed HER3 expression of approximately 200 receptors per cell across multiple lines. Cell uptake studies demonstrate counts/minute/cell of 0.28, 0.45, 0.82 for MCF-7, HCC-70, and MDA-MB-468 cells, respectively after 1 hour. Time course studies demonstrate linear increase of HER3 probe uptake over time at 37°C but not at 4°C that correlates with findings on FACS. In vivo imaging with the HER3 PET Probe of MDA-MB-468 and HCC70 tumor xenografts demonstrate SUVs of 0.35 and 0.59, with TBRs of 6.0 and 11.4 respectively.

CONCLUSION
We have developed a HER3 specific PET probe, and demonstrate successful in vivo imaging of HER3 expressing xenografts. We demonstrate that imaging of a low-expression surface protein is possible, and is dependent upon internalization of the receptor-probe complex. These findings have relevance for the development of PET probes for imaging of low-expression receptors of clinical interest.

CLINICAL RELEVANCE/APPLICATION
The developed HER3 PET probe has utility for measuring HER3 expression levels on cancers, which is thought to be a primary mediator of resistance to HER2 inhibition.

Breast Cancer Follow Up: Comparison of Whole-body Hybrid PET/MR and PET/CT Imaging: Initial Experience

Onofrio Antonio Catalano MD (Presenter): Nothing to Disclose, Bruce R. Rosen MD, PhD: Research Consultant, Siemens AG, Dushyant V. Sahani MD: Research Grant, General Electric Company, Carlo Iannace MD: Nothing to Disclose, Angelo Luongo: Nothing to Disclose, Marco Catalano: Nothing to Disclose, Mark Vangel PhD: Nothing to Disclose, Marco Aiello: Nothing to Disclose, Emanuele Nicolai: Nothing to Disclose, Alexander Ramos Guimaraes MD, PhD: Speakers Bureau, Siemens AG Expert Witness, Rice, Dolan, Kershaw, Andrea Sorcielli MD: Nothing to Disclose, Marco Salvatore MD: Nothing to Disclose

PURPOSE
To compare the diagnostic performance of whole-body PET/MR with PET/CT in patients followed up for treated breast cancer

METHOD AND MATERIALS
76 consecutive patients with treated breast cancer underwent whole-body FDG-PET/CT (Gemini TF, Philips) and same day FDG-PET/MR (Biograph mMR, Siemens). Two readers independently evaluated PET/CT and PET/MR studies for local recurrence as well as metastases according to published imaging criteria

RESULTS
5 patients were excluded due to data corruption, 1 because of study interruption. MRPET quality was adequate in the remaining 70 patients. PET/MR and PET/CT were concordant in 59 patients, ruling out recurrent disease/metastases in 24 and disclosing recurrent disease or metastases in 35. PET/MR and PET/CT were discordant in: in 4 PET/MR disclosed metastases not detected at PET/CT, in 1 PET/MR demonstrated local recurrence not seen on PET/CT. In 5 PET/MR correctly interpreted benign findings (sarcoidosis in 1, benign pelvic disease in 1, benign bony lesions in 3) confused with metastases on PET/CT. PET/CT demonstrated sclerotic bony lesion in 1 that was missed at PET/MR, however comparison with prior CT dating back to 4 years ago showed stability and therefore it was interpreted as a benign lesion

CONCLUSION
PET/MR imaging of treated breast cancer is feasible and provides diagnostic image quality in the assessment of possible local recurrent disease as well as metastases. PET/MR did not under-stage any patient when compared to PET/CT and provided the correct diagnosis for all 11 discordant cases (95% binomial upper confidence limit 0.24)

CLINICAL RELEVANCE/APPLICATION
PET/MR might represent an innovative and valid tool for accurate follow up of breast cancer patients.

### SSA12-09

**Multimodal Magnetic Resonance and Near Infrared-Fluorescent Imaging of Intraperitoneal Ovarian Cancer Using a Dual-Mode, Dual-Gadolinium Liposomal Contrast Agent**

Murali Ravoori, Sheela Singh, Rohan Bhavane, Bahman Anvari, Ananth Annapragada, Marval Pharma Ltd Stockholder, Alzeca Biosciences LLC Stockholder, Sensulin LLC Stockholder, Abbott Laboratories Stockholder, Johnson & Johnson, Vikas Kundra MD, PhD (Presenter): License agreement, Introgen Therapeutics Inc, James Bankson MD, PhD: Nothing to Disclose

**PURPOSE**

To assess whether a dual-mode, dual-Gadolinium (DM-Dual Gd) liposomal contrast agent can be used to visualize intraperitoneal ovarian tumors by multimodal magnetic resonance (MR) and near infra-red (NIR) imaging.

**METHOD AND MATERIALS**

DM-Dual Gd was manufactured based on the Dual Gd format for MR, with gadolinium molecules on the surface and within the lumen of the liposome to increase relaxivity, and the NIR agent indocyanine green (ICG) within the lumen. Phosphorus (P) and Gd content were measured by ICP-AES. Female nude mice bearing intraperitoneal Hey A8 human ovarian cancer tumors were injected IV with or without DM-Dual Gd (n=6). Two days later, the animals were imaged by T1-weighted MR. Afterwards, NIR imaging of open abdomen and excised tumors/organs was performed. Signal to noise ratio (SNR) was used to compare tumor enhancement by MR and radiant efficiency to compare tumor signal by NIR imaging. For robustness, experiments were repeated using a second human ovarian cancer (OVCAR-3) model.

**RESULTS**

Gd content was 60.34 mM and P content was 29.44 mM resulting in a Gd/P ratio of 2.05 per particle. On T1-weighted MR images, intraperitoneal ovarian tumors (HeyA8 or OVCAR3) enhanced compared to control tumors two days after DM-dual Gd injection (SNR, p<.05). As seen in the laparotomy and excised tumors views, HeyA8 or OVCAR3 tumors from animals injected with DM-dual Gd had increased fluorescence compared to control tumors (p<.05).

**CONCLUSION**

DM-Dual Gd can be used to visualize intraperitoneal ovarian tumors by MR and NIR imaging in pre-clinical intraperitoneal ovarian cancer mouse models.

**CLINICAL RELEVANCE/APPLICATION**

Nearly 75% of patients with ovarian cancer present with intraperitoneal disease; and, the degree of cytoreduction at surgery is one of the most important factors for prognosis. Current imaging is limited in detecting peritoneal disease and surgery relies on the naked eye to identify nodules for resection. The current findings suggest clinical potential for using a single injection of a single nanoparticle (DM-Dual Gd) to localize tumor by MR for pre-surgical planning and by NIR at the time of surgery for resection.

### GUS-SUA

**Genitourinary/Uroradiology Sunday Poster Discussions**

**Scientific Posters**

**GU**

*AMA PRA Category 1 Credits ™: .50*

*Sun, Nov 30 12:30 PM - 1:00 PM Location: GU Community, Learning Center*

**Participants**

*Moderator:
Paul Nikolaidis MD: Nothing to Disclose*

**Sub-Events**

**GUS100**

Radiation Dose and Imaging Quality of Dual Energy CT Angiography of Renal Artery Compared with a Standard 120kVp Acquisition in Patient with Renal Mass (Station #1)

Pinggui Lei (Presenter): Nothing to Disclose, Xiaoying Wang MD: Nothing to Disclose, Yufeng Xu: Nothing to Disclose, Jianxin Liu: Nothing to Disclose, zhongxu bi: Nothing to Disclose

**PURPOSE**

The purpose of this study was to assess the imaging quality and radiation dose of dual energy CTA of renal artery compared with a standard 120kVp acquisition in patients with renal mass.
METHOD AND MATERIALS

Twenty-nine consecutive patients performed renal artery CTA were analyzed retrospectively, and divided into DECT group and SECT group. Fifteen patients underwent DECT (tube voltages 80 and Sn140kVp) and were compared with 14 patients underwent standard SECT (120kVp) on the same dual-source scanner. CTDIvol and SSDE were recorded and calculated. Imaging quality was evaluated by two experienced radiologists. For qualitative assessment, whole quality of imaging, detail quality of imaging (sharpness of main renal artery, segmental vessels displayed in MPR and MIP, the relationship between renal lesion and vascular) were evaluated with 5 scale method (1=poor to 5=excellent). For quantitative assessment, CT values were measured in vascular lumen of aorta, renal arteries and psoas major at the almost same level. Background noise (BN) was measured as standard deviation of the surrounding air. CNR and SNR were calculated. P< 0.05 with statistical significant difference.

RESULTS

There was no significant difference for age, sex and weight. Both mean value of CTDIvol and SSDE of DECT group lower than those of SECT group [(9.15±2.20) mGy vs. (15.7±4.08) mGy, P< 0.05; (12.27±1.98) mGy vs. (21.21±4.38) mGy, P< 0.05]. Subjective evaluation for the whole quality of imaging, sharpness of vessels, the relationship between renal lesion and vascular, segmental vessels displayed in MPR and MIP between 2 groups (Z=-2.17, P=0.05; Z=-2.17, P=0.05; Z=-2.17, P=0.05; Z=-2.64, P=0.05; Z=-2.64, P=0.05). CT values of abdominal aorta and renal artery in DECT group and SECT group were [(237±33) HU vs. (215±42) HU, P=0.05] and [(223±31) HU vs. (197±37) HU, P=0.05]. CNR and SNR were calculated. P< 0.05 with statistical significant difference.

CONCLUSION

DE renal artery CTA was equivalent of standard SECT acquisitions and thus can be applied for routine diagnostic purpose in patient with renal mass, which provide satisfactory images with significant reduction of radiation exposure.

CLINICAL RELEVANCE/APPLICATION

Dual-source dual-energy CT can achive acceptable image quality and reduce radiation dose compared with single energy CT, which helps its clinical diagnosis and treatment.

GUS101

Pseudonormal Corticomedullary Differentiation of the Kidney Assessed by T1-weighted MRI in Cirrhotic Patients with Chronic Kidney Disease (Station #2)

Fumi Yamada MD (Presenter): Nothing to Disclose , Yasuo Amano MD : Nothing to Disclose , Fumitaka Hidaka MD : Nothing to Disclose , Yoshimitsu Fukushima : Nothing to Disclose , Shinichiro Kumita MD : Nothing to Disclose

PURPOSE

Corticomedullary differentiation (CMD) of the kidney on T1-weighted magnetic resonance imaging(MRI) increases in cirrhotic patients with normal renal function, compared with normal controls. If the pathological condition also occurs in cirrhotic patients with chronic kidney disease (CKD), the severity of renal insufficiency can be underestimated by T1-weighted MRI. The aim of this study was to determine whether CMD in cirrhotic patients with CKD increased to a 'pseudonormal' appearance on the T1-weighted images.

METHOD AND MATERIALS

Abdominal T1-weighted MRI was performed in 32 cirrhotic patients with CKD and 32 age-matched CKD patients without liver cirrhosis. Estimated glomerular filtration rate (eGFR) did not differ between them (P= 0.43). Visual CMD was assessed using a 3-point scale (i.e. good, moderate, poor). Quantitative CMD was calculated by (signal intensity of the cortex / signal intensity of the medulla) for patients with visually good and moderate CMD. Differences in the proportions of the visual CMD scores were assessed between the patients with and without liver cirrhosis. We evaluated the differences in eGFR between the good, moderate, and poor scores of the patients with or without liver cirrhosis. We also assessed correlations between the quantitative CMD and eGFR in the patients with and without cirrhosis.

RESULTS

For visual CMD, the proportions of patients in each of the three scores were different between patients with and without liver cirrhosis: more good and fewer poor CMD in the cirrhotic patients (P= 0.43). In cirrhotic patients, eGFR differed between poor CMD and good or moderate CMD (P< 0.01), but not between good and moderate CMD. There were significant differences in eGFR between the three visual scores in CKD patients without cirrhosis (P< 0.05). No significant correlation was observed between quantitative CMD and eGFR in the cirrhotic patients (P= 0.22), in contrast to the CKD patients without cirrhosis (P< 0.05, r= 0.62).

CONCLUSION

Cirrhotic patients with CKD had pseudonormal CMD of the kidney on the T1-weighted MRI. We should interpret CMD carefully in the patients with both liver cirrhosis and CKD.

CLINICAL RELEVANCE/APPLICATION

T1-weighted MRI is useful for identifying chronic kidney diseases in daily practice, but not necessarily in cirrhotic patients because of pseudonormal corticomedullary differentiation of the kidney.

GUS102

PET/MR of Cervical Cancer: Correlation with Baseline and Post Treatment Clinical Staging (Station #3)

Julia R. Fielding MD (Presenter): Nothing to Disclose , Amir H. Khandani MD : Nothing to Disclose
PURPOSE
To determine whether PET/MR correlates with response to treatment in women with advanced cervical cancer.

METHOD AND MATERIALS
In this prospective pilot study, simultaneous acquisition of PET/MR images of the pelvis pre- and post-initial treatment were obtained on 5 women with cervical cancer, clinical stage >1B. This study was IRB and HIPAA compliant. Contrast agents included gadobenate dimeglumine and FDG. The MR protocol consisted of high resolution T2WI, 3D pre- and post- contrast T1-weighted and diffusion series. Simultaneously, a single station PET acquisition was obtained. MR images and PET images of the primary tumor were assessed by 2 different physicians. Decreased tumor size and enhancement of the treated tumor on MR images and decreased SUV on PET images were considered to indicate response to therapy. These results were compared with clinical response to radiation therapy or surgery.

RESULTS
4 patients underwent external beam radiation therapy and 1 underwent surgery. Pre-treatment exams demonstrated maximum tumor size of 1.7, 1.7, 4.7, 4.8 and 8.7 cm. SUV were 12.8, 4.1, 4.9, 8.1 and 25.2, respectively. On MR imaging 2 patients had parametrial extension and 2 patients had lymph nodes larger than 1 cm. Increased size and SUV correlated well with a high grade tumor biopsy and clinical stage. On post-therapy images no residual tumor was identified in the surgical patient on MR or PET images. Tumor size decreased as did SUV in all patients after undergoing external beam therapy. (See attached table)

CONCLUSION
In this pilot study both PET and MR imaging response correlated with clinical staging. Assessment of 20 patients following primary and secondary stages of radiation therapy or surgery is ongoing.

CLINICAL RELEVANCE/APPLICATION
Combined functional and anatomic imaging may become surrogates for or confirm clinical staging of advanced cervical cancer.

 Modified Look-locker Inversion Recovery (MOLLI) for T1 Mapping: Usefulness in Distinguishing Benign and Malignant Renal Lesions (Station #4)
Yuqin Ding MD (Presenter): Nothing to Disclose, Jianjun Zhou: Nothing to Disclose, Mengsu Zeng MD, PhD: Nothing to Disclose, Caixia Fu: Employee, Siemens AG, Hui Liu: Employee, Siemens AG

PURPOSE
To evaluate the usefulness of T1 mapping in distinguishing benign and malignant renal lesions

METHOD AND MATERIALS
29 malignant renal lesions in 29 patients and 14 benign renal lesions in 14 patients were examined using non-enhanced modified look-locker inversion recovery for T1 mapping. The maximum, minimum and averaged T1 values of the lesions were used for quantitative evaluation. Independent t test and receiver operating characteristics analysis were performed for statistical evaluation.

RESULTS
The maximum, minimum and averaged T1 values of benign and malignant renal lesions were (1144.71±446.9)ms, (1081.9±438.9) ms, (1096.2±418.3)ms and (1830.2±350.3)ms, (1527.4±361.5) ms, (1673.5±341.2)ms, respectively. The maximum, minimum and averaged T1 values of benign renal lesions were all significantly lower than those of malignant renal lesions(p

CONCLUSION
It is valuable to use non-enhanced modified look-locker inversion recovery for T1 mapping in distinguishing benign and malignant renal lesions.

CLINICAL RELEVANCE/APPLICATION
Non-enhanced modified look-locker inversion recovery for T1 mapping is useful in distinguishing benign and malignant renal lesions especially in patients with chronic renal disease.

Arterial Spin Labelling in the Human Placenta: Mapping Perfusion (Station #5)
Gabriele Masselli MD (Presenter): Nothing to Disclose, Roberto Brunelli : Nothing to Disclose , Maria Giulia Bernieri MD : Nothing to Disclose, Saadi Sollaku : Nothing to Disclose , Riccardo Caprasecca : Nothing to Disclose, Elisabetta Polettini : Nothing to Disclose, Gian Franco Gualdi MD : Nothing to Disclose
**PURPOSE**

To prospectively evaluate the placental perfusion in both normal and Intra-Uterine Growth Restriction (IUGR) complicated pregnancies by means of magnetic resonance imaging (MRI), using Arterial Spin Labeling (ASL).

**METHOD AND MATERIALS**

This study was approved by the local ethics committee and all participants provided written informed consent. 40 women with singleton pregnancies at a gestational age between 26-39 weeks who underwent MRI for evaluating fetal abnormalities or to rule out placental adhesive disorders were enrolled in the present investigation. 33 patients displayed a fetal growth appropriate for gestational age; 7 pregnancies were complicated by late IUGR. All participants had an ultrasound scan performed on the very same day of MRI and fetal weight, amniotic fluid index and doppler interrogation of uterine and umbilical arteries were assessed. The position of ASL slice was carried out through the placenta long axis, from which placenta resulted as a discoid-shape on image. The inversion slice was positioned over spiral arteries in order to label mother blood spins. ASL parameters were: TR/TE= 2500/27; FOV=320; Matrix=100x100; TI= 1645; slice=8 mm. Measure was performed with 90 averages. Two experienced radiologists placed ROI over the perfusion maps including only the placenta and mean value was recorded.

**RESULTS**

Mean perfusion value in normal pregnancies was 190.28 ml/100g/min. We observed a positive correlation between placental perfusion and gestation age (R2=0.167). Perfusion values were significantly lower in all the 7 pregnancies complicated by IUGR (134.43 vs. 190.28 p=0.03). In 4 IUGR patients with the lower perfusion index, we observed after a mean interval of 4 days from MRI, the onset of fetal brain sparing (cerebral vasodilatation). Notably, the PI indexes of both uterine and umbilical arteries of these patients were not significantly different from those of the remaining study population.

**CONCLUSION**

ASL MR imaging of placental perfusion provides a suitable non invasive tool to measure placental perfusion and can be used to differentiate fetuses small for gestational age from those with late forms of fetal IUGR, i.e. with a normal pulsatility index of the umbilical arteries.

**CLINICAL RELEVANCE/APPLICATION**

Arterial Spin Labeling MRI is a feasible non invasive new tool for evaluating and quantifying placental perfusion that may be potentially useful for the treatment of some forms of IUGR.
**Development of a Clinical Prediction Model Based on Quantitative Imaging Metrics Derived from CT Imaging for Differentiating Clear Cell from Papillary Renal Cell Carcinoma (Station #1)**

Vinay Anant Duddalwar MD, FRCS: Research Grant, General Electric Company, Bhusan Desai MBBS, MS (Presenter): Nothing to Disclose, Darryl Hwang PhD: Nothing to Disclose, Steven Cen PhD: Nothing to Disclose, Frank K. Chen MD: Nothing to Disclose, Hannu Tapio Huhdanpaa MD: Nothing to Disclose, Phillip Ming-Da Cheng MD, MS: Nothing to Disclose, Inderbir Gill MD: Nothing to Disclose

**PURPOSE**

To build a prediction model using quantitative imaging metrics (QIM) derived from contrast enhanced computed tomography (CECT) to distinguish clear cell renal cell carcinoma (ccRCC) from papillary RCC (pRCC).

**METHOD AND MATERIALS**

We retrospectively queried the surgical database and found 72 post nephrectomy patients who had pathology proven ccRCC (53) or pRCC (19) and preoperative multiphase CECT of the abdomen. Voxel-based contrast enhancement values were collected from the lesion segmentation and displayed as a histogram. Mean and median enhancement and histogram distribution parameters skewness, kurtosis, standard deviation (SD), and interquartile range (IQR) were calculated for each lesion on corticomedullary phase. Independent t-test was used for normally distributed parameters while Wilcoxon rank sum test was used for not normally distributed parameters. Supervised machine learning (Classification and Regression Tree 7.0-CART®) was used to develop the prediction model.

**RESULTS**

ccRCC had significantly higher mean and median whole lesion enhancement, IQR and SD (p < 0.01), and significantly lower skewness and kurtosis (p < 0.01) compared to pRCC. Arterial mean and venous IQR were selected as the final predictors. ROC curve showed by using these two factors the model can reach the accuracy of AUC=0.89 (95% CI: 0.81, 0.96). The cut points selected by CART are: if arterial mean > 75 Hounsfield Units (HU) or arterial mean ≤ 75HU and venous IQR ≤ 301HU then the lesion will be classified as cRCC. Otherwise, if arterial mean ≤ 75HU and venous IQR > 301HU then the lesion is pRCC. From the learning sample only, this prediction rule reached 88.7% sensitivity and 94.7% specificity. When we applied a 10-fold cross validation, the estimated generalizable sensitivity and specificity are 77.4% and 73.7% respectively.

**CONCLUSION**

A prediction model encompassing QIM seems promising and can be used as a quantitative tool to differentiate ccRCC from pRCC. Further refinements with possible inclusion of additional QIM (spherocity, lobularity of lesion) and validation on an independent dataset are currently underway.

**CLINICAL RELEVANCE/APPLICATION**

The successful integration and validation of novel imaging-based biomarker methodologies (such as QIM) will improve our ability to stratify patients at risk, increase diagnostic accuracy, help establish guidelines for active surveillance in the management of RCC and optimize criteria used for clinical decision making.
evaluation for placental adhesive disorders. Radiologists worked independently, blinded to clinical history of patients. For each patient the presence or absence of MRI findings reported in literature in cases of placental disorders were assessed: intraplacental thick dark bands on T2w images, intraplacental abnormal vascularity, uterine bulging, myometrial thinning, focally interrupted myometrial border, heterogeneous intraplacental signal intensity, placental protrusion into internal os, tenting of the bladder and direct visualization of nearest tissues invasion. Interpretation discrepancies were resolved by consensus. A third radiologist investigated history of patients and correlated imaging data with the gold standard: histological specimen in case of hysterectomy (4/18) or difficult detachment with hemorrhage described in surgical report in case of conservative approach (3/18).

RESULTS

Each singular sign was investigated separately for sensitivity (SS) and specificity (SP): intraplacental thick dark bands on T2w images (SS 71%, SP 100%), intraplacental abnormal vascularity (SS 71%, SP 100%), myometrial thinning less than 5 mm (SS 100%, SP 18%), heterogeneous intra-placental signal intensity (SS 71%, SP 54%), uterine bulging (SS 57%, SP 90%), focal interruption (SS 0,57%, SP 100%), direct invasion (SS 42%, SS 100%) and tenting of bladder (SS 57%, SP 100 %). Protrusion into internal os was not detected. In our series combined evaluation of all imaging signs detected suggest deepest infiltration in patient who underwent hysterectomy (SS 75%; SP 100%).

CONCLUSION

MRI accuracy in diagnosis of placental adhesive disorders can be improved by taking into account the association of reported signs. However, is not possible on the basis of MRI assess the degree of myometrial involvement

CLINICAL RELEVANCE/APPLICATION

The detection of specific MRI signs could typify patients with Placental abnormality to ensure the correct preoperative assessment and the appropriate treatment planning in a safer way.

GUS106

3D Reconstruction from MRI during Human Childbirth (Station #3)

Olivier Ami MD, PhD (Presenter): Nothing to Disclose, Jean-Christophe Maran: Nothing to Disclose, Dominique MUSSET: Nothing to Disclose, Louis Bernard Boyer MD: Nothing to Disclose

PURPOSE

3D reconstruction of birthcanal and fetus was obtained from imaging performed with 1T open field MRI before and during childbirth on 10 patients. Fetal head molding and birthcanal changes are fully described in 3D vectorial meshes.

METHOD AND MATERIALS

10 women were enrolled in this study in a level I maternity center. Inclusion criteria were normal pregnancy and course of labor in healthy volunteers. A T1 gradient echo sequence was performed, lying on the back, before labor and during childbirth. A Philips 1T Panorama Open field MRI was used. 3D reconstruction was performed with a SIMULACC platform (babypress SAS, France).

RESULTS

All fetal head molding changes are described, including skull bones movements, meningeal role and brain biomechanical constraints. The birthcanal showed great deformity during the second stage of labor and highlights the biomechanical process that preludes to human birth.

CONCLUSION

Obstetrical mechanics are better understood with 3D reconstruction imaging, and this technology opens access to virtual trial of labor in the near future.

CLINICAL RELEVANCE/APPLICATION

Feasibility study of new diagnosis tools using imaging and 3D simulation to help a better management of human birth.

GUS107

Limited Utility of Negative CT Attenuation Value Pixel Distribution Analysis Using Unenhanced CT in Diagnosis of Small (<4cm) Angiomyolipoma (AML) without Macroscopic Fat (Station #4)

Naoki Takahashi MD (Presenter): Nothing to Disclose, Kohei Sasaguri MD: Nothing to Disclose, Mitsuru Takeuchi MD, PhD: Nothing to Disclose, Adam Froemming MD: Nothing to Disclose, Shuai Leng PhD: Nothing to Disclose, Akira Kawashima MD: Nothing to Disclose

PURPOSE

To evaluate if negative CT attenuation pixel distribution analysis improves detection of fat in small AML.
METHOD AND MATERIALS

29 small (<4cm) AML (mean age: 53) and 68 small RCC (46 clear-cell, 22 other, mean age: 59) who underwent unenhanced (NC) and enhanced CT before nephrectomy were included (mean NC-CT slice thickness: 4 mm). CT images were reviewed for presence of macroscopic fat (subjective method). CT pixel distribution analysis was performed using Matlab-based software. First, a largest possible, free-hand ROI was manually placed on the mass on representative NC-CT image. Subsequently, the software systematically generated multiple round overlapping micro-ROIs in the large ROI. Mean HU values and pixel counts under cutoff values in each of multiple micro-ROIs were calculated. Cutoff values tested were 0, -5, -10, -15 and -20 HU. Minimum of the mean HU values and maximum of the pixel counts were recorded (mean-HU method and pixel-count method); these are equivalent to subjectively identifying suspicious areas and placing small ROIs. Size of micro-ROIs were 37 and 49 pixels (28-37mm²) for mean-HU method and 13 and 29 pixels (10-22mm²) for pixel-count method. The mean-HU and pixel-count methods were tested if they can differentiate AML from RCC and/or detect macroscopic fat.

RESULTS

On subjective analysis, 7 AML contained macroscopic fat and 22 did not, while 1 RCC contained macroscopic fat. When AML with macroscopic fat by subjective method were excluded, neither mean-HU or pixel-cont method could differentiate AML from RCC (sensitivity specificity: 5%/97% or 9%/87%). Mean-HU/pixel-count methods and subjective method were concordant for detecting macroscopic fat in all but 1 case (fat in AML only visible on enhanced CT subjectively, and pixel analysis method did not detect fat on NC-CT). Optimal cutoff for macroscopic fat detection were <-15HU and <-10HU for 25 and 49-pixel-ROIs (mean-HU method) and ≥12 pixels of 15-pixel-ROI or ≥19 of 29-pixel-ROI below -10HU, ≥11 of 13 or ≥17 of 29 below -15HU, or ≥11 of 13 or ≥16 of 29 below -20HU (pixel count method).

CONCLUSION

Negative CT attenuation pixel distribution analysis does not improve detection of fat in small AML beyond subjective method.

CLINICAL RELEVANCE/APPLICATION

Negative CT attenuation value pixel distribution analysis is not useful in differentiating small AML without macroscopic fat from RCC.

TABLE OF CONTENTS/OUTLINE

1. Prostate and periprostatic anatomy o Anterior fibromuscular stroma, McNeal zonal anatomy o Urethra and verumontanum o Vasa deferentia and seminal vesicles o Periprostatic neurovascular bundle 2. Fundamental principles of multiparametric prostate MR imaging o T1 and T2-weighted MR imaging o Diffusion-weighted MR imaging o MR spectroscopic imaging o Dynamic contrast enhanced MR imaging o Advantages and disadvantages of the endorectal coil 3. Prostate adenocarcinoma epidemiology, histology and Gleason grade, staging, and multiparametric MR imaging. 4. Epidemiology, clinical features, multiparametric MR imaging and histology of less common prostate pathology: o Amyloid o Carcinosarcoma o Cystadenoma o Tuberculosis o Endometrioid cancer o Mucinous adenocarcinoma o Abscess o Stromal neoplasm of uncertain malignant potential o Others All sections will contain multiparametric MR images, professionally-created medical illustrations and high-resolution photographs of histological slides.

TEACHING POINTS

1. To review the fundamental principles of prostate MR imaging 2. To review prostate anatomy and its appearance on MR imaging 3. To review the imaging features of prostate adenocarcinoma 4. To describe less common prostate pathologies, and clinical and MR imaging features that distinguish them from adenocarcinoma.
**TEACHING POINTS**

The user will have a better understanding of the pitfalls and sources of misdiagnosis in CT evaluation of the Kidney, Ureters and Bladder. Major teaching points include: 1. There is no single optimal phase (non-contrast, arterial, venous, excretory phase) for detecting pathology and a combination of phases is needed. 2. Routine use of multiplanar and 3D imaging is needed to detect and classify GU pathology. 3. Study protocols are critical for lesion detection and classification. 4. Misdiagnosis occur when assumptions are made without careful lesion analysis.

**TABLE OF CONTENTS/OUTLINE**

1. Pitfalls in Imaging the GU Tract • results from the literature • sources of error in clinical practice with examples 2. Optimizing scan protocols to minimize error • role of specific phases in lesion detection and characterization 3. Designing interpretation strategies to minimize error • role of MPR and 3D imaging in minimizing error and misinterpretation • case studies illustrating specific errors and how they can be avoided with routine use of MPR and 3D 4. Select case studies illustrating specific pitfalls with recommendations to avoid these misdiagnosis 5. Discussion of study design and need to minimize radiation dose • challenges of lowering the dose in GU imaging • dose reduction and it may increase error rates
**Predictive Value of Apparent Diffusion Coefficient in Response Evaluation for the Radiofrequency Ablated Renal Cell Carcinoma: Preliminary Experience**

Duangkamon Prapruttam MD (Presenter): Nothing to Disclose, Sandeep Subhash Hedgire MD: Nothing to Disclose, Yun Mao MD: Nothing to Disclose, Mukesh Gobind Harisinghani MD: Nothing to Disclose, Debra Ann Gervais MD: Research Grant, Covidien AG

**PURPOSE**

To assess the utility of apparent diffusion coefficient (ADC) in predicting and evaluating the response of the radiofrequency ablated renal cell carcinoma.

**METHOD AND MATERIALS**

30 patients with 41 pathological confirmed renal cell carcinomas underwent MRI at 1.5T including diffusion weighted images before and after radiofrequency ablation. The ADC values of the tumor at b=0, 100 and 600 s/mm² were noted by drawing multiple regions of interest. Imaging features, histologic subtypes and Fuhrman grade of the tumor was also recorded. The participants were divided into 2 groups: complete treatment group (n=38) and residual disease group (n=3) based on follow up imaging and clinical notes. The variables were statistically analyzed.

**RESULTS**

Of 41 RCCs, 23.3% were papillary, 57% were clear cell and 3% chromophobe types. The mean pre-treatment tumor ADC value in the complete treatment group was 1.779 s/mm² and pre-treatment ADC value of residual disease group was 1.609 s/mm² (p=0.512). Given the substantial overlap, it was not possible to use the pre-ablation ADC value as a predictor of residual disease. Fuhrman grade showed significant correlation (p=0.005) with the post RF ablation response with 100% response rate in Fuhrman grade 1. For grade 2 this rate was 83.3% and for grade 3, it was 0%. There was no significant difference between ADC value of pre- and post radiofrequency ablated renal cell carcinoma. Though mean ADC values for the group before and after ablation did not differ, some cases showed increase in ADC and others showed decrease. The range in changes was -0.350 to 1.560.

**CONCLUSION**

ADC values in individual cases may increase or decrease after ablation limiting use of this marker in evaluating for viable tumor. Pre-ablation ADC did not predict outcome of ablation. Further studies are required to establish a cut of ADC value to distinguish complete responders from residual disease.

**CLINICAL RELEVANCE/APPLICATION**

ADC values in renal tumors do not appear useful in predicting outcome or in assessing residual tumor after ablation.

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**Small Renal Mass (T1a): The Case for RFA**

Debra Ann Gervais MD (Presenter): Research Grant, Covidien AG

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**Small Renal Mass (T1a): The Case for Cryoablation**

Peter John Littrup MD (Presenter): Founder, CryoMedix, LLC Research Grant, Galil Medical Ltd Research Grant, Endo Health Solutions Inc Officer, Delphinus Medical Technologies, Inc

**LEARNING OBJECTIVES**

1) Understand the different approaches and techniques of thorough renal mass cryoablation that produces very low recurrence rates, even for larger central tumors. 2) Understand the appropriate settings to utilize protective techniques (i.e., hydrodissection, balloon interposition, ureteral stent, etc.) for adjacent calyces, bowel and ureter to avoid complications. 3) Identify major imaging follow-up criteria for ablation success and any early failures. 4) Describe the overall cost-efficacy trade-offs for cryo vs. heat-based renal ablations vs. partial nephrectomy, in relation to tumor location, complications and recurrence rates.

**ABSTRACT**

Cryoablation of smaller renal cancers (i.e., T1a, or <4 cm) is an out-patient treatment that is safe, effective and flexible for nearly any renal location. Major cryoablation benefits include its excellent visualization of ablation zone extent, low procedure pain and flexible protection of tumor ablation sites near calyces, bowel and ureter. CT-guidance is the cryoablation guidance modality of choice due to circumferential visualization of low density ice and ready availability. US-guidance can augment renal cryoablation, especially for smaller visible masses and/or placement of interstitial metallic markers during biopsy for selected cases requiring better eventual CT localization. MR-guidance has little clinical benefit or cost-efficacy. For safety, cases will be considered for...
avoidance of direct calyceal puncture, selection of hydrodissection or balloon interposition for bowel protection, and protection of the ureteropelvic junction by stent placement. Imaging outcomes of complications and their avoidance will be shown. For optimal efficacy, tumor size in relation to number and size of cryoprobes emphasize the "1-2 Rule" of at least 1 cryoprobe per cm of tumor diameter and no further than 1 cm from tumor margin, as well as cryoprobe spacing of <2cm. Thorough extent of visible cryoablation margins beyond all apparent tumor margins produces very low local recurrence rates for tumors in nearly any renal location, resulting in excellent cost-efficacy by minimizing the need for re-treatments.

**Small Renal Mass (T1a): The Case for Microwave**

Fred T. Lee MD (Presenter): Stockholder, NeuWave Medical, Inc Patent holder, NeuWave Medical, Inc Board of Directors, NeuWave Medical, Inc Patent holder, Covidien AG Inventor, Covidien AG Royalties, Covidien AG

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**A Statistical Model of the Relationship between Iceball and Perfusion Deficit Visualized during MRI-guided Cryoablation**

Katherine Louise Dextraze MS (Presenter): Nothing to Disclose, Florian Maier: Nothing to Disclose, Judy Un Chong Ahrar, MD: Nothing to Disclose, Yvette Teniente: Nothing to Disclose, Kamran Ahrar MD: Nothing to Disclose, R. Jason Stafford PhD: Nothing to Disclose

**PURPOSE**

A statistical model was investigated to quantify the extent of damage within the kidney parenchyma based on tissue position with respect to the iceball surface as visualized on images during the MRI-guided cryoablation procedure.

**METHOD AND MATERIALS**

A retrospective study of 20 patients cases was performed in order to statistically correlate the lack of perfusion seen on periprocedural contrast enhanced T1 post-treatment images with the iceball signal deficit seen on MRI-guided cryoablation monitoring images. Manual land-mark based registration and manual segmentation were performed on the data sets prior to analysis. In order to reduce variability in the segmentations, repeated segmentation trials to submitted to a truth-estimation scheme. Automated measurements of the distance between the iceball surface and the perfusion deficit edge were made and logistic regression model was fit to these measurements using original MATLAB scripts. The Kolmogorov-Smirnov test was applied to the Pearson residuals of the logistic regression model to assess goodness-of-fit of the model to the data. Measurements were restricted to renal parenchyma, where reliable registration could be applied.

**RESULTS**

Using 20 patient cases and over 600 data points, the perfusion loss likelihood of renal parenchyma within the iceball was described by a unique logistic regression curve, where the parameters are alpha = -0.45 and beta = 0.79. From this curve, it was determined that tissue is 50% likely to lose perfusion at 0.57mm within the iceball, while perfusion loss is 95% likely at 4.28 mm within the iceball edge. The Kolmogorov-Smirnov test for goodness-of-fit confirmed that the logistic regression model reported here describes the observed data appropriately.

**CONCLUSION**

Through a retrospective study of 20 patient cases, the relationship between likelihood of perfusion loss in renal parenchyma and distance within iceball was statistically quantified. From the statistical model, the margin for 95% perfusion loss likelihood was found to be 4.28mm within the iceball, which agrees the clinically accepted 3-5mm margin that is estimated during the procedure.

**CLINICAL RELEVANCE/APPLICATION**

The statistical model presented here could serve effectively as a quantitative approach to assessing treatment progress during the MRI-guided cryoablation procedure, rather than relying on visual estimation.

**Biopsy or No Biopsy before Ablation? Biopsy Every Renal Tumor before Percutaneous Ablation**

William W. Mayo-Smith MD (Presenter): Author with royalties, Reed Elsevier Author with royalties, Cambridge University Press

**LEARNING OBJECTIVES**

1) Explain the expanding role of renal mass biopsy. 2) Explain why biopsy is necessary before all renal tumor ablations. 3) Demonstrate biopsy techniques.

**Biopsy or No Biopsy before Ablation? Don’t Trouble Yourself or the Patient with the Renal Mass Biopsy - Go ahead and Ablate**

Steven Satish Raman MD (Presenter): Consultant, Bayer AG Consultant, Covidien AG
LEARNING OBJECTIVES

View learning objectives under main course title.

VSIO11-14 Incidence of Post Ablation Syndrome in Image-Guided Percutaneous Cryoablation (CRYO) of Renal Tumors: A Prospective Survey


PURPOSE

The historical incidence of complete post-ablation syndrome in patients undergoing radiofrequency ablation (RFA) of renal tumors was 29.4% with both flu-like symptoms (malaise, myalgia and nausea) and low grade fever. This study aims: (1) to evaluate the incidence of post-ablation syndrome in the patients undergoing image-guided CRYO of their renal tumors (2) to determine its impact on the quality of life in the 10 days post-renal CRYO and compare it to the post-RFA historical data.

METHOD AND MATERIALS

Thirty eight patients (age 24-83 years) underwent image guided CRYO for 40 renal tumors. A telephone survey using a standardized questionnaire was conducted on days 1, 3, 5, 7 and 10 following post-CRYO. The patients' demographic details, temperature, degree of flu-like symptoms (malaise, myalgia, nausea/ vomiting), severity of pain and percentage of relief with oral analgesics, interference with general activity and with work were documented prospectively. The symptoms and interference of lifestyles were graded on a 0-10 Numeric Intensity Scale.

RESULTS

Post-CRYO, 6 patients (15.8%) developed low-grade fever (range 37.2-38.5ºC), 24 (63.2%) had flu-like symptoms, and 14 (36.8%) had no symptoms. The low grade fever did not exhibit any peak but the flu-like symptoms peaked on day-3 and resolved spontaneously in most patients by day-10. Six patients (15.8%) developed the full post ablation syndrome which was lower in incidence and the symptoms were less severe when compared to the post-RFA historical data (Figure 1). Post-CRYO patients with symptoms experienced pain and interference with general and work activities, peaking on day-3 in contrast to post RFA where symptoms peaked on day-1 and completely resolved by day-10.

CONCLUSION

Post-CRYO the incidence of complete post-ablation syndrome was 16% of patients with less severe symptoms compared to post-RFA. However, two third (63.2%) of the patients experienced at least one of the components of the syndrome. These symptoms were self-limiting with most symptoms peaking at day-3 and majority of the patients resumed their baseline pre-procedural levels of activity within 10 days following CRYO.

CLINICAL RELEVANCE/APPLICATION

Post renal-CRYO, the incidence of complete post-ablation syndrome is lower and less severe than post-RFA and this information is useful when obtaining consent from patients during the consultation.

VSIO11-16 Is Ablation Effective for Masses other than T1a RCC?

Bernhard Gebauer MD (Presenter): Research Consultant, C. R. Bard, Inc Research Consultant, Sirtex Medical Ltd Research Grant, C. R. Bard, Inc Research Consultant, PAREXEL International Corporation

LEARNING OBJECTIVES

1) Appreciate the strengths and limitations of percutaneous ablation in treating renal tumors measuring larger than 4cm.

ABSTRACT

In the 6 edition of TNM of Union internationale contre le cancer (UICC) in 2002 the differentiation between T1a and T1b renal cell cancers (RCC) was introduced. The discrimination between T1a and T1b using a threshold of 4 cm is not justified by differences in survival, it is based on the upcoming local therapeutic options for small RCCs.

In the last years techniques for local therapies for RCCs improved and multiple studies for larger RCCs beyond 4 cm in diameter were published. Especially studies concerning partial nephrectomy (PN) and thermal ablation (e.g. radiofrequency ablation (RFA) and cryoablation) are available.

Psutka et. al. could show that after RFA of T1a and T1b RCCs, disease-free survival and recurrence free survival of T1b cancers in reduced, but overall survival is not significantly different. Takaki et. al. compared RFA versus PN in T1b RCCs. Cumulative RCC-related survival and disease-free survival was not significantly different. But there was a significant difference in overall survival, probably because RFA patients were older, had a worse American Society of Anesthesiologists (ASA) score and more single kidney interventions.

Because the sensitivity of RCC-cells to radiation is debatable, not many study data for conventional radiation of RCCs is available. Newer radiation techniques like Stereotactic body radiation therapy (SBRT) and Cyberknife...
could increase the amount of radiation into the tumor and reducing the applied radiation to normal tissues. Another technique is to place afterloading catheters into the tumor under CT-guidance and perform a brachytherapy of the tumor to achieve local tumor control. Combination of different therapies could additionally increase the therapeutic options in the individual patient and should be discussed.

Active Handout

RC104
Sports Injuries in the Chest and Abdominal Wall: A Core Curriculum of the Body's Core

Participants
David Alan Rubin MD (Presenter): Nothing to Disclose
Jonathan Craig Baker MD (Presenter): Research Consultant, Biomedical Systems
William E. Palmer MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Understand the relative strengths and weaknesses of radiographs, ultrasound, CT and MR in the evaluation of suspected injuries to the trunk and use this information to logically direct an imaging evaluation. 2) Understand the anatomy of the anterior chest wall musculature and its relevance to the imaging patterns of injuries, together with how that information assists treatment planning. 3) Recognize and characterize the common and less common injuries in the abdominal and pelvic wall musculature and supporting pelvic ligaments.

ABSTRACT
The imaging of sports injuries to the extremities, joints, groin, spine, and head receive much attention. Nevertheless athletic injuries to the trunk also occur with some frequency. The thoracic, abdominal, and pelvic walls form the body's central core. The thoracic wall includes the ossified and cartilaginous parts of the ribs together with the clavicles and sternum, which provide a protective cage for the vital chest organs, as well as a site of origin for the chest wall muscles. In turn, these powerful muscles are responsible for the large movements of the upper extremities and for stabilizing the upper body during twisting motions. Similarly, the abdominal and pelvic wall muscles and supporting ligaments anchor the trunk and lower extremities to the spine and pelvis, while stabilizing the body during locomotion and limb movements. Each of these bone and soft tissue structures are susceptible to direct blunt force trauma in contact and collision sports and to indirect stretching injuries during running, cutting, throwing, kicking, and related activities. There is growing understanding of the role of the thoracoabdominal musculoskeletal structures in sports, with training regimens now incorporating 'core strengthening' as an important pillar. The recognition, staging, therapy, and rehabilitation of these injuries are likewise becoming more sophisticated. This refresher course will review the role imaging plays for these injuries, emphasizing the added value of advanced imaging modalities for diagnosis, treatment planning, and prognostication.

RC107
GYN and Pelvic Floor 2014: Latest Imaging Guidelines and Angles Simplified!

Participants
Moderator
Julia R. Fielding MD : Nothing to Disclose
Maitray D. Patel MD (Presenter): Nothing to Disclose
Reena Chetna Jha MD (Presenter): Consultant, Celonova BioSciences, Inc

LEARNING OBJECTIVES
1) Describe current best practice recommendations for management of adnexal asymptomatic, incidental, and/or potentially physiologic findings on pelvic US, CT, and MR based on lesion characteristics and patient clinical factors. 2) Understand the references and angles in pelvic MRI that are used in the evaluation of pelvic floor disorders. 3) Understand the typical imaging characteristics of the endometrium and myometrium according to patient age and stage of the reproductive cycle, and review associated benign pathology.

RC118
Global Cancer Imaging—Insights from Overseas
Functional and Molecular Imaging at Oxford University

Fergus Vincent Gleeson MBBS (Presenter): Alliance Medical Ltd Consultant

LEARNING OBJECTIVES

1) To learn about the functional and molecular imaging research being conducted within the Radiology Department of Oxford University Hospitals NHS Trust.

ABSTRACT

There is increasing functional and molecular imaging being performed in medicine. The Radiology department at the Churchill Hospital in Oxford is conducting a number of trials in these areas, and has designed these trials around interventions to measure the effect of these new techniques. It has taken the opportunity to raise the profile of Radiology within the University, to promote greater collaboration with basic scientists, attracting increased funding, and opportunities for scientists and physicians.

Lessons Learned from the National Irish Breast Screening Program: The first 12 years—One Million Mammograms On

Michelle Marie McNicholas MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) To review the results of the Irish National Breast Screening Program following 12 years of screening with over 1,000,000 mammograms performed. 2) To understand the essential components of setting up and maintaining a national breast screening program in Ireland. This includes the rationale for the decisions made at the outset, such as age range, frequency of screens, centralisation of service and responsibility of the screening process to the end of primary surgery. 3) To understand the need for and the mechanism of developing a national registry of eligible women in the absence of a national unique identifier. 4) To understand the need for a client charter which sets out client guarantees, objectives and goals around issues of consent, timeliness of screening results and recall to assessment, biopsy results and admission for surgery and further treatment where indicated. 5) To understand the necessity of national guidelines, annual reports and external accreditation. 6) To demonstrate the essential need for ongoing review of key performance indicators (recall rate, biopsy rate, cancer detection rate, DCIS rate, open biopsy rate, false negative rate, interval cancer rate) as surrogates of program success. 7) To understand the importance of communication and feedback to clients, units, practitioners and media in maintaining uptake. 8) To understand the reporting structure and the composition of various roles within the multidisciplinary medical and surgical teams. 9) To understand the requirements for ongoing training and education of all staff - physicians, technologists, nurses, physicists, administrative staff. 10) To understand the factors affecting radiation dose to the screened population and the over-riding responsibility of the ALARA principle, such as: role of physics team, mammographic technique, equipment choice, technologist expertise and training, quality assessment. 11) To understand the operational issues of different screening units, double reading, discrepancy cases, dealing with interval cancers, dealing with outliers in key performance parameters. 12) To understand the positive spinoffs from the program including increased awareness, improving national standards in the screening and the symptomatic population and the contribution to improved diagnostic and treatment options. 13) To understand how the program achieved, maintained, and monitored performance and how it adapted to changes in practice as issues or controversies arose. 14) To discuss whether this population screening program has been a successful and cost effective health care initiative for Ireland. 15) Ultimately, to understand whether the Irish National Breast Screening Program has led to improved survival in women with breast cancer in Ireland.

MRI of Pelvic Malignancy—The View from Down Under

Clair Louise Shadbolt MBChB (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) To learn about the local availability and funding of MRI in investigating pelvic malignancy that is unique to Australia. 2) To understand the current usage of Pelvic MRI in investigating pelvic malignancy in the Australian population. 3) To review some typical examples of Pelvic MRI in Oncology that illustrate the advantages of MRI in the assessment of pelvic malignancies and impact MRI has on patient management in the multidisciplinary setting.

ABSTRACT

According to the Australian and New Zealand College of Radiologists’ (RANZCR) website "MRI is only effective when it is likely to improve the health outcome for the patient ... although able to offer detailed images, MRI scanning is not always the most appropriate imaging". The Australian Government Department of Heath and Aging announced a press release in November 2012 of a $194.4 million Diagnostic Imaging Review Reform Package to increase access to MRI and increase cancer services: "This package means many more Australians will benefit from faster diagnosis and earlier detection of disease... From November 2012 Medicare will cover the cost of more MRI scans than ever before. Under the changes patients using MRI machines in regional Australia will have greater access..." However, MRI utilisation in pelvic oncology in Australia is limited in its accessibility. The unique geography and remoteness of some sectors of the population of Australia influences the usage of MRI. I will illustrate the important role of MRI in the management of pelvic malignancy with some classic examples.
Imaging of HCC—A Korean Perspective
Byung Ihn Choi MD, PhD (Presenter): Research Consultant, Samsung Electronics Co Ltd

LEARNING OBJECTIVES
1) To learn recent imaging techniques for the qualitative and quantitative diagnosis, selection of treatment methods, and evaluation of monitoring after treatment for HCC. 2) To understand the imaging findings of hepatocarcinogenesis from regenerate nodule going through low and high grade dysplastic nodule, early HCC and finally to advanced HCC. 3) To review current clinical practice guidelines including role of imaging for the diagnosis and treatment for HCC with focus on recent change of guidelines by rapid progression of imaging biomarkers.

Abdominal MRI Technique Update (An Interactive Session)

Respiratory Artifacts in Abdominal MRI: Causes and Cures
Eduard E. De Lange MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Understand how the characteristics of commonly used abdominal-imaging pulse sequences influence their susceptibility to respiratory artifacts. 2) Explain differences between multi-slice and single-shot pulse sequences. 3) Describe various approaches for suppressing respiratory artifacts. 4) Optimize routine imaging protocols for abdominal MRI.

Choosing an MRI Contrast Agent
Jay Kumar Pahade MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Provide background of different available MRI contrast agents and their properties. 2) Discuss safety profiles and concepts related to minimizing risk of NSF. 3) Review common indications for different available MRI contrast agents and their relative strengths and weaknesses.

Optimizing Contrast Enhancement: 2014 and Beyond

LEARNING OBJECTIVES
1) Learn how to perform high temporal resolution dynamic MR Contrast enhanced imaging. 2) Learn post-processing strategies for high temporal resolution MR data. 3) Review applications of high temporal resolution imaging.

First Trimester Ultrasound (An Interactive Session)

Respiratory Artifacts in Abdominal MRI: Causes and Cures
Eduard E. De Lange MD (Presenter): Nothing to Disclose

Choosing an MRI Contrast Agent
Jay Kumar Pahade MD (Presenter): Nothing to Disclose

Optimizing Contrast Enhancement: 2014 and Beyond

LEARNING OBJECTIVES
1) Learn how to perform high temporal resolution dynamic MR Contrast enhanced imaging. 2) Learn post-processing strategies for high temporal resolution MR data. 3) Review applications of high temporal resolution imaging.
**Sub-Events**

**RC210A**

**Diagnosis of Early Nonviable Pregnancy**

Peter Michael Doubilet MD, PhD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

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

**ABSTRACT**

I. Sonographic Criteria for Diagnosing Pregnancy Failure (Miscarriage) in an Intrauterine Pregnancy of Uncertain Viability [Note: an intraterine 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.

**Active Handout**


**RC210B**

**Diagnosis and Treatment of Ectopic Pregnancy**

Hope Elizabeth Peters MD (Presenter): Nothing to Disclose

**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**

**Fetal Anatomy in the First Trimester**

Phyllis Glanc MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Improve knowledge of first trimester anatomic development. 2) Compare indications for transabdominal versus transvaginal imaging in first trimester. 3) Recognize anomalies which typically present in first trimester. 4) Demonstrate understanding of the implications and management of common first trimester anomalies.

**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 recognizes 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 hypoechoic 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.

**Active Handout**


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**RC229**

**Increasing Your Gynecological MRI Referral Base: Reaching Out to the Gynecologists (An Interactive Session)**

**Refresher/Informatics**

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

**Mon, Dec 1 8:30 AM - 10:00 AM  Location: S402AB**

### Sub-Events

**RC229A**  
**Mullerian Anomalies—Guiding Management**

Julia R. Fielding MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Review the MR appearance of the septate and bicornuate uterine anomalies. 2) Define a routine MR protocol to accurately characterize anomalies. 3) Outline the necessary components in the radiology report that are of the most value to the referring physician.

**RC229B**  
**Pelvic Floor Dysfunction and Other Postpartum Sequelae**

Amy Suzanne Thurmond MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Review the complex anatomy of the female pelvic floor. 2) Understand the effect of childbirth on the muscles, ligaments, and organs of the pelvis. 3) Learn the appropriate use of fluoroscopic procedures, ultrasound, CT and MRI for diagnosis of long-term sequelae of obstetric trauma. 4) Appreciate the pre-operative considerations for treatment of pelvic prolapse and vaginal fistulas.

**ABSTRACT**

Anatomy of the female pelvic floor is complex, and divided into three compartments. The anterior compartment contains the urinary bladder and the urethra; the middle compartment contains the uterus, cervix, and vagina; and the posterior compartment contains the rectum. Pregnancy and childbirth, by nature of the process, result in trauma to the tissues and over time lead to weakness of the tissues and pelvic floor dysfunction including stress urinary incontinence, as well as fistula formation between the organs in the three compartments.

**RC229C**  
**MR Imaging of Endometriosis: Pearls and Pitfalls**

Evan Spencer Siegelman MD (Presenter): Consultant, BioClinica, Inc Consultant, ICON plc Consultant, ACR Image Metrix

**LEARNING OBJECTIVES**

1) Identify the clinical indications that should lead to imaging for the detection of endometriosis. 2) Assess the MR techniques for the detection and characterization of endometriosis. 3) Describe the classic and unusual locations of endometriosis.

**ABSTRACT**

Endometriosis, which is defined as the presence of ectopic endometrial glands and stroma outside the uterus, is a common cause of pelvic pain and infertility, affecting as many as 10% of premenopausal women. Because its effects may be devastating, radiologists should be familiar with the various imaging manifestations of the
disease, especially those that allow its differentiation from other pelvic lesions. The MR ‘pearls’ offered here apply to the detection and characterization of pelvic endometriosis. First, the inclusion of T1-weighted fat-suppressed sequences is recommended for all MR examinations of the female pelvis because such sequences facilitate the detection of small endometriomas and aid in their differentiation from mature cystic teratomas. Second, it must be remembered that benign endometriomas, like many pelvic malignancies, may exhibit restricted diffusion. Although women with endometriosis are at risk for developing clear cell and endometrioid epithelial ovarian cancers (ie, endometriosis-associated ovarian cancers), imaging findings such as enhancing mural nodules should be confirmed before a diagnosis of ovarian malignancy is suggested. The presence of a dilated fallopian tube, especially one containing hemorrhagic content, is often associated with pelvic endometriosis. Deep (solid infiltrating) endometriosis can involve the pelvic ligaments, anterior rectosigmoid colon, bladder, uterus, and cul-de-sac, as well as surgical scars; the lesions often have poorly defined margins and T2 signal hypointensity as a result of fibrosis. The presence of subcentimeter foci with T2 hyperintensity representing ectopic endometrial glands within these infiltrating fibrotic masses may help establish the diagnosis.

URL’s

http://pubs.rsna.org/doi/pdf/10.1148/rg.326125518

VSGU21

Genitourinary Series: Prostate MR 2014: Current Role in Staging and Surveillance and Intervention

Series Courses

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Participants

Moderator
Peter L. Choyke MD: Researcher, Koninklijke Philips NV Researcher, General Electric Company Researcher, Siemens AG Researcher, iCAD, Inc Researcher, Aspyrian Therapeutics, Inc Researcher, ImaginAb, Inc Researcher, Aura

Sub-Events

VSGU21-01 Intro to Prostate Cancer

Coordinator Peter L. Choyke MD Researcher, Koninklijke Philips NV Researcher, General Electric Company Researcher, Siemens AG Researcher, iCAD, Inc Researcher, Aspyrian Therapeutics, Inc Researcher, ImaginAb, Inc Researcher, Aura

LEARNING OBJECTIVES

1) To understand the limitations of PSA screening and random prostate biopsy. 2) To introduce the concepts of novel screening tests and genomic analysis of prostate biopsies. 3) To review the importance of MRI in improving tumor localization, guiding biopsy, monitoring active surveillance and focally ablating prostate cancer.

ABSTRACT

The diagnosis of prostate cancer is evolving quickly. There is increasing recognition that the combination of routine PSA screening and random prostate biopsy overdiagnoses low grade disease and underdiagnoses high grade disease. Autopsy studies show that the normal prostate harbors many low grade and microscopic cancers that never becomes clinically apparent. On the other hand, random biopsies undersample the anterior prostate gland. More accurate screening tests (e.g. PCA-3) are under development for determining which men warrant biopsy. Genomic testing of prostate biopsy samples is also becoming more common and it is thought to improve the prediction of tumor aggressiveness. The increased use of genomics to guide therapy clearly requires that the biopsy sample be representative of the tumor. MR guided biopsies, whether performed in gantry or using MR-US fusion, will improve the quality of the prostate biopsy specimen enabling more accurate genomic testing. Armed with more accurate and reliable tissue diagnosis, more rational decisions regarding active surveillance and/or focal therapy can be made. This course will review advances in MR guided diagnosis, biopsy and therapy of prostate cancer.

VSGU21-02 Multiparametric MRI Predicts 2 Year Outcomes for Low Risk Prostate Cancer Patients on Active Surveillance

Anwar Roshanali Padhani MD (Presenter): Advisory Board, Acuitas Medical Ltd Advisory Board, Siemens AG Speakers Bureau, Siemens AG Researcher, Siemens AG Speakers Bureau, Johnson & Johnson, Giuseppe Petralia MD: Nothing to Disclose, Heminder Kaur Sokhi MRCS, FRCR: Nothing to Disclose, Francesco Sanguedolce PhD, MD: Nothing to Disclose, Nicola Anyamene: Nothing to Disclose, Giles Hellawell MD, MRCS: Nothing to Disclose

PURPOSE

To investigate the ability of multiparametric MRI (mpMRI) to predict early treatment outcomes of Active Surveillance (AS) patients.
METHOD AND MATERIALS

100 AS patients (cT1a-c; PSA≤10ng/ml; PSA density ≤0.2ng/ml/cc; Gs≤6; highest tumor volume in cores ≤50%) underwent 3 monthly PSA testing and repeat TRUS biopsy at 1 and 4 years. mpMRI (T2W, DWI, DCE andMRSI) was undertaken annually. The first mpMRI was evaluated by two independent radiologists (1and4 years experience), blinded to the 2yr outcome (continued/discontinued AS). mpMRI features including index lesion (IL) presence, location, size, type (diffuse/nodular), sequence PI-RADS score, ADC value, MRSI metabolic ratio, and DCE curve type were recorded; Overall Likert score for clinically significant disease and reader’s evaluation of suitability for AS were noted. Interobserver agreement, univariate and multivariate analysis and treatment free survival curves were calculated.

RESULTS

Mean time on AS was 24.7 months; 44 withdrew from AS for PSA DT ≤2 years (11.4%), upgrading at repeat biopsy (11.4%) , worsening mpMRI appearances (17.4%) and due to patient preference (2.3%). No differences were found between the continued/ discontinued AS groups for age, PSA, gland volume, PSA density. Interobserver agreement was moderate for DCE PI-RADS score (0.57) and substantial to almost perfect (0.63-97) for the remaining continuous/ordinal variables. A number of mpMRI features were significantly correlated to outcome on univariate analysis (both radiologists). Using logistic regression, significant variables were T2W PI-RADS score and ADC value for the more experienced radiologist, while stage, IL type, DCE PI-RADS score, overall Likert score and suitability assessment for the less experienced radiologist, mpMRI significantly improved outcomes prediction for the more experienced radiologist only (odds ratio 2.4). Survival curves showed clear separation for IL PI-RADS score, overall Likert score and suitability for AS for both observers (p<0.001).

CONCLUSION

Baseline mpMRI can identify additional features that predict short term outcomes of AS.

CLINICAL RELEVANCE/APPLICATION

mpMRI has the potential to increase the precision of patient selection at initial triage for AS by helping to confirm suitability of patients by minimizing the inclusion of higher risk patients.

VSGU21-03

Automatic Classification of Prostate Cancer and Gleason Scores through Machine Learning and Salient Feature Selection from Multiparametric MRI

Duc  Fehr  PhD (Presenter):  Nothing to Disclose , Harini  Veeraraghavan :  Nothing to Disclose , Andreas Georg  Wibmer  MD :  Nothing to Disclose , Hebert Alberto  Vargas  MD :  Nothing to Disclose , Evis  Sala  MD, PhD :  Nothing to Disclose , Hedvig  Hricak  MD, PhD :  Nothing to Disclose

PURPOSE

To develop a machine learning-based automatic feature selection for classification of PCa and the associated Gleason Score (GS) from multiparametric prostate MRI (mpMRI).

METHOD AND MATERIALS

158 prostate cancer patients who underwent mpMRI within 6 months prior to prostatectomy were retrospectively analyzed. Volumes of interest were placed in cancerous and normal peripheral zone on T2-weighted MRI (T2WI) and apparent diffusion coefficient (ADC) maps, using step-section pathology maps of the surgical specimens as reference. Statistical image features (mean, standard deviation, skewness, kurtosis) and Haralick texture features (energy, entropy, correlation, homogeneity, contrast) were computed from these maps. Adaptive Boosting using support vector machine (AdaBoost-SVM) machine learning was applied to extract salient features and learn the best classification model. Robust classifier performance was obtained through 10-fold crossvalidation. In each fold a small percentage of the samples was kept for testing, while the rest was used for training. Thus, the testing was done with novel data whose true classification labels were unknown to the classifier.

RESULTS

The algorithm achieved an accuracy of 93% for classifying cancerous vs normal structures and 83% for classifying GS (6/7+). The algorithm extracted ADCentropy, T2kurtosis, T2mean, and ADCenergy as features for cancer vs normal tissue and ADCkurtosis, T2entropy, T2correlation, and ADCcontrast for GS classification. A statistical t-test analysis confirms the salient features found by our approach for normal vs cancerous tissue: ADCentropy (p<0.001), T2kurtosis (p<0.001), T2mean (p=0.45), ADCenergy (p<0.001). For GS classification, T2entropy (p=0.03) was significant.

CONCLUSION

We developed an algorithm that extracts salient features from MRI and classifies PCa and GS. The relevance of machine learning extracted features was confirmed by t-test. The extracted features can be used to generate new images that can potentially assist radiologist interpretation.

CLINICAL RELEVANCE/APPLICATION

Image-based automatic prostate cancer and GS classification can assist radiologists in interpreting MRI and contribute to patient risk-stratification and treatment selection.

VSGU21-04

Multi-parametric MRI (including PIRADS)

Clare M. C.  Tempany-Afdhal  MD (Presenter):  Research Grant, InSightec Ltd Research Consultant, Profound
LEARNING OBJECTIVES

1) The state of the art mpMR protocols/sequences for prostate cancer imaging. 2) How to acquire and interpret high quality images. 3) What ACR-Pi-Rads is and how it can be implemented in clinical practice. 4) Current and future role of Prostate MR and ACR-PiRads.

ABSTRACT

The current state of the art approaches to prostate cancer Multi-parametric MR(mpMR) Prostate imaging will be presented. MRI techniques at 1.5T and 3.0T and pulse seqeunce optimization for a state of the art mpMRI exam will be reviewed. The roles of each seqeucle will be illustrated with clinical case examples to outline technical aspects and interpretative approaches. As the examinations have become complex and the clinical demands are increasing there is a need for standarization of our techniques and interpretative reporting. Thus in keeping with Bi-Rads and Li-Rads, we are developing Pi-Rads. The current ACR-PiRads will be reviewed - goals, methods and clinical applications will be presented and future vision for the role of prostate MR and ACR-PiRADS will be presented.

Evaluation of PI-RADS for Multi-parametric Prostate MRI: How to Improve the Overall Score?

E. H. J. Hamoen MD (Presenter): Nothing to Disclose, Les Thompson: Nothing to Disclose, Fred Witjes MD, PhD: Nothing to Disclose, Maroeska M. Rovers PhD: Nothing to Disclose, Jelle O. Barentsz MD, PhD: Nothing to Disclose

PURPOSE

To evaluate the accuracy and interobserver variability of the final PI-RADS classification based on a dominant MR-sequence compared to the often used single-modality sum score.

METHOD AND MATERIALS

223 biopsy-naïve men suspected of having prostate cancer were included in a prospective clinical trial. All men underwent a 3T mp-MRI, including T2-weighted imaging (T2WI), diffusion-weighted imaging (DWI), and dynamic contrast-enhanced (DCE) MRI. Histology of all lesions was obtained by in-bore MR-guided biopsy followed by standard TRUSGB in MR-positive men, or only standard TRUSGB in MR-negative men. All MRI sequences were co-read independently by 2 investigators. Any discrepancies were resolved by consensus. Both investigators assigned single-modality scores and an overall “dominant” PI-RADS to all lesions, of which the latter was based on DWI in peripheral zone lesions, and on T2WI in transitional zone lesions. Single-modality sum-scores were calculated and compared to overall “dominant” PI-RADS. 2x2 contingency tables were created to calculate sensitivity, specificity, PPV and NPV. Proportions of agreement were calculated.

RESULTS

Best accuracy rates were reached using the overall “dominant” PI-RADS with a threshold of ≥ 4. Reader 1 and respectively 2 achieved a sensitivity of 89.8% (97/108) and 81.5% (88/108), specificity of 86.1% (99/115) and 86.1% (99/115), PPV of 85.8% (97/113) and 84.6% (88/104), and NPV of 90.0% (99/110) and 83.2% (99/119) for detecting significant prostate cancer. Using the sum score with a threshold of ≥ 10, reader 1 and respectively 2 achieved a sensitivity of 89.8% (97/108) and 81.5% (88/108), specificity of 73.9% (85/115) and 80.9% (93/115), PPV of 76.4% (97/127) and 80.0% (88/110), and NPV of 88.5% (85/96) and 82.3% (93/113) for detecting significant prostate cancer. Proportions exact agreement were 73.1% for overall “dominant” PI-RADS, 44.4% for DCE-MRI, 51.1% for T2WI, and 56.5% for DWI.

CONCLUSION

The overall “dominant” PI-RADS is a robust interpretation score for mp-MRI to detect significant cancer with good inter-reader agreement, which outperforms the commonly used single-modality sum score.

CLINICAL RELEVANCE/APPLICATION

Overall ‘dominant’ PI-RADS accurately detects significant prostate cancer with good interreader agreement and is recommended in the evaluation of mp-MRI in men suspicious for prostate cancer instead of the single-modality sum score.

The Use of the Prostate Imaging Reporting and Data System (PI-RADS) for Prostate Cancer Diagnosis on Multiparametric Magnetic Resonance Imaging: A Systematic Review and Meta-analysis

E. H. J. Hamoen MD (Presenter): Nothing to Disclose, Maarten De Rooij MD: Nothing to Disclose, Fred Witjes MD, PhD: Nothing to Disclose, Maroeska M. Rovers PhD: Nothing to Disclose, Jelle O. Barentsz MD, PhD: Nothing to Disclose

PURPOSE

To determine the diagnostic accuracy of the Prostate Imaging Reporting and Data System (PI-RADS) in prostate cancer detection using multiparametric magnetic resonance imaging (mp-MRI).

METHOD AND MATERIALS

We searched electronic databases, including MEDLINE, Embase, and Cochrane Central Register of Controlled Trials, up to March 20, 2014. We included diagnostic accuracy studies referring to the use of PI-RADS scales to detect prostate cancer on mp-MRI. Histopathologic data from prostatectomy or biopsy could be used as the reference standard. Data necessary to complete 2x2 contingency tables were obtained from the included
studies, and test characteristics including sensitivity, specificity, and predictive values were calculated. Sensitivity and specificity values of all included studies were pooled and the results were plotted in a summary receiver operating characteristics plot.

RESULTS

Fourteen studies that met the inclusion criteria (1785 patients) could be analyzed. The pooled data showed a specificity of 0.79 (95% CI, 0.69-0.86) and sensitivity of 0.78 (95% CI, 0.70-0.84) for prostate cancer detection, with negative predictive values (NPVs) ranging from 0.58 to 0.95. Subgroup analysis showed a pooled specificity of 0.84 (95% CI, 0.71-0.92) and sensitivity of 0.81 (95% CI, 0.71-0.88) in studies that correctly used the PI-RADS criteria per modality, versus a specificity of 0.71 (95% CI, 0.58-0.80) and sensitivity of 0.73 (95% CI, 0.60-0.83) in studies with a probably less strict or adjusted use of PI-RADS criteria.

CONCLUSION

Accurate use of PI-RADS leads to good sensitivity and specificity rates for prostate cancer detection. Included studies showed fairly large heterogeneity regarding the calculation of an overall PI-RADS score and used cut-off values. Therefore, a standardized method for deriving an overall score is needed for a correct comparison of different studies.

CLINICAL RELEVANCE/APPLICATION

PI-RADS is a promising tool for prostate cancer detection and is recommended in the evaluation of mp-MRI in men suspicious for prostate cancer.

VSGU21-07
MR and MR-US Guided Biopsy

Daniel Jason Aaron Margolis MD (Presenter): Research Grant, Siemens AG

LEARNING OBJECTIVES

1) Optimize multiparametric MRI protocol for surgical staging versus detection/biopsy planning. 2) Compare the advantages of in-bore and image fusion biopsy approaches. 3) Understand the differences between the various image fusion MRI-ultrasound targeting approaches. 4) Describe the advantages that image-guided prostate biopsy offers to men with known or suspected prostate cancer.

ABSTRACT

Multiparametric MRI has transformed from a tool primarily used for staging of known cancer into one for detection, localization, and sampling of suspected cancer. This has allowed for streamlining and simplifying the protocol use for imaging the prostate, which presents its own challenges, including managing decreased signal-to-noise ratios and interfacing with image-guided targeted biopsy software and hardware. The various platforms available for image-fusion targeted biopsy include in-bore MRI-directed, "cognitive-" or "mental-fusion" MRI-ultrasound targeted biopsy, software image fusion, articulated arm, and electromagnetic tracking. Attendees will learn how to incorporate image-guided targeted biopsy into their practice, how to interface with clinical collaborators and referrers, and how image-guided targeted biopsy improves confidence in managing men with suspected or known prostate cancer.

Active Handout


VSGU21-08
Prostate Cancer Detection in Biopsy-naïve Men: Targeted MR-guided in-bore Biopsy versus Systematic Transrectal Ultrasound Guided Biopsy

Michael Quentin MD (Presenter): Nothing to Disclose, Lars Schimmoeller MD : Nothing to Disclose, Christian Arsov MD : Nothing to Disclose, Frederic Dietzel : Nothing to Disclose, Gerald Antoch MD : Speaker, Siemens Medical AG Speaker, Bayer AG Speaker, BTG International Ltd, Dirk Blondin MD : Nothing to Disclose, Andreas Hiester : Nothing to Disclose, Erhard Godehardt : Nothing to Disclose, Robert Rabenalt : Nothing to Disclose, Peter Albers MD, PhD : Nothing to Disclose

PURPOSE

This study prospectively compares MR-guided in-bore biopsy with the standard systematic TRUS-guided biopsy in biopsy-naïve men with elevated PSA.

METHOD AND MATERIALS

132 biopsy-naïve men with elevated PSA (>4 ng/ml) were included in this study. After functional multiparametric MRI at 3T, patients were referred to targeted MR-guided in-bore biopsy of prostate lesions (max 3) followed by a standard systematic TRUS-guided biopsy (12 cores). Analysis of detection rates for PCa and significant PCa (>5 mm total cancer length and/or any Gleason pattern >3).

RESULTS

128 patients (age 66.1±8.1 years; median PSA 6.7 ng/ml, lower quartile 4.1 ng/ml, upper quartile 92.9 ng/ml) met all study requirements. The detection rate of both biopsy methods was 53.1% (significant PCa: TRUS 79.4%; MR 85.3%). 7.8% of clinically significant PCa were missed by the MR-guided in-bore biopsy and 9.4% by the TRUS biopsy. MR-guided in-bore biopsy needed significantly fewer cores (p<0.01) and showed higher percentage of cancer involvement per biopsy core (p<0.01). The combination of both methods showed a detection rate of 60.9% (significant PCa: 82.1%).

CONCLUSION

In our population, MR-guided in-bore biopsy and systematic TRUS-guided biopsy achieved equally high...
detection rates in biopsy-naïve patients with elevated PSA levels. MR-guided in-bore biopsy needed significantly fewer cores and showed a significantly higher percentage of cancer involvement per biopsy core.

**CLINICAL RELEVANCE/APPLICATION**

In biopsy-naïve patients with elevated PSA levels the MR-guided in-bore biopsy is a promising approach for prostate cancer diagnosis. This biopsy method enables equal cancer detection rates with fewer biopsy cores compared to the standard systematic transrectal ultrasound-guided biopsy.

**VSGU21-09**

**Does Intravenously Administered Gadolinium Enter into the Glandular Lumen of the Prostate: X-ray Fluorescence Microscopy Imaging of a Mouse Model**

Devkumar Mustafi PhD (Presenter): Nothing to Disclose, Marta A. Zamora BS: Nothing to Disclose, Sophie-Charlotte Gieber: Nothing to Disclose, Stefan Vogt PhD: Nothing to Disclose, Gregory Stanislaus Karczmar PhD: Nothing to Disclose, Aytekin Oto MD: Research Grant, Koninklijke Philips NV Consultant, Guerbet SA

**Purpose**

Dynamic contrast enhanced MRI (DCEMRI) has become a standard component of multi-parametric prostate MRI protocols and its use is incorporated into current guidelines for prostate MRI. Analysis of DCEMRI data from prostate is usually based on distribution of gadolinium (Gd) into two well-mixed compartments (the Toft model) and assumes that Gd does not enter into the glandular lumen. However, this assumption has not been directly tested. The purpose of our study was to measure the concentration of Gd in the glandular lumen of the normal mouse prostate following I.V. injection, using X-ray fluorescence microscopy (XFM) imaging in situ.

**Method and Materials**

Six C57Bl6 male mice (28-weeks old) were sacrificed 10 minutes after Gd injection I.V. (a dose of 0.13 mmol/kg) and two mice were sacrificed after saline injection. Prostate tissue samples (ventral and anterior) from each mouse were harvested and frozen; 7-μm thick slices were sectioned for XFM; and adjacent 5-μm thick slices were sectioned for H&E staining. XFM images with in-plane resolution of 0.5-1 µm were acquired using an X-ray microprobe at the Argonne National Laboratory. Concentrations of metal ions and other elements were determined.

**Results**

Baseline concentration of Gd of 0.002±0.0007 mM was determined from measurements of prostatic tissue samples when no Gd was added and was used to determine the measurement error. This 'background' value was subtracted from the measured Gd concentrations in areas of normal prostatic epithelium and lumen when Gd was added. In 32 prostatic glands in 6 mice, average Gd concentrations in regions of normal epithelium and lumen were 0.27±0.07 mM and 0.18±0.09 mM, respectively.

**Conclusion**

Our data suggest that intravenously administered Gd enters into the glandular lumen in the normal mouse prostate. Moreover, we were able to quantitatively determine Gd distributions in mouse prostatic epithelium and lumen in situ. The results suggest that the conventional two compartment model should be modified to take the glandular lumen into account. Future work will investigate the kinetics of uptake and washout from the prostatic lumen and compare the kinetics in normal lumens and cancer-containing lumens.

**Clinical Relevance/Application**

The validation of these findings in human prostate is very critical since this may have a significant impact on quantitative analysis and interpretation of DCEMRI for diagnosis of prostate cancer.

**VSGU21-10**

**Active Surveillance with MRI**

Sadhna Verma MD (Presenter): Nothing to Disclose

**Learning Objectives**

1) What is active surveillance and how it is done. 2) Who is a candidate for active surveillance. 3) The role of mpMRI in risk stratification for active surveillance. 4) The relevance of mpMRI in addition to clinical parameters in disease management.

**Abstract**

Active Surveillance with MRI Active surveillance is increasingly acknowledged as a preferred strategy for most men with low-risk disease. This lecture will discuss low risk prostate cancer and how it is managed clinically. Role of mpMRI will be reviewed with clinical case examples to show selection, follow-up or possible removal of patients from active surveillance protocols.

**VSGU21-11**

**Pain during MR-guided in-bore and MRI/US-fusion Prostate Biopsy: Comparison of Different Analgesic Techniques**

Michael Quentin MD (Presenter): Nothing to Disclose, Lars Schimmoller MD: Nothing to Disclose, Christian Arso MD: Nothing to Disclose, Frederic Dietzel: Nothing to Disclose, Gerald Antoch MD: Speaker, Siemens Medical AG Speaker, Bayer AG Speaker, BTG International Ltd, Dirk Blondin MD: VSGU21-09 VSGU21-10 VSGU21-11
PURPOSE

Retrospective investigation of patient comfort during MR-guided in-bore and MRI/ultrasound (MRI/US) fusion-guided prostate biopsies.

METHOD AND MATERIALS

260 patients with MR-guided in-bore biopsies and prior intrarectal instillation of 2% lidocaine gel (group A, n=67) or periprostatic nerve block (PPNB) with 2% mepivacaine (group B, n=128), and patients with MRI/US fusion-guided biopsies plus additional systematic transrectal, ultrasound-guided biopsy and prior application of PPNB with 2% mepivacaine (group C, n=65) were included. The maximal procedural pain (MPP) was based on a 0–10 visual analog scale and the operating room time (ORT) was recorded for each biopsy session.

RESULTS

Patients in group A had significantly higher biopsy-related MPP scores (3.1±2.1) compared to subjects in group B (2.0±1.9; p<0.01) or group C (1.8±1.7; p<0.01). Pain did not significantly differ between group B and group C (p=0.84). Biopsies in group C required significantly less time (29.4±11.3 minutes) compared to biopsies in group A (41.4±10.8; p<0.01) and group B (39.3±10; p<0.01). There was a weak correlation between MPP scores and ORT (rS=0.25, rS=0.22 and rS=0.27 for groups A, B and C, respectively), but no correlation between MPP scores and number of targeted cores or prostate volume. Increased experience led to a reduction of the mean ORT in each biopsy technique.

CONCLUSION

MR-guided in-bore and MRI/US fusion-guided biopsies are equal in terms of MPP using the same analgesic technique. With PPNB during MR-guided in-bore biopsy patients report significantly less pain compared to intrarectal instillation of lidocaine gel. The MRI/US fusion-guided biopsy is superior in terms of ORT.

CLINICAL RELEVANCE/APPLICATION

Pain levels are low for both targeted MR-guided biopsy techniques. Using the same analgesic technique both biopsy techniques are equal to each other. For the MR-guided biopsy patients report significantly less pain with prior PPNB compared to intra rectal instillation of a local anesthetic. The MRI/US fusion-guided biopsy can easily incorporate a targeted and systematic biopsy into one session requiring less time compared to MR-guided in-bore biopsy.

Evaluation of a Novel Combined T2-weighted and Diffusion-weighted MR Imaging Sequence for Diagnosis of Prostate Cancer and Determination of Its Aggressiveness: Correlation with Histopathology Following Prostatectomy

Meredith Sadinski BA (Presenter): Nothing to Disclose, Gregory Stanislaus Karczmar PhD: Nothing to Disclose, Yahui Peng PhD: Nothing to Disclose, Milica Medved PhD: Nothing to Disclose, Shiyang Wang PhD: Grant, Koninklijke Philips NV, Aytekin Oto MD: Research Grant, Koninklijke Philips NV Consultant, Guerbet SA

PURPOSE

To investigate the role of a novel, hybrid T2-diffusion-weighted (DW) MR imaging sequence for diagnosis of prostate cancer and differentiation between aggressive and non-aggressive prostate cancers. This sequence exploits the dependence of ADC values on TE, and dependence of T2 relaxation time on b values and has the potential to improve registration between T2 and DW-MR images.

METHOD AND MATERIALS

22 patients with prostate cancer underwent pre-operative prostate MR including a hybrid imaging sequence; DW-MR images were acquired with up to 4 b-values between 0 and 750 s/mm² and TE's between 47 and 200 ms, resulting in a 2x3 to 4x5 data array associated with each voxel. The voxel-based ADC and T2 decay constants were calculated using a least squares fit at each TE and b-value, respectively. ROIs of cancer and normal tissue were delineated by a radiologist and pathologist based on correlation with histopathology of the prostatectomy specimen. The behavior of ADC and T2 with changing TE and b-value for normal and cancer voxels was evaluated by comparing the number of voxels within a single ROI which display increased T2 with increasing b and TE values and has the potential to improve registration between T2 and DW-MR images.

RESULTS

A significantly higher percentage of voxels in cancer ROIs (n=41) demonstrated increased T2 and decreased ADC values with increasing b and TE compared to normal ROIs (n=21) (mean 18.9% vs. 3.0%, p=0.00035). This percentage increased as GS increased (mean 9.5% for GS 6, 22.6% for GS 7, and 30.0% for GS 8 and 9 ROIs); this was a statistically significant trend with Spearman coefficient p=0.508 (p=2.5x10-5).

CONCLUSION

Hybrid T2-DW- MR imaging shows promise for detection of prostate cancer and determination of its aggressiveness. Likely due to smaller glandular lumen volume, restricted diffusion, and high intracellular T2 in cancer cells, an increased number of voxels in prostate cancer ROIs demonstrated increased T2 and decreased ADC values with increased b and TE values.
CLINICAL RELEVANCE/APPLICATION

In addition to combining the already proven useful information from T2 and DW-MR images, Hybrid T2-DW-MR imaging can provide added quantitative parameters helpful for diagnosis of prostate cancer.

VSGU21-13  Focal Therapies
Aytekin Oto MD (Presenter): Research Grant, Koninklijke Philips NV Consultant, Guerbet SA

LEARNING OBJECTIVES

1) Emerging paradigm of focal therapy for early stage low risk prostate cancer. 2) Current status of different focal therapy methods including laser ablation, high intensity focused US, electroporation and cryotherapy. 3) Challenges in patient monitoring following focal therapy. 4) Future developments in focal therapy of prostate cancer and the importance of radiologist’s involvement.

ABSTRACT

TITLE: Image guided focal therapy of prostate cancer Focal therapy of low risk early stage prostate cancer is increasingly important as a minimally invasive option for many patients. The rationale, patient selection criteria and challenges for image-guided focal prostate cancer therapy will be discussed. The essential technical details, advantages and disadvantages of clinically available focal therapy methods will be reviewed. Post-therapy patient monitoring options will be presented. Future developments in the area of focal therapy of prostate cancer and opportunities for involvement of radiologists in focal therapy will be explored.

MSCM22
Case-based Review of Magnetic Resonance (An Interactive Session)

Multisession Courses

AM A PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50
Mon, Dec 1 10:30 AM - 12:00 PM Location: S100AB

Sub-Events

Female Pelvis
Antonio Luna MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Review the use of MRI in gynecological disorders in a case-based format. 2) Highlight common pearls and pitfalls in MRI of the female pelvis. 3) Enhance findings that should not be overlooked in MRI of gynecological disorders.

Head and Neck
Christine M. Glastonbury MBBS (Presenter): Investor, Amirsys, Inc

LEARNING OBJECTIVES

1) To learn the key points that create a succinct imaging differential diagnosis while appreciating the ‘big picture’ in HandN imaging. 2) To recognize the imaging findings of critical disease and what to do or recommend next with your patient.

Active Handout

Brain
Jonathan H. Burdette MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the latest brain imaging techniques and how they can be used in routine clinical practice. 2) Recognize commonly missed or misinterpreted findings/abnormalities. 3) Recognize imaging features of various brain pathologic entities, such as neoplastic, infectious, inflammatory, and vascular diseases.

ABSTRACT

Magnetic Resonance Imaging continues to be the workhorse technique in brain imaging. The brain imaging capabilities of MRI continue to make MRI a more sensitive and specific diagnostic tool compared with CT for most clinical entities. The past 15 years has ushered in the era of Physiologic MRI techniques, such as...
diffusion-weighted imaging, diffusion tensor imaging, gadolinium-based and arterial spin labeled perfusion imaging, spectroscopy, functional MRI (fMRI), and, most recently, connectivity/network-based imaging. This presentation will cover the MR imaging features of several brain pathologic entities, and some of the latest brain MR imaging techniques will be introduced.

GUS-MOA
Genitourinary/Uroradiology Monday Poster Discussions
Scientific Posters
GU
AMA PRA Category 1 Credits ™: .50
Mon, Dec 1 12:15 PM - 12:45 PM  Location: GU Community, Learning Center

Participants
Moderator
Mindy Meislich Horrow MD : Spouse, Director, Merck & Co, Inc

Sub-Events
GUS109
Power of the ESUR Scoring System: Prostate Cancer Detection Based on Targeted MR-guided in-bore Biopsy (Station #1)
Frederic Dietzel : Nothing to Disclose, Lars Schimmoeller MD (Presenter): Nothing to Disclose, Michael Quentin MD : Nothing to Disclose, Patrick Kroepil MD : Nothing to Disclose, Gerald Antoch MD : Speaker, Siemens Medical AG Speaker, Bayer AG Speaker, BTG International Ltd, Dirk Blondin MD : Nothing to Disclose, Christian Arsov MD : Nothing to Disclose, Andreas Hiester : Nothing to Disclose, Robert Rabenalt : Nothing to Disclose, Peter Albers MD, PhD : Nothing to Disclose

PURPOSE
This study evaluates the correlation of the ESUR scoring system (PI-RADS) with prostate cancer detection using MR-guided in-bore prostate biopsies as the reference standard.

METHOD AND MATERIALS
566 lesions in 295 consecutive patients (65.9±7.7 years, PSA 9.9±8.3ng/ml) with a multiparametric (mp)-MRI (T2WI, DWI, DCE) of the prostate at 3T were scored according to PI-RADS. All lesions were histologically verified by targeted MR-guided in-bore biopsy.

RESULTS
Lesions with a summed PI-RADS score below 9 contained no prostate cancer (PCa) with Gleason score (GS) ≥4+3=7. A summed PI-RADS score of 13-15 resulted in 87.8% (n=108) in PCa and in 42.3% (n=52) in GS ≥4+3=7. Transitional zone (T2) lesions with a score of 13-15 resulted in 76.3% (n=36) in PCa and in 26.3% (n=10) in GS ≥4+3=7, whereas for peripheral zone (PZ) lesions cancer detection rate at this score was 92.9% (n=79) and 49.4% (n=42) for GS ≥4+3=7. Using a threshold of ≥10, sensitivity was 86.0%, and negative predictive value (NPV) was 86.2%. For higher grade PCa sensitivity was 98.6%, and NPV was 99.5%.

CONCLUSION
The summed PI-RADS score showed a very good correlation to tumor detection rates, especially for higher grade PCa. PZ lesions demonstrated a better correlation to the PI-RADS score with higher detection rates for higher grade PCa compared to TZ lesions. A cut-off limit of 10 for PI-RADS leads to good sensitivity and high NPV. PI-RADS achieve for higher grade PCa detection nearly 100% sensitivity and NPV with a cut-off limit of 10.

CLINICAL RELEVANCE/APPLICATION
A summed PI-RADS score below 9 excluded a higher grade PCa, whereas lesions with a score ≥13 represented in 88% PCa, and in 42% higher grade PCa. Nonetheless further improvement of PI-RADS is required to reduce unnecessary over diagnostics.

GUS110
Integrated MR/PET in Prostate Cancer Comparison with Conventional Hybrid Imaging (Station #2)
Seunghyun Lee (Presenter): Nothing to Disclose, Jeong Yeon Cho MD : Nothing to Disclose, Sang Youn Kim MD : Nothing to Disclose, Joongyub Lee : Nothing to Disclose, Myoung Seok Lee MD : Nothing to Disclose, Sungmin Woo MD : Nothing to Disclose, Seung Hyup Kim MD : Nothing to Disclose

PURPOSE
To evaluate diagnostic value of integrated MR/PET through the comparison of standardized uptake value (SUV) between integrated MR/PET and CT/PET, and the correlation between SUVs of integrated MR/PET and apparent diffusion coefficient (ADC) values of MRI.

METHOD AND MATERIALS
We enrolled 18 patients with histopathologically documented primary prostate cancer, who underwent integrated
We enrolled 18 patients with histopathologically confirmed primary prostate cancer, who underwent integrated MR/PET using $^{18}$F-choline and $^{18}$F-fluorodeoxyglucose (FDG), respectively, and $^{18}$F-FDG CT/PET before surgery. The SUV measurements were carried out side by side on corresponding lesions on fused image data sets, and additional ADC measurements also on MR images in MR/PET. Regions of interest were drawn on 12 regions of the prostate based on anatomy, a total of 216 sectors from 18 patients. The SUVs and ADC values from CT/PET and MR/PET were calculated and compared with the receiver operating characteristic curves and the areas under these curves (AUCs) analysis. The comparison of tumor detection rate between SUVs and ADC values of CT/PET and MR/PET were tested with generalized estimating equation (GEE) method.

RESULTS
The average SUV of tumor tissue in $^{18}$F-FDG CT/PET (3.09 ± 1.75) was higher than $^{18}$F-choline MR/PET (2.75 ± 1.24) or $^{18}$F-FDG MR/PET (2.25 ± 1.32). The ROC curve analysis showed that there was no significant better modality for tumor detection, compared with each other (P > .05). The SUV of $^{18}$F-choline MR/PET and $^{18}$F-FDG MR/PET were associated with tumor detection rate at univariate analysis (P < .05). Multivariate analysis showed that there was 1.63 times more tumor detection in the SUV of $^{18}$F-choline MR/PET than ADC value of MRI (P < .0001). The correlation analysis of modalities for tumor detection showed there was significant correlation between SUV of $^{18}$F-choline MR/PET and SUV or ADC value of other modalities, including SUV of $^{18}$F-choline MR/PET and ADC value of MRI (P < .0001).

CONCLUSION
Our results suggest that there is no evidence of superior modality for tumor detection among MR/PET and CT/PET. There is only statistical significance in SUV of $^{18}$F-choline MR/PET, compared with ADC value of MRI.

CLINICAL RELEVANCE/APPLICATION
The new method of $^{18}$F-choline MR/PET can be used with confidence in clinical practice combined interpretation of $^{18}$F-FDG CT/PET and MRI.

GUS111
Retrospective Study of PI-RADS Scoring System: The Diagnostic Efficacy of Multi-parametric MRI in Detection of Prostate Cancer (Station #3)
Ge Gao MD (Presenter): Nothing to Disclose, Xiaoying Wang MD: Nothing to Disclose, Juan Hu: Nothing to Disclose, He Wang MD: Research Grant, General Electric Company, Xuedong Yang: Nothing to Disclose

PURPOSE
To investigate the efficacy of multi-parametric(mp-MRI) in detection of prostate cancer(PCa) according to PI-RADS scoring system of ESUR prostate MR guideline 2012, and to find an appropriate combined mode of mp-MRI to improve the diagnostic efficacy of prostate cancer.

METHOD AND MATERIALS
A total of 226 patients suspected of PCa by urologist were enrolled in the retrospective study, with permission of ethical committee. All patients received mp-MRI(T2WI, DWI, DCE, MRS) with subsequent ultrasound guided biopsy within 3 months. Two experienced radiologists, without known of the pathological diagnosis, graded the PI-RADS score of images of each sequence based on the 6 regions and patients. Inter-reader variability was assessed. The best weighting value of each sequence(T2WI, DWI, DCE, MRS) was calculated using FLDA. The fourfold table and the alternating free-response receiver operating characteristic(AFROC) method were used to analyze different modes of combined application of T2WI score, DWI score, DCE score, MRS score, highest score, sum score, overall score and weighting score. Differences in the area under ROC curve(AUCs), sensitivity, specificity and accuracy were calculated at a statistical significance of P

RESULTS
This retrospective study proved that there was good inter-reader agreement with Kappa=0.830(6 regions)/0.739(patients). The weighting values obtained using FLDA were as follows: DWI>T2WI>MRS>DCE. The AUCs of the combined modes based on patients were as follows: weighting score(0.955/0.952)>overall score(0.923/0.917)>sum score(0.922/0.913)>highest score(0.867/0.859). The AUCs, sensitivity, specificity and accuracy were calculated at a statistical significance of P

CONCLUSION
PI-RADS scoring system, which is an effective assessment system for detection of PCa, could improve the PCa diagnosis. While different combined mode of mp-MRI have different diagnostic efficacy, especially the weighting score. The weighting values revealed that the most important sequences were DWI and T2WI, and more diagnostic information could be supplemented by MRS and DCE.

CLINICAL RELEVANCE/APPLICATION
PI-RADS scoring system, which is a scoring system guideline for mp-MRI in detection of PCa, could improve the PCa diagnosis.

GUS112
CT Features for Diagnosing Acute Torsion of Uterine Leiomyoma (Station #4)
Yoshimitsu Ohgiya MD (Presenter): Nothing to Disclose, Masaaki Kawahara: Nothing to Disclose, Noritaka Seino: Nothing to Disclose, Yui Onoda MD: Nothing to Disclose, Masanori Hirose MD: Nothing to Disclose, Takehiko Gokan MD: Nothing to Disclose
PURPOSE

To evaluate usefulness of computed tomographic (CT) features for identifying acute torsions of uterine leiomyomas.

METHOD AND MATERIALS

We retrospectively analyzed contrast enhanced CT examinations of 7 uterine leiomyomas with acute torsion and 44 without torsion, which has been surgicopathologically confirmed. Two experienced radiologists who were blinded to the surgicopathologic findings evaluated these 2 groups of CT features. The analyzed CT features consisted of poor contrast enhancement inside the leiomyoma, thin rim enhancement around the leiomyoma, calcification within the leiomyoma, beak sign between the uterus and the leiomyoma, wedged poor contrast enhancement area in the uterus adjacent to the leiomyoma, and ascites. We acquired statistical proportions for the frequencies of these CT features in the uterine leiomyomas with torsion versus those without torsion, using the Pearson $\chi^2$ and Fisher exact tests at 5% levels of significance.

RESULTS

The frequencies of CT features in uterine leiomyomas with torsion and those without torsion were as follows: 86% and 5% with poor contrast enhancement inside the leiomyoma ($p = 0.001$); 71% and 9% with thin rim enhancement around the leiomyoma ($p = 0.001$); 29% and 18% with calcification within the leiomyoma ($p > 0.05$); 57% and 0% with wedged poor contrast enhancement area in the uterus adjacent to the leiomyoma ($p = 0.001$); 100% and 20% with ascites ($p = 0.01$). The sensitivity, specificity, and accuracy for diagnosing acute torsion of uterine leiomyoma were as follows: 86%, 96%, and 94%, respectively, with poor contrast enhancement inside the leiomyoma; 71%, 82%, and 61%, respectively, with thin rim enhancement around the leiomyoma; 29%, 82%, and 75%, respectively, with calcification within the leiomyoma; 57%, 14%, and 20%, respectively, with beak sign between the uterus and the leiomyoma; 57%, 100%, and 94%, respectively, with wedged poor contrast enhancement area in the uterus adjacent to the leiomyoma; 100%, 55%, and 61%, respectively, with ascites.

CONCLUSION

The CT features of poor contrast enhancement, thin rim enhancement, wedged poor contrast enhancement area are valuable for identifying acute torsion of uterine leiomyoma.

CLINICAL RELEVANCE/APPLICATION

These valuable CT features in confirming acute torsion of a uterine leiomyoma would help guide therapeutic decision.

Noninvasive Evaluation of Renal Allograft Function Using Shear-Wave Elastography (Station #5)

Beom Jun Kim (Presenter): Nothing to Disclose, Chan Kyo Kim MD, PhD : Nothing to Disclose, Sung Yoon Park : Nothing to Disclose, Jungs Jae Park MD: Nothing to Disclose, Byung Kwan Park MD : Nothing to Disclose

PURPOSE

Shear-wave elastography (SWE), as a noninvasive tool, assesses quantitatively the tissue elasticity. Few studies have been reported for evaluating renal allograft function using SWE. The aim of our study was to investigate the usefulness of SWE for functional assessment of renal allografts.

METHOD AND MATERIALS

81 patients (mean age, 46 years; range, 22-72 years) with renal allografts who received ultrasound-guided biopsies were enrolled in this study. All ultrasound and elasticity examinations of renal allograft were performed by a commercial scanner using a convex transducer (C5-1 ElastoPQ, Philips iU 22). SWE was performed immediately before ultrasound-guided biopsies. Tissue elasticity (kPa) in the cortex and resistive index (RI) values were measured for all renal allografts. The correlation between estimated glomerular filtration rate (eGFR) and tissue elasticity or RI value was evaluated in all patients. Both tissue elasticity and RI values were compared between patients with acute rejection (AR) and without AR, and among different grades of AR. Diagnostic accuracy of tissue elasticity to distinguish between patients with AR and without AR was analyzed using a receiver operating characteristics (ROC) curve analysis.

RESULTS

The ARs were pathologically confirmed in 39 patients. The tissue elasticity demonstrated a moderate negative correlation with eGFR (correlation coefficient $r = -0.600$, $p < 0.001$), while the RI values did not show a correlation with eGFR ($p = 0.273$). In all renal allografts, the mean tissue elasticity was $36.2 \pm 15.5$ kPa: the mean tissue elasticity of ARs ($40.8 \pm 14.6$ kPa) was significantly greater than that of no ARs ($32.0 \pm 15.3$ kPa) ($p=0.01$), while the RI values did not show significant difference between ARs and no ARs ($P=0.276$). At ROC curve analysis, the area under the curve of tissue elasticity was 0.646. No significant differences among different grades of AR were found for each tissue elasticity and RI value ($P>0.05$).

CONCLUSION

SWE, as a noninvasive tool, may demonstrate functional state of renal allografts. Furthermore, SWE may be useful to differentiate between renal allograft patients with AR and without AR.

CLINICAL RELEVANCE/APPLICATION

As a feasible technique, shear-wave elastography may help to noninvasively assess functional state of renal
Amide Proton Transfer Magnetic Resonance Imaging of Prostate Cancer: A New Biomarker of Prostate Cancer Aggressiveness (Station #6)

Yukihisa Takayama MD (Presenter): Research Grant, FUJIFILM Holdings Corporation, Akihiro Nishie MD: Nothing to Disclose, Masaaki Sugimoto: Nothing to Disclose, Osamu Togao MD, PhD: Nothing to Disclose, Yoshiki Asayama MD: Nothing to Disclose, Hiroshi Honda MD: Nothing to Disclose, Jochen Keupp PhD: Employee, Koninklijke Philips NV, Yasuhiro Ushijima MD: Nothing to Disclose, Daisuke Okamoto MD: Nothing to Disclose, Nobuhiro Fujita MD, PhD: Nothing to Disclose, Koichiro Morita: Nothing to Disclose

PURPOSE

To evaluate a clinical utility of amide proton transfer magnetic resonance imaging (APT-MRI) in assessing prostate cancer (Pca) aggressiveness.

METHOD AND MATERIALS

A total of 105 patients (age = 68.4 ± 7.0 years) with biopsy proved Pca were enrolled. In addition to conventional MRI, such as T2WI and DWI, APT-MRI was scanned on a 3T MR system. The areas of Pca, noncancerous peripheral and transitional zones, and the Gleason score (GS) of each Pca were defined referring to the needle biopsy results. The MR parameters of APT-MRI were as follows: 2D-TSE sequence with driven equilibrium refocusing, TR/TR = 5 s/6 ms, FOV = 2302 mm2, resolution = 1.8x1.8x5 mm3, 25 saturation frequency offsets = -6 to 6 ppm (step 0.5 ppm) and ω0 = -160 ppm. Saturation pulse length = 0.5 s, δB1ms = 2.0 μT. δB0 maps were acquired separately for a δB0 correction. The APT signal intensity (APTSI) was defined as: MTRsym = (S[-3.5ppm] - S[+3.5ppm])/S0×100 (%). We assessed MRI-detectable 66 cancers about Pca aggressiveness after categorizing into 4 groups: GS of 6 (GS = 3 + 3, n = 23); GS of 7 (GS = 3 + 4 or 4 + 3, n = 18); GS of 8 (GS = 4 + 4, n = 11) and GS of 9 (GS = 4 + 5 or 5 + 4, n = 14). Mean ± SDs of the APTSI of each group were calculated after drawing regions-of-interest on the APT-MRI. The mean APTSIs among 4 groups were compared one-way analysis of variance with Tukey’s HSD post hoc test.

RESULTS

Mean ± SDs of the APTSI (%) of each group were; GS of 6, 2.48 ± 0.59; GS of 7, 5.17 ± 0.66; GS of 8, 2.56 ± 0.85; and GS of 9, 1.96 ± 0.75, respectively. There was a significant difference in APTSIs between GS of 6 and GS of 7, and GS of 7 and GS of 9, (p<.05), but no significant differences in APTSI between GS of 6 and GS of 8, GS of 6 and GS of 9, and GS of 7 and GS of 8. The increase and decrease in APTSIs relating to the progression of Pca aggressiveness might reflect the changes of cellularity, cell proliferation and protein synthesis of Pca.

CONCLUSION

The APTSI in GS of 7 was the highest. The APT-MRI has a possibility as a new biomarker of Pca aggressiveness.

MR Imaging Characteristics of Retroperitoneal Tumors: Diagnostic Clues, Differential Diagnosis and Histopathological Correlation (Station #7)

Pardeep Kumar Mittal MD (Presenter): Nothing to Disclose, Courtney Ann Coursey Moreno MD: Nothing to Disclose, Nima Kokabi MD: Nothing to Disclose, William C. Small MD, PhD: Nothing to Disclose, Sadhna Nandwana MD: Nothing to Disclose, Juan Camilo Camacho: Nothing to Disclose

TEACHING POINTS

1. To demonstrate diagnostic challenges including localization of the mass, extent of invasion and characterization of specific pathology such as liposarcoma, leiomyosarcoma, solitary fibrous tumor, paraganglioma and sarcoma etc. 2. To illustrate patterns of spread, tumor components, tumor vascularity helping in narrowing the differential diagnosis

TABLE OF CONTENTS/OUTLINE

Presentation will includes MRI characterization of retroperitoneal tumors using a dedicated less than 30 minute protocol of abdomenopelvic MRI without and with contrast medium. Imaging findings will be correlated with histopathology. Primary retroperitoneal (RP) tumors originating in the RP or outside the major RP organs are uncommon. One of the challenges to radiologist is correct localization of the retroperitoneal lesions, characterization as well extent of the disease, involvement of adjacent structures, identifying the organ of origin. Hence MR imaging is valuable in evaluating RP tumors particularly in staging, assessment of vascular invasion and fat content due its excellent soft tissue contrast. Specific diagnosis might be difficult to achieve because of overlapping features but certain clues will help in narrowing the differential diagnosis such as liposarcoma, leiomyosarcoma, solitary fibrous tumor, paraganglioma and lymphoma etc.

A Users Guide to the "Anterior" Prostate Gland: Multi-parametric (mp) MRI – Pathologic Correlation (hardcopy backboard)

Bardia Moosavi MD: Nothing to Disclose, Trevor A. Flood MD, FRCP: Nothing to Disclose, Nicola Schiedea MD (Presenter): Nothing to Disclose
TEACHING POINTS

After viewing this exhibit, the viewer will: a) understand the term ‘anterior’ prostate gland and its’ normal anatomy, histology and relevance to patients treated with active surveillance (AS) or those with negative non-targeted transrectal ultrasound (TRUS) guided biopsies, and b) develop an approach using mp-MRI for the diagnosis of prostate cancer in this location with pathologic correlation.

TABLE OF CONTENTS/OUTLINE

1. Define the nomenclature of the ‘anterior and posterior’ prostate gland and their relationship to non-targeted TRUS biopsy. 2. Review the relevant anatomy and histology of the “anterior” gland, including the horns of the peripheral zone, anterior fibromuscular stroma, central and transitional zones. 3. Review the significance of mp-MRI evaluation of the “anterior” gland in the setting of elevated PSA with negative non-targeted TRUS biopsies and AS; specifically discussing the recently proposed scoring systems such as PI-RADS and the National Institutes of Health criteria for AS. 4. Illustrate proven cases of “anterior” gland tumors, discussing the mp-MRI imaging appearance with a review of literature on the topic and using pathologic correlation. 5. Discuss the mp-MRI and histologic appearance of other anterior gland processes (such as stromal and glandular benign prostatic hyperplasia (BPH)) and how these can mimic “anterior” tumors.

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**Pain during MR-guided In-bore and MRI/US-fusion Prostate Biopsy: Comparison of Different Analgesic Techniques (Station #1)**

**Lars Schimmoeller MD (Presenter): Nothing to Disclose, Michael Quentin MD : Nothing to Disclose, Christian Arsov MD : Nothing to Disclose, Frederic Dietzel : Nothing to Disclose, Gerald Antoch MD : Speaker, Siemens Medical AG Speaker, Bayer AG Speaker, BTG International Ltd, Dirk Blondin MD : Nothing to Disclose, Andreas Hieiter : Nothing to Disclose, Robert Rabenalt : Nothing to Disclose, Peter Albers MD, PhD : Nothing to Disclose**

**PURPOSE**

Retrospective investigation of patient comfort during MR-guided in-bore and MRI/ultrasound (MRI/US) fusion-guided prostate biopsies.

**METHOD AND MATERIALS**

260 patients with MR-guided in-bore biopsies and prior intrarectal instillation of 2% lidocaine gel (group A, n=67) or periprostatic nerve block (PPNB) with 2% mepivacaine (group B, n=128), and patients with MRI/US fusion-guided biopsies plus additional systematic transrectal, ultrasound-guided biopsy and prior application of PPNB with 2% mepivacaine (group C, n=65) were included. The maximal procedural pain (MPP) was based on a 0-10 visual analog scale and the operating room time (ORT) was recorded for each biopsy session.

**RESULTS**

Patients in group A had significantly higher biopsy-related MPP scores (3.1±2.1) compared to subjects in group B (2.0±1.9; p<0.01) or group C (1.8±1.7; p<0.01). Pain did not significantly differ between group B and group C (p=0.84). Biopsies in group C required significantly less time (29.4±11.3 minutes) compared to biopsies in group A (41.4±10.8; p<0.01) and group B (39.3±10; p<0.01). There was a weak correlation between MPP scores and ORT (r=0.25, r=0.22 and r=0.27 for groups A, B and C, respectively), but no correlation between MPP scores and number of targeted cores or prostate volume. Increased experience led to a reduction of the mean ORT in each biopsy technique.

**CONCLUSION**

MR-guided in-bore and MRI/US fusion-guided biopsies are equal in terms of MPP using the same analgesic technique. With PPNB during MR-guided in-bore biopsy patients report significantly less pain compared to intrarectal instillation of lidocaine gel. The MRI/US fusion-guided biopsy is superior in terms of ORT.

**CLINICAL RELEVANCE/APPLICATION**

Pain levels are low for both targeted MR-guided biopsy techniques. Using the same analgesic technique both biopsy techniques are equal to each other. For the MR-guided biopsy patients report significantly less pain with prior PPNB compared to intrarectal instillation of a local anesthetic. The MRI/US fusion-guided biopsy can easily incorporate a targeted and systematic biopsy into one session requiring less time compared to MR-guided in-bore biopsy.
**Value of MR-US Fusion in the Guidance of Repeated Prostate Biopsy: Initial Experience (Station #2)**

**GUS116**

Sung Il Hwang MD ( Presenter): Nothing to Disclose, Hak Jong Lee MD, PhD : Nothing to Disclose, Chang Jin Yoon : Nothing to Disclose

**PURPOSE**

To investigate whether MR-US fusion can improve the detection rates of prostate cancer in patients with prior negative prostate biopsy.

**METHOD AND MATERIALS**

From September 2012 to February 2014, 332 consecutive patients were referred for repeated prostate biopsy to the radiology department. Among them nineteen men (mean age: 62.8±9.2 years) who underwent multiparametric prostate MRI before repeated biopsy were enrolled in the study. Mean PSA was 42.1±103.6 (0.6~460). Suspicious areas on MRI were scored for the likelihood of cancer using 5-point index scale, from definite no cancer (score 1) to definite cancer (score 5). MR-US fusion biopsy (Logiq E9, GE) was performed by a single urologist. At least two cores were added at the suspicious area after systematic randomized 12-core biopsy. Addition of two cores after 12-core biopsy was also performed even though there was no delineated suspicious lesion on MRI. Overall detection rate of added biopsy using fusion imaging was compared with that of systematic biopsy. Cancer detection rate in patients with suspicion score over 3 on MRI Mean score of likelihood of cancer on MRI was compared in patients with added core positive for cancer and negative.

**RESULTS**

Prostate cancer was detected in 12 out of 19 patients (63.2%). 82 out of 273 cores were positive for cancer (30.0%). Detection rate for added cores was 34.9% (15/43), while 67 out of 230 systematic cores were positive (29.1%). However, for the patients with suspicion score over 3 on MRI (n=12), cancer was detected 11 patients (91.7%). Detection rates for the added cores in this subgroup rises to 57.7% (15/26). Added core showed highest gleason score in 7 out of 11 cancer patients with suspicion score over 3. In one patient with suspicion score 5, cancer was detected only at the added cores, while systematic biopsy failed to detect cancer.

**CONCLUSION**

MR-US fusion showed increased detection rate for the prostate cancer, especially in patients with suspected cancer on prebiopsy MRI.

**CLINICAL RELEVANCE/APPLICATION**

Prebiopsy MRI may guide the treatment plan in patients with active surveillance for prostate cancer. And fusion of MRI and US can help to detect cancer precisely, reducing false negative results.

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**Optimization of b-Value Distribution for Four Mathematical Models of Prostate Cancer Diffusion-weighted Imaging Using b-Values Up to 2000 s/mm2: Simulation and Repeatability Study (Station #3)**

**GUS117**

Harri Merisaari : Nothing to Disclose, Ivan Jambor MD (Presenter): Nothing to Disclose

**PURPOSE**

To find optimal b-value distributions for monoexponential, stretched exponential, kurtosis and biexponential models of prostate cancer (PCa) diffusion weighted imaging (DWI) using Monte Carlo simulations and repeated DWI examinations.

**METHOD AND MATERIALS**

Monte Carlo simulations aiming to minimize estimation accuracy error were performed using Rician noise. Ten PCa patients underwent in total four repeated 3 Tesla DWI examinations performed using 12 equally spaced b-values (0-2000 s/mm²). Normalized mean signal intensities of regions-of-interest placed in normal tissue and PCa were fitted. In total, 210 different b-value combinations consisting of 6 b-values, 0 and 100 s/mm² included in every b-value distribution, were evaluated in terms of accuracy and repeatability. Repeatability of the fitted parameters was evaluated using intraclass correlation coefficient ICC(3,1).

**RESULTS**

The simulations and in vivo DWI data suggest the optimal b-value distribution for the monoexponential model consists of 4-5 equally distributed b-values in the range of 0-1200 s/mm². The parameters of the stretched exponential and kurtosis models are best estimated using 5-7 b-values in the ranges of 300-700 and close to 2000 s/mm² in addition to low b-value. B-value distribution consisting of 8-10 b-values in the ranges of 0-100, 800-1200, 1800-2000 s/mm² is the preferred method for estimation of the biexponential model parameters of PCa DWI.

**CONCLUSION**

The optimized b-value distributions demonstrated improved estimation accuracy and repeatability of DWI signal decay derived parameters.

**CLINICAL RELEVANCE/APPLICATION**

The use of carefully selected b-values leads to improved estimation accuracy and repeatability of prostate cancer DWI signal decay derived parameters.
MRI in Presurgical Staging of Deep Endometriosis (DE) Using Enzian Score (Station #4)

Valerio Di Paola (Presenter): Nothing to Disclose, Federica Castelli: Nothing to Disclose, Sara Mehrabi: Nothing to Disclose, Roberto Pozzi Mucelli: Nothing to Disclose, Riccardo Manfredi MD: Nothing to Disclose

PURPOSE

The aim of this study is to determine the accuracy of MRI presurgical staging by using ENZIAN score.

METHOD AND MATERIALS

132 Patients with suspected DE at physical examination and transvaginal ultrasound and availability of MR examination and histopathological results from surgery were retrospectively included. We calculated ENZIAN-score for both MRI and histopathological findings, the latter considered as Gold Standard; by comparing them we calculate the sensitivity, specificity, accuracy, positive and negative predictive of MRI and K Cohen between MRI and histopathological ENZIAN score.

RESULTS

By comparing histo-pathological and MRI results, the overall sensitivity, specificity, accuracy, PPV and NPV were 94%, 97%, 95%, 99%, 86%. By comparing the histo-pathological ENZIAN score with MRI ENZIAN score, k Cohen was 0.824; concordance was optimal for vagina-rectovaginal space (0.812), for USL (0.890), for rectum-sigmoid colon (0.822) and for uterine adenomyosis (1.000), and poor for bladder (0.367).

CONCLUSION

MRI is an accurate non-invasive diagnostic tool useful to provide a correct presurgical planning by using ENZIAN score.

CLINICAL RELEVANCE/APPLICATION

MRI ENZIAN score can provide an objective tool to presurgical planning of deep endometriosis.

The Usefulness of Real Time Elastography, RTE, in the Diagnosis of Graft Interstitial Fibrosis in Kidney Transplant—Comparative Evaluation between RTE Data and Histological Findings (Station #5)

Fabrizio Chegai MD (Presenter): Nothing to Disclose, Antonio Orlacchio MD: Nothing to Disclose, Costantino Del Giudice MD: Nothing to Disclose, Elisa Costanzo: Nothing to Disclose, Marco Nezzo MD: Nothing to Disclose, Giovanni Simonetti MD: Nothing to Disclose

PURPOSE

To evaluate the feasibility usefulness of Real Time Elastography (RTE) in the diagnosis of graft interstitial fibrosis (GIF) in kidney transplant patients.

METHOD AND MATERIALS

We prospectively enrolled 70 patients clinically-suspected of graft fibrosis. RTE was performed with a broadband linear transducer using a dedicated ultrasound machine. Tissue mean elasticity (TME) was calculated by two blinded operators. All patients underwent biopsy after RTE. To determine cortical fibrosis Banff score was used. The receiver-operating-characteristic (ROC) curves analysis was performed to evaluate the accuracy of TME to discriminate between patients with mild fibrosis (F1) vs patients with moderate-severe fibrosis (F2-F3).

RESULTS

Inverse correlation between TME values and the degree of fibrosis has been shown (p <0.05). Patients with F1 had a mean TME-values significantly higher compared to TME in patients with F2 (p=0.005 ) and F3 (p=0.004). The diagnostic accuracy of TME measurement for F2-F3 evaluated by AUC-ROC analysis was 0.95

CONCLUSION

RTE was able to evaluate kidney fibrosis in a non-invasive way, and could be used as complementary imaging during follow-up of renal transplant patients.

CLINICAL RELEVANCE/APPLICATION

RTE is a non invasive promising imaging technique for renal transplant patients. It allows detection of fibrosis onset during the clinical follow-up after transplantation.

Multireader Review in Prostate Magnetic Resonance Imaging: Investigation of the Effect on Detection Rate and Sample Grade (Station #6)

Tobias Penzkofer MD (Presenter): Nothing to Disclose, Andriy Fedorov PhD: Nothing to Disclose, Kemal Tuncali MD: Research Grant, Canon Inc, Fiona Mary Fennessy MD, PhD: Nothing to Disclose, Junichi Tokuda PhD: Research Grant, Siemens AG, Clare M. C. Tempany-Afdhal MD: Research Grant, InSightec Ltd Research Consultant, Profound Medical Inc
PURPOSE

To evaluate the impact of multireader review prior to MRI-guided prostate biopsy. We hypothesized that (a) multireader review increases the positive yield MRI-guided prostate biopsy and (b) high grade lesions are reliably chosen by a high number of readers.

METHOD AND MATERIALS

The study was approved by the Institutional Review Board and is compliant with HIPAA regulations. 59 patients (66.9 ± 6.5 years, PSA 12.3 ± 10.4 ng/ml) underwent MRI-guided transperineal prostate biopsy for suspicious prostate lesions (3.9 ± 1.8 per prostate) chosen through independent review by three radiologists with at least 10 years of prostate MRI experience. The set of targets was consolidated by one reader prior to biopsy, when multiple readers selected the same lesion. The number of readers per lesion was tabulated against the histopathological outcome and the grade of the lesion and compared.

RESULTS

Thirty-eight of the 59 patients (64.4%) had positive biopsies. There were 73 (31.7%) cancer cores of 230 samples. 117 of the lesions were selected by one reader, 62 were chosen by two readers, and 51 by all three readers. The lesions selected by three readers were positive in 64.7% (33/51), lesions selected by two reader in 33.9% (21/62) and lesions selected by one reader in 16.2% of the cases (19/117). Lesions chosen by three radiologists had a significantly higher percentage of malignancy than the lesions selected by 2 or only one reader (chi², p≤0.0021). Among the 38 patients with a positive diagnosis, a highest grade lesion was selected in 25 (65.8%) by 3 readers, in 10 cases (26.3%) by 2 readers and 3 (7.9%) only by one reader.

CONCLUSION

Multireader review of pre-biopsy MRI prior to MRI-guided prostate biopsy revealed a higher probability of malignancy in lesions selected by all readers, compared to lesions chosen by fewer readers. A high level of agreement between readers could be a marker for determining the highest grade lesion, although there were a number of lesions not detected by all of the three readers.

CLINICAL RELEVANCE/APPLICATION

Multireader protocol in pre-biopsy target selection has a potential to either reduce the number of targets which need to be biopsied, or to increase the yield of MRI guided biopsy. Further evaluation of such protocols, similar to the BI-RADS multireader protocol, is warranted.

URE147

A Pictorial Tour through a Busy Highway: The Ureter Revisited (Station #7)

Mariano Volpacchio MD (Presenter): Nothing to Disclose, Mario Gerardo Santamarina MD : Nothing to Disclose, Joaquina Paz Lopez Moras MD : Nothing to Disclose, Sadhna Verma MD : Nothing to Disclose, Antonio Luna MD : Nothing to Disclose, Christine O. Menias MD : Nothing to Disclose

TEACHING POINTS

Purpose/Aim 1- Review imaging modalities useful in the evaluation of ureteral abnormalities 2- Discuss imaging findings of common and uncommon ureteral pathologic entities 3- Offer diagnostic clues useful in the diagnostic process algorithm

TABLE OF CONTENTS/OUTLINE

Content Organization Imaging Modalities - IVP and Retrograde Ureterogram/pyelogram US MDCT and CT Urography MRI and MR Urography Functional MRI techniques: DWI and Perfusion-weighted Imaging Review Embryology of the ureter Pathologic Entities and Imaging Findings: Congenital anomalies Inflammation/Infection Ig G4-related Sclerosing Disease Retroperitoneal Fibrosis Intraepithelial Hemorrhage/ Trauma Neoplasms: Benign and malignant Staging and treatment response to urothelial carcinoma Differential of ureteral abnormalities Summary: The ureter has a predictable course and understanding of its embryology allows the radiologist to easily identify congenital anomalies, and pathologies. While numerous infectious and neoplastic processes involve the ureters, it is important to remember other conditions which can give a similar appearance. The purpose of this educational review is to review the spectrum of pathologies that involve the ureter.

SSE10

ISP: Genitourinary (Benign Gynecologic Disease)

Scientific Papers

AMA PRA Category 1 Credits ™: 1.00
ARRT Category A+ Credit: 1.00
Mon, Dec 1 3:00 PM - 4:00 PM  Location: E351

Participants

Moderator
Katherine Elizabeth Maturen MD : Research support, General Electric Company
SSE10-01

Genitourinary Keynote Speaker: The Utility of 3D-MRI and MR-HSG in the Work Up of Infertility
Elizabeth A. Sadowski MD (Presenter): Nothing to Disclose

SSE10-02

MRI Predictors for High Success Rates of MRgFUS for Uterine Fibroids
Irene Mindjuk (Presenter): Nothing to Disclose, Matthias Matzko MD: CEO, Imaging Service AG Shareholder, Imaging Service AG

PURPOSE

To assess the MRgFUS treatment results in a single institution and factors that are related to treatment success.

METHOD AND MATERIALS

A total of 252 patients (mean age, 42.1 ± 6.9 years) with uterine fibroids underwent MR guided Focused Ultrasound treatment on an ExAblate 2100 system (Insightec Ltd.). All patients underwent MRI screening before the treatment. Results were evaluated by post-treatment non-perfused volume, symptom severity score (SSS), reintervention, fibroid expulsion, pregnancy, and safety data. Clinical information and data from the MR screening was evaluated with the treatment results, such as fibroid location, volume, intensity and blood perfusion.

RESULTS

The percentage of the NPV was significantly higher in lesions with low signal intensity in T2w and CE-T1w MRI, nonseptated, distanced to the spine >3cm and with no subserosal component (p< 0.001). NPV ratio is highly correlative to clinical success, specifically NPV of >80% result a clinical success of >80% of patients. Reintervention rate was 12.7% in the mean follow up time of 19.4 month (± 8, range 3-38). Thirty-six patients (16%) experienced complete fibroid expulsions that significantly correlated with a high success rate without requiring additional intervention. Successful pregnancy and delivery rate was 14% out of patients with incomplete family planning. No severe adverse events were reported.

CONCLUSION

NPV results of >80% represent a threshold correlating with high clinical success and a probability for reintervention similar with other common treatments for uterine fibroids. Patient selection is a crucial factor in achieving high NPV ratios. Expulsion of fibroids after MRgFUS was associated with a high symptomatic relief and a low complication rate. Successful pregnancy and delivery rate in this study is promising for further investigations.

CLINICAL RELEVANCE/APPLICATION

MRI screening parameters are correlated with the amount of fibroids ablation achieved using MRgFUS treatment and therefore is recommended to determine patient suitability for MRgFUS treatment.

SSE10-03

MRI in Presurgical Staging of Deep Endometriosis (DE) Using Enzian Score
Valerio Di Paola (Presenter): Nothing to Disclose, Federica Castelli: Nothing to Disclose, Sara Mehrabi: Nothing to Disclose, Roberto Pozzi Mucelli: Nothing to Disclose, Riccardo Manfredi MD: Nothing to Disclose

PURPOSE

The aim of this study is to determine the accuracy of MRI presurgical staging by using ENZIAN score.

METHOD AND MATERIALS

132 Patients with suspected DE at physical examination and transvaginal ultrasound and availability of MR examination and histopathological results from surgery were retrospectively included. We calculated ENZIAN-score for both MRI and histopathological findings, the latter considered as Gold Standard; by comparing them we calculate the sensitivity, specificity, accuracy, positive and negative predictive of MRI and K Cohen between MRI and histopathological ENZIAN score.

RESULTS

By comparing histo-pathological and MRI results, the overall sensitivity, specificity, accuracy, PPV and NPV were 94%, 97%, 95%, 99%, 86%. By comparing the histo-pathological ENZIAN score with MRI ENZIAN score, k Cohen was 0.824; concordance was optimal for vagina-rectovaginal space (0.812), for USL (0.890), for rectum-sigmoid colon (0.822) and for uterine adenomyosis (1.000), and poor for bladder (0.367).

CONCLUSION

MRI is an accurate non-invasive diagnostic tool useful to provide a correct presurgical planning by using ENZIAN score.

CLINICAL RELEVANCE/APPLICATION
SSE10-04

Improving Ultrasound Detection of Uterine Adenomyosis through Computational Texture Analysis

Joseph Steven Konrad MD (Presenter): Nothing to Disclose, Derek Merck: Nothing to Disclose, David Thomas Gildden BS: Nothing to Disclose, Grayson L. Baird MS: Nothing to Disclose, Ana P. Lourenco MD: Nothing to Disclose, Michael David Beland MD: Nothing to Disclose

PURPOSE

To determine if a textural analysis metric can be implemented to improve diagnosis of adenomyosis by ultrasound.

METHOD AND MATERIALS

We retrospectively identified 38 patients with a MRI diagnosis of uterine adenomyosis that also had a pelvic ultrasound within 6 months. We also identified 50 normal pelvic ultrasound exams confirmed by a normal pelvic MRI within 6 months as a control group. A region of interest (ROI) was subsequently placed on the study population ultrasound image corresponding to the area of adenomyosis on MRI. A ROI was placed in the area of the junctional zone in the normal controls. The abnormal and normal ROIs were then filtered to produce several metrics of texture variability and compared against trained normal and abnormal distributions to determine the success rate, sensitivity, specificity, negative and positive predictive values. The ultrasound reports performed prior to MRI were also reviewed to determine the radiologist false negative rate for comparison to our textural analysis metric.

RESULTS

Using a training population of 50 normal ultrasound exams (confirmed with a normal MRI) and 38 abnormal ultrasound exams (MRI confirmed adenomyosis) we had an overall 75% (66/88 accurately diagnosed) success rate with a sensitivity, specificity, negative and positive predictive values of 70%, 79%, 73%, 76%, respectively (p<.0001). The false negative rate of the initial ultrasound interpretation was 74% (28/38).

CONCLUSION

An easily applied uterine textural analysis of pelvic ultrasound images can accurately diagnose adenomyosis.

CLINICAL RELEVANCE/APPLICATION

Further development in textural analysis may allow radiologists to make a definitive diagnosis of adenomyosis with ultrasound, precluding the need for a confirmatory MRI.

SSE10-05

CT Features for Diagnosing Acute Torsion of Uterine Leiomyoma

Yoshimitsu Ohgiya MD (Presenter): Nothing to Disclose, Masaaki Kawahara: Nothing to Disclose, Noritaka Seino: Nothing to Disclose, Yui Onoda MD: Nothing to Disclose, Masanori Hirose MD: Nothing to Disclose, Takehiko Gokan MD: Nothing to Disclose

PURPOSE

To evaluate usefulness of computed tomographic (CT) features for identifying acute torsions of uterine leiomyomas.

METHOD AND MATERIALS

We retrospectively analyzed contrast enhanced CT examinations of 7 uterine leiomyomas with acute torsion and 44 without torsion, which has been surgicopathologically confirmed. Two experienced radiologists who were blinded to the surgicopathologic findings evaluated these 2 groups of CT features. The analyzed CT features consisted of poor contrast enhancement inside the leiomyoma, thin rim enhancement around the leiomyoma, calcification within the leiomyoma, beak sign between the uterus and the leiomyoma, wedged poor contrast enhancement area in the uterus adjacent to the leiomyoma, and ascites. We acquired statistical proportions for the frequencies of these CT features in the uterine leiomyomas with torsion versus those without torsion, using the Pearson [chi]2 and Fisher exact tests at 5% levels of significance.

RESULTS

The frequencies of CT features in uterine leiomyomas with torsion and those without torsion were as follows: 86% and 5% with poor contrast enhancement inside the leiomyoma (p = 0.001); 71% and 9% with thin rim enhancement around the leiomyoma (p = 0.001); 29% and 18% with calcification within the leiomyoma (p > 0.05); 57% and 86% with beak sign between the uterus and the leiomyoma (p > 0.05); 57% and 0% with wedged poor contrast enhancement area in the uterus adjacent to the leiomyoma (p = 0.001); 100% and 20% with ascites (p = 0.01). The sensitivity, specificity, and accuracy for diagnosing acute torsion of uterine leiomyoma were as follows: 86%, 96%, and 94%, respectively, with poor contrast enhancement inside the leiomyoma; 71%, 91%, and 88%, respectively, with thin rim enhancement around the leiomyoma; 71%, 91%, and 88%, respectively, with calcification within the leiomyoma; 57%, 14%, and 20%, respectively, with beak sign between the uterus and the leiomyoma; 57%, 100%, and 94%, respectively, with wedged poor contrast enhancement area in the uterus adjacent to the leiomyoma; 100%, 55%, and 61%, respectively, with ascites.
CONCLUSION

The CT features of poor contrast enhancement, thin rim enhancement, wedged poor contrast enhancement area are valuable for identifying acute torsion of uterine leiomyoma.

CLINICAL RELEVANCE/APPLICATION

These valuable CT features in confirming acute torsion of a uterine leiomyoma would help guide therapeutic decision.

SSE10-06

The Shading Sign: Is It Exclusive of Endometriomas?

Joao Lopes Dias MEd (Presenter): Nothing to Disclose, Filipe Veloso Gomes MBChB : Nothing to Disclose
Rita Nobre Lucas MD : Nothing to Disclose, Teresa Margarida Cunha MD : Nothing to Disclose

PURPOSE

To investigate if the shading sign is exclusive of endometriomas and to analyze its different patterns.

METHOD AND MATERIALS

346 women with adnexal masses who underwent 1.5-T or 3-T MRI were included in this retrospective, descriptive, board-approved study. The shading sign was found in 56 patients, but 5 cases were excluded due to lack of follow-up or histological correlation. 51 women (mean age, 47 years) were finally considered. The type of tumor was recorded taking into account clinical and imaging follow-up, imaging-guided biopsies and surgical specimens analysis. The pattern of shading was also described for each case.

RESULTS

30 endometriomas (58.8%), 6 serous adenocarcinomas, 5 endometrioid adenocarcinomas, 3 mucinous borderline tumors, 3 cystic mature teratomas, 1 unclassifiable primary adenocarcinoma, 1 mucinous unclassifiable primary tumor, 1 mucinous tumor within an endometrioid cyst, and 1 struma ovarii were found among the 51 cases with positive shading. The overall sensitivity and specificity of shading in the diagnosis of endometrioma was 73% and 93%, respectively. Positive and negative predictive values were 59% and 96%, respectively. Five shading patterns were identified: layering (8, 15.7%), liquid-liquid level (6, 11.8%), homogenous (23, 45.1%), heterogeneous (6, 11.8%), and focal/multifocal shading within a complex mass (10, 19.6%). No significant correlation was found between these patterns and the type of tumor. However, the authors emphasize two points: firstly, homogenous shading was the most prevalent pattern in endometriomas (17 in 30); secondly, half of the cases with focal/multifocal shading within a complex mass corresponded to endometrioid adenocarcinomas (5 in 10).

CONCLUSION

Despite the moderate-to-high levels of sensitivity and specificity, the shading sign is not exclusive of endometriomas or endometrioid tumors, and may be found in several benign and malignant non-endometrioid adnexal tumors.

CLINICAL RELEVANCE/APPLICATION

The shading sign is a distinguished feature of endometriomas at magnetic resonance imaging (MRI). It corresponds to the complete or partial loss of signal intensity of an hyperintense adnexal cyst from T1-weighted images (T1WI) to T2-weighted images (T2WI). However, in daily practice, some non-endometrioid tumours of distinct histological types also show this sign and it should not lead to erroneous diagnosis.

SSE11

ISP: Genitourinary (Intravenous Contrast Issues in Uroradiology)

Scientific Papers

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AMA PRA Category 1 Credits ™: 1.00
ARRT Category A+ Credit: 1.00
Mon, Dec 1 3:00 PM - 4:00 PM Location: E353B

Participants

Moderator
Erick Marc Remer MD : Nothing to Disclose
Moderator
Robert Perry Hartman MD : Nothing to Disclose

Sub-Events

SSE11-01 Genitourinary Keynote Speaker: CT Contrast Agents—Administration and Safety
Matthew Scott Davenport MD (Presenter): Book contract, Wolters Kluwer nv
Different Hydration Regimens for Prevention of Contrast-induced Nephropathy in Patients with Renal Insufficiency Undergoing Coronary Angiography or Intervention

Ya-Chen Zhang: Research Grant, General Electric Company; Yong Tang: Research Grant, General Electric Company; Jian Chen: Research Grant, General Electric Company; Qing Zhou: Research Grant, General Electric Company; Yu-Quan Xie: Research Grant, General Electric Company; Man-Tian Chen: Research Grant, General Electric Company; Xiaozheng Yang (Presenter): Research Grant, General Electric Company

PURPOSE

Though hydration is one of widely accepted methods to decrease the incidence of contrast-induced acute kidney injury (CI-AKI), the regimens and concentration for hydration was still debatable. The study was going to compare the effectiveness of 3 kinds of hydration regimens used routinely in clinical for prevention of CI-AKI in patients with renal insufficiency undergoing percutaneous coronary intervention or angiography (PCI).

METHOD AND MATERIALS

300 patients with serum creatinine (Scr) > 97 μmol/L undergoing PCI were randomized into 3 different groups equally. 0.45% (w/w) sodium chloride was given to group 1 at a rate of 1ml/kg/h 12h before and after procedure. Group 2 received 0.9% (w/w) sodium chloride with the same administration strategy. Group 3 was treated with 1.25% (w/w) sodium bicarbonate 1h before procedure (3ml/kg/h), 6h after procedure (1ml/kg/h). Iodixanol 320 mgI/ml (Visipaque, GE Healthcare) was given during all procedure with a volume of 95 - 190 ml. The primary endpoint was incidence of CI-AKI defined as a relative increase in Scr of >= 25% from baseline in 72 hours after administration of contrast. Secondary endpoints were the incidence of major adverse cardiac and cerebral events (including allcause death, myocardial infarction (MI), re-PCI, and stroke) in 6 months after procedure.

RESULTS

All subjects finished the study and were eligible for analysis. The average Scr peaked in 48 hour in all groups. Group 1 had a significantly highest peak level of Scr (116.9 ± 20.5) than other two groups (P < 0.05), while there was no significant difference between group 2 and group 3 (110.6 ± 12.5 vs 113.4 ± 12.1). The incidence of CI-AKI in group 1, group 2 and group 3 were 12%, 4%, 3%, respectively (all P < 0.05). Patients developed CI-AKI after procedure had much greater risk of MI than patients without CI-AKI (Log-rank test, P < 0.01).

CONCLUSION

When PCI needs to be done on patients with renal insufficiency, using 1.25% sodium bicarbonate solution for hydration can not only reduce the risk of developing CI-AKI, but also improve the longterm prognosis.

CLINICAL RELEVANCE/APPLICATION

This study provided vital clinical proofs on hydration application for PCI. Patients benefit most from hydration with 1.25% sodium bicarbonate. With a shorter time of pre-procedure, this regimen is also practicable in emergent PCI.

Comparison of Gd-DTPA-BMA versus Gd-DOTA of Gadolinium Retention in Human Bone Tissue with Normal Renal Function

Takaki Maeda MD (Presenter): Nothing to Disclose, Hajimu Goto MD, PhD: Nothing to Disclose, Hitomi Hara MD, PhD: Nothing to Disclose, Toshihiro Akiyae MD, PhD: Nothing to Disclose, Teruya Kawamoto MD, PhD: Nothing to Disclose, Yasuo Oh-nishi MD, PhD: Nothing to Disclose, Yuki Iwama MD: Nothing to Disclose, Masahiro Kurosaka: Nothing to Disclose, Kazuo Sugimura MD, PhD: Research Grant, Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, Eisai Co, Ltd Research Grant, DAIICHI SANKYO Group

PURPOSE

The purpose of this study was to determine the Gadolinium concentration remaining in human bone tissue after administration of typical Gadolinium contrast agent such as macrocyclic (Gd-DOTA) or linear (Gd-DTPA-BMA) chelate at a standard clinical dose and to evaluate the relationships with renal function.

METHOD AND MATERIALS

Eleven patients underwent contrast-enhanced MRI before surgical resection of bone tumor. Nine male patients and two female patients aged between 13 to 43 years old. Patients divided into two groups (Gd-DTPA-BMA-group and Gd-DOTA-group). After administration of 0.1mmol Gd/kg of Gd-DTPA-BMA (n=5) or Gd-DOTA (n=6) to patients with bone tumor undergoing surgical resection, bone specimens (normal tissues in the resection margin of tumor) were collected and analyzed Gd concentration by Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Surgical resection of bone tumor was performed within 8 to 14days after MRI. Renal function (eGFR) in each patients was evaluated before MRI examination. Gd concentration in bone tissue and eGFR were compared Gd-DTPA-BMA group with Gd-DOTA group. The differences between the Gd-DTPA-BMA group and Gd-DOTA group were determined using a non-paired t-test. Statistical significance was defined as p < 0.05.

RESULTS

Bone tissue retention of Gd was 625.2±374.5ng Gd/g for Gd-DTPA-BMA group versus 141.7±91.5 ng Gd/g for Gd-DOTA group, and statistically significant difference of Gd concentration in bone was observed (*p <0.05). However, there was no statistically significant difference in eGFR(83.2±5.6 versus 86.2±12.5 ml/min/1.73m2) and the number of days before surgery (11.9±0.9 versus 11.2±2.5 days).
**CONCLUSION**

Typical linear Gd chelate, Gd-DTPA-BMA left approximately 4.4 times more Gd behind in bone than did macrocyclic Gd chelate, Gd-DOTA.

**CLINICAL RELEVANCE/APPLICATION**

In patients within normal range of eGFR, Gd retention in bone tissue is significantly different between linear chelate and macrocyclic chelate Gd based contrast agent.

**SSE11-04**

**Assessment of Functional Changes after Partial Nephrectomy with Combined MR-Renography and Diffusion-Weighted Imaging**

Mike Notohamiprodjo (Presenter): Nothing to Disclose, Katharina Stella Winter: Nothing to Disclose, Andreas Dietrich Helck MD: Nothing to Disclose, Konstantin Nikolau MD: Speakers Bureau, Siemens AG Speakers Bureau, Bracco Group Speakers Bureau, Bayer AG, Jozefina Casuscelli: Nothing to Disclose, Maximilian F. Reiser MD: Nothing to Disclose, Christian Stief MD: Nothing to Disclose, Michael Staehler MD: Nothing to Disclose

**PURPOSE**

To investigate effects of partial nephrectomy with combined MR-Renography (MRR) and Diffusion-Weighted Imaging (DWI).

**METHOD AND MATERIALS**

This IRB approved prospective study was performed according to the declaration Helsinki. 28 patients with renal tumors underwent MR at 3T directly before and one week after partial nephrectomy. 21 patients were examined 3 months after surgery. MRR and volumetry were performed with a TWIST-sequence (2.5 seconds temporal resolution, 5 minutes total acquisition) and analyzed with a 2-compartment-model providing plasma flow/volume and the glomerular filtration rate (GFR) per 100ml. DWI was acquired with an EPI-sequence (10 b-values 0-800 s/mm²) and monoexponential analysis. Statistical analysis was performed with paired t-tests and Pearson's correlation coefficient.

**RESULTS**

Clamping time (cold ischemia) ranged from 4 to 29 minutes. One week after partial nephrectomy a significant reduction of kidney volume, plasma flow and GFR of the operated kidney by 25±12%, 34±16%, 40±32% (p<0.05) was detected. The contralateral kidney showed no significant difference compared to baseline. ADC showed a reduction of 8±6% in the operated and an increase of 7±8% in the contralateral kidney. Estimated GFR (eGFR) using MDRD showed a significant reduction of 27%. There was a moderate correlation of reduction of plasma flow and GFR to clamping time (r=0.41 and r=0.48). After 3 months plasma flow and GFR were reduced by 11±21% and 10±23%. The contralateral kidney showed an increase of 7±14% and 5±17%. ADC showed a decrease of 5.7±9.2% on the operated side and an increase of 4±7% on the contralateral side. eGFR was not significantly altered (+2%±13%) compared to baseline. 3 patients did not show complete recovery of kidney function (-20±13%).

**CONCLUSION**

MRR detects significant changes in the operated kidney after partial nephrectomy, whereas ADC shows only mild changes. After 3 months, recovery of the operated kidney and contralateral compensation can be demonstrated.

**CLINICAL RELEVANCE/APPLICATION**

MRR detects significant changes in the operated kidney after partial nephrectomy, whereas ADC shows only mild changes. After 3 months, recovery of the operated kidney and contralateral compensation can be demonstrated.

**SSE11-05**

**Comparison of eGFR Changes after Injection of Different Iodinated Contrast Medium by Multi-phase Dual-energy CT: A Time Course Study in Rabbit Model**

Kai Zhao MD (Presenter): Nothing to Disclose, Jia Liu: Nothing to Disclose, Yu Dong Zhang PhD: Nothing to Disclose, Xiaoying Wang MD: Nothing to Disclose

**PURPOSE**

To compare the effect of different iodinated contrast medium on renal filtration function by multi-phase dual-energy CT.

**METHOD AND MATERIALS**

A total of 11 New Zealand White Rabbits (2.5 kg-3.0 kg) were in this study. Experiments were conducted on a fast kVp-switching dual-energy CT scanner with dual energy scan mode. On the first (baseline) day, all the rabbits were injected with 4ml iopamidol (370mgI/mL). Then serial three-phase dual-energy CT scans of rabbits' kidneys were performed at 20, 40 and 60 minutes after iodine administration. On the second day, rabbits were divided into 2 groups randomly: 1) iopamidol group, 6 rabbits received large dose (5.0 ml/kg) monomeric, low-osmolality iopamidol (370mgI/mL); 2) iodoxanol group, 5 rabbits received large dose (5.8...
ml/kg) dimeric, iso-osmolality ioxaglate (320mgI/ml). The total iodine administered was equal between the 2 groups. CT were performed at 20, 40 and 60 minutes after injection. On the third day, first day’s procedures were done again to all the rabbits. On AW 4.6 workstation, the iodine-based maps were generated. The average iodine concentration of 6 ROIs in the cortex of left kidney was used to quantify the iodine content at that time point. By adopted a one-compartment model and pharmacokinetical model $C(t) = C_{\text{max}}e^{-qt}$, with 3 iodine concentrations at the 3 time points, a similar straight line after natural logarithm conversion could be fitted. And the slope represented eGFR.

**RESULTS**

In iopamidol group, eGFR of the three days were $7.71 \pm 4.11$, $2.49 \pm 0.86$ and $3.82 \pm 1.47$ (×10-3 min-1) ($p=0.007$). In iodixanol group, eGFRs were $8.75 \pm 5.12$, $9.14 \pm 5.75$ and $3.67 \pm 5.69$ (×10-3 min-1) ($p=0.081$). Between the two groups, there was no significant difference before administration ($p>0.05$), but significant difference appeared after high dose of contrast medium administration ($p=0.020$). The obvious difference disappeared on the third day ($p>0.05$).

**CONCLUSION**

Iodinated contrast medium causes obvious deterioration on renal filtration function, which is still below the normal level until 24 hours after contrast administration. Iopamidol cause more deterioration on renal filtration function, which appears quickly after administration.

**CLINICAL RELEVANCE/APPLICATION**

Our result shows that different iodinated contrasts have different influence on kidney, which may be helpful to understand the pathogenesis of contrast induced nephropathy (CIN). It can guide us to choose appropriate contrast medium.

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**SSE11-06 Maximum Renal Arterial Contrast Concentrations in Cardiac Angiography and Contrast-enhanced CT: Implications for Different Contrast Nephropathy Rates**

Nicholas Mark Gutierrez MD (Presenter): Nothing to Disclose, Jeffrey Hooker Newhouse MD: Research Consultant, PAREXEL International Corporation

**PURPOSE**

Contrast-associated nephropathy occurs more frequently after cardiac angiography, which usually includes left ventriculography via direct left ventricular injection, than after contrast-enhanced CT, despite the usually-higher intravenous contrast dose used for CT. To determine whether maximum renal arterial contrast concentration is higher after left ventriculography, we assessed this parameter for both procedures.

**METHOD AND MATERIALS**

Contrast concentration (% by volume) in abdominal aortic blood during contrast-enhanced CT was measured by performing CT densitometry of aortic blood before contrast, and in the arterial phase, in fifty adults undergoing abdominal CT (100ml iohexol 300mgI/ml 3ml/sec). Densities were converted to contrast concentrations by scanning water phantoms containing twenty graded concentrations of contrast and comparing their densities to patient data. Since it was impossible to perform CT densitometry during cardiac angiography, aortic contrast concentrations (% by volume) were calculated from standard contrast doses and injection rates with the range of clinically-encountered cardiac output rates assuming ultimate steady state for blood/contrast mixing and normal data distribution.

**RESULTS**

Maximum aortic (and hence renal arterial) concentrations were significantly higher (range: 12.3 - 14.2%) after ventriculography than after CT (3.2 +/-0.9%). Since ventricular injection times are much shorter than than published initial-appearance-to-maximum-concentration times after intravenous administration, the rate of change of contrast concentration is also higher after ventriculography than after CT.

**CONCLUSION**

Higher maximum renal arterial contrast concentration may be responsible for the greater risk of nephropathy after cardiac angiography than after doses for CT. The faster rate of change of renal arterial contrast concentration after ventriculography may also increase the likelihood of renal toxicity.

**CLINICAL RELEVANCE/APPLICATION**

Maximum renal arterial contrast concentration, and/or the rapidity of change of this parameter, may be partly responsible for the risk of nephropathy. Controlling these factors might permit reduction of nephropathy risk; they also suggest avenues of research into the pathophysiology of contrast nephropathy.
Sub-Events

SSE25-01  Ready or Not: Are Medical Students Prepared to Decide between Diagnostic Radiology and Interventional Radiology?

Jessica Kelly Stewart MD (Presenter): Nothing to Disclose, Charles M. Maxfield MD: Nothing to Disclose, Mark Lewis Lessne MD: Nothing to Disclose

PURPOSE

In 2012, the American Board of Medical Specialties approved a new Dual Primary Certificate in Interventional Radiology and Diagnostic Radiology (IR/DR), recognizing IR as a distinct medical specialty. Independent IR/DR training programs will soon select their first trainees, requiring that medical students decide between IR/DR and DR residency programs early in their fourth year. The purpose of this study is to determine whether medical students are prepared to decide between the newly distinct residency training programs of DR and IR/DR.

METHOD AND MATERIALS

An electronic survey was sent to all US radiology residency programs, requesting distribution to third and fourth year (R3 and R4) residents. The anonymous survey was comprised of closed-response questions focusing on choice of fellowship, the timing of this fellowship decision, and the impact of residency rotations on this choice. 385 R3 and R4 residents completed the survey. 76% of the respondents were male and 24% were female. 35% of residents reported that they would be pursuing subspecialty training in IR.

RESULTS

Of the R3 and R4 residents responding to the survey, 69% considered both IR and DR while deciding as medical students to pursue radiology residency. Only 14% of responding residents chose a radiology residency for the sole purpose of pursuing IR. 61% of the 133 residents who plan to pursue IR subspecialty training also considered DR as medical students. 74% of R3 and R4 residents reported that IR rotations during their radiology residency were important in making the ultimate decision of whether to pursue an IR fellowship.

CONCLUSION

A minority of residents planning to pursue IR fellowship training make this decision as medical students. Currently, the decision to pursue IR specialization is most often made after completing IR rotations as a radiology resident. Medical school mentors and IR and DR physicians must soon improve efforts to educate medical students and create opportunities for extensive exposure to these distinct specialties and training programs. Additionally, DR and DR/IR residency programs should anticipate requests for transfers between these programs within the same institution.

CLINICAL RELEVANCE/APPLICATION

Most R3 and R4 residents report that IR rotations in residency were important in choosing whether to pursue IR. Increased medical student education and exposure to IR and DR will be necessary as new IR residency programs are initiated.

SSE25-02  Vascular/Interventional Keynote Speaker: Do Medical Students Know Who Interventional Radiologists Are?

Robert G. Dixon MD (Presenter): Nothing to Disclose

SSE25-03  Trends in Non-Vascular Interventional Radiology Procedures Performed by Advanced Practice Providers: An Analysis of Annual Medicare Claims over Two Decades

Deborah Gail Walls MS, RN (Presenter): Nothing to Disclose, Michael Bowen: Nothing to Disclose, Danny Hughes PhD: Nothing to Disclose, Jennifer Marie Hemingway MS: Nothing to Disclose, Jennifer M. Wang PhD: Nothing to Disclose, Richard Duszak MD: Nothing to Disclose

PURPOSE

To evaluate national trends in non-vascular interventional procedures performed by nurse practitioners (NPs) and physicians assistants (PAs), collectively advanced practice providers (APPs).

METHOD AND MATERIALS

Non-vascular interventional procedures commonly performed by APPs at our two largest hospitals were used to identify index procedures for national analysis. Corresponding services were identified using Medicare Physician Supplier Procedure Summary Master Files from 1991 to 2012. National APP trends were analyzed for: paracentesis; thoracentesis; liver, renal and other abdominal biopsy; lung biopsy; superficial lymph node biopsy; and fine needle aspiration (FNA). Similar analytics were undertaken for services performed by radiologists.

RESULTS
Between 1991 and 2012 Medicare claims by APPs increased dramatically for all targeted procedures: paracentesis from 0 to 17,967; thoracentesis from 0 to 4,141; liver, renal, and other abdominal biopsy from 0 to 1,819; lung biopsy from 0 to 25,443; superficial lymph node biopsy from 0 to 5,740; and FNA from 0 to 3,921. Overall, volumes increased for radiologists as well, but relatively less dramatically: paracentesis from 2,175 to 139,144 (+6,297%); thoracentesis from 2,084 to 35,787 (+1,617%); liver, renal and other abdominal biopsy from 9,663 to 86,423 (+794%); lung biopsy from 11,078 to 54,060 (+388%); superficial lymph node biopsy from 111 to 14,951 (+13,369%); and FNA from 531 to 96,504 (+18,074%).

CONCLUSION

Although APPs perform a relatively small portion of non-vascular interventional procedures commonly provided by radiologists, successful Medicare claims have increased dramatically over two decades, and at a faster pace. Given multiple hurdles for Medicare reimbursement, such growth suggests increasing acceptance at institutional credentialing, state licensure, and payer policy levels.

CLINICAL RELEVANCE/APPLICATION

National acceptance of APPs performing non-vascular interventional procedures has increased dramatically.

SSE25-04

Correlation of Prostate Specific Antigen Levels Obtained by Internal Iliac Venous Sampling to Radical Prostatectomy Specimens in Patients with Prostate Cancer: A Pilot Study


PURPOSE

To correlate prostate specific antigen(PSA) values and free to protein-bound PSA ratios(fPSA/PSA) in specimens taken from peripheral upper limb, internal iliac and deep branch internal iliac veins bilaterally to prostatectomy specimens in patients with prostate adenocarcinoma and borderline elevation of PSA.

METHOD AND MATERIALS

7 patients with biopsy proven prostate cancer had venous sampling procedure prior to prostatectomy(mean 3.2 days, range: 1-7). All had borderline elevation of PSA on prior peripheral venous sampling(4-10 ng/mL). Sampling procedure involved peripheral vein sample(PVS) taken from a 5 Fr sheath in right basilic vein. Pelvic vein samples were taken through a 5Fr catheter fluoroscopically guided into right internal iliac vein(RIV), deep right internal iliac vein branch(dRIV), left internal iliac vein(LIV), and deep left internal iliac vein branch(dLIV). Venous sampling results were compared to prostatectomy surgical specimens.

RESULTS

Mean PVS PSA was 3.9, range 2.3-6 ng/mL. Total PSA in PVS did not differ significantly from internal iliac or deep internal iliac vein samples(P>0.05). Total PSA in RIV and dRIV did not differ significantly from LIV or dLIV samples(P>0.05). PSA/PSA was significantly higher in internal iliac and deep internal iliac vein samples compared to PVS(p<0.05). Compared to contralateral internal iliac and contralateral deep branch internal iliac vein PSA/PSA did not correlate positively with the side of highest tumor volume(p>0.05). On pathology, 6 patients had tumor in both sides of the prostate. PSA/PSA was highest on the side ipsilateral to the highest grade of tumor in all 7 patients. 1 of 7 patients had unilateral left sided prostate cancer. This patient had a PSA/PSA ratio of 6% from PVS, 6% from RIV and 14% from LIV samples. There were no procedural complications.

CONCLUSION

Free PSA, unlike total PSA, is significantly higher in pelvic vein compared to peripheral vein samples when prostate cancer is present. This prospective pilot study suggests that PSA/PSA is higher in pelvic veins ipsilateral to highest grade tumor. Larger studies including patients with higher PSA values are warranted to further investigate this counterintuitive finding.

CLINICAL RELEVANCE/APPLICATION

This new minimally invasive procedure could help localize prostate cancer within the pelvis thus helping to guide biopsies, select patients for new localized therapies and detect local recurrence post surgery.

SSE25-05

Left Renal Vein Compression as Cause for Varicocele: Prevalence and Associated Findings on Contrast-enhanced CT

Douglas Smoot Lewis MD (Presenter): Nothing to Disclose, Lars J. Grimm MD: Advisory Board, Medscape, LLC, Charles Yoon Kim MD: Consultant, CareFusion Corporation Research Grant, Galil Medical Ltd Consultant, Kimberly-Clark Corporation Consultant, Cryolife, Inc

PURPOSE

While numerous etiologies for varicocele formation have been proposed, none have been well-proven. The purpose of this study was to determine the contribution of left renal vein compression in patients with varicocele.
METHOD AND MATERIALS

Using a radiology report search engine, all contrast-enhanced CT scans and ultrasound examinations performed at our institution over the past 10 years with a diagnosis of varicocele were identified. Patients were included only if they had a concurrent contrast-enhanced CT scan. Analysis was performed on 101 male patients (mean age 50.3 years). On CT, the left renal vein (LRV) was analyzed for greater than 50% compression by the SMA (nutcracker morphology) or any other structures. As a control group, 99 asymptomatic patients undergoing contrast-enhanced CT as potential renal transplant donors were analyzed.

RESULTS

A varicocele was identified on the left in 68 patients, right in 9 patients, and bilaterally in 24 patients. Compression of the left renal vein was identified significantly more commonly in patients with a left varicocele (78%) compared to patients with a right (13%, p<0.001) or bilateral (42%, p=0.002) varicocele. 64% of left renal vein compressions were due to nutcracker morphology and 36% were due to a retroperitoneal lymph node, most commonly due to pancreatic or renal cell carcinoma. In total, LRV compression by a lymph node was found in 30% of left-sided varicoceles. Excluding patients with retroperitoneal lymphadenopathy, the prevalence of nutcracker morphology was significantly higher for patients with left-sided varicocele (69%) compared to the control group (27%, p<0.001), whereas the prevalence of nutcracker morphology in patients with right (13%) or bilateral (33%) varicocele was similar to controls.

CONCLUSION

Left renal vein compression by the SMA or a mass was significantly more common in isolated left-sided varicoceles compared to right-sided and bilateral varicoceles in this predominantly adult population. Furthermore, nutcracker phenomenon was identified significantly more commonly in patients with a left-sided varicocele compared to an asymptomatic control group.

CLINICAL RELEVANCE/APPLICATION

Both nutcracker morphology and malignant lymph nodes are significantly associated with isolated left-sided varicoceles, suggesting that attention on imaging is likely warranted.

Internal Iliac Artery Occlusion Decreases Prostate Volume and Urologic Symptoms: Evidence for Potential Efficacy of Prostate Artery Embolization?

Amy Robin Deipolyi MD, PhD (Presenter): Nothing to Disclose, Shehab A. Alansari MD: Nothing to Disclose, Shahin Tabatabaei MD: Education Advisory Board, Endo Health Solutions Inc Scientific Advisory Board, TARIS BioMedical, Inc, Suvranu Ganguli MD: Research Grant, Merit Medical Systems, Inc Consultant, Boston Scientific Corporation, Rahmi Oklu MD, PhD: Nothing to Disclose

PURPOSE

Benign prostatic hyperplasia (BPH), widely prevalent in men over 50 years old, is associated with significant disability and healthcare cost. Prostate artery embolization (PAE) has been shown to be an effective interventional radiology treatment in other countries but is not approved in the US, limiting its study here. We evaluated the impact of internal iliac artery occlusion (IIAO) on prostate volume and urologic symptoms.

METHOD AND MATERIALS

We reviewed 95 sequential male patients who underwent abdomen-pelvis CTA with runoff for evaluation of lower extremity claudication, including those 50 years of age and older and excluding those with prior prostate surgery, radiation or hormone therapy. We measured the diameter of both internal iliac origins and assessed for the presence of IIAO. Prostate volume was calculated from three diameters. Medical records were reviewed for PSA levels and urologic symptoms (i.e., hesitancy, frequency, urgency, nocturia) and symptoms of IIAO (buttock claudication, impotence). Statistical analyses included student’s t test, Fisher’s exact test and linear regression.

RESULTS

We included 77 men, 46 with patent internal iliac arteries and 31 men with either unilateral or bilateral occlusion. There was no difference in age between groups (mean 68 vs 64 years; p>0.1). However, men without IIAO had significantly larger prostates (mean 29cc, range 12-96cc), compared with men with IIAO (mean 19cc, range 8-67cc) (p=0.01). Prostate volume correlated with average internal iliac artery diameter (r2=0.2; p 0.05). Men without IIAO were significantly more likely to have PSA levels assessed (66%) compared to men with IIAO (32%) (p=0.005). There was no significant difference in the number of men with impotence (8% vs 0; p>0.1) or with buttock claudication (17% vs 19%; p>0.1) in men without or with IIAO, respectively.

CONCLUSION

IIAO is associated with a 33% decrease in prostate volume and decreased urinary complaints, suggesting that PAE is likely an effective treatment for symptoms of BPH. Our findings furthermore suggest that unilateral and proximal arterial occlusion may be sufficient for therapeutic effect.

CLINICAL RELEVANCE/APPLICATION

Internal iliac artery occlusion predicts reduced prostate volume, suggesting prostate artery embolization may be an effective interventional therapy for benign prostatic hyperplasia.
**Multisession Courses**

**RC307**

**GU Ultrasound 2014: The Expert's Update on Kidney, Gynecologic and Testicular US**

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- **Location:** N228

**Participants**

- **Mindy Meislich Horrow MD (Presenter):** Spouse, Director, Merck & Co, Inc
- **Paula J. Woodward MD (Presenter):** President, Amirsys, Inc

**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.

**RC310**

**Second and Third Trimester Obstetrical Ultrasound**

*Refresher/Informatics*

- **US OB GU**
- **AMA PRA Category 1 Credits™:** 1.50
- **ARRT Category A+ Credits:** 1.50
- **Tue, Dec 2 8:30 AM - 10:00 AM**
- **Location:** E450B

**Active Handout**


**Sub-Events**

**RC310A**

**Fetal Genitourinary Anomalies**

- **Roya Sohaey MD (Presenter):** Nothing to Disclose

**LEARNING OBJECTIVES**

1) Diagnose and offer a management plan for mild fetal hydronephrosis (pelviectasis). 2) Differentiate between different causes of significant hydronephrosis using ultrasound and MRI. 3) Develop an approach to differential diagnosis for renal cystic dysplasia.
This lecture will discuss the approach to fetal GU anomalies. Mild and significant hydronephrosis differential diagnoses and associations will be stressed. Strategies for imaging with MR and need for follow up imaging or further diagnostic testing will be discussed. Finally, the differential diagnosis of renal cystic dysplasia will be explored as it relates to etiology and associations with genetic disorders.

Active Handout

**Multiple Gestations**
Anne M. Kennedy MD (Presenter): Nothing to Disclose

**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**

This lecture will review how to determine chorionicity and amnionicity with emphasis on doing so in the first trimester. Monochorionic pregnancies require increased surveillance because of specific complications relating to shared placental vasculature. We will review the imaging findings of twin to twin transfusion syndrome and twin reverse arterial perfusion sequence as the prognosis is very poor if untreated. Early recognition and prompt referral is essential for pregnancy management.

Active Handout

**Obstetrical Emergencies**
Carol Beer Benson MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Diagnose and differentiate causes of bleeding in pregnancy based on sonographic findings.
2) Apply transvaginal and translabial techniques to assess the cervix and placenta.
3) Use ultrasound to diagnose causes of pain in pregnancy.
4) Recognize the sonographic appearance of uterine incarceration during pregnancy and its clinical significance.
5) Understand how to interpret fetal umbilical artery Doppler in the assessment of fetal well-being.

**ABSTRACT**

This lecture will discuss how ultrasound is used to assess acute problems in pregnancy during the second and third trimesters, including symptoms of pain and bleeding, abnormal findings at physical examination, and concerns for fetal well-being. Techniques for assessing cervical length and placenta previa will be discussed, including transvaginal and translabial scanning. Also included will be a discussion about when and how to use fetal umbilical artery Doppler for assessing fetal well-being. Sonographic assessment of abnormal fetal heart rate patterns will also be covered.
**ABSTRACT**

**Purpose/Objective(s):** To compare the effect of photon and carbon-ion radiation on four cell lines with different HPV-status regarding cell cycle regulation and HPV associated protein expression. Hypothesis is that carbon-ion radiation might overcome radiation resistance of HPV-negative or HPV-integrated cells.

**Materials/Methods:** W12 cell line was derived from a low grade cervical lesion by Stanley MA et al. 1989, and is unique among HPV16-containing cell lines in carrying its HPV 16 genome as a multicopy epism. W12 cells contain episomal HPV 16 genomes, whereas S12 cells, which derived from the W12 line, contain HPV DNA as integrated copies. Caski cells have their origin in epidermoid cell cervical cancer and are reported to contain an HPV 16 genome as well as sequences related to HPV-18. C33A is a HPV-negative human cervical cancer derived cell line. Cell cycle analyses were performed using flow cytometry (PI staining) 24 h and 48 h after RT with 2 Gy and 7 Gy using photon RT and 2 GyE and 7 GyE carbon ion RT(C12). Expression of pRB and p53 after irradiation with 2 and 7 Gy were analyzed by flow cytometry using intracellular staining comparing the mean fluorescence of 10000 gated cells.

**Results:** C33A cells (HPV-negative) showed a minimal enhanced expression of pRB after RT with photons or C12 (2 Gy=1.0, 2 Gy=1.09, 7 Gy=1.4, 2 GyE=1.3, 7 GyE=1.1). There was no effect of photon or C12 irradiation on p33 expression in C33A cells. Caski cells (HPV16/18 positive) showed increased expression after photon RT (2 Gy=1.3, 7 Gy=1.7). C12 induced a strong increase of pRB expression (2 GyE=7.7, 7 GyE=8.3). There was a minimal change of p53 expression after RT (2 Gy=1.3; 7 Gy=1.2, 2 GyE=1.6, 7 GyE=1.5). S12 cells (HPV 16 integrated) showed a decrease of pRB expression after RT with photons (2 Gy=0.47, 7 Gy=0.38). Irradiation with C12 enhanced the expression of pRB positive cells (2 GyE=1.8, 7 GyE=1.94), but showed no significant expression of p53 in the control group. W12 cells (HPV 16 episomal) showed no change of pRB expression in the control group or after RT. C12 RT induced an increase of pRB expression (2 GyE=1.5, 7 Gy=2.9). There was no significant change of p53 expression in W12 and S12 cells after RT. C12 RT showed no effect on cell cycle distribution in W12/S12 and C33A cells. 48 h after irradiation with 7 Gy photons in C33A cells and 24 h after RT in S12 cells a G2/M-block was induced.

**Conclusions:** The effect of carbon-ion-RT on protein expression seems to be dependent on HPV-status and type of protein with no effect on p53 or on HPV-negative cells, but a strong effect on pRB expression in HPV-positive cells. The converse effect of carbon-ion-RT compared to photon-RT on HPV positive cell with integrated HPV regarding pRB expression indicates that carbon-ion therapy might overcome HPV-integration induced radioresistance.

**METHOD AND MATERIALS**

IRB-approved study of imaging, demographic and treatment data for patients with advanced cervical cancer referred for definitive radiation therapy between 2006-2013. Pelvic (PLN) and paraaortic (PALN) lymph nodes were mapped on baseline CT examinations. PLN >8 mm and PALN >10 mm were considered abnormally enlarged and a surrogate for nodal metastatic disease. The anatomic location was recorded for PLN (common, internal, external iliac) and PALN (left paraaortic LPA, aortocaval AC, right paracaval RPC). Cranio-caudal position and location with relation to the adjacent vertebral body for all PALN was recorded to create nodal maps. PET/CT was also obtained in 71.4% of this population; FDG-avid nodes were compared to the results of standard conformal radiation planning techniques.

**RESULTS**

There were 77 patients included. PLN were identified in 74 of which 23 also had PALN. There were 3 additional patients with isolated PALN. Distribution of nodal disease in the pelvis was predominantly external iliac. The mean age of patients with and without PALN was different (55 v. 46.5 years, p=0.002). Higher FIGO stage (III or IV) also had a higher likelihood of PALN (p=0.0371). The most common PALN distribution was LPA (82.6%). No isolated RPC nodes were identified. Nearly all PALN (95.6%) were below the renal arteries. There was no correlation with type of PLN or presence of lower PALN to predict upper PALN indicating necessity to treat the entire infra-renal PALN chain with the presence of a single PALN. For the subset of patients with PET/CT evaluation, when a size threshold of >8 mm was used in the pelvis, no FDG-avid nodes were below detection, but if >10 mm was used in the pelvis, 13 out of 58 patients had metabolically active lymph nodes that would not have been identified.

**CONCLUSION**

Short axis PLN size of 8 mm on CT was a good surrogate for PET avidity which will assist resource poor locations. Geographic mapping of nodal size and patterns aid CRT planning by directing radiation port size and extent.
CLINICAL RELEVANCE/APPLICATION

Advanced cervical cancer treatment can be tailored by reviewing the common distribution patterns of pelvic and paraaortic lymphadenopathy on CT in an indigent US population.

MSRO35-04 Prognosis and Survival of Women with Endometrial Carcinoma after Adjuvant Radiotherapy

Robert Foerster (Presenter): Nothing to Disclose, Robert Kluck: Nothing to Disclose, Stefan Rieken: Nothing to Disclose, Juergen Debus MD, PhD: Nothing to Disclose, Katja Lindel: Nothing to Disclose

ABSTRACT

Purpose/Objective(s): Endometrial cancer is the most common gynecologic malignancy. While therapy guidelines are widely established for endometrioid carcinomas, optimal treatment of subgroups with highly malignant histologies remains unclear. The purpose of this retrospective analysis was to determine the meaning of adjuvant radiotherapy (RT) for clinical outcome and to define prognostic factors. Materials/Methods: 380 patients (pts) underwent adjuvant radiotherapy (RT) for endometrial carcinomas at the University Hospital Heidelberg, Germany, from 2004 until 2012. Median age at diagnosis was 66 years. The majority were early stage carcinomas (FIGO I 68.7%, FIGO II 13.6%, FIGO III 16.3%, FIGO IV 1.4%). 96.9% underwent lymphadenectomy (LNE) and 3.6% received additional adjuvant chemotherapy (ChT). 52.6% were treated with intravaginal brachytherapy (IVB) and 47.4% with IVB + external beam radiotherapy (EBRT). All pts were included in this retrospective cohort study and statistically evaluated (chi-square, LogRank test, Cox regression) Results: Five year local recurrence free survival (LRFS), distant metastases free survival (DMFS) and overall survival (OS) were 90%, 88.2% and 77.8% respectively. 22.2% died, 8.9% had a local recurrence and 8.9% developed distant metastases. Better LRFS was associated with lower FIGO stage (p<.002), smaller tumor size (p<.001), N0 (p<.001), L0 (p<.001), V0 (p=.003), R0 (p<.001) and after LNE (p<.016). DMFS was prolonged with age <66 (p=.005), lower FIGO stage (p=.006), smaller tumor size (p<.001), N0 (p=.001), lower grading (p=.039), endometrioid histology (p=.043), L0 (p<.001), V0 (p<.001) and after LNE (p=.006). OS was improved with age <66 years (p=.014), lower FIGO stage (p<.001), smaller tumor size (p<.001), N0 (p<.001), lower grading (p<.001), endometrioid histology (p<.001), L0 (p<.001), V0 (p<.001), R0 (p<.001) and after LNE (p=.004). In stage I pts the no statistically significant survival differences for Grading in LRFS, DMFS or OS. In multivariate analysis for OS age (p=.019), grading (p=.014), histology (p<.001) and blood vessel infiltration (p<.001) remained as prognostic factors. For DMFS only blood vessel infiltration (p<.001) remained and for LRFS lymph vessel infiltration showed a tendency towards statistical significance (p=.05). Conclusion: Endometrioid carcinomas vessel infiltration might be the best predictive factor for a benefit from systemic therapy.

MSRO35-05 Does the Apparent Diffusion Coefficient Value Predict Disease Recurrence in Patients with Locally Advanced Cervical Cancer Treated with Radical Chemoradiation?

Adam Gladwish MD, MSc (Presenter): Nothing to Disclose, Michael Milosevic: Nothing to Disclose, Anthony Fyles: Nothing to Disclose, Warren D. Foltz PhD: Nothing to Disclose, Nathan Becker PhD: Nothing to Disclose, Haiyan Jiang: Nothing to Disclose, Wilfred Levin MD: Nothing to Disclose, Lee Manchul MD: Nothing to Disclose, Kathy Ran MD: Nothing to Disclose

PURPOSE

To investigate whether pre-treatment apparent diffusion coefficient (ADC) from diffusion-weighted MRI is predictive of disease recurrence in women with locally advanced cervical cancer treated with radical chemoradiation.

METHOD AND MATERIALS

Eighty-five women with stage IB-IVA cervical cancer treated with radical chemoradiation from 2009-2013 had staging MRI, including T2-weighted (T2W) and DWI series at either 1.5 or 3.0T (b-value 0-1000). T2W images and ADC maps were co-registered in Pinnacle, and the tumor was delineated on the ADC maps with the aid of T2W images. The mean, median, 75th, 90th and 95th percentile ADC of the tumor were extracted using Matlab, and ADC maps were co-registered in Pinnacle, and the tumor was delineated on the ADC maps with the aid of T2W images. The mean, median, 75th, 90th and 95th percentile ADC of the tumor were extracted using Matlab, and ADC maps were co-registered in Pinnacle, and the tumor was delineated on the ADC maps with the aid of T2W images.

RESULTS

Of the 85 women included, 62 were disease free at last follow-up (FU). Median FU was 2.2 years. FIGO stage was IB in 45 patients, II in 33, and III/IVA in 7 patients. Median tumor diameter was 4.8 cm. Thirty-two women had pelvic nodal involvement, and 11 had paraaortic nodal involvement on staging CT/MR. The median nADC95 was 0.58 (range 0.41-0.83). Significant variables on univariate analysis included tumor size (HR 1.45, p = 0.01), paraaortic nodal involvement (HR 4.25, p=0.002), and all nADC parameters (HR ranged from 0.91-0.94 per 0.01 increase in nADC, p < 0.04). nADC75, nADC90, and nADC95 were highly correlated, and therefore only nADC95 (lowest HR and p value) was included in multivariate analysis. On multivariate analysis, paraaortic nodal involvement and nADC95 remained predictive of DFS (HR 3.12, p=0.02; and HR 0.92, p=0.005, respectively).

CONCLUSION

ADC may be a useful imaging biomarker for predicting treatment failure in patients with locally advanced cervical cancer treated with chemoradiation.
MSRO35-07  
Clinical Outcome of Adjuvant Radiation Therapy in Early Stage Uterine Cervical Cancer  
Hyunjoo Kim (Presenter): Nothing to Disclose  

ABSTRACT  
Purpose/Objective(s): To evaluate the outcome of adjuvant radiotherapy (RT) in FIGO IB-IIA uterine cervical cancer. Materials/Methods: We retrospectively reviewed the medical records of 197 patients with FIGO IB-IIA uterine cervical cancer who had undergone curative surgery followed by adjuvant RT in Yonsei Cancer Center between June 1997 and December 2011. The patient’s median age was 48 years (range, 28-80yrs). Pelvic lymph node dissection and para-aortic lymph node dissection were performed in 138 (70.1%) and 92 (46.7%) patients, respectively. Adjuvant radiotherapy was delivered to whole pelvis field or extended field with or without brachytherapy up to total dose 50.4 Gy (range, 30-80.4 Gy). Eighty-eight patients were high risk group and 109 patients were low-intermediate risk group. Of whole patients, 111 patients (56%) received adjuvant chemotherapy concurrently or sequentially. Results: The median follow-up period was 54.5 months. Loco-regional recurrence alone was occurred in 6 patients, distant metastasis was in 15 patients, and simultaneous regional and distant metastasis was in 2 patients. For all patients, 5 year locoregional recurrence-free survival (LRFS) and 5 year distant metastasis-free survival (DMFS) were 95.8% and 89.3%, respectively. Tumor size and non-squamous histology were the significant prognostic factors associated with LRFS (p=0.049) and DMFS (p=0.047), respectively in multivariate analysis. Conclusions: Our results indicate that high loco-regional control rate was achieved by adjuvant RT for early cervical cancer. But, new systemic treatment is needed to be considered to reduce distant metastasis.

MSRO35-08  
Feasibility of Cervical Brachytherapy with a Novel 50 kV Electronic Brachytherapy Source  
J. Spencer Thompson MD (Presenter): Nothing to Disclose  

ABSTRACT  
Purpose/Objectives: To explore the feasibility of using a 50 kV electronic source for delivery of brachytherapy treatment in cervical cancer.  
Materials/Methods: Two patients have been treated using the electronic source, with instruments provided by the manufacturer (tandem and colpostats). Both patients received 45 Gy to the pelvis at 1.8 Gy per fraction with weekly cisplatinum at 40 mg/m². A parametrical boost was then given to 50.4 Gy for the first patient and to 54 Gy for the second. After 36 Gy, both patients were implanted under general anesthesia and dilation of the cervical os to sufficient width in order to permit tandem insertion under ultrasound guidance with a cervical stopper attached to the tandem at the distance from the tip of the tandem to correspond the sounded depth of the uterus. Brachytherapy was performed weekly while external beam treatment was still occurring and then twice weekly to complete treatment within 8 weeks. Colpostat covers were chosen to provide maximum lateral displacement of the vaginal mucosa. CT-based three dimensional planning with non-contrast images was utilized after fixation of the instruments and packing of the vagina to push the bladder and rectum as far away as possible. Dose was prescribed to point A using 5.5 Gy per fraction for one patient and 6 Gy per fraction for the second patient (who had a larger tumor with initial clinical stage IIIB disease). Five fractions were performed for each patient.  
Results: The implantation procedure, treatment planning, treatment delivery and post-anesthesia recovery took over 6 hours in the first induction attempt, but the total required time had dropped to approximately 3 hours once all staff became familiar with the instruments and software. There were no observed complications from treatment and both patients tolerated anesthesia and brachytherapy well. Mean dose to point A was 5.57 Gy for patient 1 and 5.68 Gy for patient 2. Corresponding doses for points B and H were 1.26 Gy and 1.28 Gy; and 4.59 Gy and 5.68 Gy, respectively. Mean dose to the bladder was 1.37 Gy for patient 1 and 1.61 Gy for patient 2. The dose (D90) received by 5% of bladder volume was 3.64 Gy for patient 1 and 4.49 Gy for patient 2. Mean rectum doses were 1.97 Gy and 1.13 Gy and rectum D2 was 2.37 Gy and 2.95 Gy for patients 1 and 2, respectively.  
Conclusions: To our knowledge, this represents the first report of electronic-source brachytherapy for cervical cancer and was accomplished with acceptable dosimetry and clinical tolerability.

MSRO35-09  
Clinical Outcomes of Post-Operative Endometrial Cancer Patients Treated with Vaginal Brachytherapy Alone  
Katarina Petras (Presenter): Nothing to Disclose  

ABSTRACT  
Purpose/Objective: To assess the clinical outcomes of post-operative endometrial cancer patients undergoing adjuvant vaginal brachytherapy (VBT).  
Materials and Methods: The records of all endometrial cancer patients treated with adjuvant VBT alone following total abdominal hysterectomy and bilateral salpingo-oophorectomy (TAH/BSO) at our institution between 2006 and 2010 were retrospectively reviewed. VBT was delivered with vaginal cylinders using high-dose-rate (HDR) iridium-192 radiation. All relevant clinical and brachytherapy plan dosimetric data were collected. For the purpose of this study, patients were restaged according to FIGO 2009 classification. Any short-term or long-term treatment related toxicity, as well as the incidence of local, regional, and distant failure was recorded. Results: A total of forty-five patients were examined. The median age was 67 years (range 37 – 86), Median follow-up from the date of the last VBT fraction was 39.2 months (range 6.1 - 83.0). All patients but one received 22 Gy in 4 fx prescribed to 0.5 cm depth (one patient received 21 Gy in 3 fx). Thirty-six percent of
patients received concurrent chemotherapy (most frequently with carboplatin and taxol). The number of stage IA, IB, II, and IIIA patients were 20, 13, 11, and 1, respectively. Twenty-nine had endometrioid-type adenocarcinoma (64.4%), 12 were papillary serous (26.7%), 3 were clear cell (6.7%), and 1 was a mixed mesenchymal tumor (2.2%). The median cylinder apex point dose, as a percentage of total prescription dose, was 100% (range 80 - 130%). The median treatment length was 3.1 cm (range 1.5 - 5.0 cm). Treatment was well tolerated as no patients experienced any on-treatment or long-term toxicity (fatigue, GI, GU, or skin) greater than grade 1. Two patients failed locally (1 adenocarcinoma, 1 clear cell), 5 patients failed regionally (1 adenocarcinoma, 4 papillary serous), and the mixed mesenchymal tumor patient failed distally. Median time to recurrence was 12.2 months from the date of the last VBT fraction (range 3.9 - 41.2). One local failure occurred at the vaginal cuff (adenocarcinoma, grade 2, stage IA) while the other occurred in the vagina location NOS (clear cell, grade 3, stage IA). Of the four papillary serous regional recurrences, 2 were stage IA, 1 was stage IB, and 1 was stage II; all 4 patients received concurrent chemotherapy.

Conclusion: Satisfactory local control (96%) was achieved in our patient population with minimal toxicity. Since most of our regional failures were of papillary serous histology, consideration should be given to pelvic nodal irradiation in addition to, or in lieu of, VBT in this particular subset of patients.

SSG03
Emergency Radiology (Abdominal Emergencies)

Scientific Papers
ER CT GU GI
AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Tue, Dec 2 10:30 AM - 12:00 PM   Location: E352

Participants

Moderator
Michael Nathan Patlas MD, FRCP : Nothing to Disclose
Moderator
Mariano Scaglione MD : Nothing to Disclose

Sub-Events

SSG03-01

Rapid Acquisition Axial and Coronal T2 HASTE MR in the Evaluation of Acute Abdominal Pain
Sam Byott MBChB (Presenter): Nothing to Disclose , Ian Harris MBChB, FRCR : Nothing to Disclose

PURPOSE
To assess MR in acute abdominal imaging and ascertain if it is a reliable alternative to CT in patients under 60

METHOD AND MATERIALS
Four year prospective analysis from January 2009 - December 2013. In patients under 60 presenting with acute abdominal pain, MR was used either as a primary investigation, or following ultrasound when there was ongoing clinical concern. Rapid acquisition HASTE (Half Fourier Acquisition Single Shot Turbo Spin Echo) coronal and axial sequences without intravenous contrast. Patients were followed up for minimum of 3 months.

RESULTS
468 cases included in the study. 349 negative for acute abdominal pathology 116 positive for acute abdominal pathology 3 indeterminate

MR Negative: 324 had uneventful follow up 22 had negative laparoscopies 3 had subsequent appendectomies, appendicitis on histology (3 days, 10 days and 2 months post scan)

MR Positive: 64 had surgery confirming MR findings: 34 appendicitis, 14 SBO, 3 Ovarian torsion, 3 LBO, Intussusception, Ovarian carcinoma, Ovarian dermoid, 2 Pelvic inflammatory disease, Diverticular abscess, Crohns, 4 Endoscopy for acute bowel pathology 1 had surgery for MR diagnosis of appendicitis, sigmoid diverticular perforation identified at surgery 51 were treated conservatively with concordant follow up: 4 SBO, 11 diverticulitis, 6 Pelvic inflammatory disease, 7 Infectious bowel disease, 7 Colitis, 6 Pyelonephritis, 2 Cholecystitis, Renal abscess, Pseudomembranous colitis, Splenic hematoma, Mesenteric adenitis. 2 Pancreatitis, Lymphoma, Epiploic appendagitis

MR indeterminate: 1 treated conservatively, 1 had laparoscopic appendectomy, normal appendix on histology, 1 had laparoscopic appendectomy with acute appendicitis on histology Overall diagnostic accuracy of 99% (463/468), with respect to correlation between MR diagnosis and clinical/surgical follow up Negative laparoscopy rate: 4.9%

CONCLUSION
This study demonstrates that rapid acquisition axial and coronal T2 HASTE MR is a practical, safe and effective method in the diagnosis of acute abdominal pain. MR is the preferred option to CT in patients of an age prone to radiation with a potential surgical diagnosis.

CLINICAL RELEVANCE/APPLICATION
MRI in acute abdominal imaging is both effective and practical and is the preferred imaging option in patients of an age prone to radiation with a potential surgical diagnosis.

SSG03-02
Ureteral Stone Detection Using Virtual Nonenhanced Images in Enhanced Spectral CT Imaging: A Preliminary Study
Duan Haifeng MMED (Presenter): Nothing to Disclose , He Taiping MMED : Nothing to Disclose , Yang Chuangbo MMED : Nothing to Disclose , Ma Guangming MMED : Nothing to Disclose , Guo Youmin MD :
PURPOSE

To evaluate the clinical value of detecting ureteral stones with the virtual nonenhanced (VNE) images generated in the enhanced spectral CT imaging.

METHOD AND MATERIALS

38 adults (21 males and 17 female, ages: 24-76 years) with positive calculi in the urinary system found during abdominal CT for lesion diagnosis or clinical emergency were retrospectively analyzed. True nonenhanced (TNE) CT was performed with 120kVp with noise index of 12 at 5mm slice thickness. Contrast-enhanced scans in the venous phase (VP) and delayed phase (DP) were performed with spectral CT mode. VNE images were generated from the 2 enhanced phases. 2 board-certified radiologists reviewed both TNE and VNE images for image quality and stone detection rate. Mean CT number, size and contrast-noise-ratio (CNR) of stones were measured.

RESULTS

52 stones were detected from TNE images, including 11 in the renal parenchyma, 25 in the renal pelvises, 4 in the ureters of abdominal segments, 7 in the ureters of pelvis segments and 5 in the bladder; 51 and 52 stones were detected with VNE images at VP and DP, respectively. The missed stone at VP located in renal parenchyma with diameter less than 0.8mm and low CT number of 86HU, similar to that of renal parenchyma. The mean CT number (in HU) for the stones from TNE was 310.15±154.85, higher than the 244.33±153.20 from VNE at VP and 251.78±155.73 at DP (p<0.05). The maximum stone areas (in mm2) determined from VNE images were 39.0±32.7 and 38.8±33.4, within 83% of the 47.0±36.8 determined by TNE images. The 3 sets images produced similar image quality scores and CNR values at 22.51±12.99, 19.25±15.69 and 20.91±17.71, respectively with no difference. The dose reduction achieved by omitting TNE scan was 21.4%.

CONCLUSION

The use of VNE images generated from the enhanced spectral CT provides very high sensitivity in detecting ureteral stones with good image quality and 21% dose reduction compared with the TNE images. There is good correlation in stone CT number and size measurement between TNE and VNE images.

CLINICAL RELEVANCE/APPLICATION

VNE images from enhance spectral CT may be used to replace TNE for ureteral stone detection with excellent sensitivity and dose reduction.

SSG03-03 Direct Comparison of Contrast-Enhanced MRI with Contrast-Enhanced CT to Diagnose Appendicitis


PURPOSE

To determine the accuracy of an MRI protocol (with and without contrast plus DWI) when compared with a CE-CT protocol for the detection of acute appendicitis.

METHOD AND MATERIALS

This is a HIPAA-compliant, IRB-approved prospective study of patients presenting to the emergency department with abdominal pain. Patients were eligible for enrollment if they were over 11 years old and had a CT ordered to evaluate for appendicitis. After consent was obtained, patients underwent CT and MR imaging in tandem. Three attending radiologists interpreted all MR and CT images independently. Image sets were de-identified. Multiple parameters were documented for each image set including characteristics of the appendix (size, location, etc), the likelihood of appendicitis, possible alternative diagnoses, and the time required to interpret the images. Follow-up consisted of a chart review for pathological/surgical findings or follow-up phone interview/chart review. Continuous variables were summarized with descriptive statistics using means and 95% confidence intervals. Receiver operating characteristic (ROC) curves for the likelihood of appendicitis were drawn. Pair-wise comparisons of AUCs were obtained. Cohen’s kappa with quadratic weights was used to assess inter-reader agreement.

RESULTS

We enrolled 93 patients from 2/2012-7/2013, including 60 women (64.5%), with a mean age of 33.3 years (30.5, 36.2). The incidence of appendicitis was 37.6%. Sensitivity and specificity were 0.94 (0.79, 0.99) and 1 (0.91, 1) for unenhanced MRI/DWI, 0.94 (0.79, 0.99) and 0.92 (0.91, 0.98) for CE-MRI, and 1 (0.88, 1) and 0.98 (0.89, 1) for CT. The ROC curves had AUCs of 0.868 (0.784, 0.953), 0.885 (0.814, 0.956), and 0.903 (0.832, 0.973) for unenhanced MRI/DWI, 0.864 (0.782, 0.947), 0.867 (0.795, 0.938) and 0.9 (0.823, 0.976) for CE-MRI, and 0.947 (0.999, 0.996), 0.959 (0.915, 1), and 0.961 (0.915, 1) for CT. The mean time to read the MR images was 4.45 minutes (4.23, 4.67) compared with 2.04 minutes (1.91, 2.17) for CT. The mean time to read the MR images was 4.45 minutes (4.23, 4.67) compared with 2.04 minutes (1.91, 2.17) for CT. Kappa values were 0.643-0.805 for unenhanced MRI/DWI, 0.722-0.778 for CE-MRI, and 0.769-0.976 for CT.

CONCLUSION

The accuracy of this MRI protocol approached that of CT for the diagnosis of appendicitis, with substantial
Usefulness of Low-Dose Non-enhanced CT with Coronal Reformations in Patients with Suspected Acute Appendicitis: Comparison with Standard-Dose Non-enhanced CT


PURPOSE
To evaluate usefulness of low-dose (LD) non-enhanced CT (NECT) with coronal reformation to diagnose acute appendicitis in comparison with standard-dose (SD) NECT and SD contrast-enhanced CT (CECT).

METHOD AND MATERIALS
The institutional review board approved this retrospective study and waived the informed consent. This study population included 452 adult patients (age range, 18-89 years) who underwent CT performed by using a SD (SD NECT and SD CECT1, n = 182) or a LD protocols (LD NECT and SD CECT2, n = 270) for suspected acute appendicitis. Two reviewers independently interpreted the axial and the coronal reformatted images of NECT and CECT scans during separate sessions. They assessed appendix visualization and proposed a diagnosis of appendicitis using a 4-point scale. Diagnostic performance and interobserver agreement for diagnosing acute appendicitis were compared between SD NECT and SD CECT1, LD NECT and SD CECT2, and LD NECT and SD NECT, respectively.

RESULTS
The frequencies of appendix visualization of reviewers 1 and 2 were 95.6% (174/182) and 94.5% (172/182), 98.4% (179/182) and 98.9% (180/182), 90.7% (243/270) and 90% (246/270), and 98.9% (267/270) and 98.1% (265/270) for SD NECT, SD CECT1, LD NECT, and SD CECT2, respectively. Areas under the curves (AUCs) of reviewers 1 and 2 for SD NECT (0.97 and 0.96, respectively) were not significantly lower than those of SD CECT1 (0.99 and 0.97) (P = 0.19 and 0.64, respectively). AUCs of reviewers 1 and 2 for LD NECT (0.95 and 0.95) were significantly lower than those of SD CECT2 (0.99 and 0.98) (P = 0.002 and 0.02, respectively). However, AUCs of reviewers 1 and 2 for LD NECT (0.95 and 0.95) were not significantly lower than those of SD NECT (0.97 and 0.96) (P = 0.18 and 0.92, respectively). All of the values for interobserver agreement of SD NECT, SD CECT1, LD NECT, and SD CECT2 were excellent (k = 0.84, 0.84, 0.85, and 0.86, respectively).

CONCLUSION
LD NECT with coronal reformation was not inferior to SD NECT for the initial evaluation of acute appendicitis.

CT Features of Small Bowel Closed Loop Obstruction in Emergency Room: Comparison between Patients Groups according to Treatment Strategies

Cherry Kim MD (Presenter): Nothing to Disclose, Choong Wook Lee: Nothing to Disclose, Mi-Hyun Kim: Nothing to Disclose, Gil-Sun Hong: Nothing to Disclose

PURPOSE
To assess CT features of small bowel closed loop obstruction (CLO) in patients who need emergency operation within 24 hours, and to compare CT features between patients who need delayed operation and who were recovered by conservative treatment.

METHOD AND MATERIALS
From 2009 to 2013, 187 patients were diagnosed as having CLO based on CT results in the emergency room (ER). Among them, 135 patients were enrolled using the exclusion criteria as follows; (a) CLO by peritoneal seeding, (b) CT images without coronal images, and (c) patients who were immediately transferred to other hospital. Clinical decision for treatment strategy was made based on both clinical and CT findings: 51 patients (Group A) were treated surgically within 24 hours and the remaining 84 patients (Group B) were initially decided to be conservatively treated. Among the 84 patients, 27 patients (Subgroup B1) underwent operation after 24 hours due to aggravation of clinical signs, and 57 patients (Subgroup B2) were recovered with conservative treatment only. CT images were analyzed regarding CT features as follows; pre-contrast bowel wall (BW) attenuation, BW enhancement, BW thickening, mesenteric edema, whirling sign, shape of entrapped mesenteric vessels, distance between beaked bowel loops, mesenteric vascular collapseness, and vascular enhancement of mesenteric arteries and veins. CT features were compared between group A and B, and between subgroup B1 and B2 using Fishers exact test and Student t-test.
RESULTS

CT features of group A showed significantly increased pre-contrast BW attenuation, decreased BW enhancement, decreased vascular enhancement of mesenteric arteries and veins, increased BW thickening, severe mesenteric edema and severe mesenteric vascular collapseness than those of group B (all, p<0.001). In subgroup analysis between B1 and B2, all CT features didn't show any significant differences (all, p>0.05).

CONCLUSION

In patients who admitted ER with CLO, CT features were quite different between the groups who need emergency operation or not. However, there were no significant CT findings to differentiate the patients who need delayed operation from the patients who were completely recovered with conservative treatment.

CLINICAL RELEVANCE/APPLICATION

In patients with small bowel closed loop obstruction, some CT features could be important factors for clinical decision about emergency operation or initial conservative treatment.

**Virtual Monochromatic Reconstruction of Contrast-enhanced Dual-energy CT at 70 keV Maximizes the Conspicuity of Mucosal Enhancement in Acute Small Intestinal Obstruction**

Kathryn Darras MD (Presenter): Nothing to Disclose, Patrick McLaughlin FFR(RCSI): Nothing to Disclose, David M. Thomas BSC: Nothing to Disclose, Shamir Rai BSC: Nothing to Disclose, Luck Jan-Luck Louis MD: Nothing to Disclose, Tim O’Connell MD, Meng: President, Resolve Radiologic Ltd, Silvia D. Chang MD: Nothing to Disclose, Alison Clare Harris MBChB: Nothing to Disclose, Savvas Nicolaou MD: Nothing to Disclose

PURPOSE

To evaluate the role of virtual monochromatic imaging (VMI) to maximize the conspicuity of mucosal enhancement in computed tomography (CT) of the abdomen and pelvis for acute small intestinal obstruction and to compare this technique to conventional polychromatic imaging (PCI).

METHOD AND MATERIALS

Institutional review board approval was obtained, with no informed consent required, for this retrospective analysis. 20 consecutive patients with acute small intestinal obstruction were scanned using a 128-section dual source, dual energy CT system using a standardized protocol (100-140 kV, ref mAs of 115-89, 32x0.6mm). Scans were retrospectively reconstructed at VMI energy levels from 40 - 150 keV in 10 keV increments and were analyzed both quantitatively and qualitatively. SNR and CNR values for mucosal enhancement in collapsed segments were recorded using region of interest (ROI) analysis at each energy level for all VMI datasets and compared to PCI. Subjective analysis of mucosal enhancement was performed by two independent, blinded readers.

RESULTS

The SNR and CNR for mucosal enhancement at the different VMI levels were compared using ANOVA with posthoc analysis with Newman-Keuls Multiple Comparison Test, demonstrating statistical significance (p < 0.05). Optimal SNR and CNR for small intestinal mucosal enhancement was observed at 80 keV and 70 keV, respectively. Qualitatively, both readers reported increased conspicuity of mucosal enhancement at the 70keV level.

CONCLUSION

VMI reconstruction of contrast enhanced dual energy CT scans of the abdomen and pelvis at 70 keV maximizes the conspicuity of mucosal enhancement in computed tomography (CT) of the abdomen and pelvis for acute small intestinal obstruction. At this level, conspicuity was improved for all readers.

CLINICAL RELEVANCE/APPLICATION

VMI reconstruction of contrast enhanced dual energy CT scans of the abdomen and pelvis at 70 keV maximizes the conspicuity of mucosal enhancement in acute small intestinal obstruction.

**Usability of Ultrasound for the Diagnosis of Acute Appendicitis Correlated to Patients BMI and the Severity of Inflammation**

Sebastian Bickelhaupt (Presenter): Nothing to Disclose, Sandra Tschirky: Nothing to Disclose, Michael A. Patak MD: Nothing to Disclose

PURPOSE

The clinical diagnosis of acute appendicitis in emergency departments is often backed by ultrasound (US) or/and computed tomography (CT). US is commonly the initial modality as an inexpensive and fast tool avoiding ionizing radiation. The increasing number of patients with a high body mass index (BMI) might limit the use of US. Our study investigated the accuracy of US for the diagnosis of appendicitis correlated to the patients BMI, the severity of inflammation and the need for additional CT-examinations.

METHOD AND MATERIALS

716 patients with suspected acute appendicitis(mean age 40.33, 309 female, 408 male)were included in this
IRB-approved, retrospective study between 2005-2011. Inclusion criteria: clinically suspected acute appendicitis, data of body mass index (BMI), leukocytes, C-reactive protein and a consecutive surgical intervention with histopathologically proven appendicitis. Patients grouping followed WHO definitions (BMI <18.5; 18.5-24.9; 25.0-29.9; >30). Correlations between the BMI, ultrasound-ability in detecting acute appendicitis, the necessity for CT examinations (Siemens Somatom 64, Erlangen, Germany) and the level of inflammation were calculated using Spearman's rank correlation.

RESULTS

Ultrasound-usage decreased with increasing BMI from 65.5%(BMI<18.5) and 67.1%(18.5-24.9) to 54.6%(25.0-29.9) and 45.6%(>30) in a significant negative correlation (r=-0.1, p=0.006). Vice versa initial CT usage increased from 7.8% to 18.5% (r=0.2, p<0.05). The need for additional CT after US significantly decreased with increasing BMI from 48.27% and 45.8% to 38% and 30.8% (r=-0.097, p=0.006), that did not correlate with levels of inflammatory markers (p>0.05) which did not differ between the groups.

CONCLUSION

The diagnostic certainty for the diagnosis of acute appendicitis significantly correlates with the BMI of the patients, leading to an increasing need for additional CT in obese patients. This finding was independent of the severity of inflammation with no correlation between the level of inflammatory markers and the diagnostic certainty of the ultrasound examination.

CLINICAL RELEVANCE/APPLICATION

Our study revealed a significant and robust negative correlation between the diagnostic certainty and an increasing BMI in the patients which helps to assess the appropriateness of initial ultrasound in patients depending on the BMI.

Evaluation of the Distribution of Enteral Contrast in ED Patients Undergoing Abdominal-Pelvic CT: Does It Get Where It Is Supposed to Go and What Is the Added Value?


PURPOSE

Current oral prep for adult abdominal-pelvic CT (AP CT) has shortened to one hour to facilitate faster Emergency Department (ED) patient care. How often does oral contrast optimally opacify the gastrointestinal tract? Does this contrast reach the site of pathology or assist in diagnosis?

METHOD AND MATERIALS

All adults undergoing AP CT exams in the ED at two university-affiliated urban hospitals were identified via the healthcare database over a 3-month period in 2012. Two raters reviewed CTs for the proximal and distal location of enteric contrast. Presence, site, and type of bowel pathology as well as prior gastrointestinal surgery were documented. When applicable, the site of bowel pathology was evaluated for the presence or absence of enteric contrast.

RESULTS

Of 1349 patients, 530 (39%; 61% female, mean age 50+/- 19 years) were administered oral contrast. In 321/530 (61%), oral contrast reached the terminal ileum (TI). Bowel pathology was present in 31% of these cases (165/530). When small or large bowel pathology was present, 47% (77/165) of cases had oral contrast present at the bowel pathology site. When the bowel was categorized into 4 anatomic segments, there was a significant difference (p<0.001) in oral contrast reaching the site of bowel pathology based on location: stomach and duodenum (84%), Jejunum to TI (35%), proximal colon (57%), and distal colon (28%). In 8% of cases (41/530), the original interpretation was equivocal for bowel pathology. 59% (24/41) of these equivocal cases had oral contrast present at the site of pathology. Of all 530 oral contrast cases, in only 84 cases (16%) did contrast extend from the stomach to the distal colon.

CONCLUSION

Only 61% of adults in the ED that undergo CT achieve oral contrast passage to the TI. 16% had complete stomach to distal colon contrast distribution. Oral contrast was present at the possible pathology site in equivocal reports (59%) in a similar frequency to positive cases (47%). These results raise questions about the use of oral contrast to facilitate identification and characterization of bowel pathology, unless prep time is lengthened.

CLINICAL RELEVANCE/APPLICATION

ED length of stay time pressures continue to intensify, leading to shorter prep times for oral contrast administration. As a result, optimal CT bowel prep is not achieved in many patients.

A New Technique for the Diagnosis of Acute Appendicitis: Abdominal CT with Compression to the Right Lower Quadrant

Erhan Akpinar MD : Nothing to Disclose , Abidin Kilincer MD (Presenter): Nothing to Disclose , Bulent SSG03-08 SSG03-09
PURPOSE

To determine the diagnostic accuracy of abdominal CT with compression to right lower quadrant in adults with acute appendicitis.

METHOD AND MATERIALS

Institutional review board approved this prospective study, and compression group patients gave written informed consent. The study included 168 patients (age range, 18-78 years) who underwent contrast enhanced CT for suspected appendicitis performed either by using compression to the RLQ (n = 71) or by standard protocol (n = 97). Compression was applied to RLQ with 1000cc saline bag and an elastic belt. All compression group patients had abdominal US examination before CT to exclude conditions like abdominal aortic aneurysm, etc. Two radiologists reviewed in consensus CT images; receiver operating characteristic (ROC) analysis, Fisher exact tests, and Mann-Whitney U tests were used to compare diagnostic accuracy between the two groups.

RESULTS

Fifty-nine patients (23 in compression group and 36 in standard protocol) had pathologically proven acute appendicitis. Median (min-max) outer diameter of appendix was 10 mm (7-15 mm), 10.5 mm (7.1-17.6 mm), 5 mm (4-7.5 mm) and 6.3 mm (4.8-10.3 mm) among patients with appendicitis in compression and standard-CT, and without appendicitis in compression and standard-CT, respectively. While appendix diameter was not significantly different among patients with appendicitis undergoing CT with or without compression, there was a significant difference across other groups in pairwise comparisons (p<0.01). In patients without appendicitis, filling of contrast material to the appendiceal lumen was statistically higher in compression group when compared to standard protocol (p<0.01). Area under the ROC curve of compression and standard CT were 0.997 and 0.979, respectively. Using a cut-off value of 6.75 mm for outer appendiceal diameter, the sensitivity and specificity for diagnosing appendicitis was 100% and 67.3% with standard CT, while the specificity increased to 94.9% with preservation of sensitivity at 100% with compression CT.

CONCLUSION

Normal appendix diameter was significantly smaller in compression-CT group when compared to standard-CT group, increasing the diagnostic accuracy of CT performed by abdominal compression.

CLINICAL RELEVANCE/APPLICATION

Abdominal CT with compression to right lower quadrant, which can be considered as a CT counterpart of graded compression US, has a high diagnostic accuracy in the setting of acute appendicitis.
METHOD AND MATERIALS

103 patients diagnosed with urinary stones (n=284) using both a standard-dose non-enhanced CT (SDCT, 120 kV and 150mAs) and an ultra low-dose non-enhanced CT (100kV and 20mAs) at two institutions were enrolled in the study. SDCT images were reconstructed with filtered back projection (FBP), and ULDCT images were reconstructed with FBP, hybrid iterative reconstruction (iDose level 5), and the IMR (body soft tissue level 3) algorithm. Interpretations of the two scans were performed prospectively with respect to radiation dose, objective image noise, and subjective image assessment (image quality, noise, diagnostic confidence). With SDCT-FBP as the reference standard, diagnostic performance and inter-observer agreement of ULDCT-IMR were assessed between two reviewers.

RESULTS

The average effective dose of SDCT and ULDCT was 8.31 mSv, and 0.68 mSv, respectively, and the average radiation dose reduction rate was 91.82% (p<0.01). Objective image noise was lower in ULDCT-IMR (p<0.01) than SDCT-FBP as well as ULDCT-FBP and ULDCT-iDOSE. The subjective assessment in ULDCT-IMR was comparable to that of SDCT-FBP, although SDCT-FBP was still superior statistically. Among 284 urinary stones detected by SDCT-FBP, 229 (80.6%) were detected by ULDCT-IMR, in which detection percentage were 66/69 (95.7%) for ureter stones and 155/207 (74.9%) for kidney stones. Non-detectable stones were 3 mm or less in size, which are clinically insignificant. Inter-observer agreement of ULDCT-IMR between the two reviewers in the diagnosis of stones was high with kappa values (kappa = 0.82, excellent).

CONCLUSION

ULDCT-IMR provided a significant reduction in radiation dose while maintaining diagnostic performance and image quality comparable to that of SDCT-FBP for diagnosing urinary stones.

CLINICAL RELEVANCE/APPLICATION

Patients with urolithiasis can be evaluated with ultra low-dose non-enhanced CT using knowledge-based iterative model reconstruction algorithm at a substantially reduced radiation dose, thereby minimizing risks to patient from radiation exposure while providing the clinically relevant diagnostic benefits.

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SSG05-03  Urinary Stone Composition Analysis: Impact of Increased Spectral Separation in Dual-energy CT on Urinary Stone Material Classification

Xinhui Duan PhD : Nothing to Disclose, Mingliang Qu MD : Nothing to Disclose, Guozhi Zhang : Nothing to Disclose, Zhoubo Li (Presenter) : Nothing to Disclose, Lifeng Yu PhD : Nothing to Disclose, Shuai Leng PhD : Nothing to Disclose, Ahmed Halaweish PhD : Employee, Siemens AG, Joel Garland Fletcher MD : Grant, Siemens AG, Cynthia H. McCollough PhD : Research Grant, Siemens AG

PURPOSE

To assess the impact of increased spectral separation on urinary stone classification in phantoms mimicking a range of patient sizes.

METHOD AND MATERIALS

87 human urinary stones of 5 common types (uric acid, cystine, calcium oxalate, brushite, calcium apatite) were scanned in 35, 40, 45, and 50 cm wide anthropomorphic phantoms. Data were acquired using 2 dual-source CT scanners. On scanner A (SOMATOM Force, Siemens), we used 150 kV and 0.6 mm tin on the high-energy tube and 70, 80, 90 or 100 kV on the low-energy tube. On scanner B (Definition Flash, Siemens), we used 140 kV and 0.5 mm tin on the high-energy tube and 80 or 100 kV on the low-energy tube. The volume CT dose index (CTDIvol) for all kV combinations matched clinical values (e.g. 13.5 mGy for 35 cm phantom). A decrease in the mean CT number of water > 10 HU was used as objective evidence of photon starvation; images meeting this criterion were removed from the analyses. Ratios of the CT numbers in the low and high energy images were calculated and used to differentiate uric acid (UA) from all types of non-UA stones, and oxalate from apatite stones. The ability to accurately classify stone type was assessed using receiver operating characteristic (ROC) analysis.

RESULTS

The 100/150 Sn kV combination on Scanner A was the only combination to avoid photon starvation artifacts across all phantom sizes; 70 kV combinations avoided artifact only for the 35 cm phantom. For scanner B, no kV combinations avoided starvation artifacts for the 45 and 50 cm phantoms; 80 kV combinations avoided artifact only for phantoms ≤ 40 cm. Spectral separation increased the area under the ROC curve (AUC) for differentiation of UA and non-UA stones for large phantoms, e.g., 0.95 (Scanner A, 100/150 kV) vs. 0.63 (Scanner B, 80/140 kV) for the 50 cm phantom. At each phantom size, the AUC for oxalate vs. apatite stones was higher for all kV combinations on Scanner A than any kV combination on Scanner B.

CONCLUSION

Increased spectral separation between the low and high energy x-ray beams resulted in decreased photon starvation artifact in large phantoms, and improved classification of urinary stones, particularly for oxalate and apatite stones.

CLINICAL RELEVANCE/APPLICATION

Increased spectral separation in dual-energy CT improves the ability to characterize renal stone types,
especially for large patients.

**Renal Stone Composition in Vivo Determination: Comparison between 100/140 kV Dual-energy CT and 120 kV Single-energy CT**

**METHOD AND MATERIALS**

Retrospective study (Jan 2013-Dec 2013) approved by our Institutional Review Board; informed consent was obtained. We included in our study 30 consecutive patients who underwent a CT on our second-generation dual-source scanner according to a "renal stone protocol", which included a 120 kV single-energy acquisition of the whole abdomen followed by a 100/140 kV dual-energy acquisition of the region(s) where one or more stones were identified, with subsequent renal stone surgical extraction or spontaneous expulsion within 1 month and stone examination by means of infrared spectroscopy. Stone largest diameter, estimated volume, attenuation values at 100, 120 and 140 kV, and 100/140 kV attenuation ratios were calculated by means of an automated software (Syngo.via, "CT Dual Energy - Kidney Stones" application). At CT, renal stones were classified as follows: uric acid (attenuation at 120 kV > 1064HU; >1.24).

**RESULTS**

50 stones were detected in 30 patients. At laboratory, 17/50 (34%) of the stones were prevalently composed by uric acid, 4/50 (8%) by cystine and 29/50 (58%) of calcium oxalates and phosphates. Stones showed a median diameter of 4.8mm (range 1.0-24.1mm) and a median volume of 35.7mm³ (1.9-1390.0mm³). 120kV single-energy CT correctly assessed stone composition in 26/50 (52%) of the cases, whereas dual-energy CT in 45/50 (90%) of them (p < 0.05).

**CONCLUSION**

Dual-energy CT performs significantly better then single-energy CT in renal stone composition determination and reliably discriminates between uric acid and non-uric acid stones. Ureteral catheters may reduce dual-energy CT accuracy in ureteral stones composition determination.

**CLINICAL RELEVANCE/APPLICATION**

Automated dual-energy CT renal stone evaluation reliably determines renal stone composition in vivo and, therefore, represents an useful tool for therapeutic planning.

**Accurate Assessment of Urinary Stone Volume Using Virtual Non Contrast (VNC) Images Created from Contrast-Enhanced Dual-Energy CT (DECT) Scans**

**METHOD AND MATERIALS**

Seventeen Uric Acid (UA) and 27 non-UA stones of different sizes (mean volume 98 mm³, range 10-330 mm³) were placed in 1.5 ml vials, submerged in 35 and 40 cm wide water phantoms, and scanned with a newer dual-source CT scanner (Siemens Somatom Force). Images were reconstructed using a medium sharp kernel, 1.0-mm thickness and 0.8-mm interval. Initially, vials were filled with saline in order to acquire True Non-Contrast (TNC) data, which were reconstructed as mixed DECT images. The saline was then replaced with iodine solutions having concentrations consistent with clinical CT urogram studies (40 and 80 mg/ml). Scans were repeated for each iodine concentration and VNC images were created using commercially available software (Siemens, Syngo Via VA30). Using a custom Matlab-based program (Mathworks, Matlab 8.2), stones were segmented in TNC and VNC images with an adaptive threshold technique. After segmentation, stone volumes were calculated and a two-tailed t test was performed to compare TNC and VNC volume measurements (SAS, JMP 9).

**RESULTS**

Volume measurements from VNC images were not statistically different than those from TNC mixed images (P > 0.05 for both phantom sizes and iodine concentrations).

**CONCLUSION**

VNC images created from contrast-enhanced DECT data sets can accurately quantify urinary stone volumes, which may reduce the need to obtain a separate TNC scan in CT urogram studies.

**CLINICAL RELEVANCE/APPLICATION**
SSG05-06

**Ultra Low-dose MDCT for the Detection of Ureteric Stone Disease: Diagnostic Accuracy and Image Quality in Sub-milisievert MDCT Using 4th Generation Iterative Reconstruction for Noise Reduction**

Marc Regier (Presenter): Nothing to Disclose, Simon Veldhoen MD: Nothing to Disclose, Cyrus Behzadi: Nothing to Disclose, Frank Oliver Gerhard Henes MD: Nothing to Disclose, Chressen Catharina Remus MD: Nothing to Disclose, Azien Laqmani: Nothing to Disclose, Gerhard B. Adam MD: Nothing to Disclose

**PURPOSE**

The purpose of the presented study was to assess the diagnostic accuracy and image quality of sub-milisievert MDCT provided with the 4th generation IR technique iDoseTM for the detection of ureteric stone disease.

**METHOD AND MATERIALS**

In 46 consecutive patients suspected of ureteral stone disease raw data of unenhanced 256 slice MDCT (120kV, 20mAs, mean CTDIvol: 0.9mGy; 29male, 17female; mean age, 42years) were reconstructed using iDoseTM. IR level settings were varied between 0 (filtered-back-projection (FBP)), 4 and 6. Images were reconstructed with a slice thickness of 3mm. Image analysis was independently performed by two blinded radiologists who assessed location and diameter of ureteral calculi. The level of confidence was recorded based on a 3-point scale (1, inconclusive; 3, confident). For evaluation of image quality a 4-point grading scale was applied regarding the depiction of anatomical details of the upper urinary tract and degree of artifacts (1, worst; 4, excellent). The signal-to-noise ratio (SNR) was assessed. Statistical evaluation included weighted kappa and Wilcoxon analysis.

**RESULTS**

A total of 26 ureteral stones was found ranging from 1 to 8 mm (mean, 3.2 mm). Sensitivity rates were equivalent for FBP and IR, regardless of the iteration level. The level of confidence was superior for data sets reconstructed with IR (FBP, 2.4; IR4, 2.6; IR6, 2.6; p>0.05). Compared to FBP (mean score, 2.78) a significant improve in image quality was assessed applying an IR level of 4 (mean score, 3.41; p<0.02).

**CONCLUSION**

Ureteral stone disease can reliably be achieved by ultra low-dose MDCT at radiation doses in the sub-milisievert range. Whereas the application of IR does not affect the accuracy of stone detection, a slight improvement in diagnostic confidence and a significant increase in image quality can be reached applying IR level 4.

**CLINICAL RELEVANCE/APPLICATION**

Applying IR of the 4th generation for sub-milisievert MDCT of the upper urinary tract remarkably improves image quality and allows for stone detection with higher confidence compared to filtered back projection.

SSG05-07

**Single-source Dual Energy CT (ssDECT) Renal Stone Characterization: A Multi-Parametric Approach**

Jeffry S. Kriegshauser MD (Presenter): Nothing to Disclose, Alvin C. Silva MD: Nothing to Disclose, Robert Gene Paden: Nothing to Disclose, Miao He: Nothing to Disclose, Eric Wisenbaugh MD: Nothing to Disclose, Mitchell Humphreys MD: Nothing to Disclose, Steven Ilan Zell MD: Nothing to Disclose

**PURPOSE**

Evaluate predictability of renal stone composition using values for 53 variables obtained with ssDECT and by applying selected data analysis algorithms.

**METHOD AND MATERIALS**

Thirty-two ex vivo stones found to be >90% pure by IR spectroscopy (IRS) were evaluated with ssDECT using up to 53 variables, including size, effective Z, density (in HU) at 11 monochromatic keV values, and 40 material density pairs. Data was evaluated using several algorithms, including ANN, Random Tree, and NB Tree models. A subset of 23 stones, which excluded stones less than 5 mm, also was evaluated using up to 26 variables. Seventeen stones measuring 5 mm or larger removed from 13 patients were evaluated in vivo with ssDECT using up to 11 variables, focusing on commonly available variables: density (70 keV), effective Z, and iodine and water pairs. IRS determined true composition.

**RESULTS**

In the 32 stone dataset, 14 were uric acid (UA) and 18 non-UA stones. Non-UA stones were 7 cystine (CYS), 7 struvite (STR) and 4 calcium oxalate (CaOx) stones. In the 23 stone dataset, 12 were uric acid (UA) and 11 non-UA stones. Non-UA stones were 5 CYS, 4 STR and 2 CaOx stones. In vivo stones included 2 UA, 2 CYS, 12 calcium-based (90-100% CaOx Monohydrate (COM) or mixtures of COM with CaOx Dehydrate and calcium phosphonates), and 1 N4-Acetyl-Sulfomethoxazol. Several algorithms could predict UA versus non-UA with 82% for stones >5mm (23 stone dataset). Both errors in the latter set were misclassified STR stones. In vivo, 1 small (5 mm) calcium-based ureteral stone was misclassified as CYS and the N4-Acetyl-Sulfomethoxazol stone was classified as a calcium-based stone.

**CONCLUSION**

Using ssDECT, UA stones can be consistently distinguished from non-UA stones, most simply using the iodine-water material density pairs. Considerable overlap in parameters is seen with non-UA stones, although VNC images may now have sufficient quality to allow omission of TNC scans in CT urography, or to allow detection and size assessment of urinary stones in routine contrast enhanced exams.
CYS and calcium-based stones are more accurately predicted than STR stones.

**CLINICAL RELEVANCE/APPLICATION**

Accurate in vivo prediction of renal stone composition is important for determining cause and best management, and can aid surgical planning.

**SSG05-08**

**Single-Phase Split-bolus Dual-Energy CT-Urography in Patients with Hematuria: Diagnostic Performance and Potential Dose Reduction**

Chiao-Yun Chen (Presenter): Nothing to Disclose, Twei-Shiun Jaw MD: Nothing to Disclose, Gin Chung Liu MD: Nothing to Disclose, Lo-Yeh Lee MD: Nothing to Disclose, Jui-Sheng Hsu MD, PhD: Nothing to Disclose, Ming-Chen Paul Shih MD: Nothing to Disclose, Chun-Nung Huang: Nothing to Disclose

**PURPOSE**

To assess the diagnostic performance of portal venous phase split-bolus dual-energy CT (DECT) in patients with hematuria and to measure the potential radiation dose reduction using a single-phase acquisition.

**METHOD AND MATERIALS**

This retrospective study received protocol approval with a waiver of informed consent from our institutional review board. Study included 110 consecutive patients who underwent unenhanced single energy CT and enhanced DECT urography for hematuria. Enhanced weighted average (WA) 120kVp, iodine-overlay and virtual nonenhanced (VNE) images were reconstructed from enhanced 80 and Sn140kVp scans. Single-phase enhanced DECT urography (iodine-overlay and VNE) images were independently reviewed by two radiologists blinded to the final diagnosis. Prospective interpretations of the true nonenhanced (TNE) and enhanced WA 120kVp images (dual-phase) were also reviewed. The standard of reference included all available clinical, imaging, pathology and laboratory data for up to 12 months after DECT urography. Sensitivities, specificities and diagnostic accuracies were recorded for prospective (dual-phase) and retrospective (single-phase) interpretations. The overall imaging quality (5-point scale) of the TNE and VNE images was also evaluated. The potential dose reduction of a single-phase from dual-phase protocol was calculated. Results were tested for statistical significance.

**RESULTS**

Final diagnoses for hematuria were renal cell carcinoma, 17(15.5%); ureter urothelial cancer, 16(14.5%); bladder cancer, 17(15.5%); renal angiomyolipoma, 14(12.7%); ureterolithiasis 31(28.2%); complex cyst, 5(4.5%) and no detectable cause, 10(9%). Overall accuracy for single-phase acquisition and dual-phase acquisition were 96.7% and 97.2% (p > 0.05). Although the overall imaging quality of the VNE was significantly inferior to the TNE images, the quality scales of the VNE were excellent or good. The mean scores were 1.7±0.5 vs 1.0±0.2 (p<0.05). The mean dose of the single-phase DECT acquisition was 6.7mSv comparing with 15.4mSv of the dual-phase study.

**CONCLUSION**

Single portal venous phase split-bolus DECT urography using iodine overlay techniques and VNE images yield high diagnostic accuracy in patients with hematuria and potentiality to reduce radiation exposure.

**CLINICAL RELEVANCE/APPLICATION**

In patients with hematuria, single-phase split-bolus DECT urography provides high diagnostic accuracy and potential to reduce radiation exposure.

**SSG05-09**

**Model-based Iterative Reconstruction (MB-IR VEOTM) with Ultra Low-dose Abdominal CT versus Adaptive Statistical Iterative Reconstruction (ASIR) in the Diagnosis of Acute Renal Colic**

Mikael Fontaresky MD (Presenter): Nothing to Disclose, Agaicha Alfidja: Nothing to Disclose, Renan PERIGNON MD: Nothing to Disclose, Arnaud Schoenig: Nothing to Disclose, Christophe Perrier: Nothing to Disclose, Aurelien Mulliez: Nothing to Disclose, Laurent Guy: Nothing to Disclose, Louis Bernard Boyer MD: Nothing to Disclose

**PURPOSE**

To evaluate the accuracy of ultra-low dose abdominal CT in the diagnosis of acute renal colic with a new generation model-based iterative reconstruction MB-IR / VeoTM, comparing it to low dose abdominal CT using 50% Adaptive Statistical Iterative Reconstruction (ASIR 50%).

**METHOD AND MATERIALS**

Prospective monocentric study including 118 patients with symptoms of acute renal colic who underwent 2 successive CT acquisitions: « Standard-ASIR50% » and « ultra-low dose VeoTM ». Two readers independently reviewed both CT examinations concerning the presence of renal colic, differential diagnoses and associated abnormalities. The results and doses as well as image quality of both two CT expositions were compared.

**RESULTS**

Intra observer correlation was 100% for the diagnosis of renal colic (kappa k=1), τ=98.7% k=0.97, and τ=98.16% k=0.95 respectively for the detection of calculus and uretero hydronephrosis, and / τ=98.87%
\( \kappa = 0.95 \) for differential or alternative diagnoses. Ultra-low dose CT using VeoTM allows a reduction of 84\% of the dose delivered (DLP = 92.07±44.58 versus 586±270.01 mGy.cm \( p<0.001 \)), without any significant alteration of image quality (mean score 3.83±0.49/4 for ultra-low dose VeoTM versus 3.92±0.27/4 for ASIR 50 \%(p=0.32), nor increase in noise (18.36±2.53 versus 17.40±3.42UH).

**CONCLUSION**

Ultra-low dose CT using model-based iterative reconstruction MB-IR/VeoTM allows a dose reduction (84\%) without any noise increase or alteration of image quality in the diagnosis of acute renal colic. We have also determined a threshold of 40mGy.cm in abdominal CT.

**CLINICAL RELEVANCE/APPLICATION**

Detection of renal colic with ultra low-dose CT-scan using Model-based iterative reconstruction VEOTM is as accurate as standard CT-Scan with adaptative statistical iterative reconstruction (ASIR), and allows a dose reduction of 84\%.

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**GUS-TUA**

Genitourinary/Uroradiology Tuesday Poster Discussions

**Scientific Posters**

**AMA PRA Category 1 Credits™: .50**

_Tue, Dec 2 12:15 PM - 12:45 PM Location: GU Community, Learning Center_

**Participants**

Moderator
Dean Akira Nakamoto MD : Research Grant, Galil Medical Ltd

**Sub-Events**

**GUS121**

Upper Tract Urothelial Cancers Identified on CT Urography: A Six-year Review (Station #1)

Ellie Rose Lee MD (Presenter): Nothing to Disclose, Bryan Michael Hoag MD : Nothing to Disclose, Lauren Marie Brubaker Burke MD : Consultant, Amgen Inc, Julia R. Fielding MD : Nothing to Disclose

**PURPOSE**

To identify upper tract tumors in those patients undergoing CT urography for hematuria and/or history of urothelial cancer.

**METHOD AND MATERIALS**

The study was IRB approved and HIPAA compliant. A retrospective review was performed on 2054 adult patients (median age, 56 years; range 18-94 years) who underwent CT urography (CTU) examination at a single institution between October 2006 and October 2012 for evaluation of hematuria and/or history of urothelial cancer. Patients were identified via electronic medical records. A standardized multi-phase CT urography protocol was used over the six-year time frame which included 5 mm axial non-contrast, post-contrast, and delayed images through the kidneys and bladder and 3 mm coronal reformats in the delayed phase. All CT urograms were interpreted by radiologists specializing in abdominal imaging. The radiology reports were reviewed for urothelial lesions. The medical charts and pathologic results were reviewed for those patients with positive CT urograms.

**RESULTS**

Of the 2054 patients, 114 (5.6 \%) were positive for pathology proven urothelial tract cancer on CT urography examination. 86 of the 2054 (4.2 \%) patients had bladder masses on CTU, 25 of the 2054 (1.2 \%) patients had upper tract lesions on CTU, and 3 of the 2054 (0.2 \%) patients had both upper tract and bladder lesions on CTU.

**CONCLUSION**

Upper tract urothelial cancers are extremely rare in a tertiary care institution. Only 1 \% of the patients who underwent CT urograms for hematuria or for history of urothelial cancer were positive for upper tract disease. This should prompt reconsideration of indications for interval follow-up or surveillance with this high radiation dose exam.

**CLINICAL RELEVANCE/APPLICATION**

CT urography for hematuria and/or history of urothelial cancer was positive in only 1\% of patients, and interval surveillance intervals should be reconsidered to avoid unnecessary radiation exposure.

**GUS122**

Post-Cystectomy Hernias: Lessons Learned in Appropriate Reporting and Detection (Station #2)

James Reza F. Fernandez MD, MS (Presenter): Nothing to Disclose, Hooman Djaladat MD : Nothing to Disclose, Kamran Movassaghi : Nothing to Disclose, Vinay Anant Duddalwar MD, FRCR : Research Grant, General Electric Company
Purpose
Post-cystectomy hernias, designated as incisional or para-stomal depending on whether an ileal conduit or neobladder is constructed, are not uncommon complications of surgery. Radiologists sometimes under-report such hernias for a variety of reasons, including small size (<1 cm) or, in the case of para-stomal hernias, attributing them to normal post-operative change. In addition, some hernias appreciated on clinical exam are not identified during cross-sectional imaging as they may reduce at the time of the scan. This project was aimed to identify what types of hernias were missed, the hernia defect sizes, and correlation with clinical exam findings to identify occult hernias which were not identified at the time of the scan. The ultimate goal was to identify the cause of under-reporting hernias, and to adjust scanning protocols to maximize sensitivity for detecting hernias.

Results
Approximately 18 out of 401 patients were found to have para-stomal hernias postoperatively. Another 3 were found to have clinical evidence of para-stomal hernias, without corresponding cross-sectional imaging findings. Another 122 patients were found to have clinical evidence of incisional hernias, of which 51 were not seen radiographically.

Conclusion
Two changes were implemented as a result of this: 1) Protocol for post-cystectomy patient surveillance imaging of the abdomen and pelvis is now performed during valsalva to maximize hernia manifestation 2) Radiologists were notified of the study findings, and educated expected post-surgical stoma formation findings, and encouraged to report any fascial defects > 1 cm along incision lines given their propensity to enlarge over time.

Methods
401 post-cystectomy patient CT scans of the abdomen and pelvis, for which reports did not have any mention of post-operative hernias (other hernias, including hiatal, umbilical, or inguinal, were not excluded), were reviewed retrospectively for presence of hernias. Any hernias identified were then analyzed for hernia contents and abdominal wall defect size.

Testicular Microlithiasis: Is Ultrasound Surveillance Necessary? A 14 year Experience in 461 Patients in a Single Centre (Station #3)

Ketul Patel (Presenter): Nothing to Disclose, Subash Naravarte MBBS, MRCS: Nothing to Disclose, Emily Bartlett: Nothing to Disclose, Maria E. Sellers MD, FRCP: Nothing to Disclose, Jane L. Clarke MS: Nothing to Disclose, Paul Singh Sidhu MRCP, FRCR: Speaker, Bracco Group Speaker, Siemens AG Speaker, Hitachi, Ltd

Purpose
Testicular microlithiasis (TM) is frequently an incidental finding on ultrasound (US). An increased incidence of germ cell tumours (GCT) is seen in the presence of TM suggesting TM is a premalignant condition and routine surveillance is advocated. There is no evidence of a causal link between TM and the development of GCT. We present the largest cohort of patients with TM followed up in a single centre and deliberate on the merits of annual US surveillance.

Method and Materials
A retrospective analysis of male patients undergoing US of the testis for a variety of reasons between 1998 and 2012 was performed. Routine 1-yearly US follow-up was offered to all patients with TM and a database of attendances was maintained. Patient demographics, follow-up details and the development of a testicular mass were recorded. For those found to have a testicular mass, detailed analysis of the radiological and histological findings were recorded. The TM was divided into limited (5 microliths/field) and florid (‘snowstorm’ appearance). Any co-existing tumor at presentation with background TM was recorded.

Results
20,224 patients were examined with US of which 867 (4.3%) (median age 38 years, range 4-86) had TM. 21/867 (2.4%) had neoplastic tumors on presentation. All patients consented to follow-up with 461 patients (53%) achieving this and entered into the follow-up program (median duration 420 days, range 138-4957). Three patients developed tumors during the follow-up period, two of which were malignant (seminomas), the other a benign adenomatoid tumor. Of the two malignant tumors, one had a history of orchiectomy for contralateral GCT and developed a palpable mass on day 616 of follow-up. The other had an atrophic testis and the tumor was found at day 1886 of follow-up. There was no relationship to the classification of the TM.

Conclusion
On follow-up of 461 patients with TM for median duration of 420 days, we demonstrated the de-novo occurrence of GCT in only 2 patients. Both of these patients were high risk exclusive of their TM status. Our findings strongly support the impression that patients with TM and no other clinical risk factors for testicular GCT do not require routine surveillance.

Clinical Relevance/Application
We present 14 year data of the largest single centre cohort of patients with testicular microlithiasis and demonstrate no increase in the tumour detection rate from routine ultrasound surveillance.

Usefulness of Low-dose Non-enhanced CT with Hybrid Iterative Reconstruction for Evaluation of Urolithiasis: Diagnostic Performance and Agreement between the Urologist and the Radiologist (Station #4)

Joonho Hur (Presenter): Nothing to Disclose, Sung Bin Park MD: Nothing to Disclose, Jong Kyou Kwon: Nothing to Disclose, Jong Beum Lee: Nothing to Disclose, Hyun Jeong Park: Nothing to Disclose, Yang
PURPOSE

The purpose of this study was to evaluate the efficacy of iterative reconstruction (IR) technique for reducing image noises in low-dose non-enhanced CT (LDCT) and the diagnostic performance of LDCT-IR for urolithiasis.

METHOD AND MATERIALS

116 patients diagnosed with urinary stones (n=197) using both a standard dose non-enhanced CT using filtered-back projection (SDCT-FBP, 120 kV and 150 mAs) and a low dose non-enhanced CT using hybrid IR (LDCT-IR, iDOSE4 level 5, 100 kV and 60 mAs) were enrolled in the study. Interpretations of the two scans were performed prospectively with respect to stone characteristics (size, volume, location, Hounsfield unit (HU), skin-to-stone distance (SSD)), radiation dose, objective image noise, and subjective image assessment. With SDCT-FBP as the reference standard, diagnostic performance and inter-observer agreement of LDCT-IR for urinary stones according to the stone size; all sizes, ≥ 3 mm, and <3 mm were assessed between one urologist and one radiologist.

RESULTS

No statistically significant differences were found in stone characteristics between the two scans. The average effective radiation dose of SDCT and LDCT was 5.92 mSv, and 1.39 mSv, respectively, and the average radiation dose reduction rate was 76.6% (p<0.001). Objective image noise was higher in LDCT-IR (p<0.01), but there were no significant differences in subjective image assessment between the two scans. The sensitivity and specificity of LDCT-IR were 99.1% to 100.0% with a diagnostic accuracy of 99.1% to 99.6% for diagnosing stones ≥3 mm. All statistical parameters for diagnostic accuracy were similar between the urologist and radiologist (p>0.05, respectively). Inter-observer agreement of LDCT-IR between the two reviewers in the diagnosis of stones was high with kappa values ranging from 0.901 to 1.000 in all three groups.

CONCLUSION

LDCT-IR provided a significant reduction in radiation dose while maintaining the image quality comparable to that of SDCT-FBP, thus making it an attractive option for the urologist as well as radiologist for diagnosing urinary stones.

CLINICAL RELEVANCE/APPLICATION

Patients with urolithiasis can be evaluated with low dose non-enhanced CT using hybrid iterative reconstruction at a substantially reduced radiation dose by urologist as well as radiologist, thereby minimizing risks to patient from radiation exposure while providing the diagnostic benefits of low dose non-enhanced CT using iterative reconstruction.
Impact of Postoperative Changes of the Membranous Urethra Angle on the Outcome after Retrourethral Transobturator Sling for Treating Post Prostatectomy Incontinence (Station #1)

Sonja Kirchhoff MD (Presenter): Nothing to Disclose
Olga Solyanik MD: Nothing to Disclose
Maximilian F. Reiser MD: Nothing to Disclose
Irina Soljanik: Nothing to Disclose

PURPOSE
The aim of the study was to evaluate the outcome after retourethral transobturator sling (RTS) for treating post-prostatectomy incontinence (PPI) using functional magnetic resonance imaging (MRI) for identifying parameters associated with RTS failure and to assess the reliability of the measurements.

METHOD AND MATERIALS
Thirty men with PPI consecutively underwent cine-MRI before and 12 months after RTS placement in a sequential clinical observational study. T2-weighted turbo spin echo (TSE) sequences in axial and sagittal orientation were acquired to analyse anatomical structures and to plan the dynamic examination of the pelvic floor (PF). Sagittal TrueFISP (Fast Imaging with Steady State Precession) sequences during the Valsalva maneuver (VM) and micturition were acquired in terms of functional imaging. The membranous urethra angle (AMU), the distance between the bladder neck (BN) and the pubo-coccygeal reference line (PCL) and the distance between the external urinary sphincter (EUS) and PCL during maximal VM and voiding were evaluated.

Two radiologists performed the measurements independently for interrater reliability. Intrarater reliability was assessed by the same radiologist performing the evaluation 6 weeks after the first analysis. RTS success rate was defined as no or one dry “security” pad use.

RESULTS
The success rate was 60% (18/30 patients). The median follow-up was 32.5 months (range:16-39 months). The AMU was significantly reduced postoperatively during maximal VM (39.550 vs. 36.820, p=0.025) and voiding (38.250 vs. 34.830, p=0.001). The EUS was significantly elevated (2.9 vs. 4.8mm, p=0.017) postoperatively. The RTS failure was significantly associated with slighter postoperative AMU-change during voiding (p=0.001). The interrater and intrarater reliability of the assessed parameters was excellent (ICC>=0.75).

CONCLUSION
RTS placement leads to AMU reduction and EUS elevation on cine-MRI. Only slight AMU changes after sling placement seem insufficient for RTS success. However, Cine-MRI of the male PF appears to be a reliable tool in the evaluation of RTS-outcome.

CLINICAL RELEVANCE/APPLICATION
Cine-MRI of the male pelvic floor appears to be a reliable tool in the evaluation of the outcome after RTS-placement for treating post prostatectomy incontinence.

Study of Clear Cell Renal Cell Carcinoma and Papillary Renal Cell Carcinoma by Applying Magnetic Resonance Diffusion Kurtosis Imaging: A Preliminary Study (Station #2)

Jingtao Wu: Nothing to Disclose
Qingqiang Zhu (Presenter): Nothing to Disclose

PURPOSE
To characterize Magnetic Resonance Diffusion Kurtosis Imaging (DKI) in the study of clear cell renal cell carcinoma (CCRCC) and papillary renal cell carcinoma (PRCC).

METHOD AND MATERIALS
Twenty-four patients with CCRCC and 22 patients with PRCC were retrospectively studied. Tumor DKI features (b value=0, 300, 600 s/mm²), including Mean Diffusivity (MD), Fractional Anisotropy (FA), mean kurtosis (MK), radial kurtosis (RK), kurtosis anisotropy (KA), were assessed and investigated. Evaluated DKI features were compared between two tumor types by applying independent-sample t test.

RESULTS
In all subjects good image quality was achieved. Statistically significant differences were observed in the properties under evaluation between CCRCC group and PRCC group. MD: (7.13±1.19 vs 0.686±0.109,
CONCLUSION

Our initial results indicate the feasibility of DKI in differentiating CCRCC from PRCC. Future studies in patients with kidney diseases are required to determine the value of DKI for functional kidney imaging.

CLINICAL RELEVANCE/APPLICATION

Strictly limited amount of topics involving DKI method in the study of oncology. And this is the only option throughout the section. Our initial results indicate the feasibility of DKI in differentiating CCRCC from PRCC. Future studies in patients with kidney diseases are required to determine the value of DKI for functional kidney imaging.

GUS128

Effective Atomic Number Accuracy for Urinary Stone Characterization Using Gemstone Spectral Imaging (GSI) on Spectral CT (Station #3)

Xiaohu Li (Presenter): Nothing to Disclose, Bing Liu MD: Nothing to Disclose, Yu Yongqiang MD, PhD: Nothing to Disclose

PURPOSE

To evaluate the accuracy for Urinary Stone Characterization using Effective Atomic Number (Zeff) on spectral CT

METHOD AND MATERIALS

Twenty freshly excised pig kidneys with 120 extracted human Urinary stones in them (two in the upper calices, two in the renal pelvis, two in the lower calices of each kidney) which were immersed in a 15cm-deep water tank underwent GSI using spectral CT (Discovery CT750 HD). All data were transferred to Workstation (AW4.4, GE Healthcare) GSI Viewer to obtain Effective Atomic Number (Zeff) images for measurement of the mean Zeff. The mean Zeff was compared among the stone groups. The composition of stones was determined by infrared spectrom

RESULTS

Dual energy imaging is dependent upon accurate attenuation measurements. From our observations we find that the Zeff measurements closely match expected values. The measured Zeff correlates well with the analytically calculated Zeff for each stone type. Our results showed good separation in effective Z for Uric Acid vs. Cystine/Struvite group vs. Calcium based stones. There was some overlap between the Cystine and Struvite stones. However, in conjunction with density measurements, we are able to differentiate all 4 stone types. We color coded the stones using a threshold in Zeff combined with a threshold in density

CONCLUSION

The combination of effective atomic number and monochromatic attenuation demonstrated good separation of all four stone types considered - even Cystine and Struvite which have poor separability in conventional CT. These results are encouraging and motivate further study to confirm the role of spectral CT in the diagnostic imaging of urinary stones

CLINICAL RELEVANCE/APPLICATION

Determination of stone composition by Effective Atomic Number can help urologist choose the optimal treatment project to minimize complications and costs

GUS129

Split-bolus Portal Venous Phase Dual-Energy Computed Tomography Urography: Protocol Design, Image Quality and Dose Reduction (Station #4)

Lo-Yeh Lee MD (Presenter): Nothing to Disclose, Chiao-Yun Chen: Nothing to Disclose, Gin Chung Liu MD: Nothing to Disclose, Twei-Shiun Jaw MD: Nothing to Disclose, Jui-Sheng Hsu MD, PhD: Nothing to Disclose, Ming-Lai Dorothy Lai: Nothing to Disclose, Ming-Chen Paul Shih MD: Nothing to Disclose

PURPOSE

To evaluate the image quality of a second-generation dual-source dual-energy computed tomography (DECT) scanner using the split-bolus portal venous phase CT urography protocol and the potential radiation dose reduction by eliminating the need for a nonenhanced scan.

METHOD AND MATERIALS

Our institutional review board approved this retrospective study and waived informed consent. DECT urography was performed in 84 patients. Non-enhanced CT scan was performed 20 minutes after drinking of 800mL water. The split-bolus protocol consisted of a sequence of injections (200mL of normal saline [2.0mL/s], 50mL of contrast medium [2.5mL/sec] at 0 second, and 70mL of contrast medium [2.5mL/sec] at 420 second) and a saline flush of 25mL thereafter. Scan started at 480 second. Virtual nonenhanced (VNE) images were reconstructed from enhanced DECT scans. The mean CT density and signal-to-noise ratio (SNR) of the upper urinary tract, renal parenchyma, vessels, renal/urothelial tumors, normal reference tissues, and image noise were measured. Image quality was rated by two radiologists.
RESULTS
Opacification of the intrarenal collecting system, proximal, middle, and distal ureters, and bladder was complete in 92.9%, 83.9%, 78.6%, 74.4%, and 26.2% of patients, respectively. Image quality of the renal parenchyma, arteries, and veins was excellent in 59.5%, 75%, and 97.6% of cases. The mean CT density of renal/urothelial tumors (n=16) was 90.9HU±6 in enhanced images, 31.7HU±2 in true nonenhanced (TNE) and 36.3HU±2 in VNE images. The SNR of all measured lesions except renal pelvis showed significant correlation (p<.01) between the TNE and VNE images. The overall sensitivity of stone detection was 87.5% (28 of 32; 95% CI: 70.4%, 95.4%) in VNE images. If the TNE would be omitted, the dose of this protocol could reduce from 15.6mSv to 6.7mSv.

CONCLUSION
Our single portal venous phase split-bolus protocol provides sufficient opacification of upper urinary tract collecting system, good enhancement of vessels, renal/urothelial tumors and potential to reduce radiation exposure.

CLINICAL RELEVANCE/APPLICATION
Our split-bolus portal venous phase DECT urography protocol is timed to acquire good corticomedullary-nephrographic-excretory phase and vascular/tumor enhancement data and provide sufficient opacification of the collecting system. The "all-in-one" protocol has the inherent advantage of omitting the non-contrast scan, thus reducing the radiation dose.

GUS130
Detection of Bladder Cancer: Comparison of Low Dose Scans Using Adaptive Iterative Dose Reduction 3D and Routine Dose Scans Using Filtered Back Projection in CT Urography (Station #5)

Hiroshi Juri (Presenter): Nothing to Disclose, Takahiro Tsuboyama MD: Nothing to Disclose, Seishi Kuma MD: Nothing to Disclose, Kazuhiro Yamamoto MD: Nothing to Disclose, Haruhito Azuma: Nothing to Disclose, Yoshifumi Narumi MD: Nothing to Disclose

PURPOSE
To prospectively compare the diagnostic ability of low dose scans with adaptive iterative dose reduction 3D (AIDR 3D) and routine dose scans with filtered back projection (FBP) for the detection of bladder cancer on the excretory phase (EP) in CT urography.

METHOD AND MATERIALS
Forty-two patients known to have or at high risk for urothelial carcinoma were included. Routine and low dose EP of CT urography were performed at 15 minutes after administration of contrast material. Low dose images were reconstructed with AIDR 3D and routine dose images were reconstructed with FBP. Two radiologists independently scored the confidence levels for the presence or absence of bladder cancer using 5-point scale, and the number of tumors in the urinary bladder was recorded on each EP. Differences were resolved by consensus. Standard of reference was obtained from histopathologic findings or cystoscopy. In addition, one radiologist measured the maximum diameter of the tumor of each patient, and averaged. The CT dose index (CTDIvol) was measured and the percentage of dose reduction was calculated.

RESULTS
Bladder cancer was revealed in 23 patients by cystoscopy. The mean maximum diameter of the tumors of each patient was 32.8 mm (range; 5.7 - 101.3 mm). Sensitivity, specificity, and accuracy were 87.0%, 94.5%, and 90.5% on routine dose, and were 87.0%, 89.5%, and 88.1% on low dose scans, respectively, and there was no significant difference. Area under the receiver operating characteristic curves for detecting cancer was 0.915 and 0.901 on routine and low dose scans, and there was no significant difference (p = 0.263). The number of tumors in the urinary bladder on low dose scans was almost equal to that on routine dose scans in all patients with bladder cancer. The average CTDIvol was 8.07 mGy and 2.61 mGy on routine and low dose scans, and the percentage of the dose reduction with low dose scans was 67.8%.

CONCLUSION
The diagnostic ability of low dose scans with AIDR 3D is almost equal to that of routine dose scans with FBP on the EP in CT urography. The dose reduction is nearly 70% using AIDR 3D.

CLINICAL RELEVANCE/APPLICATION
Using AIDR 3D, we can perform nearly 70% dose reduction without worsening the diagnostic ability for the detection of bladder cancer on the excretory phase in CT urography.

GUS131
MRI Features of Non-palpable Leydigiomas of the Testis (Station #6)

Valeria Vinci MD (Presenter): Nothing to Disclose, Lucia Manganaro MD: Nothing to Disclose, Matteo Saldari MD, PhD: Nothing to Disclose, Silvia Bernardo MD: Nothing to Disclose, Andrea Isidori: Nothing to Disclose, Carlo Catalanino MD: Nothing to Disclose, Paolo Sollazzo MD: Nothing to Disclose

PURPOSE
This study aimed to summarize an important finding we experienced in our study regarding the MRI features of leydigomas.
METHOD AND MATERIALS

In 2 years time, we performed around 130 MRI of the testis for suspected testicular lesions found on a previous ultrasound, all patients underwent surgery within one month from MRI. Of these we included in this study 42 cases in which the Histological diagnosis reported Leydigiomas. We evaluated the Radiologists suggestion based on the evaluation of margins, signal intensity on both T1 and T2 w sequences, and contrast enhancement behaviour( on dynamic acquisition).

RESULTS

In 38/42 cases Radiologists had suggested the presence of Leydigiomas, these lesions presented defined margins, very low intensity signal on T2 weighted sequences and iso-hypointense signal on T1 weighted sequences, moreover these lesions were characterized by an hipervascular pattern with high peak at 1st minute (between 20" and 40"). In 4 cases Radiologists had suggested a Seminomatous origin due to the blurred margins and slow enhancement peak. We achieved a100% sensibility and a positive predictive value of 90%.

CONCLUSION

This study suggest an increasing role for MRI in the characterization of testicular lesions; thanks to the high sensibility, the Radiologist may help clinicians and surgeons to choose the best therapeutic options in favour of a conservative approach instead of a radical orchiectomy, also in light of fertility context.

CLINICAL RELEVANCE/APPLICATION

MRI examination is validated third level method of imaging in a diagnostic algorithm of the testes, which may help to characterize benign lesions in order to avoid radical orchiectomy in young patients and help clinicians and surgeons to choose the best therapeutic options.

Beauty of the Groin: Functional Anatomy Yields Simple Diagnostic Strategy (Station #7)

Yuka Morita MD (Presenter): Nothing to Disclose, Mitsutomi Ishiyama MD: Nothing to Disclose, Mariko Okura: Nothing to Disclose, Tomoya Nishiyama MD: Nothing to Disclose, Takeshi Wada MD: Nothing to Disclose, Yasuyuki Kurihara MD: Nothing to Disclose, Kazuhiro Hosoya: Nothing to Disclose, Masaki Matsusako MD, PhD: Nothing to Disclose, Tsutomu Nihei: Nothing to Disclose

TEACHING POINTS

1) To illustrate the normal structure of groin region highlighting functional anatomy. 2) To demonstrate easy steps to approach pathologic conditions of the groin region based on functional anatomy. 3) To present clinical cases to achieve a comprehensive radiologic understanding of groin region.

TABLE OF CONTENTS/OUTLINE

I. Key structures of the groin region and clinical functionality How to differentiate inguinal canal, vascular space (lacuna vasorum), and muscular and nerve space (lacuna musculorum)? Let’s brush up our knowledge about key functional anatomy in connection with clinical presentation. II. Pathologic conditions of the groin region; The concise approach to differentiate them based on functional anatomy 1) Inguinal canal: direct/indirect inguinal hernia, hydrocele of the canal of Nuck, epididymitis, spermatoc/round ligament varicocele, hematoma, endometriosis, and neoplasms 2) Vascular space (Lacuna vasorum): femoral hernia, lymphadenopathy, lymphatic malformation, dissection and pseudoaneurysm 3) Muscular and nerve space (Lacuna musculorum): iliopsoas bursitis, abscess, lipoma, ganglion, and neurofibroma In this section, we review pathological conditions of the groin lesion and build up firm understanding of radiologic findings based on functional anatomy.

Case-based Review of Nuclear Medicine: PET/CT Workshop—Cancers of the Abdomen and Pelvis (In Conjunction with SNMMI) (An Interactive Session)

MSCC33

Participants

Shikha Gupta MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the role of PET/CT in the staging and follow up of common gastrointestinal tumors like colon adenocarcinoma. 2) Evaluate the role of PET/CT in gynecologic malignancies. 3) Discuss the importance of PET/CT in determination of early response in gastrointestinal stromal tumors. 4) Discuss the role of PET/CT in evaluation of select renal and prostate malignancies. 5) Be familiar with limitations of PET imaging in evaluating certain conditions like malignant ascites, peritoneal and omental metastasis and the importance of careful evaluation of CT findings in addition to the FDG PET image.

ABSTRACT
PET/CT has increasingly become the modality of choice for initial evaluation and follow up of patients with many gastrointestinal cancers including colorectal, esophageal and gastric cancer, pancreatic adenocarcinoma and hepatobiliary malignancies. Unlike the conventional radiologic modalities, change in FDG uptake can help identify responders even 4 to 5 weeks after chemotherapy for most cancers and much earlier for the gastrointestinal stromal tumors. PET/CT can also aid in the evaluation of indeterminate lesions like lung nodules, hepatic masses and lymph nodes. While the role of FDG PET in renal, prostate and bladder cancer is still being defined, it has a high positive predictive value and can be used for evaluation of lesions seen on other conventional imaging. In gynecological cancers PET/CT is predominantly used for patients with locally advanced disease or suspected recurrence. PET is also being increasingly incorporated into radiotherapy planning for dose delineation and modification according to metabolic activity.

**MSRO36**

**BOOST: Gynecology—Case-based Review (An Interactive Session)**

**Multisession Courses**

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<tr>
<td>RO</td>
<td>Updates in PET/CT Imaging and New Horizons with PET/MRI in Gynecologic Oncology</td>
<td>Lale Kostakoglu MD, MPH</td>
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<td>OI</td>
<td>Advances in Radiation Treatment of Cervical Cancer as a Result of Image Guided Brachytherapy—Case Based Discussion</td>
<td>William Small MD</td>
<td>Speakers Bureau, Carl Zeiss Stiftung</td>
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<td>GU</td>
<td>Re-defining the Role for Surgical Lymph Node Staging in Endometrial Cancer in 2014?</td>
<td>Manjeet Chadha MD</td>
<td>Nothing to Disclose, Ronald K. Potkul MD</td>
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<td>GU</td>
<td>Can Imaging Be Used as a Prognosticator of Disease Outcome?</td>
<td>Nina A. Mayr MD</td>
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**LEARNING OBJECTIVES**

1) Present the multidisciplinary management of gynecologic cancers including surgery, radiation and chemotherapy. 2) Highlight the importance of diagnostic imaging before, during and after treatment. 3) Highlight the importance of imaging in the planning and delivery of radiation.

**ABSTRACT**

The care of patients with gynecologic cancers requires the collaboration of imaging specialists as well as gynecologic and radiation oncologists. Patterns of disease spread and recurrence have tremendous impact on the management of these patients, and diagnostic imaging is key in defining disease at diagnosis and following patients for detection of recurrence after treatment. Image-guided radiation is considered the standard of care for both the planning of external beam and brachytherapy and is key in maximizing the benefits of radiation while minimizing the risks. Case examples of the pivotal impact of imaging and its importance in multidisciplinary care will be highlighted in this session.

**Sub-Events**

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<th>Updates in PET/CT Imaging and New Horizons with PET/MRI in Gynecologic Oncology</th>
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**SSJ10**

**Genitourinary (MR and CT of the Urothelium)**

**Scientific Papers**

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**Participants**

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<td>Moderator</td>
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<td>Speaker</td>
<td>Inpyeong Hwang MD: Nothing to Disclose, Jeong Yeon Cho MD: Nothing to Disclose, Myoung Seok Lee</td>
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PURPOSE

The aim of the present study was to investigate the image quality and feasibility of CT urography with low iodine concentration (240 mg/mL) contrast media and low (80 kVp) tube voltage with iterative reconstruction algorithm.

METHOD AND MATERIALS

This prospective study enrolled 63 patients who underwent CT urography. The subjects were randomized into two arms of excretory phase CT urography protocol; 480 seconds after intravenous injection of 1.5 mL/kg of ioversol with concentration of 240 mg/mL (low-concentration protocol, n = 29) or 350 mg/mL (conventional protocol, n = 26). In low-concentration protocol, tube voltage was reduced to 80 kVp (120 kVp in conventional protocol) to increase attenuation value, and iterative reconstruction algorithm were used to reduce the noise. Two genitourinary radiologists were qualitatively evaluated images with 5-point scale for overall diagnostic acceptability. Mean attenuation, signal to noise ratio (SNR), contrast to noise ratio (CNR) and figure of merit (FOM = CNR^2 / effective dose) were measured at urinary tract. Mean image noise were measured at background tissue. Mann Whitney U test were used to compare quantitatively measured values and qualitative rated scores.

RESULTS

In terms of radiation dose, low-concentration protocol showed significantly lower effective dose (3.4 vs. 5.7 mSv, P < .001). Subjective diagnostic acceptability was significantly lower in low-concentration group (4.1 ± 0.5 vs. 4.5 ± 0.4, P < .001). However, all subjects showed more than standard diagnostic acceptability (score ≥ 3) in each group. Mean image noise showed no significant difference (15.0 vs. 14.3, respectively, P = .243). SNR, CNR and FOM were significantly higher at all segments of urinary tract in low-concentration protocol (P = .004 for CNR of left lower ureter, P = .005 for CNR of urinary bladder, P < .001 for all other values).

CONCLUSION

Image quality of CT urography with 240 mgI/mL iodine content contrast media, 80 kVp tube voltage and iterative reconstruction algorithm were lower than conventional protocol. However, it showed higher CNR and FOM, and its diagnostic acceptability were still maintained above standard quality. Therefore it can be performed for clinical use to reduce total amount of iodine and radiation dose.

CLINICAL RELEVANCE/APPLICATION

Considering risk of contrast-induced nephropathy and radiation, low iodine content contrast media with low tube voltage CT urography might be beneficial.

SSJ10-02

Learning T Staging and Grading of Bladder Tumor with 3.0 T MR: The Combination of T2WI, Dynamic Enhancement and DWI

Yang Wang (Presenter): Nothing to Disclose, Hongqian Guo: Nothing to Disclose, Bin Zhu: Nothing to Disclose

PURPOSE

To evaluate bladder tumors using high-b-value diffusion imaging and compare imaging features to pathological results on 3.0 T MR.

METHOD AND MATERIALS

Approval for the study was obtained from the local institutional review board. 163 consecutive patients were prospectively enrolled. The population included 142 (87.1%) men (mean age, 65.2 years) and 21 (12.9 %) women (mean age, 65.8 years). We evaluated the sensitivity, specificity, positive predictive value (PPV), negative predictive value, and accuracy of DW, DCE and T2-weighted MR images as aids in the identification of bladder tumors, abnormal bladders. A comparison of imaging findings with the results of cystoscopy and histologic examination was subsequently performed by using the McNemar test. A P value of less than .05 was considered to indicate a statistically significant difference.

RESULTS

Specificities obtained by using T2-weighted plus DW images, DCE plus DW images or all three image types together were significantly better than that obtained by using T2-weighted images alone (P = .004, .003 and .001, respectively). Sensitivity obtained by using T2-weighted plus DW images, DCE plus DW images or all three image types together were significantly better than that obtained by using T2-weighted images alone (P = .04, .02 and .003, respectively). The number of Ta with papillary archlike shape on DWI were majority. In contrast, the number of T1 with sessile were majority. The differences in ADC were significant between low-grade and high-grade (P < .01).

CONCLUSION

The method of T2WI, DWI plus DCE images provided useful information for evaluating the T stage in bladder tumors. Some imaging features of bladder tumors to distinguish Ta from T1 bladder tumors were presented.
1. More accurate imaging information could be contributed to the bladder tumors with 3.0T MRI.
2. Some imaging features of bladder tumors to distinguish Ta from T1 bladder tumors were presented.

SSJ10-03

**Multi-parametric MRI Staging of Bladder Urothelial Carcinoma**

Huanjun Wang MD (Presenter): Nothing to Disclose, Yan Guo MD: Nothing to Disclose, Shurong Li: Nothing to Disclose, Jian Guan MD: Nothing to Disclose, Xiaoling Zhang: Nothing to Disclose, Mingjuan Liu MMEd: Nothing to Disclose

**PURPOSE**

To determine an optimal multi-parametric MRI protocol for preoperative staging of bladder urothelial carcinoma.

**METHOD AND MATERIALS**

The study was approved by the institutional ethics committee and informed consent was obtained from all patients. Enrollment requirement: patients with suspected or confirmed urothelial bladder cancer and no renal function impairment. Exclusion criteria: patients without histopathologic confirmation and tumors smaller than 1cm. Thirty-nine patients underwent conventional, diffusion-weighted (DW) and dynamic contrast-enhanced (DCE) MRI within one week before surgery. Three image sets of T2WI and DW-MRI, T2WI and DCE-MRI, and T2WI and DCE-MRI and DW-MRI were independently interpreted by two readers at 2-week intervals. Diagnostic efficacy of detrusor muscle invasion by cancer was compared among the three image sets. The apparent diffused coefficient (ADC) values were correlated with histopathologic grading.

**RESULTS**

54 urothelial carcinomas (36 T1, 13 T2, 1 T3 and 4 T4 stages) in 33 patients were analyzed. Receiver operating characteristic (ROC) curves were plotted for both readers to compare the diagnostic efficacy of the three image sets for detrusor muscle invasion and the area under the ROC curve were compared using Bonferroni test. The ADC values of 11 high-grade carcinomas were significantly lower than those of 20 low-grade carcinomas. Using the cutoff ADC value of 0.899 x10-3 mm2/s, the sensitivity and specificity for differentiating high- and low-grade bladder urothelial carcinoma were 100% and 95%, respectively.

**CONCLUSION**

Multi-parametric MRI with T2WI, DW-MRI and DCE-MRI is the optimal imaging protocol for preoperative staging of bladder urothelial carcinoma. The ADC of low-grade tumor is significantly higher than that of high-grade bladder malignancy with 100% sensitivity and 95% specificity at cutoff ADC value of 0.899 mm²/s.

SSJ10-04

**MDCT Urography in Detecting Recurrence after Transurethral Resection of Bladder Cancer: Comparison of Nephrographic Phase with Pyelographic Phase**

See Hyung Kim: Nothing to Disclose, Yujin Yeo (Presenter): Nothing to Disclose

**PURPOSE**

We prospectively compare nephrographic phase (NP) MDCT urography using oral hydration and a diuretic with the standard pyelographic phase (PP) for detecting recurrence after transurethral resection (TUR).

**METHOD AND MATERIALS**

We included 140 MDCT urography examinations in 121 patients (87 men and 34 women; range, 46-88 years) who had a risk for recurrence of urinary tract. MDCT urography after contrast injection was performed at 60 seconds NP and 420 seconds PP. Two radiologists independently recorded recurred lesion for each phase. Standard of reference was obtained from histology and prospective clinical decision. Distention and opacification were compared for each radiologist in each segment in each phase by kappa and Spearman rank coefficients. Generalized estimating equations for logistic regression were used to compare performance in each radiologist and phase, and adjusted for possibility within patient correlation.

**RESULTS**

Urinary tract distention was rated significantly better at the PP for all segments (P < 0.001). The degree of pacification provided by each radiologist for the same segment showed high correlation. There were 59 bladder and 19 upper tract recurrences in 38 and 13 patients. For recurrence detection in bladder, the overall accuracy was significantly higher the NP than the PP [91.9% (354/386) vs. 83.2% (321/386), P = 0.038]. For recurrence detection in upper tract, the overall accuracy was significantly higher the NP than the PP [86.7% (260/300) vs. 80.2% (240/300), P = 0.028].

**CONCLUSION**

NP MDCT urography has higher detection in recurrence than the PP, which suggests indispensable use for evaluating the urinary tract after TUR.
It is impractical to perform follow-up cystoscopy or ureteroscopy on all the patients after TUR. NP with sufficient distention perhaps could be of help to use invasive modality properly and to reduce the number of studies needed to diagnose recurrence.

Can Nephrographic Dual-energy CTU Replace Three-phase CTU?

Byung Kwan Park MD (Presenter): Nothing to Disclose, Jung Jae Park MD: Nothing to Disclose, E-Ryung Choi MD: Nothing to Disclose

PURPOSE

To retrospectively evaluate nephrographic dual energy CT (DECT) with virtual non-contrast CT (VNCT) compared to three-phase CT urography (CTU) in patients with hematuria.

METHOD AND MATERIALS

A total of 296 consecutive patients (167 men and 129 women; mean age, 57.9±13.5 years) received three-phase (120 kvp non-contrast and 140/80 kvp nephrographic and excretory) CTU using DECT technique due to hematuria between September 2009 and August 2012. Two genitourinary radiologists independently evaluated three-phase CTU scans first and then, nephrographic DECT with VNCT. Sensitivity, specificity, and accuracy on three-phase CTU and nephrographic DECT were calculated and compared for detecting urothelial tumor. Stone detection rate and dose-length product (DLP) were compared between VNCT and three-phase CTU. Standard reference of urothelial tumor was biopsy or surgery and that of stone was 120 kvp unenhanced CT. DLP was automatically recorded on the patient protocol of each CT scan. McNemar test and paired t-test were used between DECT or VNCT and three-phase CTU for statistical analysis.

RESULTS

Of 296 patients, 27 tumors in 20 patients were pathologically confirmed. On three-phase CTU, 26 tumors in 19 patients and 148 stones in 64 patients were detected. On nephrographic DECT with VNCT, 24 tumors in 19 patients and 108 stones in 56 patients were detected. Sensitivity, specificity, and accuracy for tumor on three-phase CTU were 95% (19/20), 98.9% (273/276), and 98.6% (292/296); those on nephrographic DECT were 95% (19/20), 98.2% (271/276), and 98% (290/296), respectively (p>0.1). A total of 148 stones were detected on 120 kvp unenhanced CT. On VNCT images obtained from nephrographic DECT scan, 108 (73%) stones were detected, respectively. On VNCT from nephrographic DECT, mean sizes of detected and undetected stones were 5.0±3.5 mm and 1.5±0.5 mm, respectively (p<0.0001). Mean DLP of nephrographic (410±98 mGy•cm) was significantly lower than that (1076±248 mGy•cm) of three-phase CTU (p<0.0001).

CONCLUSION

Nephrographic DECT has potential to replace three-phase CTU for detection of urothelial tumor using much lower radiation dose. However, this single-phase DECT can miss a significant number of small stones that are detected on 120 kvp unenhanced CT.

Can Diffusion Weighted MRI including ADC Values Predict the Response of Bladder Tumor to the Chemo-radiotherapy?

Mohamed Abou El-Ghar MSc, MD (Presenter): Nothing to Disclose, Huda Refaie MD: Nothing to Disclose, KHALED ZAKY SHEIR MD: Nothing to Disclose, Abdallah Abdelhamid Abdelaziz MBCh: Nothing to Disclose, Hashim Mohamed Farg MBCh: Nothing to Disclose, Tarek A. El-Diasty MBCh, MD: Nothing to Disclose

PURPOSE

To evaluate the role of diffusion weighted (DW) MRI in prediction of bladder tumor response to chemo-radiotherapy.

METHOD AND MATERIALS

The study included 38 patients with fifty bladder tumors under follow up during chemo-radiotherapy for bladder tumor. The patients were followed up to 4 years and the tumor response including changes in the size after the chemo-radiotherapy. All of our patients underwent MRI before and after management, the restricted diffusion and the ADC values were calculated at every study.

RESULTS

Among our patients; the group treated with chemo-radiotherapy showed good response in 25 masses with tumor size reduction or resolution of the tumor, while in the other 25 masses there were no or increase in the tumor size with no statistical difference in the pretreatment ADC values between both groups but diffusion can detect the presence or absence of tumor after treatment with high sensitivity and specificity in comparison to cystoscopy. The range and mean and standard deviations of the ADC values (x10-6 mm2/sec) in the masses respond to chemo-radiotherapy were 102-1360 [549+436], and for the other group that not respond to the chemo-radiotherapy were 103-970 [394+352], p=0.425. In the patients group who respond to...
chemo-radiotherapy there were significant decrease in the ADC value of the mass from the pretreatment values, its range and [mean and standard deviations] of the ADC values (×10⁻⁶ mm²/sec) were 111-1730 [1791 + 2579] and p=0.009.

CONCLUSION
The pretreatment DWI with ADC map can't predict the response to chemo-radiotherapy but can detect the residual lesions accurately also there is increase in the post-treatment ADC values in cases respond to chemo-radiotherapy in comparison to the pretreatment values.

CLINICAL RELEVANCE/APPLICATION
bladder tumor is a common problem in egypt and we use a DWI as a fast study to predict tumor response to chemo-radiotherapy and to evaluate the the changes of ADC in case of tumor response to the chemo-radiotherapy

SSJ11
ISP: Genitourinary (Male Pelvis with Lymph Node Characterization)

Scientific Papers

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AMA PRA Category 1 Credits ™: 1.00
ARRT Category A+ Credit: 1.00
Tue, Dec 2 3:00 PM - 4:00 PM  Location: E353B

Participants
Moderator
Mukesh Gobind Harisinghani MD : Nothing to Disclose
Moderator
Andrew D. Hardie MD : Nothing to Disclose

SSJ11-01  Functional MRI to Detect Metastases in Normal-sized Pelvic Lymph Nodes: Which Technique Is the Best?
Harriet Carolina Thoeny MD (Presenter): Nothing to Disclose, Maria Triantafyllou : Nothing to Disclose, Giuseppe Petralia MD : Nothing to Disclose, Johannes M. Froehlich PhD : Consultant, Guerbet SA

PURPOSE
To prospectively compare the diagnostic performance of 3 functional MRI methods (ultrasmall superparamagnetic particles of iron oxide-enhanced MRI (USPIO); diffusion-weighted MRI (DWI); combined USPIO / DWI (USPIO-DWI)) to detect pelvic lymph node (LN) metastases in normal-sized nodes.

METHOD AND MATERIALS
A consecutive series of 75 pts with bladder (n=19), prostate cancer (n=48) or both (n=8) and normal-sized LNs on crosssectional imaging underwent two separate MRI exams of the pelvis at 3T after written informed consent. Imaging included T1-and T2-w 3D-sequences with isotropic voxels of 0.75/1 mm³, respectively and transverse DWI of the entire pelvis (3b-values: 0,500,1000sec/mm²). After the first MRI USPIO (2.6mg Fe/kg bw) was administered i.v. followed by a second MRI with the identical protocol 24-36 hrs thereafter. All pts underwent template lymphadenectomy. Image analysis was performed by 3 different independent readers separately for all 3 functional methods. Results of the mean diagnostic performance were reported on a per patient basis for each method separately and correlated to histopathology.

RESULTS
A total of 2993 LNs were resected and 54 metastatic LNs were detected in 20/75 pts (26.7%) on histopathology. On a per patient level the readings of each of the 3 methods yielded the following mean diagnostic results: sensitivity: USPIO= 58.5%, DWI=78.9%, USPIO-DWI= 70.0%; specificity: USPIO=83%, DWI=81.5%, USPIO-DWI=94%; PPV: USPIO=58%, DWI=58.9%, USPIO-DWI=80.8%; NPV: USPIO=84.4%, DWI=92.1%, USPIO-DWI=89.6%; diagnostic accuracies: USPIO=76.4%, DWI=80.9%, USPIO-DWI=87.6%, respectively. The vast majority of the missed metastases had a short axis diameter < 5mm on histopathology. The false positive LNs attributed on USPIO and DWI were mainly due to fibrosis, lipomatosis or histiocytosis.

CONCLUSION
DWI allows detection of LN metastases in normal-sized LNs without contrast medium administration in a high number of pts. USPIO-DWI further decreases the number of false positive LNs and facilitates reading, however needs contrast medium at the expense of higher costs and invasiveness. USPIO alone is inferior and is therefore not recommended.

CLINICAL RELEVANCE/APPLICATION
Improvement of LN staging in normal sized LNs would allow to omit extended pelvic LN dissection in case of
negative findings. It would allow to guide the surgeon in case of suspicious LNs or change treatment to adjuvant chemotherapy or hormonal therapy instead of surgery alone.

**SSJ11-03** Characterization of Lymph Node Metastases Using Diffusion-weighted MRI in Cases of Bladder Cancer

Mohamed Abou El-Ghar MSc, MD (Presenter): Nothing to Disclose, Ahmed Adel Mansour BMedSc: Nothing to Disclose, Huda Refaie MD: Nothing to Disclose, Tarek A. El-Diasty MBBCCh, MD: Nothing to Disclose

**PURPOSE**

To assess the utility of Diffusion weighted MRI (DWI) including apparent diffusion coefficient (ADC) for distinguishing lymph nodes harboring metastatic disease in bladder cancer patients.

**METHOD AND MATERIALS**

The study cohort included 138 patients who underwent MRI with diffusion weighted imaging prior to radical cystectomy between April 2012 and May 2013. ADC values were measured in a circular region of interest where lymph node enlargement was found. Two radiologists blinded to the pathologic outcome interpreted the DW images. All patients underwent radical cystectomy with bilateral extended lymphadenectomy extending above the bifurcation of the common iliac vessels. Anatomical mapping of the removed lymph nodes was performed intraoperatively and the nodes were sent in separate packages for pathological assessment. Qualitative analysis of lymph nodes ans the ADC values obtained from the enlarged lymph nodes were then correlated with the final pathological assessment of the resected lymph nodes.

**RESULTS**

One hundred and thirty eight patients were evaluated by DW-MRI. Patients with radiological lymph node enlargement were identified (n=88, 63%), ADC values were calculated in areas of lymph node enlargement in four anatomical regions on each side, namely, common iliac, external iliac, internal iliac and obturator regions. Mean(SD) ADC value was 1.06 (0.2) x10-3 mm2/s. There was a significant difference in ADC values of areas of metastatic lymph nodes and areas of negative node involvement (p=0.0012). ROC analysis identified an optimal ADC threshold of 1.25 x10-3 mm2/s for identifying the presence or absence of metastatic disease. Qualitative analysis shows no difference between metastastic and non-metastastic lymph nodes.

**CONCLUSION**

Our results suggests that DW-MRI ADC values correlate with the presence of metastatic disease in patients with bladder cancer and radiologically enlarged lymph nodes. Qualitative analysis shows fluid restriction in both metastatic and non metastatic nodes.

**CLINICAL RELEVANCE/APPLICATION**

ADC values can differentiate enlarged lymph nodes with tumor metastases from that without metastases in cases of bladder cancer.

**SSJ11-04** Pilot Study to Evaluate the Use of Full-body MRI for Tumor Detection in Asymptomatic Subjects with Succinate Dehydrogenase B (SDHB) Gene Mutations

Mark Alan Rosen MD, PhD (Presenter): Nothing to Disclose, Katherine Nathanson: Nothing to Disclose, Lauren Fishbein: Nothing to Disclose, Laurie A. Loevner MD: Nothing to Disclose, Shana Merrill: Nothing to Disclose, Debbie Cohen: Nothing to Disclose

**PURPOSE**

To evaluate the potential for rapid full-body MRI to identify occult tumors in asymptomatic subjects with SDHB gene mutations, a population at risk for pheochromocytoma/paraganglioma (PCC-PGL).

**METHOD AND MATERIALS**

Asymptomatic and previously unaffected SDHB gene mutation carriers underwent full-body MRI scanning of the neck, chest, abdomen, and pelvis (NCAP) using a modified rapid full body imaging sequence. Scanning was performed on a 1.5 Tesla imaging unit (Espree®, Siemens, Erlangen, GE) equipped with continuous table movement (CTM) software for rapid large volume imaging. Imaging included four axial sequences (T2 HASTE, T2 HASTE with fat suppression, and T1 DIXON chemical shift imaging before and after gadolinium administration) from the skull base through the pelvis, supplemented with step-table diffusion weighted imaging. Positive findings were correlated with pathological data.

**RESULTS**

Twenty previously unaffected SDHB carrier subjects underwent a total of 22 whole body MRI examinations. Single solid masses were identified in 6 subjects, for an overall positive screen rate of 6/22, or 27%. In 5/6 positive cases (PPV=83%), pathology confirmed presence of a paraganglioma (N=3) or another clinically significant tumor (N=2). Two retroperitoneal paraganglioma were identified, 2.3 and 5.4 cm, respectively. The larger lesion demonstrated vascular invasion and increased mitotic activity. One para-urethral paraganglioma (1.5 cm) was also identified. Pathology in the remaining two positive cases included a 2 cm typical carcinoid tumor in the lung and an 8 cm unclassified RCC. In one false positive case, a 1.8 cm retrocrural mass demonstrated indeterminate results on endoscopic FNA.

**CONCLUSION**

Rapid full-body MRI scanning using continuous moving table techniques is feasible as a screening study in
patients at risk for tumors in various locations. Application to an asymptomatic population of SDHB mutation carriers can readily demonstrate clinically significant tumors.

**CLINICAL RELEVANCE/APPLICATION**

Rapid full-body MRI allows for clinical evaluation of the neck, chest, abdomen, and pelvis and demonstrates clinically relevant findings in a high percentage of SDHB mutation carriers.

**SSJ11-05**

**Can Radiologists Prevent Unnecessary Orchiectomies? Role of Multiparametric Ultrasonography in Facilitating Testis - Sparing Surgery**

Dean Yi-Hsiang Huang MBBS, FRCP (Presenter): Nothing to Disclose , Eleni Konstantatou MD, MSc: Nothing to Disclose , Robert John Eckersley PhD: Nothing to Disclose , Maria E. Sellars MD, FRCP: Nothing to Disclose , Paul Singh Sidhu MRCP, FRCP: Speaker, Bracco Group Speaker, Siemens AG Speaker, Hitachi, Ltd

**PURPOSE**

The availability of scrotal ultrasonography has led to an increasing number of incidentally detected intra-testicular lesions, resulting in a number of unnecessary orchidectomies. Testis-sparing surgery (TSS) is the preferred option when there is a possibility of a benign lesion. We aim to evaluate the role of pre-operative multiparametric ultrasonography (MP-US), which include gray-scale and color Doppler sonography combined with contrast-enhanced ultrasound (CEUS) and real time elastography RTE), in facilitating case selection for patient selection for testis - sparing surgery.

**METHOD AND MATERIALS**

Consecutive patients undergoing surgery for testicular lesions between 2010 and 2013 were studied. All lesions were assessed with MP-US pre-operatively and consensus imaging and clinical assessments were made at a multi-disciplinary meeting for suitability for TSS. Patient demographics, tumour characteristics and histological outcomes were recorded. Oncological outcome in the TSS group was assessed with follow-up ultrasound.

**RESULTS**

51 patients who had either orchidectomy or TSS were studied. 12 patients (median 39 years, range 24 - 48) underwent TSS for 13 testicular lesions (median size 6 mm, range 3.3 - 15 mm). 38 patients (median age 40 years, range 19-84) underwent orchidectomy for 38 lesions (median size 20.5 mm, range 7-50). All malignancies were correctly identified pre-operatively on MP-US. Histopathological findings for all 13 lesions selected for TSS confirm no malignant features, with final diagnosis including Leydig cell tumours (6), Epidermoid cysts (2), Sertoli cell tumour (1), sarcomiosis (2), focal testicular atrophy (1) and Leydig cell hyperplasia (1). The sensitivity, specitivity, positive predictive value and negative predictive value of MP-US for a benign lesion suitable for TSS are 96.3%, 92%, 92.86% and 95.8% respectively. Oncological follow-up reveals no disease recurrence in all patients in TSS group at 12 months.

**CONCLUSION**

Our experience suggests that multi-parametric ultrasonography could be a valuable non-invasive investigation to predict benign testicular disease, and improve pre-operative diagnostic confidence to allow testis-sparing surgery to be considered.

**CLINICAL RELEVANCE/APPLICATION**

Multi-parametric ultrasonography could improve pre-operative diagnosis of testicular lesions. Clinicians should be aware of this possibility so unnecessary orchidectomies may be prevented.

**SSJ11-06**

**Diffusion Weighted Imaging of Testicular Tumors – Is there a Value for Differentiation between Benign and Malignant?**

Emina Talakic MD (Presenter): Nothing to Disclose , Sebastian Tschauner : Nothing to Disclose , Helmut Schoellnast MD : Nothing to Disclose , Tillich Manfred : Nothing to Disclose

**PURPOSE**

To assess the value of diffusion-weighted imaging (DWI) for differentiation between benign and malignant solid testicular tumors.

**METHOD AND MATERIALS**

This retrospective study was IRB approved and the requirement for patient informed consent was waived. A search of the medical databases 2011 / 2012 yielded 25 patients (mean age ± SD, 48 ± 14 yrs; range, 21-76 yrs) who underwent MRI with DWI of the testes for evaluation of a mass which was detected with ultrasound. The mean apparent diffusion coefficient (ADC) and the standard deviation (SD) of the ADC were recorded for each tumor using ROI measurements to assess both, mean ADC of the tumor and heterogeneity of ADC within the tumor. Histopathology or clinical follow-up was used to define the definitive diagnosis. The K-S test and the unpaired t-test were used to assess normal distribution of the values and to compare differences in mean ADC and mean SD of ADC between benign and malignant tumors. A p-value <.05 was considered statistically significant.

**RESULTS**

Histopathology revealed malignancy in 8 tumors and no evidence of malignancy in 4 tumors. In the remaining 13 tumors, malignancy was ruled out by clinical and imaging follow-up. The mean ADC of benign tumors was
CONCLUSION

Benign and malignant testicular tumors showed similar mean ADC values and SD of ADC values indicating comparable cell density and tissue homogeneities between the tumors. Therefore, DWI may not enable differentiation between benign and malignant testicular tumors.

CLINICAL RELEVANCE/APPLICATION

'Diffusion-weighted (DW) MR imaging is a technique proved to improve tissue characterization and could be used in the detection and characterization of testicular tumors.'
Hypoxia Modification during Prostate Radiotherapy. An Evaluation of Changes in the Tumor Microenvironment Using Multi-parametric MRI (mpMRI)

Kent Yip, MRCP, FRCR (Presenter): Nothing to Disclose, Juliette Valentine, MSc: Nothing to Disclose, James Stirling: Nothing to Disclose, Ian Simcock: Nothing to Disclose, N. Jane Taylor, PhD: Nothing to Disclose, David John Collins, BSc, BA: Nothing to Disclose, Andrew Gogbashian, MD, FRCR: Nothing to Disclose, Peter Hoskin: Nothing to Disclose, Uma Patil: Nothing to Disclose, Andrew Gogbashian, MD, FRCR: Nothing to Disclose, Anwar Rashanalii Padhani, MD: Advisory Board, Acuitas Medical Ltd Advisory Board, Siemens AG Speakers Bureau, Siemens AG Researcher, Siemens AG Speakers Bureau, Johnson & Johnson, Roberto Alonzi, MD: Nothing to Disclose

**PURPOSE**

Hypoxia correction improves survival in patients treated with radiotherapy (RT) for some cancers. Previous studies have shown the presence of hypoxia in untreated prostate cancer (PCa) and hypoxia resolution following carbogen breathing. Androgen deprivation therapy (ADT) is normally given prior to RT. Because ADT is anti-angiogenic, its not known whether the use of carbogen gas will still be effective in correcting hypoxia post ADT. This study has assessed this during hypoxia modified RT.

**METHOD AND MATERIALS**

50 men with high risk PCa took part in a phase II trial of prostate RT with hypoxia modification using carbogen gas and nicotinamide. 20 men also underwent serial mpMRI examination. 6 scans were carried out: 1st immediately prior to ADT (3 months pre RT); 2nd and 3rd (reproducibility pair) 1 week pre RT and 3 months into ADT; 4th, 5th and 6th at weeks 1, 3 and 7 of RT. The following sequences were carried out: T2-weighted; Dynamic Contrast Enhanced MRI; Intrinsic Susceptibility Contrast MRI; Diffusion Weighted MRI. Tumors were identified and outlined on the T2W and DW-MRI images on each scan for every time point. Voxel based calculations were performed to derive Ktrans, IAUGC60 and R2*. The extended Tofts' Model was used for data fitting to calculate Ktrans. Percentage change in R2* compared to baseline values for each day was calculated.

**RESULTS**

The changes in all the parameters are presented in table 1. Basal tumor R2* increased by 17% after 3 months of ADT compared to baseline. Carbogen administration caused a drop in delta R2* at all time points, by as much as 10%. Whole prostate Ktrans and IAUGC60 reduced after 3 months of ADT and then recovered during RT.

**CONCLUSION**

Reductions in blood flow and worsening in tumor hypoxia were seen after the 3 months of ADT. Despite this, tumors remained responsive to carbogen. The increase in blood supply during RT may explain the preservation of response to hypoxic modification.

**CLINICAL RELEVANCE/APPLICATION**

The strategy of using carbogen to overcome intra-tumoral hypoxia remains valid for prostate cancer even with the prior use of ADT. Phase III testing of this hypoxia modification strategy can proceed, provided acceptable toxicity is confirmed in this phase II trial.

Edelfosine Sensitizes Androgen Deprived Prostate Tumor Growth by Modulating ATF3 and Inhibiting Androgen Receptor Activity

Thirupandiyur Udayakumar (Presenter): Nothing to Disclose

**ABSTRACT**

**Purpose/Objectives:** Edelfosine is a synthetic alkyl-lysophospholipid and has been shown to possess significant antitumor activity in several human tumor models. Here, we investigated the effects of edelfosine combined with androgen deprivation (AD) in androgen sensitive prostate cancer cells (LNCaP and VCaP). Materials/Methods: LNCaP and VCaP cells were grown for 3 days in respective medium. AD was achieved by culturing in medium containing 10% charcoal-stripped serum. Cell proliferation was examined using a real-time cell monitoring system. Apoptosis was measured by Annexin-V and caspase-3/7 activity.
assays. Reporter gene assays and transfections were performed for measuring PSA and androgen receptor response element (ARE) luciferase activity. Western analyses, TUNEL and immunohistochemistry were carried out on tumor samples. For in vivo studies, male athymic nude mice with orthotopic LNCaP tumors were androgen deprived by bilateral orchietomy. These mice were then treated with edelfosine by oral gavage. Tumor volume (TV), and serum PSA levels were obtained weekly after treatments.

**Results:** Treatment of androgen sensitive cells in vitro with AD combined with edelfosine resulted in higher antiproliferative activity and apoptosis, as compared to edelfosine or AD alone. AD combined with Edelfosine resulted in a dose-dependent decrease in pAKT, while not effecting the expression of total AKT. Furthermore, edelfosine treatment inhibited AKT mediated phosphorylation of the androgen receptor (AR-Ser213-210) and was associated with an increase in ATF3 protein expression, a stress response gene and a negative regulator of AR signaling. Co-immunoprecipitation with AR antibody in edelfosine+AD treated LNCaP cell lysates confirmed the interaction between AR and ATF3. ATF3 binds to AR after AD+edelfosine treatment and represses the transcriptional activation of AR that was shown here by PSA promoter studies, where edelfosine or overexpression of ATF3 inhibited PSA promoter activity. Knockdown of ATF3 using a siRNA-ATF3 reversed the inhibition of PSA promoter activity by AD+edelfosine, suggesting that the growth inhibition effect of edelfosine was ATF3 dependent. Further, in vivo LNCap experiments showed significant reductions in TV (TV=15±6mm3) and PSA (2±1ng/ml) after edelfosine+AD, compared to edelfosine (TV=19±2mm3; PSA=39±12ng/ml) or AD alone (TV=112±52mm3; PSA=30±12ng/ml) alone.

**Conclusions:** Here we report for the first time that AKT and ATF3 are involved in Edelfosine mediated apoptosis. Edelfosine is a promising agent for enhancing the inhibitory effect of AD on androgen sensitive cells for a range of patients, from those without metastasis and intermediate to high risk features to those with metastasis.

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**Participants**

**Moderator**
- Alex Towbin, MD: Author, Amirsys Inc Shareholder, Merge Healthcare Incorporated Consultant, Guerbet SA
- Robert Orth, MD, PhD: Grant, Toshiba Corporation Research support, General Electric Company

**Sub-Events**

**VSPD32-01 Imaging of Diffuse Liver Disease**

Prakash Mohan Masand, MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Learn about the various modalities available for the evaluation of diffuse liver disease in children. The emphasis of the talk will be on MRI techniques like Diffusion weighted imaging, MR spectroscopy and MR elastography in diffuse hepatic pathology. The three F’s of fat, fibrosis and iron (Fe) will be tackled in terms of diagnosis, and quantification. These will be reviewed via case examples. Also, a thorough review of the existing literature will be presented during the course of the talk.

**ABSTRACT**

Diffuse liver pathology in children has traditionally been evaluated using ultrasound (US) and CT scan. US is relatively operator dependent and lacks from an inability to quantify. CT carries the inherent disadvantage of ionizing radiation, which is detrimental for pediatric use, especially since it cannot be used as a follow-up tool. The superior tissue contrast with MRI and benefit of lesion characterization in the setting of diffuse liver disease has made it an attractive first line modality. Apart from diagnosis, the ability to quantify iron, fat and fibrosis has made it extremely useful in clinical practice. MR applications like diffusion weighted imaging, spectroscopy and elastography has generated immense interest in the field of pediatric diffuse liver disease. Recent research and early clinical data holds great promise for the future in this regard.

**VSPD32-02 Normal Range of Hepatic Fat Fraction in Dual- and Triple-echo Fat Quantification MR in Healthy Children**

Hyun Joo Shin, MD (Presenter): Nothing to Disclose, Hyun Ki Kim, MD: Nothing to Disclose, Myung-Joon Kim, MD: Nothing to Disclose, Hong Koh: Nothing to Disclose, Mi-Jung Lee, MD, PhD: Nothing to Disclose

**PURPOSE**

Measurement of hepatic fat fraction (%) using dual- and triple-echo gradient-recalled-echo sequences is an easy way to evaluate fatty liver even in children. However, the normal range of hepatic fat fraction on these sequences in children is not known yet. The purpose of this study was to evaluate normal range of hepatic fat fraction on these sequences in healthy children.

**METHOD AND MATERIALS**

We retrospectively reviewed children who visited our medical check-up clinic for last two years. Age, sex, height, weight, body mass index, and laboratory findings including liver function tests, cholesterol, and
triglyceride level were reviewed. Hepatic fat fraction (%) was measured on the dual- and triple-echo gradient-recalled-echo sequences of our routine check-up MR protocol performed at 3T. We excluded children with abnormal laboratory findings or overweight (body mass index more than 25 kg/m²). Paired t-test was used to compare dual and triple fat fraction. Pearson’s chi-squared test was used to evaluate the correlation between fat fraction and clinical or laboratory findings.

RESULTS
Among the total 72 children visited our clinic during the study period, 18 were excluded due to the abnormal laboratory findings or overweight. The enrolled 54 children (M:F = 26:28) were 5-15 years old with a mean of 9 years. Dual fat fraction (range 0.1-8.0%, mean 2.3 ± 2.0 %) was lower than triple fat fraction (range 0.4-6.5%, mean 2.9 ± 1.4 %) (p=0.006). Eight children (8/54, 15%) on dual and six children (6/54, 11%) on triple-echo sequences showed more than 5% fat fraction. In the correlation analysis, only dual fat fraction and triglyceride level was correlated significantly (Pearson’s correlation coefficient 0.314, p=0.021).

CONCLUSION
The upper limit of normal hepatic fat fraction was 8% on dual- and 6.5% on triple-echo sequences. Dual fat fraction was lower than triple fat fraction and correlated with triglyceride level in healthy children.

CLINICAL RELEVANCE/APPLICATION
Knowing normal range of hepatic fat fraction using dual- and triple-echo gradient-recalled-echo sequences of MRI is important for accurate diagnosis of fatty liver in children.

Preliminary Assessment of a Hi SNR mMRI Sequence for Use in Determination of Low Hepatic Proton Density Fat Fraction (PDFF) in Children

PURPOSE
Low signal-to-noise (SNR) could interfere with hepatic fat assessment by magnitude-based MRI (mMRI). The purpose of this study was to assess in children the accuracy of a high-SNR (Hi-SNR) mMRI sequence to determine hepatic proton density fat fraction (PDFF), at PDFF values less than ten percent.

METHOD AND MATERIALS
In this prospective, single-site, IRB approved, HIPAA compliant study, a Hi-SNR variant of an mMRI sequence was developed by increasing slice thickness from 8 to 10 mm, and decreasing matrix from 224x128 to 128x92. Pediatric subjects with known or suspected non-alcoholic fatty liver disease (NAFLD) were recruited, provided written informed consent, and underwent 3T MR examinations including mMRI and an advanced multi-TR-TE magnetic resonance spectroscopy (MRS) sequence capable of measuring T1 of water and fat as well as PDFF. The mMRI PDFF values used in this study are the means of three circular 1-cm radius regions of interest (ROIs) placed on source mMRIs co-localized to the MRS voxel location, one slice above that location, and one slice below that location. Linear regression models were used to assess accuracy of MRI-estimated PDFF for the three ROI locations, using multi TR-TE MRS PDFF as reference.

RESULTS
Standard and Hi-SNR mMRI, and multi-TR-TE MRS (to measure PDFF and T1) were obtained for 19 children (13 male, 6 female, age 11.8 ± 2.5 years). Regression analysis of Hi SNR mMRI using multi-TR-TE MRS had a slope, y-intercept and R2 value, respectively, of 0.960, 1.216% and 0.993 for all 19 subjects; and 1.185, 0.602% and 0.822 for the 13 subjects with PDFF less than ten percent. Those values for standard mMRI were 0.987, 0.738% and 0.990 for all 19 subjects; and 1.139, 0.240% and 0.691 for the 13 subjects with PDFF less than ten percent.

CONCLUSION
In children with known or suspected NAFLD, correlation of Hi-SNR MRI PDFF with MRS was similar, or slightly improved compared to that for mMRI, for PDFF values less than ten percent.

CLINICAL RELEVANCE/APPLICATION
PDFF estimation using a high SNR mMRI variant sequence in children is feasible, and may be helpful if future research suggests that low SNR affects accuracy.

Diagnosis of Liver Rejection by Acoustic Radiation Force Impulse in Pediatric Liver Transplant Patients

VSPD32-04
Acoustic radiation force impulse (ARFI) imaging has been developed as a new non-invasive ultrasound-based elastography modality to investigate liver stiffness using shear wave velocity (SWV). The aim of this study was to evaluate the role of ARFI imaging for assessing episodes of liver dysfunction (rejection, hepatitis, cholangitis and fibrosis) during the post-operative course after pediatric LT.

**METHOD AND MATERIALS**

ARFI was performed using an US device (Acuson S2000, Siemens Medical Solutions) equipped with a 4-MHz transducer. SWV by ARFI imaging was performed in 59 pediatric LT recipients (median 6 month after transplantation). Liver transplantation was performed with a full liver graft in 15 cases (25%) and with a split liver (segments II-III) in 44 (75%). SWV was measured ten times to quantify hepatic stiffness. Liver biopsy and laboratory analysis (including aminotransferases, alkaline phosphatases, albumin and bilirubin) were performed in a range of time from one day to one month from the ARFI imaging. SWV was compared to biochemical parameters using liver biopsy as reference standard. Data were evaluated retrospectively.

**RESULTS**

During the study period ARFI was performed 138 times. According to histopathology there were 15 rejections, 29 hepatitis episodes, 12 cholangitis episodes. Median SWV (m/s, IQR) was higher in patients with diagnosis of graft rejection than in patients without liver disease [2.03, 1.67-2.44, vs 1.22, 1.09-1.31, p < 0.01]. Median SWVs in patients with hepatitis and cholangitis were respectively 1.80, (IQR = 1.49-2.06) and 2.07 (IQR = 1.91-2.48). A few patients had fibrosis with a median SWV of 1.67 m/s. At ROC curve analysis ARFI resulted able to predict rejection (AUC = 0.932), hepatitis (AUC = 0.916) and cholangitis (AUC = 0.949). Statistical analysis wasn’t reliable for fibrosis (n = 4).

**CONCLUSION**

SWV obtained by ARFI predicts the diagnosis of rejection, hepatitis and cholangitis in pediatric liver transplantation independently to biochemical markers. ARFI could be useful to reduce the number of liver biopsy in order to guide the immunosuppressive therapy.

**CLINICAL RELEVANCE/APPLICATION**

ARFI, together with serological markers, is an efficient modality for the diagnosis of graft dysfunction allowing the reduction in the number of liver biopsies in pediatric patients after LT.

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**VSPD32-05**

**Acoustic Radiation Force Impulse (ARFI) Quantification for Assessing the Severity of Liver Fibrosis in Patients with Biliary Atresia before Kasai Surgery: Comparison with Liver Fibrosis Biopsy Pathology**

Mei Wei : Nothing to Disclose, Yaqing Chen PhD (Presenter): Nothing to Disclose, Jing Fang: Nothing to Disclose, xiaoyin wang: Nothing to Disclose

**PURPOSE**

To assess liver fibrosis severity with acoustic radiation force impulse (ARFI) quantification in biliary atresia(BA) patients before Kasai surgery.

**METHOD AND MATERIALS**

Patients with conjugated hyperbilirubinemia of unknown causes were prospectively evaluated. BA was diagnosed with laparotomy and cholangiography, liver biopsy was performed in the process of operation. Subjects without hepatobiliary diseases were recruited at the same period as controls. The pSWE with ARFI(Acuson S2000, Virtual Touch Tissue Quantification mode) was performed on all subjects before surgery and ARFI values were calculated in BA patients and control group. The difference between the two groups was statistical analyzed.

**RESULTS**

There were 27 BA patients and 20 controls in total. The ARFI values in patients were significantly faster than controls(P<0.001). Median and mean values of ARFI according to liver fibrosis stages in BA patients were 1.16, 1.16m/s(F0), 1.70, 1.69m/s(F1), 1.67, 1.70m/s(F2), 2.21, 2.14m/s(F3) and 2.71, 2.65m/s(F4), respectively. In control group, median and mean values of ARFI were 1.11 and 1.13m/s, respectively. The correlation between ARFI and fibrosis stages was analyzed with spearman correlation coefficient, and r=0.757(P<0.001).

**CONCLUSION**

ARFI could reflect the liver fibrosis, and had good correlation with liver fibrosis stages in BA patients. It may become noninvasive method to predict the prognosis and determine the treatment in the future.

**CLINICAL RELEVANCE/APPLICATION**
ARFI is a reliable noninvasive method in evaluating the severity of liver fibrosis in BA patients before Kasai surgery.

**VSPD32-06**

**Imaging of Ambiguous Genitalia**

Jeanne S. Chow MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) To understand the imaging findings on prenatal ultrasound which may alert the radiologist to the possibility of DSD, a proposed imaging evaluation for the post natal evaluation of a newborn with DSD, and the most common types of DSD that we encounter in the newborn child.

**Active Handout**


**VSPD32-07**

**CT and MR Enterography**

Alex Towbin MD (Presenter): Author, Amirsys Inc Shareholder, Merge Healthcare Incorporated Consultant, Guerbet SA

**LEARNING OBJECTIVES**

1) Describe the advantages and disadvantages of performing CT and MR enterography in children. 2) Describe the protocol employed to perform CT and MR enterography in children. 3) Describe the most common imaging findings of pediatric inflammatory bowel disease.

**ABSTRACT**

Inflammatory bowel disease (IBD) is a general term used to describe the idiopathic inflammatory disorders of the gastrointestinal tract. The most common types of IBD are Crohn disease and ulcerative colitis. A number of imaging studies can be used to diagnose IBD in the pediatric population. Over the past ten years, CT and MR enterography have become the imaging tests-of-choice due to their image quality, speed of procedure, lack of bowel preparation, and ability to diagnose the extraintestinal complications of IBD. The purpose of this talk is to compare the advantages and disadvantages of CT and MR enterography, describe the unique components of the imaging protocol required to perform CT or MR enterography in children, and describe the common imaging findings of IBD in the pediatric population.

**VSPD32-08**

**Magnetic Resonance Enterography Features of Mucosal Healing in Pediatric Patients with Crohn’s Disease**

Matthew Paul Moy MD (Presenter): Nothing to Disclose, Jess Kaplan MD: Nothing to Disclose, Christopher James Moran MD: Nothing to Disclose, Harland Steven Winter MD: Consultant, PAREXEL International Corporation Consultant, Johnson & Johnson Consultant, Shire plc Consultant, Salix Pharmaceuticals, Inc Institutional Grant support, Johnson & Johnson Institutional Grant support, AstraZeneca PLC Institutional Grant support, Shire plc, Michael Stanley Gee MD, PhD: Nothing to Disclose

**PURPOSE**

We evaluated qualitative and quantitative magnetic resonance enterography (MRE) findings which best correlate with mucosal healing assessed by ileocolonoscopy as a reference standard.

**METHOD AND MATERIALS**

In this IRB-approved, HIPAA-compliant retrospective study, patients 18 years of age or below with Crohn’s disease were identified who underwent two ileocolonoscopy exams to assess disease activity with an MRE closely timed with the second endoscopy. Two pediatric gastroenterologists reviewed the paired endoscopic exams by consensus to assess inflammatory activity as reference. All bowel segments with macroscopic evidence of inflammation on the first endoscopy were included in the study, and were then categorized for the presence or absence of mucosal healing (MH) based on whether macroscopic inflammation was observed on the second endoscopy. An experienced pediatric abdominal radiologist evaluated the corresponding MRE exams of these patients, blinded to the endoscopic results, for multiple imaging features associated with active inflammation. Imaging-endoscopic correlation was then performed.

**RESULTS**

25 patients were included in the study (mean age 17.6 ± 2.8 years) with a mean time between MRE and endoscopy of 12.4 ± 7.3 days. On endoscopy, 38 bowel segments demonstrated MH and 22 segments demonstrated persistent inflammation. Among imaging features, MRI Index of Activity (MaRIA) score <8 (accuracy 85%, sensitivity 89%, specificity 77%) and bowel wall thickness (WT) < 4mm (82%, 87%, 73%) were most strongly associated with MH (P < 0.0001, Fisher’s Exact Test). The average WT in healing segments was 2.7 ± 0.9 mm compared with 5.2 ± 2.2 mm in segments with persistent inflammation (P<0.0001, Student’s t test). Other MRE features significantly (P < 0.005) associated with MH included mesenteric hypervascularity (78%, 97%, 45%), and bowel wall T2 hyperintensity (78%, 92%, 55%).

**CONCLUSION**
MRE is an accurate noninvasive technique for assessing mucosal healing in pediatric patients with Crohn's disease. The MRE features most strongly associated with MH include MaRIA score < 8 and WT < 4 mm.

**CLINICAL RELEVANCE/APPLICATION**

MRE assessment of mucosal healing has great potential in pediatric Crohn's disease as a noninvasive imaging biomarker of disease activity and a therapeutic endpoint of clinical trials.

**VSPD32-09**

**Performance of Diffusion Weighted Sequences in Pediatric Patients with Inflammatory Bowel Diseases (IBD) Evaluated by MR-enterography**

Celine Dubron (Presenter): Nothing to Disclose, Elisa Amzallag-Bellenger MD: Nothing to Disclose, Alain Duhamel: Nothing to Disclose, DOMINIQUE TURCK: Nothing to Disclose, Nathalie Boutry: Nothing to Disclose, Fred E. Avni MD, PhD: Nothing to Disclose

**PURPOSE**

Prospective evaluation of the performances of DWI for the detection of active lesions on MR-enterography in children with IBD.

**METHOD AND MATERIALS**

Sixty five children (mean age 12.9 years (3-18 years), median age 14 years) with suspected or known IBD were examined by MR-enterography (1.5 Tesla magnets Philips - Eindhoven and GE - Milwaukee). Preparation included pre-examination ingestion of a mixture of Mannitol and water. T2 weighted, T1 after Gadolinium injection and diffusion weighted sequences were obtained. All images were reviewed on a PACS system by two radiologists, each blinded to the clinical data and to the conclusion of the second reviewer. The digestive tract was divided into 7 segments. The 2 radiologists were asked to analyze the images obtained and to report on the presence of active lesions defined as bowel thickening observed on T2 sequences associated with contrast enhancement. The radiologists analyzed successively and independently the images obtained by combining T2 and DWI on one site, T2 and T1 + Gadolinium on the other. The latter was considered as the gold-standard. Whenever no agreement was observed, analysis with consensus was obtained. Inter-observers agreement and sensitivity, specificity, PPV and NPV were calculated.

**RESULTS**

The couple « T2 + diffusion » detected 64 lesions in 42 patients whereas the couple "T2 + T1 with Gadolinium" detected 58 lesions in 36 patients. The inter-observer agreement was excellent with a Kappa coefficient of 0.84. Sensitivity, specificity, PPV and NPV for the couple "T2+DWI" for the detection of active lesions of IBD were respectively 100%, 96%, 79% and 100%. The accuracy between the two techniques reached 97%, with Kappa coefficient of 0.86. Seven supplementary lesions were detected by DWI and not by T1+gadolinium. 5/7 had an endoscopic or histologic study confirming active lesions.

**CONCLUSION**

Associated with T2 weighted sequence, DWI have equivalent or probably better performances than T1+gadolinium.

**CLINICAL RELEVANCE/APPLICATION**

Its use would allow to perform shorter examination and obviate the need for gadolinium injection.

**VSPD32-10**

**MR Enterography (MRE) Findings in Pediatric Ulcerative Colitis (PUC) vs Controls: The Added Value of DWI**

Simone Chaudhary BSC, MSc (Presenter): Nothing to Disclose, Jorge Humberto Davila Acosta MD: Nothing to Disclose, David Mack MD: Nothing to Disclose, Ericc Benchimol MD: Nothing to Disclose, Elka Miller MD: Nothing to Disclose

**PURPOSE**

To compare DWI, post-gadolinium enhanced MRI (PGE) and bowel wall thickness (BWT) in active PUC with a group of normal controls on endoscopy.

**METHOD AND MATERIALS**

This is a retrospective study that included newly diagnosed patients with PUC who underwent MRE within 7 days after endoscopy and a group of controls with normal endoscopy findings. Bowel was divided in Cecum (Ce); ascending colon (AC); transverse colon (TC); descending colon (DC); sigmoid colon (SC); and rectum (Re). Terminal ileum was not affected. MRE was performed in a 1.5 T Magnet. Protocol included coronal and axial DWI, b=1000; pre- and post- gadolinium coronal dynamic multiphase and axial LAVA fat saturation. DWI was restricted (DR) if there was high signal intensity on b1000 and corresponding low signal intensity on the ADC map. PGE was positive if there was avid mucosal enhancement in comparison with the small bowel. Endoscopy was positive if ulceration, inflammation or edema were documented. Two readers were blinded to diagnosis and assessed BWT, DR and PGE in each segment. Interclass correlation (ICC) and Linear Mixed Effects Models with Random Intercept (LMMEMRI) were calculated for BWT. Inter-rater reliability (kappa), sensitivity (Se) and specificity (Sp) for DWI and PGE were calculated.

**RESULTS**

Data from 15 patients with PUC and 15 normal controls was analyzed. Kappa values for DWI/PGE were: Ce 0.64/0.76, AC 0.62/0.67, TC 0.71/0.64, DC 0.81/0.49, SC 0.87/0.78 and Re 0.86/0.55. ICC for BWT were Ce 0.22, AC 0.63, TC 0.65, DC 0.40, SC 0.41 and Re 0.59. For reader 1/reader 2: Se of DWI: Ce 91/73%; AC 69/62%; TC 77/69%; DC 100/93%; SC and Re100%. Sp of DWI: Ce 94%; AC 100%; TC 94/100%; DC
87/100%; SC 93%; and Re 87%. Se of PGE: Ce 36/55%; AC 31/46%; TC 38/62%; DC and SC 60/73%; and Re 47/67%. Sp of PGE: Ce and AC 100%; TC 94/100%; DC and SC 93/100%; and Re 87/93%. LMEMRI for BWT showed statistical difference in all segments (p<0.01) with exception of AC (p=0.11). The median difference was 0.5-1.5mm

CONCLUSION

PGE and DWI show high inter-rater reliability. Se of DWI detecting active PUC is superior to PGE; whereas specificity is comparable. BWT showed significant difference between active PUC versus controls, but these differences were only 0.5-1.5mm.

CLINICAL RELEVANCE/APPLICATION

Routine MRE should include DWI sequences which increase the degree of detection of active PUC within 7 days of diagnostic endoscopy with high sp values when compared with controls.

VSPD32-11 Development and Validation of an Ultrasound Scoring System for Children with Suspected Acute Appendicitis

Robert Orth MD, PhD (Presenter): Grant, Toshiba Corporation Research support, General Electric Company, Sara Fallon: Nothing to Disclose, R. Paul Guillerman MD: Nothing to Disclose, Martha Mappus Munden MD: Nothing to Disclose, Wei Zhang PhD: Nothing to Disclose, George S. Bisset MD: Nothing to Disclose, Monica Lopez MD: Nothing to Disclose, Mary Brandt MD: Nothing to Disclose

PURPOSE

To facilitate consistent, reliable communication among providers, we developed a novel scoring system for reporting limited right lower quadrant ultrasound (US) exams obtained for suspected pediatric appendicitis. The purpose of this study was to evaluate implementation of this scoring system and its ability to risk-stratify children with suspected appendicitis.

METHOD AND MATERIALS

We developed a risk-stratification scale (Appy-Score) and structured reporting template for limited abdominal US exams obtained for suspected pediatric appendicitis. Appy-Score strata were: 1=normal completely visualized appendix; 2=normal partially visualized appendix; 3=non-visualized appendix, 4=equivocal; 5a=non-perforated appendicitis; 5b=perforated appendicitis. The Appy-Score was applied retrospectively to all limited right lower quadrant US exams ordered through our Emergency Department during a 5-month pre-implementation period (1/1/2013-5/31/2013), and Appy-Score use was tracked prospectively post-implementation (7/1/2013-9/30/2013). Diagnostic performance measures of US exams were computed post-implementation. Secondary outcomes included CT imaging following US exams and negative appendectomy rates.

RESULTS

We identified 1,235 patients in the pre- and 687 patients in the post-implementation groups. Appy-Score use increased from 24% in July to 89% in September (p=0.0001). The likelihood of appendicitis progressively increased with each score stratum. Sensitivity, specificity, positive predictive value and negative predictive value post-implementation were 93.8%, 92%, 83.8%, and 97.1%, respectively. The rate of CT imaging after US decreased from 8.6% pre-implementation to 5.9% post-implementation (p=0.048). Negative appendectomy rates did not significantly change (4.4% vs. 4.1%, p=0.88).

CONCLUSION

The use of a risk-stratified scoring system and standardized template for reporting the results of US exams for suspected pediatric appendicitis clearly communicated the likelihood of appendicitis to the treating physician and decreased the need for CT imaging. Future studies should assess whether this streamlines care in the emergency room setting and whether the risk strata are generalizable to other institutions with varying expertise in US imaging.

CLINICAL RELEVANCE/APPLICATION

A scoring system for reporting limited US exams performed for suspected pediatric appendicitis can risk-stratify patients and decrease the rate of follow-up CT imaging.

VSPD32-12 Definition of Normal Newborn Anorectal Anatomy by Ultrasound Using a Novel Posterior Approach

Ellen Christine Wallace MD (Presenter): Nothing to Disclose, Jean-Marc Gauguet MD, PhD: Nothing to Disclose, Jeremy Aidlen MD: Nothing to Disclose

PURPOSE

Describe the normal anatomy and characteristics of the anus, rectum, levator ani, puborectalis, ischiorectal fossa, sacrum and coccyx using a novel, posterior, trans-sacroccocygeal, high resolution ultrasound imaging approach. Illustrate how to perform the technique and validate the information obtained by comparison with anatomic drawings and selected CT and MR images, which are more commonly used to evaluate this area.
METHOD AND MATERIALS

Retrospective review of images obtained as part of routine spinal ultrasound evaluations in newborns between 2005 and 2014. High resolution linear ultrasound probes were used via a trans-sacrococcygeal approach, in the posterior sagittal and axial planes with the infant prone. A series of images demonstrate rectum, anus, presacral space, levator ani, puborectalis, sacrum, coccyx and ischiorectal fossa. Review of CT and MR imaging data, obtained for unrelated reasons, has been used to corroborate, compare and contrast with the ultrasound imaging data.

RESULTS

The anal canal is particularly well seen by high frequency, linear, ultrasound probes, when evaluated from a posterior trans-sacrococcygeal approach in newborns. It has a characteristic cyclindrical appearance quite distinct from the rectum. The length, muscle thickness, anorectal ring, anal verge, and anorectal angle, are nicely depicted on sagittal images. The mucosa, internal and external anal sphincteric layers, and anorectal course through the levator ani muscles are well seen on axial images. The anal canal orientation with respect to rectum, sacrum, vagina and urethra can also be defined on the sagittal images. The integrity of the posterior sacrococcygeal elements is clearly seen. The images compare favorably with MR and CT of the same area without need for sedation or ionizing radiation in this young population.

CONCLUSION

Posterior, midline, trans-sacrococcygeal, high resolution, ultrasound imaging is a reproducible technique, which demonstrates normal anorectal and pelvic floor anatomy exquisitely well. Facility with this technique provides useful supplementary data to that obtained by transabdominal and transperineal ultrasound techniques.

CLINICAL RELEVANCE/APPLICATION

Confident demonstration and knowledge of normal ultrasound anorectal complex anatomy from a posterior approach provides a foundation to evaluate anorectal malformations, anterior ectopic anus and cloaca.

VSPD32-13  MRU: What Is Current Clinical Practice?

J. Damien Grattan-Smith MBBS (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) To discuss key protocol aspects for MR urography in children to reproducibly generate high quality studies and show how MR urography is has widespread application in the evaluation of children with urinary tract disease.
Masses and Parenchymal Diseases

Michael David Beland MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Identify the imaging features of a variety of etiologies of renal masses and understand the potential overlap between malignancy, non-malignant mass-like lesions and pseudomasses. 2) Recognize the potential limitations of ultrasound in the identification of renal masses and learn to maximize technique. 3) Demonstrate the wide range of appearances of parenchymal diseases on ultrasound and develop an approach to evaluation.

ABSTRACT

Renal masses are a common finding on ultrasound. While the vast majority are cysts, solid appearing lesions are also frequently encountered. Not all 'masses' are cancer and there are numerous mimicers of malignancy on renal ultrasound. Numerous cases will be shown of various malignant and non-malignant etiologies of renal masses. Factors impacting the sensitivity of renal ultrasound for detection of masses will be reinforced. Finally, renal parenchymal diseases can demonstrate a wide variety of sonographic appearances. Multiple examples will be shown as well as the importance of developing a systematic evaluation of the patient with parenchymal disease.

Renal Doppler

John Stephen Pellerito MD (Presenter): Nothing to Disclose

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.

Renal Transplants

Deborah J. Rubens MD (Presenter): Nothing to Disclose

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.

Active Handout


Interactive Game: Prostate MRI Using PI-RADS (Prostate Imaging Reporting and Data System)

Refresher/Informatics

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

Tue, Dec 2 4:30 PM - 6:00 PM  Location: E351
LEARNING OBJECTIVES

1) Describe the clinical indications for prostate MRI and MRI-targeted interventions. 2) Assess technical considerations for performance of multi-parametric prostate MRI, including pulse sequences, coils, contrast administration, magnetic field strength. 3) Integrate information from T2, DCE, and DWI to analyze and report prostate MRI exams using new ACR-PIRADS methodology. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

Sub-Events

RC429A  
Introduction to PI-RADS  
Jeffrey C. Weinreb MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES  
View learning objectives under main course title.

RC429B  
Technical Considerations  
Clare M. C. Tempany-Afdhal MD (Presenter): Research Grant, InSightec Ltd Research Consultant, Profound Medical Inc

LEARNING OBJECTIVES  
View learning objectives under main course title.

RC429C  
How to Use PI-RADS  
Jelle O. Barentsz MD, PhD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES  
View learning objectives under main course title.

MSRO39  
BOOST: Gynecology—Hands-on Contouring

Multisession Courses

AMA PRA Category 1 Credits™: 1.25  
ARRT Category A+ Credits: 1.50

Tue, Dec 2 4:45 PM - 6:00 PM   Location: S101A

Participants

Beth A. Erickson MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Contour Post-operative pelvis :Nodal CTV and Vaginal ITV. 2) Contour an intact cervical case. 3)Contour the GTV and HR CTV at the time of cervical brachytherapy.

ABSTRACT

Proper contouring of radiation targets and organs at risk is essential in developing treatment plans which maximize the benefits and minimize the risks of radiation, both for external beam and brachytherapy. This course will focus on contouring the nodal CTV and vaginal ITV for a post-op endometrial cancer patient as well as the non-nodal CTV and nodal CTV for an intact cervix patient as well as the GTV and HR CTV for a patient at the time of cervical brachytherapy.

SPSH40  
Hot Topic Session: Prostate Interventions - Fused US/MRI Guidance

Special Courses

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

Wed, Dec 3 7:15 AM - 8:15 AM   Location: E351

Participants

Moderator
LEARNING OBJECTIVES

1) Learn current clinical applications for MR/US fusion biopsy of the prostate. 2) Describe elements of 2 fusion systems important to the radiologist. 3) Compare use of MR/US fusion systems with visual targeting of prostate cancers.

Sub-Events

SPSH40A  
Fused MR/US Prostate Biopsy with a Single Vendor System: How and When to Use It  
Andrew B. Rosenkrantz MD (Presenter):  Nothing to Disclose  
LEARNING OBJECTIVES

View learning objectives under main course title.

SPSH40B  
Prostate Biopsy Using Two Fused MR/US Systems: Clinical Use and Comparison  
Daniel Jason Aaron Margolis MD (Presenter):  Research Grant, Siemens AG  
LEARNING OBJECTIVES

View learning objectives under main course title.

Active Handout


MSES41  
Essentials of Ultrasound

Multisession Courses

ER  US  OB  GU  
AMA PRA Category 1 Credits ™: 1.50  
ARRT Category A+ Credits: 1.50  
Wed, Dec 3 8:30 AM - 10:00 AM  Location: S100AB

Sub-Events

MSES41A  
Arterial Doppler Waveforms around the Body  
Mindy Meislich Horrow MD (Presenter):  Spouse, Director, Merck & Co, Inc  
LEARNING OBJECTIVES

1) Analyze the difference between high resistance and low resistance arterial waveforms and where they normally occur. 2) Demonstrate an understanding of the parvus tardus waveform and the situations in which it occurs. 3) Demonstrate an understanding of Doppler waveforms related to stenosis, pseudoaneurysm and arterio-venous fistula.

ABSTRACT

This lecture will review the basic types of normal arterial waveforms throughout the body including carotid, vertebral, visceral organ and peripheral vessels. Further discussion will include general and specific changes related to stenosis, occlusion, pseudoaneurysms and arterial venous fistulas with some cases related to pitfalls and quality assurance.

MSES41B  
First Trimester US  
John Stephen Pellerito MD (Presenter):  Nothing to Disclose  
LEARNING OBJECTIVES

1) Recognize sonographic features and landmarks of a normal first trimester pregnancy. 2) Interpret sonographic findings and hCG measurements to determine a normal or abnormal gestation. 3) Analyze diagnostic criteria for nonviable first trimester pregnancy. 4) Apply sonographic findings to clarify a pregnancy of uncertain viability or unknown location.

ABSTRACT

First Trimester US John S Pellerito, MD FACR This presentation highlights the sonographic presentations of
normal and abnormal first trimester pregnancy. We will discuss the normal landmarks that are visualized during the first weeks of life. Expected hCG titers are reviewed for each landmark and discrepancies between sonographic findings and hCG levels will be discussed. The diagnostic criteria for normal and nonviable early pregnancy will be established. There will be case discussions to evaluate the findings associated with an intrauterine pregnancy of uncertain viability as well as how to assess a pregnancy of unknown location.

**LEARNING OBJECTIVES**

1) List the main placental causes of significant bleeding in the third trimester of pregnancy. 2) Explain the causes of false sonographic diagnosis of placenta previa. 3) Explain the differences among placenta accreta, increta, and percreta. 4) List the complications of cervical incompetence.

**ABSTRACT**

This lecture will review the sonographic findings seen in obstetrical emergencies in the second and third trimesters of pregnancy. The diagnosis of placenta previa will be discussed along with the pitfalls in the sonographic diagnosis. Differences between placenta accreta, increta and percreta will be highlighted. Examples of placental abruption will be shown. Cervical incompetence and its complications will be discussed along with several other abnormalities that constitute emergent situations.

**Active Handout**


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**RC507**

**Advancements in Renal Tumor Treatment: What We Need to Know Before and After Therapy**

**Refresher/Informatics**

![Images](IR GU IR GU M RT)

**AMA PRA Category 1 Credits™**: 1.50

**ARRT Category A+ Credits**: 1.50

**Wed, Dec 3 8:30 AM - 10:00 AM  Location: E451A**

**Participants**

Ronald Jay Zagoria MD (Presenter): Nothing to Disclose

Debra Ann Gervais MD (Presenter): Research Grant, Covidien AG

**LEARNING OBJECTIVES**

1) Attendees will learn the current treatment options for RCC, including partial nephrectomy and tumor ablation. 2) Attendees will be able to articulate the benefits and drawbacks of treatment options, specifically complications and outcomes. 3) Attendees will understand the steps of renal tumor ablation and considerations to assure ablation success. 4) Attendees will be able to report salient imaging findings before and after RCC treatment, especially partial nephrectomy and tumor ablation.

**ABSTRACT**

This course will provide an introduction to trends in imaging of RCC, imaging appearances of different tumor types, and clinical decision making in selecting appropriate patient management. Current treatment options (partial nephrectomy, tumor ablation) and how they are performed will be discussed and the benefits and drawbacks of each will be detailed. Important imaging findings when interpreting studies before and after treatment will be reviewed.

**RC508**

**Multimodality Imaging of the Acute Female Pelvis: US, CT and MRI (An Interactive Session)**

**Refresher/Informatics**

![Images](ER US MR CT OB GU M RT)

**AMA PRA Category 1 Credits™**: 1.50

**ARRT Category A+ Credits**: 1.50

**Wed, Dec 3 8:30 AM - 10:00 AM  Location: E450B**

**Sub-Events**

**RC508A**

**US of Obstetrical Emergencies**

Ana P. Lourenco MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Recognize the sonographic appearance of common and uncommon obstetric emergencies. 2) Demonstrate
understanding of management for emergent obstetric diagnoses. 3) Identify those cases requiring additional imaging, beyond US, for definitive diagnosis.

**ABSTRACT**

In this refresher course focused on US of Obstetrical Emergencies, we will review the key imaging findings and management of both common and uncommon obstetrical emergencies. As many hospitals and radiology practices may not routinely evaluate pregnant patients, these are particularly important topics to review. Timely and accurate diagnosis is critical to improved outcomes for both the mother and fetus. The range of topics to be reviewed will cover the first, second, and third trimester, as well as the immediate post-partum period. Diagnoses will include ectopic pregnancy, with a focus on the less commonly encountered types of ectopics - cervical, C-section scar, interstitial, and ovarian ectopics. We will also review the imaging findings of ovarian hyperstimulation as well as associated complications, which can be potentially life-threatening. Ovarian torsion in pregnancy will be discussed, as the hormonal changes of pregnancy and mass effect from corpus luteal cysts of pregnancy or other masses may predispose patients to torsion. Furthermore, the non-specific clinical presentation often makes the diagnosis challenging. Similarly, the presentation of acute appendicitis in pregnancy may be non-specific. Imaging findings of acute appendicitis in pregnancy will be reviewed, as accurate diagnosis prior to appendiceal rupture can markedly improve outcomes for both mother and fetus. Placental abnormalities will be reviewed, including placenta previa, placental abruption, and abnormal placentation (accreta, increta, percreta). Imaging findings of cervical incompetence will be reviewed, as well as important next steps in clinical management once this diagnosis is discovered. We will also review the sonographic findings of uterine dehiscence, which although rare, is potentially catastrophic to both mother and fetus. Lastly, we will review imaging findings of retained products of conception, most commonly presenting in the immediate post-partum period.

**Active Handout**


**RC508B**

**US of Gynecological Emergencies**

Robin Beth Levenson MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Discuss gynecologic causes of acute female pelvis and the role of ultrasound in evaluation. 2) Identify important gynecologic ultrasonic findings in the acute setting and recognize pearls and pitfalls in diagnosis. 3) Illustrate examples demonstrating range of imaging findings. 4) Recognize the key ultrasound features in gynecologic emergencies.

**Active Handout**


**RC508C**

**CT of the Acute Female Pelvis**

Anjali Agrawal MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Highlight the importance of recognition of acute gynecologic conditions on CT. 2) Outline the physiologic processes that may present as acute pelvic pain and their CT findings. 3) Describe the CT features of various pathologic causes of the acute female pelvis. 4) Illustrative case examples with correlative imaging findings on sonography or MRI to improve the understanding of the anatomy and pathology on CT.

**RC508D**

**MRI of the Acute Female Pelvis**

Stephan W. Anderson MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) The participant will review the etiologies of acute pelvic pain for which MRI may be effectively employed in the diagnostic evaluation. 2) The participant will be able to apply an MRI-based approach to certain etiologies of acute abdominal pain at their own institution. 3) The participant will review the current pertinent literature in the application of MRI in acute pelvic pain.

**RC510**

**Gynecologic Ultrasound: 2D and 3D**

Refresher/Informatics

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

Wed, Dec 3 8:30 AM - 10:00 AM  Location: S404CD
3D Ultrasound in Gynecology

Beryl R. Benacerraf MD (Presenter): Nothing to Disclose

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.

Ovarian Masses and Cysts

Douglas L. Brown MD (Presenter): Author with royalties, UpToDate, Inc Author with royalties, Reed Elsevier Editor with royalties, Reed Elsevier

LEARNING OBJECTIVES

1) Demonstrate understanding of what ovarian features are normal or inconsequential, so as to not over-diagnose ovarian cysts or masses. 2) Be able to recognize sonographic features that reliably predict benign and malignant ovarian cysts. 3) Understand the appropriate imaging follow-up of benign and indeterminate ovarian masses.

Uterus and Endometrium

Ruth Beth Goldstein MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

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

Imaging in Practice: DWI in the Abdomen and Pelvis (How-to Workshop)

Refresher/Informatics

AMAA PRA Category 1 Credits: 1.50
ARRT Category A+ Credits: 1.50
Wed, Dec 3 8:30 AM - 10:00 AM Location: N228

How to Perform DWI - Principles and Protocol

Shreyas Shreenivas Vasanawala MD, PhD (Presenter): Research collaboration, General Electric Company Stockholder, Morpheus Imaging, Inc

LEARNING OBJECTIVES

1) Understand basic principles of contrast formation in diffusion weighted MRI. 2) Understand sources of artifacts in diffusion weighted MRI. 3) Know techniques to reduce artifacts to produce diagnostic quality diffusion weighted images.

ABSTRACT

Diffusion-weighted imaging is being used with increasing frequency in body MRI. The basic mechanism of contrast generation is the use of large motion-sensitizing gradients such that water molecules undergoing random motion are dephased, resulting in signal loss. Tissues and lesions with high cellularity have reduced diffusive motion of water, which results in relatively high signal. However, a number of issues make
diffusion-weighted imaging in the body challenging relative to neurological applications. First, the vast majority of clinical DWI is performed with an echo-planar technique, which suffers from image distortions due to field inhomogeneity. These become problematic particularly where there are gas-tissue interfaces, such as at the dome of the liver and near gas-filled bowel. The presentation will discuss methods to minimize these distortions. Second, the T2 relaxation rates of abdominal tissues are less than that of pelvic viscera and much less than that of the brain, whereas normal water diffusivity is higher; as the choice of diffusion sensitivity (b value) heavily influences the echo time, lower b values must be used. Third, motion from cardiac pulsations, respiration, and peristalsis produce artifacts, some of which are easily recognizable, and others which can subtly hide pathology. Techniques to minimize these pitfalls will be presented. Finally, issues of reproducibility that affect the practical clinical use of DWI for lesion characterization in body MRI will be discussed, along with approaches to improve reliability.

Interpretation of DWI - How to Create and Use ADC Maps in Your Practice

Thomas A. Hope MD (Presenter):  Speaker, Guerbet SA Research Grant, General Electric Company

LEARNING OBJECTIVES

1) Understand the principles of calculating ADC. 2) Understand the effect of b-value selection and weighting on diffusion calculations. 3) Explore the value of IVIM and other parameters.

ABSTRACT

In order to incorporate diffusion weighted imaging into clinical practices, it is important to understand how diffusion data is evaluated. Qualitatively, one can simply say that lesions are "bright" on diffusion, but intensity on high b-value imaging is not always equal to a lesion that has reduced diffusion. The understanding and implementation of quantitative analysis is therefore critical for both research and everyday clinical practice. The first step is the calculation of the apparent diffusion coefficient (ADC) map, which is used to help tease out the differences in intrinsic T2 hyperintensity and diffusivity. The calculation of the ADC map is greatly affected by the methodology used as well as the selection of b-values acquired. The ADC of a tissue describes how quickly signal decreases as the b-value is increased. Those lesions with high diffusivity will have high ADC values, while those lesions with reduced diffusion will have lower ADC values. In addition to ADC, other parameters have been described that affect the measured diffusivity. The most commonly discussed is intravoxel incoherent motion (IVIM) that is thought to represent the random movement of blood within the capillary system, often called pseudodiffusion. This parameter has its greatest effect on diffusion weighted images at low b-values.

URL's

http://www.radiology.ucsf.edu/research/meetings/rsna

Applications of DWI in Clinical Practice – When It Does and Doesn't Help

Frank H. Miller MD (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

1) Demonstrate the utility of diffusion weighted imaging in the abdomen. 2) Show advantages and limitations of diffusion weighted imaging in the abdomen.

ABSTRACT

Diffusion weighted imaging (DWI) has been used in neuroimaging for many years. It has only more recently become feasible in the abdomen. The objective of this talk is to emphasize the important role that diffusion-weighted imaging can have in your practice and that it can be used routinely without difficulty in the abdomen and pelvis. DWI potentially can detect additional lesions and direct the radiologist to lesions that are not as well seen on conventional imaging. DWI helps in characterization of lesions but does have limitations in specificity which will be discussed. Qualitative and quantitative evaluation can be performed and the applications of these techniques clinically will be described. The strengths and limitations of DWI in multiple organs including the liver, pancreas, adrenal gland, kidney, and evaluation for metastases and infections will be discussed. DWI is especially helpful for identify lymph node and peritoneal metastases. Emerging techniques include the use of diffusion weighted imaging to assess response to therapy following liver-directed therapy will also be discussed. In summary, DWI should be used routinely if not being used at your institution. This talk will show benefits and limitations of DWI in a number of organs in the body.
Sub-Events

SSK09-01

Molecular Imaging of Cervix Cancer with Multiparametric 18FDG/18FMISO PET-MRI at 3Tesla: Proof of Concept


PURPOSE

To demonstrate the feasibility of molecular imaging of cervix cancer with combined multiparametric PET-MRI using T2-weighted, dynamic contrast-enhanced MRI (DCE-MRI), diffusion-weighted imaging (DWI), the tracer 18 fluoro-desoxy-glucose (18FDG) for the detection of increased glycolysis and the tracer 18fluoromisonidazole (18FMISO) for detection of tumor hypoxia at 3T.

METHOD AND MATERIALS

In this IRB approved study five patients with cervix cancer underwent combined 3T MP 18FDG/18FMISO PET-MRI. The MRI protocol consisted of an isotropic T2-weighted SPACE (TR/TE 89/4630; SI 3mm isotropic; matrix 384 x 384, TA 3min 40sec), a DWI EPI sequence (TR/TE = 82/x6300s; SI 5mm; b-values 50 and 850 sec/mm²; matrix 192 x 156; TA 2min 20 sec) and an axial T1 VIBE with fat-sat (TR/TE 1.4/3.4 SI 3mm; matrix 480 x 360; TA 4min) before and after application of a standard dose Gd-DOTA (Dotarem). Patients were injected with approx. 300-700 MBq 18FDG and 330 MBq and subjected to 18FDG/18FMISO -PET-CT scanning (Siemens Biograph). CT data was used for attenuation correction. Co-registration of imaging data and image fusion were performed. Tumor size, enhancement-kinetics, restricted diffusivity and 18FDG/18FMISO -avidity was assessed.

RESULTS

3T MP 18FDG/18FMISO PET-MRI was successfully performed in all patients. Tumor volumes ranged from 111.3-440cc (median: 213.2cc). Tumors demonstrated restricted diffusivity (ADC values 0.56-0.82 x 10-2 mm²/sec; median 0.72 x 10-2 mm²/sec). 4 tumors demonstrated initial strong enhancement followed by a wash-out (type III) and one tumor demonstrated initial strong enhancement and followed by a plateau (type II). Tumors were highly 18FDG-avid with SUVmax values ranging from 11.9-25.6 (median 18.2). None of the tumors were highly 18FMISO-avid (SUVmax 1.3-2.4, median 1.87). In two patients 18FMISO PET identified 18FMISO-avid spots (SUVmax 2 and 2.4) within the 18FDG-avid lesion indicative of areas of tumor hypoxia (cf Fig)

CONCLUSION

Molecular imaging with MP PET/MRI at 3T using T2-weighted, DCE-MRI, DWI, 18FDG and 18FMISO at 3T in patients with cervix cancer is feasible. 3T MP 18FDG/18FMISO PET-MRI provides unique information on tumor morphology and biology.

CLINICAL RELEVANCE/APPLICATION

3T MP 18FDG/18FMISO PET-MRI identifies areas of tumor hypoxia, which are more resistant to radiation therapy and necessitate dose-escalation and thus enables an improved therapy planning.

SSK09-02

The Value of Whole Body Diffusion-weighted MRI for Detection, Restaging and Evaluation of Operability in Recurrent Ovarian Carcinoma as Compared with CT

Katrijn Michielsen PhD (Presenter): Nothing to Disclose, Ignace Vergote MD, PhD : Nothing to Disclose, Katja Op de beeck MD : Nothing to Disclose, Frederic Amant MD, PhD : Nothing to Disclose, Karen Leunen MD : Nothing to Disclose, Steven Dymarkowski MD : Nothing to Disclose, Philippe Moerman MD, PhD : Nothing to Disclose, Frederik De Keyzer : Nothing to Disclose, Vincent Ronny Andre Vandecaveye MD : Nothing to Disclose

PURPOSE

To evaluate whole body diffusion-weighted imaging (WB-DWI/MRI) for detection, staging and operability assessment in recurrent ovarian cancer compared with computed tomography (CT).

METHOD AND MATERIALS

Fifty-one women suspected for recurrent ovarian cancer underwent 3 Tesla WB-DWI/MRI using 2 b-values (b=0-1000 s/mm²), T2- and contrast T1-weighted sequences in addition to CT. WB-DWI/MRI and CT were compared for detection of tumor recurrence on a per-patient basis, detection of disease extent on a per-site basis including peritoneal, serosal, retroperitoneal, periportal and distant metastases and for detection of
disease extent according to reported institutional operability criteria (Vergote et al, Gynaecol Oncol 2013). Imaging findings were correlated with surgical/pathological findings or imaging follow-up for at least 6 months.

RESULTS

According to the reference standard, recurrence was confirmed in 48/51 patients. WB-DWI/MRI showed 94% accuracy for detecting recurrence, compared with 78% for CT. Per-site analysis showed significantly higher sensitivity of WB-DWI/MRI over CT for assessing disease extent of the peritoneum, small bowel and colon mesentry and serosa (91 versus 46%, p=0.00002), retroperitoneal suprarenal lymphadenopathies (100 versus 14%, p=0.031) and perportal lesions (73 versus 18%, p=0.031). Following institutional operability criteria, WB-DWI/MRI showed better sensitivity for detection of disease extent operability; mesenteric root infiltration (92 versus 31%, p=0.008), carcinomatosis of small bowel (93 versus 21%, p=0.002) and colon (91 versus 27%, p=0.016), high volumetric peritoneal disease load (100 versus 50%, p=0.004) and irresectable distant metastases (90 versus 20%, p=0.016). WB-DWI/MRI correctly predicted complete cytoreduction in 93% patients undergoing cytoreductive surgery compared with 40% for CT.

CONCLUSION

WB-DWI/MRI showed higher accuracy compared with CT for recurrence detection while improving the sensitivity for staging and operability assessment of disease extent. WB-DWI/MRI may be most valuable to select patients for surgical resection.

CLINICAL RELEVANCE/APPLICATION

WB-DWI/MRI may be of added value to CT for selecting women with recurrent ovarian cancer for complete cytoreductive surgery.

SSK09-03

Association between Radiophenotypic Computed Tomography Features and Prognostically Relevant Gene Signatures in Women with High-grade Serous Ovarian Cancer

Maura Micco MD (Presenter): Nothing to Disclose, Hebert Alberto Vargas MD: Nothing to Disclose, Seong Im Hong: Nothing to Disclose, Debra A. Goldman MS: Nothing to Disclose, Fan tuy Dao: Nothing to Disclose, Britta Weigelt: Nothing to Disclose, Robert Solow: Nothing to Disclose, Hedvig Hricak MD, PhD: Nothing to Disclose, Douglas Levine: Nothing to Disclose, Evis Sala MD, PhD: Nothing to Disclose

PURPOSE

Transcriptomic analyses of high-grade serous ovarian cancer (HGSOC) by The Cancer Genome Atlas (TCGA) Research Network revealed four prognostically-relevant “Classification of Ovarian Cancer” (CLOVAR) subtypes of HGSOC. We aimed to investigate associations between radiophenotypic features observed on computed tomography (CT), CLOVAR gene signatures and survival in women with HGSOC.

METHOD AND MATERIALS

Retrospective analysis of CT images obtained before cytoreductive surgery in 46 women with HGSOC, whose tumors were subjected to molecular analyses by TCGA. Two readers independently evaluated all CTs. Fisher’s exact test was used to examine the relationship between imaging features and CLOVAR subtypes (CLOVAR “differentiated,” “immunoreactive,” “mesenchymal” and “proliferative”). Inter-reader agreement was assessed using Cohen’s kappa (k) statistics. Kaplan-Meier survival analyses were performed.

RESULTS

The presence of mesenteric infiltration and diffuse peritoneal involvement by tumor on CT were significantly associated with CLOVAR subtype (p=0.002-0.004 for reader 1 [R1] and p=0.006-0.012 for R2). Inter-reader agreement in evaluating these two features on imaging was substantial to almost perfect (k=0.79-0.91). Mesenteric infiltration on imaging was associated with CLOVAR mesenchymal subtype. Patients with mesenteric infiltration had shorter median progression-free survival than patients without mesenteric involvement (14.75 months vs 25.57 months according to both readers; p=0.019/0.015 for R1/R2) and overall survival (49.04 vs 58.18 months; p=0.010 [R1] and 50.03 vs 59.05 months; p=0.011 [R2]). No other imaging features were significantly associated with CLOVAR subtype or survival.

CONCLUSION

Specific CT features are associated with the HGSOC CLOVAR subtypes and may have potential as prognostic biomarkers in patients with HGSOC.

CLINICAL RELEVANCE/APPLICATION

Our study highlights potentially clinically useful associations between prognostically relevant genomic signatures and specific imaging phenotypes observed on CT in patients with HGSOC.

SSK09-04

Metabolic Tumor Volume on FDG-PET/CT Predicts Deep Myometrial Invasion, Lymph Node Metastases and Survival in Patients with Endometrial Carcinoma

Jenny Aase Husby MD (Presenter): Nothing to Disclose, Bernt Christian Reitan MD: Nothing to Disclose, Jone Trovik MD: Nothing to Disclose, Oyvind Salvesen: Nothing to Disclose, Martin Biemann PhD: Nothing to Disclose, Helga Salvesen MD, PhD: Nothing to Disclose, Ingfrid S. Haldorsen MD, PhD:
**PURPOSE**

Explore the value of metabolic tumor volume assessment on 18F-fluorodeoxyglucose Positron Emission Tomography / Computer Tomography (18-FDG-PET/CT) in the preoperative evaluation of endometrial carcinoma patients and explore the potential for prediction of outcome by this quantity.

**METHOD AND MATERIALS**

In this prospective study, 104 consecutive patients with histologically confirmed endometrial carcinoma underwent preoperative FDG-PET/CT. The images were reviewed by a radiologist / nuclear medicine physician blinded to patient data, and metabolic tumor volume was calculated by placing a volume of interest (VOI) covering the portion of tumor with SUVmax > 2.5. Metabolic tumor volume was analyzed in relation to surgical staging parameters using logistic regression analysis and receiver operating characteristic (ROC) curves. The prognostic impact of metabolic tumor volume was explored using Kaplan-Meier method, log rank test and Cox regression analysis.

**RESULTS**

Large metabolic tumor volume was significantly related to presence of deep myometrial invasion (odds ratio (OR): 1.02, p=0.01) and presence of lymph node metastases (OR: 1.02, p=0.05). Metabolic tumor volume had a significant impact on recurrence-free survival with a hazard ratio of 1.014 (p<0.001). ROC analysis identified the optimal cutoff for metabolic tumor volume to be 18.1 ml. Significantly better recurrence-free survival was observed in patients with metabolic tumor volume ≥ 18.1 ml compared to patients with volume < 18.1 ml (p=0.004).

**CONCLUSION**

Preoperatively performed metabolic tumor volume measurements on FDG-PET/CT predict deep myometrial invasion, presence of lymph node metastases and prognosis in endometrial carcinoma patients, and may thus be a useful tool in risk stratification and decision-making prior to surgical and adjuvant treatment.

**CLINICAL RELEVANCE/APPLICATION**

Metabolic tumor volume measurements on FDG-PET/CT can aid in the prediction of deep myometrial invasion, presence of lymph node metastases and outcome in endometrial carcinoma patients, and thus be an important tool for preoperative risk stratification and choice of treatment.

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**SSK09-05 Power Doppler Quantification in Assessing Gestational Trophoblastic Neoplasia**

Yuanwei Li MSc, BEng : Nothing to Disclose , Mengxing Tang : Nothing to Disclose , Daksha Patel : Nothing to Disclose , Mary Elizabeth Roddie MD : Nothing to Disclose , Guillaume Barrois : Nothing to Disclose , Adrian Kuok Pheng Lim MD, FRCR (Presenter) : Luminary, Toshiba Corporation , Philip Savage : Nothing to Disclose , Michael Seckl MD : Nothing to Disclose

**PURPOSE**

Gestational trophoblastic neoplasia (GTN) is curable if given appropriate chemotherapy treatment. However, in a proportion of patients, the FIGO score fails to accurately stratify low risk patients who develop chemoresistance after initial chemotherapy. The degree of tumour vascularisation is a key factor in risk assessment and therefore quantifying tumour vascularisation may provide an important non-invasive way of complementing risk assessment.

**METHOD AND MATERIALS**

187 FIGO staged, low risk GTN patients were prospectively recruited. Baseline power Doppler ultrasound was analysed using a quantification program written in MATLAB. Four diagnostic indicators were obtained consisting of the number of colour pixels (NCP), mean dB, power Doppler quantification (PDQ), and the percentage of colour pixels (%CP). The performance of each indicator was then assessed to determine if they could distinguish the subset of low risk patients who became chemoresistant to first line treatment.

**RESULTS**

There were 111 non-resistant patients and 76 resistant patients. The NCP performed best at distinguishing these two group where the non-resistant group had an average value of 3435(±2060) and the resistant group 6151(±3192) pixels (p<0.001). PDQ and %CP also showed significant differences (p<0.001) but had poorer performance (area under the receiver operator curves were 72% and 67% respectively compared with 75% for NCP). The mean dB index did not reach significance (p=0.133).

**CONCLUSION**

Power Doppler ultrasound quantification shows much potential as a non-invasive method of assessing tumour vascularity in patients with GTN and can distinguish low risk patients who become chemoresistant from those who have an uncomplicated course with first line treatment.

**CLINICAL RELEVANCE/APPLICATION**

Low risk GTN patients who become chemoresistant to single agent therapy can be more accurately staged at
outset and thus given the appropriate chemotherapeutic regime at start of treatment.

**SSK09-06**

**Parametrial Invasion in Cervical Cancer: Utility of Fused T2-Weighted and High B-Value Diffusion-Weighted Imaging at 3T**

**Jung Jae Park** MD (Presenter): Nothing to Disclose, **Chan Kyoo Kim** MD, PhD: Nothing to Disclose, **Sung Yoon Park**: Nothing to Disclose, **Byung Kwan Park** MD: Nothing to Disclose

**PURPOSE**

With the use of T2-weighted imaging (T2WI), prediction of parametrial invasion in cervical cancer may be limited due to peritumoral edema or inflammation. The aim of our study was to retrospectively investigate the utility of fused T2WI and high b-value diffusion-weighted imaging (DWI) at 3T for evaluating parametrial invasion in cervical cancer.

**METHOD AND MATERIALS**

Between January 2010 and December 2012, 152 consecutive patients (median, 51 years; range, 26-80 years) with biopsy-proven cervical cancer who received radical hysterectomy underwent pretreatment MR imaging at 3T (i.e., T2WI and DWI). DWI was obtained using a STIR single-shot echo-planar imaging technique with background suppression. Fusion of high b-value DWI (1000 s/mm²) to T2WI (fused T2-DWI) was performed using a dedicated image processing workstation (AZE Virtual Place). Two radiologists independently evaluated the presence of parametrial invasion on T2WI, fused T2-DWI, and combined T2WI and fused T2-DWI (T2 + fused T2-DWI), and the results were compared with histopathological findings. Statistical analysis was performed using receiver operating characteristics (ROC) curve analysis, McNemar’s test and weighted kappa statistics.

**RESULTS**

Parametrial invasion was pathologically identified in 37 patients (24.3%). For predicting parametrial invasion, fused T2-DWI and T2 + fused T2-DWI showed better specificity, accuracy and predictive positive value than T2WI alone for both readers (all \( P < 0.05 \)), but the sensitivity was not significantly different between each imaging method for both readers (all \( P > 0.05 \)). The area under the curve (AUC) for predicting parametrial invasion of T2WI, fused T2-DWI, and T2 + fused T2-DWI were 0.912, 0.951 and 0.976 for reader 1 and 0.890, 0.932, and 0.968 for reader 2, respectively: all pairwise comparisons were significantly different (all \( P < 0.05 \)). Inter-reader agreement was good for T2WI (\( \kappa = 0.78 \)) and excellent for fused T2-DWI and T2 + fused T2-DWI (\( \kappa = 0.83 \) for both).

**CONCLUSION**

Fused T2-DWI can improve the diagnostic performance for the prediction of parametrial invasion in cervical cancer as compared with T2WI alone.

**CLINICAL RELEVANCE/APPLICATION**

Fusion of high b-value diffusion-weighted imaging (1000 s/mm²) to T2-weighted imaging (T2WI) can provide incremental diagnostic value for predicting parametrial invasion in cervical cancer by decreasing false positive rate compared with T2WI alone.

**SSK09-07**

**Prediction of Tumor Recurrence in Uterine Cervical Cancer Following Concurrent Chemoradiotherapy Using Diffusion-Weighted Imaging**

**Jung Jae Park** MD (Presenter): Nothing to Disclose, **Chan Kyoo Kim** MD, PhD: Nothing to Disclose, **Jungmin Bae**: Nothing to Disclose, **Byung Kwan Park** MD: Nothing to Disclose

**PURPOSE**

To retrospectively investigate the utility of diffusion-weighted imaging (DWI) for the prediction of tumor recurrence following concurrent chemoradiotherapy (CCRT) in patients with uterine cervical cancer.

**METHOD AND MATERIALS**

Between April 2009 and February 2014, 74 consecutive patients (mean age, 62.9 years; range, 32-87 years) with biopsy-proven cervical cancer who received CCRT were examined with 3T pelvis MR imaging including DWI. DWI was obtained using a STIR single-shot echo-planar imaging technique with background body signal suppression (b= 0 and 1000 s/mm²). All patients had two serial MR examinations: before therapy (pre-Tx) and at 4 weeks of therapy (mid-Tx). At each examination, ADC (apparent diffusion coefficient) was calculated in the tumors. For predicting tumor recurrence, MR variables (baseline tumor ADC, tumor ADC changes, tumor size and volume, tumor size and volume changes) and clinical variables (age, FIGO stage, serum squamous cell antigen level, and histological type) were evaluated.

**RESULTS**

During a median follow-up of 31.5 months, tumor recurrence developed in 15 (20%) patients: local recurrence (n= 7), distant metastasis (n= 5) and local recurrence and distant metastasis (n= 3). Univariate Cox analysis revealed that histological types, baseline tumor size and volume, tumor size changes between pre-Tx and mid-Tx, and tumor ADC changes between pre-Tx and mid-Tx were significantly related to the development of tumor recurrence following CCRT (\( P < 0.05 \)). On multivariate Cox analysis, however, tumor ADC changes between pre-Tx and mid-Tx (hazard ratio [HR], 0.839; \( P = 0.001 \)) and histological type (HR, 7.213; \( P = 0.033 \)) were the significant independent predictors of tumor recurrence following CCRT.

**CONCLUSION**
Tumor ADC changes between pre-Tx and mid-Tx may be a useful clinical prognostic biomarker for the prediction of cervical cancer recurrence following CCRT.

**CLINICAL RELEVANCE/APPLICATION**

Tumor ADC changes before and after CCRT may help to predict therapeutic outcomes of cervical cancer. As an imaging biomarker, the ADC may play an important role in the development of an individualized treatment.

SSK09-08  
**Second-opinion Interpretations of Gynecological MRI by Subspecialty Radiologists Benefit Patient Care**

Melvin D'Anastasi MD (Presenter): Nothing to Disclose, Yuliya Lakhman MD: Nothing to Disclose, Maura Micco MD: Nothing to Disclose, Chiara Scelzo MD: Nothing to Disclose, Dennis Chi MD: Nothing to Disclose, Nadeem Abu-Rustum: Nothing to Disclose, Hedvig Hricak MD, PhD: Nothing to Disclose, Evis Sala MD, PhD: Nothing to Disclose

**PURPOSE**

To determine if second-opinion interpretations of outside gynecologic (GYN) magnetic resonance imaging (MRI) examinations by sub-specialty radiologists significantly impact patient care.

**METHOD AND MATERIALS**

The institutional review board approved the retrospective review of patient data for this HIPAA-compliant study, and waived the need for individual informed consent. Between January 2008 and July 2013, 469 second-opinion readings of outside GYN MRI studies were performed by one of four GYN-specialized radiologists. These interpretations were compared to the outside reports submitted with the images. All reports with any differences between the original and second-opinion interpretations were independently reviewed by two gynecologic oncology (GYN ONC) surgeons blinded to the origin of each report. Both surgeons recorded patient management based on each report and noted whether the differences between the reports were clinically significant, i.e. led to a change in patient management such as treatment approach, patient counseling, and/or patient referral.

**RESULTS**

Second-opinion interpretations of outside GYN MRIs by GYN-specialized radiologists changed patient management in 94/469 (20%) of patients for surgeon 1 (S1) and 101/469 (21.5%) of patients for surgeon 2 (S2). The treatment approach, patient counseling, and patient referral were altered based on second-opinion reports in 71/469 (15.1%), 92/469 (19.6%), and 50/469 (10.7%) of patients for S1 and 61/469 (13.0%), 101/469 (21.5%), 53/469 (11.3%) of patients for S2, respectively. Moreover, second-opinion reports resulted in a switch from surgical to nonsurgical management and surgical procedure change in 35/469 (7.5%) and 19/469 (4.1%) of patients for S1 and 31/469 (6.6%) and 12/469 (2.5%) of patients for S2, respectively. MRI interpretations by GYN-specialized radiologists were accurate in 82.3% of cases with histopathologic specimens and imaging follow-up as reference standards.

**CONCLUSION**

Second-opinion interpretations of outside GYN MRI examinations by the experts in gynecologic imaging significantly change patient management.

**CLINICAL RELEVANCE/APPLICATION**

Second-opinion interpretations of outside GYN MRI studies by the experts in gynecologic imaging significantly change patient management.

SSK09-09  
**Assessment of PET/MR Imaging in Preoperative Staging of Endometrial Carcinoma**

Hongzan Sun (Presenter): Nothing to Disclose, Jun Xin: Nothing to Disclose, Pengyuan Wang: Nothing to Disclose, Qiyong Guo MD: Nothing to Disclose

**PURPOSE**

To evaluate the usefulness of hybrid PET/MR imaging in assessing preoperative staging of patients with endometrial carcinoma.

**METHOD AND MATERIALS**

44 cases of endometrial carcinoma were examined by hybrid PET/MR before operation, including T2WI, DWI and FDG PET. Imaging information from T2WI, T2WI-DWI and T2WI-PET combined imaging, and overall imaging (T2WI-PET+DWI) was compared with pathological findings. Overall stage (according to 2009 FIGO staging) was defined after the consensus determination of two radiologists. Accuracy, sensitivity and specificity were analysed with the McNemar test; the areas under the receiver operating characteristic curve (Az) were compared with the Pairwise comparison.
RESULTS

12, 14, 8 and 10 cases were pathologically staged in IA, IB, II and III. The accuracy, sensitivity, specificity and Az for preoperative staging, respectively, were as follows: Stage IA- T2WI, 75%, 58%, 81% and 0.698; T2WI-DWI, 91%, 75%, 97% and 0.844; T2WI-PET, 80%, 58%, 88% and 0.760; T2WI-PET+DWI, 93%, 83%, 97% and 0.901. Besides lowest diagnostic efficacy in T2WI (P<0.05), significant difference was also found between T2WI-PET and T2WI-PET+DWI (P=0.0362). Stage IB- T2WI, 70%, 57%, 77% and 0.669; T2WI-DWI, 82%, 64%, 90% and 0.771; T2WI-PET, 80%, 71%, 86% and 0.774; T2WI-PET+DWI, 89%, 86%, 90% and 0.879. There was significant difference in diagnostic efficacy between T2WI and T2WI-DWI (P<0.05) and between T2WI and T2WI-PET+DWI (P=0.0028). Stage II- T2WI, 76%, 50%, 81% and 0.667; T2WI-DWI, 86%, 75%, 89% and 0.819; T2WI-PET, 80%, 63%, 92% and 0.771; T2WI-PET+DWI, 91%, 75%, 94% and 0.847. Significant difference in diagnostic efficacy could only be found between T2WI and T2WI-PET+DWI (P=0.0358). Stage III- T2WI, 84%, 40%, 97% and 0.685; T2WI-DWI, 89%, 80%, 91% and 0.856; T2WI-PET, 93%, 80%, 97% and 0.885; T2WI-PET+DWI, 95%, 90%, 97% and 0.935. Only T2WI showed lowest diagnostic efficacy with significant difference compared to T2WI-DWI, T2WI-PET and T2WI-PET+DWI (P=0.0427, 0.0143 and 0.0027 respectively).

CONCLUSION

For preoperative staging of endometrial carcinoma during pelvic hybrid PET/MR imaging, T2WI-PET plus DWI provides superior diagnostic efficacy, and DWI is a useful supplementary sequence in defining early stage (like stage IA) of endometrial carcinoma.

CLINICAL RELEVANCE/APPLICATION

Huge potentials of hybrid PET/MR imaging in gynecologic oncology are emerging in right now clinical radiology.

SSK10

Genitourinary (Prostate Staging and Follow-up Using MRI)

Scientific Papers

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

Wed, Dec 3 10:30 AM - 12:00 PM   Location: E353C

Participants

Moderator
Andrew B. Rosenkrantz MD : Nothing to Disclose
Moderator
Sebastian Feuerlein MD : Nothing to Disclose

Sub-Events

SSK10-01

Pre-biopsy Anatomical T2-weighted and Diffusion Weighted MR Imaging in Patients with a Clinical Suspicion of Prostate Cancer: IMPROD Clinical Trial

Ivan Jambor MD (Presenter): Nothing to Disclose, Peter Bostrom : Nothing to Disclose, Pekka Taimen : Nothing to Disclose, Esa Kähkönen : Nothing to Disclose, Markku Kallajoki : Nothing to Disclose, Harri Merisaari : Nothing to Disclose, Jari Saunavaara : Nothing to Disclose, Kari Syvanen : Nothing to Disclose, Hannu Juhani Aronen MD, PhD : Nothing to Disclose

PURPOSE

To evaluate the diagnostic accuracy of biparametric MRI (anatomical T2-weighted and diffusion weighted MR imaging, T2wi+DWI) at 3 Tesla and T2wi+DWI targeted TRUS-guided biopsy using visual co-registration (TB) in patients with a clinical suspicion of prostate cancer (PCa) before their first biopsy.

METHOD AND MATERIALS

Sixty-five patients with elevated PSA (>2.5 ng/ml) and/or abnormal digital rectal examination underwent T2wi+DWI examination performed using surface array coils prior to a systematic 12 core biopsy (SB). If a suspicious lesion was present on T2wi+DWI, an additional 2 cores of TB were taken prior to the SB. In patients diagnosed with PCa, clinically significant (SPCa) was defined if meeting at least one of the following criteria: PSA >10 ng/ml, PSA density ≥0.2 ng/ml per milliliter, three or more positive biopsy cores, and Gleason score >6.

RESULTS

The median (range) serum PSA value was 7.0 (1.7-20.0) ng/ml. Prostate cancer and SPCa were diagnosed in 43 (66%, 43/65) and 37 (57%, 37/65) patients, respectively. The sensitivity, specificity, and positive and negative predictive values for the detection of PCa using T2wi+DWI on the patient level were 88%, 59%, 81% and 72%, respectively. The corresponding values for the detection of SPCa were 92%, 54%, 72% and 83%, respectively. In 6 patients (9%, 6/65) clinically significant prostate cancer was diagnosed by means of TB only while 3 patients (5%, 3/65) with SPCa did not have any T2wi+DWI target. The overall PCA detection rates per core were 21% (167/780) for SB and 55% (52/95) for TB (p<0.01). The mean core cancer lengths were 3.6 mm for SB and 5.4 mm for TB (p<0.01).

CONCLUSION
The use of T2w+DWI is a sensitive tool for PCa detection and biopsy targeting in patients with a clinical suspicion of prostate cancer before their first biopsy.

**CLINICAL RELEVANCE/APPLICATION**

Pre-biopsy biparametric MRI (T2w+DWI) is a sensitive tool for biopsy targeting in patients with a clinical suspicion of prostate cancer based on PSA and/or abnormal digital rectal examination.

**SSK10-02**

**Evaluation of MR Imaging in Patients with Clinical Suspicion of Prostate Cancer but Negative Initial Prostate Biopsy: A Long-term Follow-up Study with PI-RADS**


**PURPOSE**

To evaluate the role of MRI with PI-RADS in patients with clinical suspicion of prostate cancer (PCa) but negative initial biopsy by a long-term follow-up.

**METHOD AND MATERIALS**

Patients with clinical suspicion of PCa (elevated serum PSA, abnormal digital rectal examination (DRE) or family history of PCa), undergoing prostate MRI before biopsy between July 2002 and December 2009, were recruited prospectively. Individual patients were followed in 2002-2013. Patients were included only if they met the following criteria: (a) negative initial biopsy; (b) final diagnosis of PCa by biopsy, surgical pathology, TURP or clinical comprehensive diagnosis. The ages and serum total PSA (TPSA) values within 3 months of prostate MRI were recorded. A three-point subjective suspicion score (SSS) based on PI-RADS was assigned to all focal abnormalities: SSS 1 referred to score 1 and 2 in PI-RADS (definitely or likely benign); SSS 2 referred to score 3 in PI-RADS (indeterminate); SSS 3 referred to score 4 and 5 in PI-RADS (likely or definitely malignant). Patients were divided into three groups based on grades of SSS. The times of biopsies, the delay between final diagnosis of PCa and initial negative biopsy, and the delay between final diagnosis of PCa and MRI were recorded. Non-parametric test was used to analyze the difference of biopsy times, delay between the final diagnosis of PCa and initial negative biopsy or MRI.

**RESULTS**

During 137 months of follow-up, of 1821 patients recruited, 44 patients (male; age: 59-82 years, median follow-up: 77.5 m) met the inclusion criteria. Of 44 patients, group SSS 1, SSS 2 and SSS 3 was 14 (32%), 6 (14%) and 24 (54%), respectively. There was no significant difference in ages or TPSA among three groups (P>0.05). The biopsy times of group SSS 3 were significantly less than group SSS 1 and SSS 2 (P=0.001). The median delay between final diagnosis of PCa and initial negative biopsy in group SSS 3 was 9.5 months, which was much lower than group SSS 1 (40.0 m) and SSS 2 (34.0 m) (P<0.05). Meanwhile, the median delay between final diagnosis of PCa and MRI in group SSS 3 was 11.0 months, which was significantly lower than group SSS 1 (42.0 m) and SSS 2 (34.50 m) (P<0.01).

**CONCLUSION**

Patients with SSS 3, even if with negative initial biopsy, still should be very alert to PCa.

**CLINICAL RELEVANCE/APPLICATION**

MRI with PI-RADS can provide incremental value to patients with clinical suspicion of PCa but negative initial biopsy.

**SSK10-03**

**Prostate Cancer Localization with a Multiparametric MR Approach (PCaMAP): Initial Validation of a Prospective Multi-center Study**

Tom W.j. Scheenen PhD (Presenter): Research Grant, Siemens AG, Alan Wright: Nothing to Disclose, Kirsten Selnaes: Nothing to Disclose, Masoom A. Haider MD: Consultant, Bayer AG, Katarzyna J. Macura MD, PhD: Nothing to Disclose, Daniel Jason Aaron Margolis MD: Research Grant, Siemens AG, Berthold Kiefer PhD: Employee, Siemens AG, Marnix C. Maas PhD: Nothing to Disclose, Jurgen J. Futterer MD, PhD: Nothing to Disclose

**PURPOSE**

To prove the diagnostic accuracy of 3T multi-parametric MR imaging (mpMRI) in a multi-center setting for distinguishing clinically significant prostate cancer from other prostate tissue.

**METHOD AND MATERIALS**

mpMRI in PCaMAP(NCT01138527) exists of high resolution T2-weighted imaging, diffusion weighted imaging (DWI), dynamic contrast enhanced (DCE) imaging and 1H-spectroscopic imaging (MRSI) at 3T without an endorectal coil (ERC). Fifty patients from 5 institutions (mean±SD age 61±7; PSA 7.4±3.5 ng/ml) underwent identical scanning protocols on 3T MRI systems before radical prostatectomy. All data was centrally analyzed. From histopathology, 1.0 cc spherical ROIs were drawn on T2w MRI, and functional parameters were extracted for tumor and healthy tissues.
RESULTS

70 tumors were annotated (54 in peripheral zone, 16 in transition zone). 1756 ROIs were annotated (349 original, 1407 nearest neighbors), of which 712 (136 original) were in prostate cancer. Automatic QC passed 53% of MRSI voxels (worst-performing center 28%, best-performing center 68%). Significant differences between non-cancer PZ and PCa were found for ADC, (Choline+Spermine+Creatine)/Citrate [CSC/C], Choline/(Spermine+Creatine) [C/SC], Ktrans and ve (all p<0.001). Significant differences between non-cancer CG and PCa were found for ADC (p<0.001) and C/SC (p<0.005). ROC analysis resulted in AUC comparable to literature values for ADC, but lower than previously published values for MRSI and DCE parameters. A Logistic Regression Model including ADC, CSC/C and Ktrans did not yield an improvement over using ADC alone.

CONCLUSION

Using identical scanning protocols at 3T without an ERC in a multi-center setting yields good separation of PCA tissue from non-cancer tissues with ADC maps. Data analysis of DCE and MRSI needs further steps before definite conclusions about the multi-center performance of these methods can be drawn. The validation part of this prospective trial will be used to determine the parameters contributing most to the detection and localization of clinically significant PCa as well as their optimal threshold values.

CLINICAL RELEVANCE/APPLICATION

In a multi-center setting, mpMRI of the prostate at 3 Tesla can discriminate between cancer and non-cancer tissue. With identical scanning protocols, homogeneous mpMRI data can be acquired across different institutions.
to validate the role of a multiparametric-MRI (mp-MRI) exam in the diagnostic procedure of patients with clinically suspicious Prostate Cancer (PCa).

METHOD AND MATERIALS
950 patients with PSA > 2.5 ng/mL and negative TRUS were enrolled in the study. They were divided randomly in 2 groups. Group A included 475 patients who underwent a TRUS-guided biopsy with 10 cores sampled. Group B included 474 patients who first underwent an mp-MRI to detect the suspicius focus of PCa and, after that, underwent a TRUS-guided biopsy with 12 cores, 10 of which performed randomly and the other 2 ones were targeted to the index lesion depicted at mp-MRI. Group A patients with negative results at biopsy, underwent an mp-MRI and than a second TRUS-guided biopsy with 12 cores sampled, according to the scheme used in group B patients. Group B patients with or without negative mp-MRI along with negative findings at following guided biopsy, underwent a second TRUS-guided biopsy using a saturation method.

RESULTS
In group A a PCa was found in 215 patients after the first biopsy. In group B a PCa was found in 417 patients after the first biopsy; in the remaining 58 patients both mp-MRI and TRUS-guided biopsy were negative for PCa. In 215 out of 260 group A patients with no evidence of PCa at first biopsy, a PCa was found in the second biopsy, 15% of which were transitional zone tumours. In 49 out of 58 group B patients with no evidence of PCa at the first biopsy, a PCa with a Gleason score of 6 (3+3) was found.

CONCLUSION
mp-MRI is highly recommended in patients with suspicious PCa because it is able to detect the index lesion to which target the biopsy, particularly transitional zone lesions which are not sampled during random TRUS-guided biopsy. Mp-MRI is sometimes unable to depict foci of low-grade PCa, suggesting that patients with negative findings on mp-MRI could be scheduled on active surveillance.

CLINICAL RELEVANCE/APPLICATION
Avoiding delays in PCa diagnosis or avoiding unnecessary biopsies
Evaluating the Relationship between Gleason Score, Tumor Tissue Composition, and Diffusion Kurtosis Imaging in Intermediate/High-risk Prostate Cancer Whole-mount Specimens

PURPOSE
To investigate the relationship between diffusional kurtosis imaging (DKI), Gleason score (GS), and the tissue composition of peripheral zone (PZ) tumors.

METHOD AND MATERIALS
Twenty patients underwent magnetic resonance imaging (MRI) at 3 T, including DKI (b-values: 150,650,1050,1500 s/mm^2) for this prospective study. Axial T1W images and high-resolution T2W images of the pelvis in axial, sagittal and coronal planes were acquired. Maps of apparent diffusion (Dapp) and apparent kurtosis (Kapp) were calculated from these b-values, and PZ tumor location was marked on these maps using whole-mount histopathology slides as a reference. These hematoxylin & eosin slides were digitalized at 20x resolution and percentage areas of cellularity, fibromuscular stromal matrix (FSM), and luminal space were measured by using color based image segmentation (ImageScope v11.2; Aperio Technologies, Vista, CA). PZ tumors were divided into 2 groups: (1) GS = 4+3 (high grade). Correlations between DKI and histopathology were assessed using Wilcoxon Rank Sum test and Spearman’s correlation.

RESULTS
Twenty patients were included (median age, 64; median prostate specific antigen- 8.2 ng/mL). Twelve patients had low grade and 8 had high grade PZ tumors. Kapp was significantly increased in high grade compared to low grade PZ tumors (0.85 v. 0.66, respectively; p=0.035); Dapp was decreased, but the change was not significant (p=0.193). Higher grade PZ tumors had both a significant increase in the percentage area of cellularity (p=0.041) and a decrease in the percentage area of FSM (p=0.011). Kapp had a significant positive correlation with cellularity using Spearman’s correlation (ρ = 0.48, p=0.034) and a moderate negative correlation with FSM (ρ = -0.43, p = 0.057). Dapp only had a weak negative correlation with percentage area of cellularity (ρ = -0.40) (p=0.078). Tumor GS, Kapp, and Dapp all had an insignificant correlation with luminal space.

CONCLUSION
There is a significant positive relationship between diffusional kurtosis, measured with Kapp, and the percentage area of cellularity. Kapp also shows improved performance over Dapp in assessing tumor grade.

Skl10-08
Validation of MR-sequences for Prostate Cancer Diagnostics Based on the PI-RADS Scoring System and Targeted MR-guided in-bore Biopsy

PURPOSE
This study evaluates the accuracy of MR-sequences (T2WI, DWI, DCE) at 3T based on the ESUR scoring system (PI-RADS) using MR-guided in-bore prostate biopsies as the reference standard.

METHOD AND MATERIALS
In 295 consecutive patients (65.9±7.7 years, PSA value 9.9±8.3 ng/ml; median PSA 8.0 ng/ml, lower/upper quartile 5.8/11.0 ng/ml) with multiparametric prostate MRI (mp-MRI) 566 lesions were scored according to the PI-RADS. Histology of all lesions was obtained by targeted MR-guided in-bore biopsy. Statistical analysis including variance and ROC analysis was conducted for lesions and MR-sequences.

RESULTS
In 200 lesions biopsy revealed a prostate cancer (PCa). The area under the curve (AUC) for cancer detection was 0.70 (T2WI), 0.80 (DWI), and 0.74 (DCE). A combination of T2WI+DWI, T2WI+DCE, and DWI+DCE achieved an AUC of 0.81, 0.78, and 0.79. A summed PI-RADS score of T2WI+DWI+DCE achieved an AUC of 0.81. For higher grade PCa (main Gleason pattern ≥4) the AUC was 0.85 for T2WI+DWI, 0.84 for T2WI+DCE, 0.86 for DWI+DCE, and 0.87 for T2WI+DWI+DCE. The AUC for T2WI+DWI+DCE for transitional zone PCa was 0.73, and 0.88 for peripheral zone PCa. Regarding higher grade PCa, AUC for transitional zone PCa was 0.88, and 0.96 for peripheral zone PCa.

CONCLUSION
The combination of T2WI+DWI+DCE achieved the highest test accuracy, especially in patients with higher grade PCa. The combination of T2WI, DWI, and DCE results in a higher accuracy for peripheral than for transitional zone prostate cancer. DCE have lower impact on cancer detection in the transitional zone.
The use of two or only a single MR-sequences leads to a lower AUC and therefore cannot be recommended. Our data suggest, that the PI-RADS scoring system needs further improvement with respect to weighting and selection of MR-sequences and regarding specific criteria for transitional zone prostate cancer.

**SSK10-09**

**Diagnosis of Prostate Cancer in Patients with Rising PSA but Unremarkable Digital Rectal Exam/Transrectal Ultrasound: Value of Endorectal Diffusion-Weighted MR Imaging at 1.5 and 3T in a Large Patient Cohort for the Selection of Patients for Biopsy**

Juergen E. Scheidler MD (Presenter): Nothing to Disclose, Markus Rechl: Nothing to Disclose, Christian Brinkschmidt MD : Nothing to Disclose, Andreas Friedrich Heuck MD : Nothing to Disclose, Christian Glaser MD : Nothing to Disclose

**PURPOSE**

Studies have shown the high influence of readers’ experience on the accuracy of prostate MRI. The aim of this study was to assess whether the widely reader-independent calculation of minimal ADC within the peripheral (PZ) and transitional zone (TZ) may assist in patient selection for biopsy or re-biopsy in pts with suspected prostate cancer (PC).

**METHOD AND MATERIALS**

After IRB approval 412 patients (pts) referred to prostate MRI were identified who fulfilled the inclusion criteria of rising PSA and unremarkable DRE/TRUS. eDWI was performed at 3T or 1.5T at b-values of 50 and 800. Min. ADC were calculated for the left/right peripheral (PZ) and transitional zone (TZ) zone and correlated on a side-by-side basis to 8-12 core biopsy (231 pts) or clinical follow-up (PSA reduction) of at least two years. ROC curves and post-test probabilities for a given ADC-threshold were calculated using the Bayes theorem for PZ and TZ prostate cancer (PC).

**RESULTS**

157/412 pts (234/824 prostate lobes) were diagnosed with PC. In 193 lobes tumor was present in the PZ, whereas in 41 lobes tumor was only affecting the TZ. Mean ADC±SD values for benign vs. malignant tissue were 1.60 ± 0.25 vs. 0.97 ± 0.19 x10

**CONCLUSION**

Diagnosis of PC based on min. ADC in eDWI assists in patient selection for biopsy. Reducing the post-test probability for PZ-PC in pts with min. ADC of >1.3 to 1.4% allow for further clinical follow-up instead of (re-)biopsy. Since the threshold based approach (ADC >1.0) is less effective (post-test probability 6.8%) for the rarer TZ-PC, additional criteria (min. benign ADC=0.75, morphology) need to be considered for diagnosis.

**CLINICAL RELEVANCE/APPLICATION**

eDWI prostate MRI may serve as a rule-out test prior to biopsy in patients with rising PSA and unremarkable DRE/TRUS.

**GUS-WEA**

**Genitourinary/Uroradiology Wednesday Poster Discussions**

**Scientific Posters**

**GU**

AMA PRA Category 1 Credits™: 0.50
Wed, Dec 3 12:15 PM - 12:45 PM Location: GU Community, Learning Center

**Participants**

Moderator
Mary Catherine Frates MD : Nothing to Disclose

**Sub-Events**

**GUS132**

**Magnetic Resonance Diffusion Kurtosis Imaging in Differential Diagnosis of Renal Angiomyolipoma with Minimal Fat and Clear Cell Renal Cell Carcinoma (Station #1)**

Qingqiang Zhu (Presenter): Nothing to Disclose

**PURPOSE**

To characterize Magnetic Resonance Diffusion Kurtosis Imaging (DKI) in the study of renal angiomyolipoma with minimal fat and clear cell renal cell carcinoma.

**METHOD AND MATERIALS**

19 patients with renal angiomyolipoma with minimal fat and 24 patients with clear cell renal cell carcinoma were retrospectively studied. Tumor DKI features (b value=0, 300, 600 s/mm2), including Mean Diffusivity (MD), Fractional Anisotropy (FA), mean kurtosis (MK), radial kurtosis (RK), kurtosis anisotropy (KA), were assessed and investigated. Evaluated DKI features were compared between two tumor types by applying
RESULTS
Statistically significant differences were observed in the properties under evaluation between renal angiomyolipoma with minimal fat and clear cell renal cell carcinoma group and group. MD: (1.48±0.46 vs 7.13±1.19, P<0.005); FA: (0.78±0.12 vs 0.72±0.13, P<0.05); MK: (1.74±1.42 vs 0.33±0.26, P<0.005); KA: (1.42±0.66 vs 0.49±0.13, P<0.05); RK: (5.88±3.26 vs 0.33±0.22, P<0.05). For differentiating renal angiomyolipoma with minimal fat from clear cell renal cell carcinoma, combined evaluation of MD, FA, MK, KA and RK features was found to have an accuracy of 97.7%.

CONCLUSION
Our initial results indicate the feasibility of DKI in differentiating renal angiomyolipoma with minimal fat from clear cell renal cell carcinoma. Future studies in patients with kidney diseases are required to determine the value of DKI for functional kidney imaging.

CLINICAL RELEVANCE/APPLICATION
Strictly limited amount of topics involving DKI method in the study of renal oncology. And this is the only option throughout the section. Our initial results indicate the feasibility of DKI in differentiating renal angiomyolipoma with minimal fat from clear cell renal cell carcinoma. Future studies in patients with kidney diseases are required to determine the value of DKI for functional kidney imaging.
METHOD AND MATERIALS
Twelve patients (12 with AML with minimal fat [mean diameter, 3.0 cm; range, 1.8-4.3 cm] and 58 with RCC [mean diameter, 3.1 cm; range, 2.0-4.3 cm]) who had undergone 320-slice dynamic volume CT perfusion were evaluated. The age and sex distribution were compared between the AML with minimal fat and the RCC. Equivalent blood volume (Equiv BV), permeability surface-area product (PS), and blood flow (BF) of tumor and normal renal cortex were measured and analyzed. Receiver operating characteristic (ROC) curve analysis was performed for the comparison of AML with minimal fat and RCC.

RESULTS
The mean Equiv BV of normal renal cortex, AML with minimal fat, and RCC were (112.9±16.7) ml/100mg, (48.2±6.4) ml/100mg, and (77.8±20.2) ml/100mg, respectively. The mean PS of normal renal cortex, AML with minimal fat, and RCC were (207.9±68.7) ml/100mg/min, (98.2±16.4) ml/100mg/min and (90.8±26.2) ml/100mg/min, respectively. The mean BF of normal renal cortex, AML with minimal fat, and RCC were (296.9±18.7) ml/100mg/min, (138.2±86.4) ml/100mg/min, and (213.8±26.2) ml/100mg/min, respectively. There was a significant difference in all three parameters between tumor and normal renal cortex (P<0.001). Equiv BV and BF were significantly different between AML with minimal fat and RCC (P<0.05). Equiv BV and BF were highly predictive for distinguishing between AML with minimal fat and RCC, with areas under the ROC curves of 0.80 and 0.96. A threshold value of 56.16 ml/100mg in Equiv BV permitted this distinction with 79% sensitivity, 86% specificity, and 80% accuracy. A threshold value of 153.84 ml/100mg/min in BF permitted this distinction with 79% sensitivity, 98% specificity, and 95% accuracy.

CONCLUSION
Perfusion imaging using 320-slice dynamic volume CT may be useful in differentiating AML with minimal fat from RCC, with Equiv BV and BF being valuable perfusion parameters.

CLINICAL RELEVANCE/APPLICATION
CT perfusion imaging can demonstrate the perfusion features of angiomyolipoma (AML) with minimal fat with those of size-matched renal cell carcinoma (RCC) and is useful in the differential diagnosis of these two types of tumors.

Efficacy of Feraheme as a Lymphatic Contrast Agent in Prostate Cancer (Station #5)
Teresa Catherine Bravo : Nothing to Disclose, Michael Joseph Dattoli MD : Nothing to Disclose, Stephen Michael Bravo MD (Presenter): Nothing to Disclose, Matthew Hayes : Nothing to Disclose, Alexandra Osorio MD : Nothing to Disclose, Patricia M. Dycus RRA : Nothing to Disclose, Charles Myers MD : Nothing to Disclose

PURPOSE
Ferumoxytol (Feraheme) is a ferromagnetic nanoparticle with lymphotrophic biokinetics. Feraheme is delivered to lymph nodes via normal macrophages. MRI is successful in suppressing normal lymph nodes containing Feraheme. The purpose of this study is to validate this agent’s safety and determine its role as a lymph node contrast agent in the prostate cancer population.

METHOD AND MATERIALS
A nonrandomized prospective evaluation of 152 prostate cancer patients. All patients received IV Feraheme. T2 MEDIC and T2* sequence imaging of the abdomen and pelvis, using Verio and Skyra 3T Siemens MR units, was performed approximately 24 hours after Feraheme infusion. Images were reviewed by 2 board certified radiologists with consensus interpretation. Lymph nodes were considered abnormal if they did not suppress after Feraheme infusion. Thirty nine patients subsequently underwent image guided lymph node biopsy. Radiology-pathology correlation was performed.

RESULTS
Forty-nine patients demonstrated abnormal lymph nodes consistent with metastatic disease based on Feraheme imaging criteria. Thirty-nine of these patients underwent image guided lymph node biopsy, 1 underwent mediastinoscopy, and 1 underwent pelvic lymph node exoneration. A total of 84 lymph nodes were sampled. Ninety-one percent of these demonstrated metastatic prostate carcinoma, 2% demonstrated lymphoma, and 7% were normal. Forty-seven percent of all malignant lymph nodes did not fulfill traditional imaging criteria for malignancy. All of the normal lymph nodes on biopsy were either femoral or axillary lymph nodes demonstrating heterogeneous peripheral hypointense T2* signal and heterogeneous central hyperintense T2* signal.

CONCLUSION
Feraheme can be used to evaluate for the presence of lymphatic dissemination of metastatic disease in prostate cancer patients, with a lower limit of resolution of focal lymph node metastases of 3-4 mm. This improved resolution carries implications for therapeutic radiation planning in the setting of newly diagnosed or recurrent/metastatic prostate carcinoma. Feraheme may play a significant future role as a lymphatic contrast agent in the early dissemination of lymphatic metastatic disease.

CLINICAL RELEVANCE/APPLICATION
3T MR after Feraheme administration has the potential to identify neoplastic nodes down to a resolution of 3-4 mm, thereby markedly improving the detection of metastatic lymph node disease.
Adrenal Hyperplasia: Analysis by Using Adrenal Protocol Computed Tomography (CT) and Comparison with Adrenal Adenoma (Station #6)

Solbee Han (Presenter): Nothing to Disclose, Byung Kwan Park MD: Nothing to Disclose, Sung Yoon Park: Nothing to Disclose, Chan Kyo Kim MD, PhD: Nothing to Disclose

PURPOSE

To retrospectively evaluate CT characteristics of adrenal hyperplasia by using adrenal protocol CT

METHOD AND MATERIALS

Between January 2004 and November 2012, 14 patients with adrenal hyperplasia and 144 patients with adrenal adenoma had both adrenal protocol CT and surgical confirmation. The adrenal protocol CT consisted of unenhanced, 1-minute, and 15-minute postcontrast images. The lesion size, number, attenuation value, absolute percentage washout (APW), and relative percentage washout (RPW) rates were compared between hyperplasia and adenoma. The mixed model was used for the statistical analysis.

RESULTS

Four of 14 patients with adrenal hyperplasia had 3 or more nodules (28.6%), while no patients with adenoma had 3 or more nodules (p< 0.001). Between hyperplasia and adenoma, the mean attenuation value on unenhanced CT image, APW, and RPW rates were 18.8 ± 10.8HU and 13.7 ± 15.6HU (p= 0.106), 73.7 ± 9.3% and 67.3 ± 26.2% (p= 0.107), and 61.2 ± 9.2% and 59.9% ± 23.0% (p= 0.751), respectively. The rates of hyperplasia and adenoma to satisfy CT criteria for adenoma were 100% and 91.7% (p= 1.000).

CONCLUSION

There is a large overlap quantitatively between adrenal hyperplasia and adenoma on adrenal protocol CT. The multiplicity such as 3 or more nodules may raise the likelihood of hyperplasia.

CLINICAL RELEVANCE/APPLICATION

Although adrenal protocol CT has shown excellent diagnostic performance for differentiating adenoma from nonadenoma in the adrenal gland, radiologists now may add adrenal hyperplasia as another differential diagnosis for adenoma because most of hyperplasia also satisfy the quantitative CT criteria of adenoma.

Role of Multiparametric MRI for Managing Active Surveillance of Prostate Cancer Patients (Station #7)

Anwar Roshanali Padhani MD (Presenter): Advisory Board, Acuitas Medical Ltd Advisory Board, Siemens AG Speakers Bureau, Siemens AG Researcher, Siemens AG Speakers Bureau, Johnson & Johnson, Giuseppe Petralia MD: Nothing to Disclose, Heminder Kaur Sokhi MRCS, FRCR: Nothing to Disclose, Francesco Sanguedolce PhD, MD: Nothing to Disclose, Giles Hellawell MD, MRCS: Nothing to Disclose, Nicola Anyamene: Nothing to Disclose

TEACHING POINTS

- Multiparametric (diffusion weighted, dynamic contrast enhancement and spectroscopy) MRI (mpMRI) has the potential to improve patient selection at initial triage for active surveillance (AS)
- Changing mpMRI phenotype during AS should prompt histologic sampling to assess for interval disease upgrading prior to AS discontinuation
- Physician communication via structured, pictorial reporting is key to the successful implementation of mpMRI for AS

TABLE OF CONTENTS/OUTLINE

- Overview of the concepts underpinning AS strategies for low risk prostate cancer patients
- Discuss contemporary challenges for AS
- Illustrate the ability of mpMRI to delineate tumor location, extent and grade
- Discuss the role of mpMRI for confirming clinical patient selection criteria for AS and potential to replace early confirmatory biopsy
- Demonstrate the ability of mpMRI to predict adverse pathological features thus to detect the approximately 30% of patients currently misclassified who are unsuitable for AS
- Illustrate the changing imaging phenotype during the AS period which should prompt out-of-program histologic resampling
- Demonstrate structured pictorial reporting of mpMRI using the ESUR PI-RADS system
- Discuss guidelines advocating implementation of mpMRI in routine management of AS candidates

Genitourinary/Uroradiology Wednesday Poster Discussions

Scientific Posters

GU

AMA PRA Category 1 Credits™: .50

Wed, Dec 3 12:45 PM - 1:15 PM Location: GU Community, Learning Center

Sub-Events

Identifying Subtypes of Papillary Renal Cell Carcinoma (pRCC) on CT – Accuracy and Distinguishing
PURPOSE

Type 2 pRCC are more aggressive than type 1 pRCC. Recent studies have described CT features of types 1 and 2 pRCC, but without non-pRCC controls. The aims of this study were:
1. Define the accuracy of CT for differentiating pRCC from non-pRCC
2. Define the accuracy of CT for differentiating type 1 pRCC from type 2 pRCC
3. Assess the diagnostic value of individual CT features for diagnosis of pRCC

METHOD AND MATERIALS

CT scans of 114 patients (mean age = 64 years, range 32-85 years) with histologically confirmed malignant renal masses underwent blinded radiological review without knowledge of the pathology. Each mass was assigned as type 1 pRCC, type 2 pRCC or non-pRCC, using previously described radiological features of each subtype. The presence of individual CT features was noted. Separate pathological review confirmed 26 as type 1 pRCC, 9 as type 2 pRCC, 63 as clear cell RCC and the rest as miscellaneous tumour types. Results were used to calculate overall diagnostic accuracy and odds ratios (OR) for individual CT features.

RESULTS

Patients with pRCC and non-pRCCs were matched for age/sex/tumour stage. Specificity and sensitivity of CT for the diagnosis of pRCC was 75% and 55% respectively, with a negative predictive value of 78%. Comparable figures for subtyping of type 1 and 2 pRCC were specificity 75% and sensitivity 20%. Regarding the value of individual CT signs, pRCC enhanced less than non-pRCCs, with a mean post contrast density rise of 31HU vs. 55HU (p=0.0001; unpaired t-test). pRCCs were significantly more likely to demonstrate homogenous enhancement (OR 2.9), round or oval vs. complex shape (OR 7.4), calcification (OR 5.7), solid vs. cystic or necrotic appearance (OR 8.8) and have a smooth vs. irregular edge (OR 3.9). Centripetal growth was less common in pRCC. Regarding subtyping of pRCC, a smooth tumour edge was more common in type 1 (p=0.007). Other described subtyping CT signs of pRCC were not found to be useful (p>0.5).

CONCLUSION

A homogenous, solid, round or oval shaped renal mass with a smooth edge and low-level enhancement is more likely to be a pRCC with odds ratios of 2.9-8.8. Types 1 and 2 pRCCs cannot be reliably differentiated from each other.

CLINICAL RELEVANCE/APPLICATION

Papillary RCC can be reliably predicted from CT features using the described CT signs. However, there is an overlap between the described CT signs of types 1 and 2 pRCC, and biopsy for subtyping of pRCC should be considered.

GUS140

Assessment of Radiation Dose and Conspicuity of Clear-cell Renal Cell Carcinoma with Split-Bolus Multidetector Spectral CT Imaging (Station #3)

Meng Zhang (Presenter): Nothing to Disclose, Hong Zeng MD, PhD : Nothing to Disclose, Chang-jiang Sun MS : Nothing to Disclose, Yan Lv BA : Nothing to Disclose, Lin Liu MD, PhD : Nothing to Disclose

PURPOSE

To assess the radiation dose and conspicuity of clear-cell renal cell carcinoma with single-phase enhanced split-bolus multidetector spectral CT imaging.

METHOD AND MATERIALS

Ninety patients with suspected renal malignancies were randomly divided into two groups to receive single-phase enhanced split-bolus spectral CT (group A) and single-dose traditional double-phase dynamic enhanced CT (group B). Group A: 70ml contrast agent was injected by bolus; 25s later, 50ml contrast agent was injected; thereafter 40ml physiological saline was injected at the same rate. At 70s after the first injection of contrast agent, spectral CT was performed. The optimal monochromatic energy (keV) images were reconstructed. Group B: 120ml contrast agent was injected, the arterial-phase scan was performed when the arterial CT value reached 100HU, and at a delay of 60s after the first scan, the venous-phase scan was performed. The BMI and radiation dose were recorded. t test, Fisher exact test, and Mann-Whitney test were used for statistical analysis.

RESULTS

In group A, 43 cases were clear-cell renal cell carcinoma, 1 case was chromophobe renal cell carcinoma, and 1 case was renal angiomylipoma with minimal fat. In group B, 44 cases were clear-cell renal cell carcinoma, and 1 case was papillary renal cell carcinoma. There were no statistically significant differences in age, body weight, sex and BMI between two groups (35/45;38/45). The optimal keV was 58keV for visualizing renal tumors and 67keV for renal arteries. The conspicuity of tumors and CNR in 58keV(1.7±0.02and 10.3±3.2) were better than those in group B(1.08±0.04and 5.3±2.2). All inter-group comparisons showed P<0.01. The CT values of renal arteries in 58keV and group B were equivalent (196±20.3HU vs. 203±14.5HU, P>0.05), while the CT value of renal veins in 67keV was higher than that in group B (200±34.0HU vs. 140±12.6HU). The DLP of group A was
735 mGy•cm ± 162, significantly lower than that of group B (1032 mGy • cm ± 324) (P<0.01).

CONCLUSION

In visualizing clear-cell renal cell carcinoma, renal arteries and veins, single-phase enhanced split-bolus spectral CT is better than traditional double-phase dynamic enhanced CT, with the radiation dose decreased by 28.78%.

CLINICAL RELEVANCE/APPLICATION

Low radiation dose single-phase enhanced split-bolus spectral CT imaging can be widely used in visualizing clear-cell renal cell carcinoma, renal arteries and veins.

GUS141

Postoperative Outcomes of MR-invisible FIGO Stage IB1 Cervical Cancer (Station #4)

E-Ryung Choi MD (Presenter): Nothing to Disclose, Byung Kwan Park MD: Nothing to Disclose, Jung Jae Park MD: Nothing to Disclose

PURPOSE

Tumor volume is a significant prognostic factor of cervical cancer. It is still unknown about outcome of biopsy-proven FIGO stage IB1 cervical cancer which is invisible on preoperative magnetic resonance imaging (MRI). The aim was to retrospectively evaluate the postoperative outcomes of MR-invisible IB1 cervical cancers.

METHOD AND MATERIALS

Between January 2001 and December 2007, we reviewed the medical records of 86 patients with biopsy-proven FIGO stage IB1 cervical cancer which was invisible on MRI. During the same period, we also reviewed the medical records of 260 patients with biopsy-proven FIGO stage IB1 cervical cancer which was visible on MRI. Both of these cancer groups were treated with radical hysterectomy and lymph node dissection. MR-invisible and MR-visible IB1 cancers were compared in terms of pathologic parameters and long-term survival rate.

RESULTS

The median sizes and depths of stromal invasion of MR-invisible versus MR-visible IB1 cancers were 4.5±7.1 mm and 33.3±20.1% versus 30±14 mm and 66.7±26.6%, respectively (p=0.000). The incidences of lymph node metastasis, parametrial invasion, and lymphovascular invasion were 1.1% (1/86) and 18.8% (49/260) (p=0.000, odd ratio=19.7), 0% (0/86) and 6.5% (17/260) (p=0.009, odd ratio=12.4), and 4.7% (4/86) and 26.9% (70/260) (p=0.000, odd ratio=7.6) in the MR-invisible and MR-visible IB1 cancers, respectively. Recurrence-free and overall 5-year survival rates of MR-invisible versus MR-visible IB1 cancers were 98.8% (85/86) versus 91.2% (237/260) and 100% (86/86) versus 95.8% (249/260), respectively (p=0.011 and 0.045).

CONCLUSION

MR-invisible IB1 cancer provides better postoperative outcomes than MR-visible Ib1 cancer because of the much lower tumor burden.

CLINICAL RELEVANCE/APPLICATION

MR-invisible FIGO stage IB1 cervical cancer accounting for 25% of IB1 cancers might be treated less invasively because of lower tumor burden than MR-visible IB1 cervical cancer.

GUS142

Comparison of MRI Guided Prostate Biopsy with TRUS Guided Prostate Biopsy in Patients with Persistently Elevated PSA, Multiple (≥ 2) Prior Negative TRUS Biopsies and at Least One Suspicious Lesion at MP-MRI (Likert score ≥3) (Station #5)

Jinxing Yu MD (Presenter): Nothing to Disclose, Ann S. Fulcher MD: Nothing to Disclose, Mary Ann Turner MD: Nothing to Disclose, Liang Wang MD, PhD: Nothing to Disclose, Don Nguyen MD: Nothing to Disclose, Xiaoming Li: Nothing to Disclose, Sean Li MEd: Nothing to Disclose

PURPOSE

To compare MRI guided prostate biopsy (MRGB) with TRUS guided biopsy in patients with persistently elevated PSA, multiple prior negative TRUS biopsies and at least one suspicious lesion at mp-MRI (Likert score ≥3). Clinical significance of detected tumors will be determined.

METHOD AND MATERIALS

The study group comprises consecutive patients referred for MRGB with at least two negative TRUS GB, persistently elevated PSA greater than 4 ng/ml and at least one lesion suspicious for prostate cancer (PCa) on mp-MRI. Images of all patients were reviewed independently and blindly by two experienced radiologists who recorded Likert score for each cancer suspicious region. Patients who underwent 2 or more TRUS GB, with one additional TRUS biopsy performed at the same time period as the study group, comprised the comparison group. Clinical information and biopsy results were collected; clinical significance of detected tumors was established using accepted criteria including Gleason score.
RESULTS

Eighty-eight patients who underwent MRGB were included in the study group. Median number of prior negative TRUS GB was 3 (range 2-6), median PSA at time of biopsy was 13.4 ng/mL (4.1-164 ng/mL), mean PSA density was 0.44, and mean prostate volume was 56.1 cc (range 25-153 cc). PCa was detected in 47 out of 88 patients (53%). PSA density was much higher in patients with positive (0.62) vs. negative MRGB (0.24) result (p<0.001). Detection rate increased to 86.5% if MRGB was only performed in patients with MR imaging Likert score ≥3. In comparison group (n=48), 5 patients had a positive result (10.4%) at subsequent TRUS GB. Tumor detection rate was significantly higher in patients with MRGB than in those with TRUS GB (p < 0.001). All 46 of 47 patients (98%) with cancer detected with MRGB had clinically significant tumors, as compared to 60% in comparison group (p<0.001).

CONCLUSION

MRGB shows high detection rate of PCa in patients with at least 2 prior negative TRUS GB, and even higher detection rate if MRGB was only performed on patients with imaging Likert score ≥3. Tumors detected by MRGB have much higher chance of being clinically significant than those detected with repeated TRUS GB.

CLINICAL RELEVANCE/APPLICATION

The rate of false negative TRUS GB results may be as high as 35% even with multiple attempts. Our study showed MRI guided prostate biopsy yielded a very high detection rate of PCa in patients with high PSA and multiple negative TRUS biopsies.

GUS143

Proton-density Fat Fraction: A Viable Tool for Differentiating Adenoma from Nonadenoma in Adrenal Glands (Station #6)

Meng Xiaoyan BMedSc (Presenter): Nothing to Disclose, Hao Tang: Nothing to Disclose, Dao Yu Hu MD, PhD : Nothing to Disclose

PURPOSE

To investigate the application of proton-density fat fraction (PDFF) measurement for accurately quantifying the fat content of adrenal gland nodules, differentiating adenoma from metastasis and pheochromocytoma.

METHOD AND MATERIALS

This study was approved by the committee on human research with the waivers of informed consent. The consecutive research was performed between August 2013 to March 2014, 27 patients (men: 8, women: 14; mean age 51.8±12.2 years, range 22-68 years) with 33 adrenal nodules (18 histopathologically proven adenomas, 5 proved pheochromocytoma and 8 clinically proven metastases) who underwent MRI scanning with T1 independent volumetric multi-echo gradient-echo imaging with spectral fat modeling. All MRI examinations were performed on a 3.0-T MR scanner. PDFF quantitative measurements were calculated by placing suitable regions of interest in the nodules, avoiding hemorrhage and necrosis. Mean and standard deviation were calculated and One-way ANOVA was used to test.

RESULTS

PDFF of adenoma, metastasis and pheochromocytoma calculated were 20.15±9.01; 1.92±0.65; 1.22±0.65 (mean±std), respectively. PDFF of adenoma was significantly higher than metastasis (p=0.001, <0.05) and pheochromocytoma (p=0.006, <0.05), while there was no significantly difference between metastasis and pheochromocytoma (p=0.0927, >0.05).

CONCLUSION

PDFF measurement provided an accurate estimation for fat content in adrenal gland nodules, and it could be a reliable and precisely parameter for differentiating adenomas from nonadenomas.

CLINICAL RELEVANCE/APPLICATION

PDFF is sensitive to quantify the fat content in adrenal glands which could be used to distinguish early metastasis from small adenomas, especially with bilateral nodules, therefore, can benefit tumor staging.
**SSM11-01**

**Adrenal Gland Metastases from Renal Cell Carcinoma: Can Arterial and Venous Phase Enhancement Levels and Pattern Aid in Distinction from Lipid Poor Adenoma?**


**PURPOSE**

Recent data has shown that adrenal metastases from renal cell carcinoma may washout similar to adrenal adenoma on CT. Because the routine renal MDCT protocol includes an arterial phase acquisition, we hypothesize that additional discriminatory information can be gleaned from the CT exam if the arterial enhancement is incorporated into analysis. The purpose of this study was to determine if metastatic renal cell carcinoma can be distinguished from lipid poor adenoma by enhancement level and pattern on arterial and venous phases.

**METHOD AND MATERIALS**

CT exams of 43 adult patients with 18 lipid poor adenomas (LPA) and 27 adrenal metastases from renal cell carcinoma (mRCC) measuring < 4 cm were reviewed retrospectively. LPA were defined as having ≥10 HU precontrast density, meeting APW and/or RPW criteria on washout CT or at least 2 years size stability, and no clinical indicators of pheochromocytoma. Renal cell metastases were confirmed by either new appearance or change in size of an adrenal mass on serial examinations in a patient with RCC. Contrast attenuation measurements (arterial and venous phase acquisitions) and relative enhancement (arterial > venous, arterial = venous, arterial < venous) were compared. A difference of ≥ 5 HU between the arterial and venous phases was used to define a higher level of enhancement.

**RESULTS**

Average lesion size was not significantly different (mRCC 1.99 cm compared to LPA 2.34 cm, p=0.11). Mean arterial phase enhancement of the mRCC was higher than LPA (77.7 HU vs 55.4 HU respectively, p=0.02). Arterial enhancement > 100 HU (5% identified in 13% (9/27) of mRCC, compared to 0 adenomas). Venous enhancement levels were similar between the two lesions (mean 71.6 HU for mRCC and 71.9 HU for LPA). Nearly half of mRCC (48%, 13/27) enhanced more on the arterial phase than the venous phase, compared to 11% (2/18) of adenomas. Most adenomas (72%, 13/18) enhanced more on the venous phase, compared to 22% (6/27) of mRCC. Equal enhancement across the 2 phase was present in 30% (8/27) of mRCC and 17% of LPA (3/18).

**CONCLUSION**

In patients with RCC, an adrenal lesion that measures > 100 HU on the arterial phase and enhances greater on the arterial than venous phase is more likely to be a metastasis than a lipid poor adenoma.

**CLINICAL RELEVANCE/APPLICATION**

If an adrenal lesion is identified in a patient with renal cell carcinoma, evaluation of the arterial phase can aid in distinguishing metastasis from adenoma.

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**SSM11-02**

**Intravoxel Incoherent Motion MRI and Histogram Analysis of the Apparent Diffusion Coefficient for the Differentiation between Adrenal Cortical Adenomas and Pheochromocytomas**

Tomokazu Umanodan (Presenter): Nothing to Disclose, Yoshihiko Fukukura MD, PhD: Nothing to Disclose, Junichi Ideue: Nothing to Disclose, Tomohide Yoneyama: Nothing to Disclose, Koji Takumi: Nothing to Disclose, Hiroto Hakamada: Nothing to Disclose, Masanori Nakajo MD: Nothing to Disclose, Masatoyo Nakajo MD, PhD: Nothing to Disclose, Megumi Jinguji: Nothing to Disclose, Takashi Yoshiura MD, PhD: Nothing to Disclose

**PURPOSE**

To determine the diagnostic performance of intravoxel incoherent motion (IVIM) diffusion weighted imaging and histogramic analysis of the apparent diffusion coefficient (ADC) for differentiating adrenal cortical adenomas from pheochromocytomas.

**METHOD AND MATERIALS**

We retrospectively evaluated 35 adrenal tumors (24 cortical adenomas and 11 pheochromocytomas) in 34 patients (17 male and 17 female patients; mean age, 58.8 years; range, 16-86 years). The tumors were delineated by a free-hand region of interest (ROI) on each equatorial plane. The IVIM parameters (ADC, D, D*, and f) were obtained by using 10 b values (0, 10, 20, 30, 50, 80, 100, 200, 400, and 800 s/mm²), including the mean, variance, coefficient of variation (CV), kurtosis, skewness, and 10th, 25th, 50th, 75th, and 90th percentiles were calculated. The IVIM and histogram parameters were compared between cortical adenomas and pheochromocytomas by using the Mann-Whitney U test. Receiver operating characteristic curve analyses were used to assess the ability of the variance and CV of ADC derived from values of 0 and 800 s/mm² for differentiating adrenal adenomas from pheochromocytomas. Sensitivity and specificity were calculated by using a threshold criterion that would maximize the average of sensitivity and specificity.

**RESULTS**

In ADC histogram analysis obtained at b values of 0 and 800 s/mm², the variance and CV of cortical adenomas were significantly lower than those of pheochromocytomas (p=0.001 and 0.003, respectively). For cortical
adenomas, the diagnostic sensitivities and specificities were 91.7% and 63.6% (cut off,

CONCLUSION
The variance and CV of ADC (b values of 0 and 800s/mm2) are useful for distinguishing cortical adenomas from pheochromocytomas. The other histogram and IVIM parameters did not show significant differences.

CLINICAL RELEVANCE/APPLICATION
Histogram analysis of diffusion-weighted magnetic resonance imaging can help differentiate adrenal cortical adenomas from pheochromocytomas.

SSM11-03 Prediction of Adrenal Adenomas with Cortisol Hypersecretion by Using Adrenal Computed Tomography: Emphasis on Contralateral Adrenal Atrophy
Sung Yoon Park (Presenter): Nothing to Disclose, Young Taik Oh MD : Nothing to Disclose, Dae Chul Jung : Nothing to Disclose

PURPOSE
To retrospectively analyze computed tomography (CT) characteristics of adrenal adenomas with cortisol hypersecretion by using adrenal CT compared to adenomas with aldosterone hypersecretion or non-function.

METHOD AND MATERIALS
Between 2011 and 2013, thirty three surgically confirmed adrenal adenomas were evaluated with adrenal CT. They were divided into group A (cortisol hypersecretion, n= 15) and group B (aldosterone hypersecretion, n= 17; non-function, n= 1). In adenomas, the lesion size, attenuation values, and absolute and relative washout rates were assessed. In the contralateral adrenal gland, the thickness of lateral and medial limbs, and body was measured and averaged. Quantitatively, CT parameters of adenomas and contralateral adrenal thickness were compared between two groups. Qualitatively, two radiologists predicted group A with 5-point scale based on CT findings of the contralateral adrenal atrophy in consensus. The student t-test and receiver operating characteristic (ROC) curve analysis were conducted.

RESULTS
All of subjects satisfied absolute (≥ 60%) or relative (≥ 40%) washout criteria for diagnosing adenoma on adrenal CT. The contralateral adrenal thickness was 1.6 ± 0.3mm in group A and 2.6 ± 0.5mm in group B (p< 0.001). The area under the curve of the contralateral adrenal thickness was 0.939, and sensitivity and specificity with a cut-off of 2.0mm or less in thickness were 93.3% and 88.9%, respectively, for predicting group A. In qualitative analysis, 30 of 33 adenomas were correctly differentiated between two groups (overall accuracy, 90.9%).

CONCLUSION
Findings of the contralateral adrenal atrophy on CT may help predict adrenal adenomas with cortisol hypersecretion.

CLINICAL RELEVANCE/APPLICATION
Current laboratory tests for characterizing functioning adrenal adenomas are costly and often need hospitalization. Our results suggest CT evaluation could help differentiate adenomas with cortisol hypersecretion from other types of adenomas, which information may allow clinicians to plan optimal diagnostic and therapeutic strategies.

SSM11-04 Distinguishing Adrenal Adenomas from Non-adenoma by Dual Energy CT Analysis with 320-row Area Detector CT: Comparison with Single Energy CT Analysis and Chemical Shift MR Imaging
Koji Takumi (Presenter): Nothing to Disclose, Yoshihiko Fukukura MD, PhD : Nothing to Disclose, Junichi Ideue : Nothing to Disclose, Tomokazu Umanodan : Nothing to Disclose, Tomohide Yoneyama : Nothing to Disclose, Hiroto Hakamada : Nothing to Disclose, Masanori Nakajo MD : Nothing to Disclose, Takashi Yoshiura MD, PhD : Nothing to Disclose

PURPOSE
To determine whether dual energy CT analysis can help differentiate adrenal adenomas from non-adenomas.

METHOD AND MATERIALS
The study population consisted of 64 patients with 76 adrenal lesions (25 lipid-rich adenomas, 37 lipid-poor adenomas, and 14 non-adenomas) who underwent dual energy CT examination using a 320-row area detector CT. Unenhanced CT scan with 120 kVp followed by unenhanced dual energy CT scan with 80 and 135 kVp were performed in all patients. Chemical shift MR imaging with a 3.0-T unit was performed in 31 adrenal lesions. For each adrenal lesion, an ovoid region of interest as large as possible to cover the largest dimension was drawn. We evaluated the following 5 parameters: mean attenuation value on 120, 80 and 135 kVp (MAV_{120}, MAV_{80}, MAV_{135}), difference of mean attenuation values between 80 and 135 kVp (DMAV_{135-80}), and signal intensity (SI) index: [(SI on in-phase imaging-SI on opposed-phase imaging)/(SI on in-phase imaging)]×100%. Receiver-operating characteristic (ROC) curve was used to assess the ability of the 5 parameters to discriminate total or lipid-poor adenomas from non-adenomas. The sensitivity obtained at the threshold criteria of 100% specificity for diagnosing adrenal adenomas were compared between all CT parameters by using the McNemar’s test. Pearson’s correlation analysis was used to evaluate the correlation between DMAV_{135-80} and SI index.

RESULTS
For diagnosing total and lipid-poor adenomas, area under the ROC curve values were 0.869 and 0.780 for MAV_{120}, 0.895 and 0.823 for MAV_{80}, 0.844 and 0.738 for MAV_{135}, 0.893 and 0.820 for DMAV_{135-80}; and
0.969 and 0.950 for SI index, respectively. With the thresholds values of individual parameters to yield 100% specificity, the sensitivity for diagnosing total and lipid-poor adenomas were 61.3 and 35.1% for MAV120, 66.1, 43.2% for MAVg0, 53.2 and 21.6% for MAV135, and 75.8 and 59.5% for DMAV135-80. The sensitivities for diagnosing total and lipid-poor adenoma were significantly higher with DMAV135-80 than with MAV120 (p=0.012,respectively) and MAV135 (p=0.001,respectively). DMAV135-80 values correlated well with SI index (r=0.650,p<0.001).

CONCLUSION

Dual energy CT analysis can help differentiate adrenal adenomas from non-adenomas.

CLINICAL RELEVANCE/APPLICATION

Dual energy CT analysis can be used to detect lipid component, and improve diagnostic performance to differentiate adrenal adenomas from non-adenomas in comparison with single energy CT analysis.

SSM11-05 Dual Energy MDCT in Incidental Adrenal Nodules: Impact of Material Density Analysis on Lesion Characterization


PURPOSE

To investigate whether contrast-enhanced dual energy MDCT with material decomposition analysis is able to distinguish adrenal adenomas from nonadenomatous lesions.

METHOD AND MATERIALS

Thirty-eight nonconsecutive patients (22 men, 16 women; mean age, 65 years), having 47 adrenal nodules, underwent noncontrast and contrast-enhanced dual energy MDCT of the abdomen. For each adrenal nodule, noncontrast attenuation values were measured and dual energy density measurements were obtained using fat/iodine and fat/water material density basis pairs. The diagnostic performance of noncontrast MDCT and dual energy material densities for diagnosis of adenomas were assessed using a leave one out cross-validation.

RESULTS

Adenomas (lipid-rich and lipid-poor) displayed significantly different mean density values (mg/cm3), compared to nonadenomas, on fat-iodine (970 ± 17.2 vs. 1011.4 ± 10.5), iodine-fat (2.5 ± 0.3 vs. 4.6 ± 1.6), fat-water (-666.7 ± 154.8 vs. -2245 ± 1090.2), and water-fat (1628.4 ± 177.3 vs. 3316.2 ± 1113.2) images, respectively (P<0.0001). For diagnosis of adenoma, dual energy material density analysis showed sensitivity of 96% and specificity of 100%, yielding significantly improved diagnostic performance compared to noncontrast MDCT attenuation (sensitivity, 66%; specificity 100%; P=0.04).

CONCLUSION

Contrast-enhanced dual energy MDCT with material density analysis is able to differentiate between adrenal adenomas and nonadenomas, reflecting an improved ability for the diagnosis of lipid-poor adenoma over noncontrast MDCT.

CLINICAL RELEVANCE/APPLICATION

Contrast-enhanced dual energy material density analysis allows for characterizing incidental adrenal nodules, potentially eliminating the need of additional work-up.

SSM11-06 Assessment of Adrenocortical Carcinoma with Whole-lesion Apparent Diffusion Coefficient Histogram-derived Parameters: Correlation with Prognostic and Tumor Proliferative Markers

Andrea Farias Melo MD (Presenter): Nothing to Disclose, Sara R. Teixeira MD: Nothing to Disclose, Gyl Eanes Silva MD, PhD: Nothing to Disclose, Valdair Francisco Muglia MD, PhD: Nothing to Disclose, Jorge Elias MD, PhD: Nothing to Disclose

PURPOSE

To assess the prognostic relevance of apparent diffusion coefficient value (ADC) in patients with adrenocortical carcinoma (ACC) and to investigate if there is correlation between ADC and ki-67 staining index (ki67), a tumor proliferation marker

METHOD AND MATERIALS

Institutional board review approved the study design. Signed informed consent was waived. From January 2011 to December 2013, twelve patients with histopathologically confirmed ACC who underwent magnetic resonance imaging (MRI) were retrospectively included. A histogram-derived of ADC parameters was obtained from whole-lesion assessment of diffusion-weighted MRI. The 10th (ADC10) and 25th (ADC25) percentiles, minimum (ADCmin) and maximum ADCs (ADCmax), mean, and median of the ADCs were correlated with cellularity and
ki67. Associations along with staging and disease-free survival were also analyzed. Mann-Whitney U test and Spearman's rho were used.

RESULTS

There were 13 lesions in 7 adults and 5 pediatric patients (10 females). Mean age with standard deviation (sd) at the time of diagnosis was 324.4 months (286). Seven patients (53.8%) were at stage II, 4 (30.8%) at stage III, and 2 (15.4%) at stage IV. Mean disease-free survival (sd) was 546.1 days (376). Mean ADCs (sd) were 1,100 mm²/s (223), ADCmin 422 mm²/s (338), ADCmax 2,284 mm²/s (613), ADC10 846 mm²/s (173), and ADC25 944 mm²/s (179). Correlation was found between ADC10 and cellularity (Spearman's rho = -0.610) and a trend was observed for ADCmin and ADC25 (p = .058 and .052, respectively). There was no correlation between ADCs and ki67. There was correlation between disease-free survival and ADCmin, ADCmax, ADC10, and cellularity (Spearman's rho = .83, -.58, .57, and -.60, respectively). There was no correlation between staging and ADC values or ki67.

CONCLUSION

In patients with ACC, when whole-lesion histograms were used to derive ADC parameters, ADCmin, ADCmax, and ADC10 correlated with disease-free survival and with cellularity of the tumors, better than did other ADC parameters. However, ADCs failed to correlate with tumor proliferation markers.

CLINICAL RELEVANCE/APPLICATION

In adrenocortical carcinomas, ADC parameters derived from whole-lesion histograms correlated with clinical prognosticators and tumor cellularity, unlike traditional average ADC values.

MSCU42

Case-based Review of US (An Interactive Session)

Multisession Courses

ER US GU

AMA PRA Category 1 Credits™: 1.50
ARRT Category A+ Credits: 1.50
Wed, Dec 3 3:30 PM - 5:00 PM Location: S406A

Sub-Events

MSCU42A GYN Challenging Cases

Oksana Helena Baltarowich MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the sonographic features of various manifestations of gynecological pathologies. 2) Discuss the differential diagnosis for each entity.

ABSTRACT

A variety of sonographic images of gynecological pathologies will be shown as unknowns. Differential diagnoses will be discussed for each entity. The most likely diagnosis will be revealed in the context of the clinical setting in which it was presented.

MSCU42B Acute Abdomen: Diagnosis and Intervention

Michael David Beland MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize when ultrasound is an appropriate first line imaging modality for the patient presenting with acute abdominal pain. 2) Be able to recognize the pertinent positive and negative findings on ultrasound when evaluating common and occasionally uncommon causes of acute abdominal pain. 3) Learn when to consider ultrasound as a modality for performing interventions to treat the patient presenting with acute abdominal pain.

ABSTRACT

Ultrasound is often the first line imaging modality for the patient presenting with acute abdominal pain. This is particularly true when there is a high clinical suspicion of biliary or renal etiologies. Through multiple case presentations, this session will review the ultrasound findings one may encounter when working up acute abdominal pain. In addition, cases where ultrasound guided interventions may be appropriate in patients present with abdominal pain will be shown. Audience involvement will be encouraged through the use of audience response.
Head to Toe: Small Parts Matter!

Deborah J. Rubens MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Review some of the common pathologic entities involving superficial glands and structures. 2) Emphasize the unique technical parameters which are critical to optimize imaging of small parts. 3) Test the attendant’s knowledge of some critical decision pathways in superficial pathology.

ABSTRACT

High frequency ultrasound is a powerful tool to assess superficial structures including the neck (thyroid, parathyroid, other neck masses) chest and abdominal wall, extremities and the scrotum. Accurate performance requires optimizing scanning frequency for adequate tissue penetration as well as Doppler sensitivity to differentiate fluid collections from tumors, to assess organs for blood flow and to diagnose inflammatory conditions. Cases will be selected to emphasize thyroid, neck, testicular and extra-testicular pathology, particularly those cases which require urgent surgical or medical intervention such as incomplete or partial torsion, hernias and testicular ischemia. Additional cases will include symptomatic lumps and bumps as well as the incidentalomas one commonly encounters in superficial scanning.

Active Handout


RSNA/ESR Emergency Symposium: Abdominal Emergencies (An Interactive Session)

Multisession Courses

- ER
- CT
- GI

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Wed, Dec 3 3:30 PM - 5:00 PM Location: S402AB

Sub-Events

MSSR44A Abdominal Injuries

Andras Palko MD, PhD (Presenter): Medical Advisory Board, Euromedic International NV

LEARNING OBJECTIVES

1) To explain the significance of injury mechanism and its role in the formation of consequent abdominal lesions and their complications. 2) To outline the role of proper imaging technique and diagnostic algorithm in the sufficiently fast diagnosis of abdominal injuries. 3) To learn more about the typical and unusual findings of various abdominal traumatic conditions.

ABSTRACT

Abdominal injuries require a timely and reliable diagnosis in order to prevent the potentially lethal outcome. The armory of clinical tools (physical examination, lab tests) does not fulfill these criteria, since they are either not fast, or not reliable. Imaging diagnostic modalities help the clinician to acquire the necessary amount of information to initiate focused and effective treatment. However, the selection of the appropriate imaging algorithm, modality and technique, as well as the precise detection and interpretation of essential imaging findings are frequently challenging, especially because the circumstances, under which these examinations are performed (open wounds, bandages, non-removable life-supporting equipment, lack of patient cooperation, etc.), are frequently less than optimal. Knowledge of critical imaging signs, symptoms and the role they play in the evaluation of the patient's condition, but also fast decision-making and ability to closely cooperate with the clinicians are skills of key importance for radiologist members of the trauma team.

MSSR44B The Enemy Within, Non-Traumatic Abdominal Emergencies

Ronald Jay Zagoria MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) Attendees will be able to better analyze CT scans for non-traumatic causes of abdominal pain. 2) Attendees will learn the CT signs and causes of bowel ischemia. 3) Attendees will learn the CT findings of common causes of an 'acute' abdomen. 4) Attendees will learn the imaging findings of acute, nontraumatic urinary tract and GI tract emergencies.

ABSTRACT

This segment of the course will go over the optimal imaging approach for patients presenting with acute abdominal pain. CT findings will be emphasized. Key imaging findings of nontraumatic causes of acute abdominal pain including gastrointestinal tract and urinary tract pathology will be explained. A systematic approach for the imaging evaluation of patients with abdominal emergencies will be illustrated and explained.
including proper scan protocols and analysis of imaging findings. Imaging diagnosis of urinary tract obstruction, infection, bowel obstruction, and ischemia will be emphasized.

**Interactive Case Discussion**

Ronald Jay Zagoria MD (Presenter): Nothing to Disclose, Andras Palko MD, PhD (Presenter): Medical Advisory Board, Euromedic International NV

**LEARNING OBJECTIVES**

1) Attendees will be able to better analyze CT scans for traumatic and non-traumatic causes of abdominal pain.
2) Attendees will learn the CT signs and causes of bowel ischemia and injuries.
3) Attendees will learn the CT findings of common causes of a traumatic and non-traumatic 'acute abdomen'.
4) Attendees will learn the imaging findings of acute, traumatic and nontraumatic urinary tract and GI tract emergencies.

**ABSTRACT**

Using cases and an audience response system, this segment of the course will go over the optimal imaging approach for patients presenting with acute abdominal pain and abdominal wall injuries. CT findings will be emphasized. Key imaging findings of traumatic and nontraumatic causes of acute abdominal pain including gastrointestinal tract and urinary tract pathology will be explained. A systematic approach for the imaging evaluation of patients with abdominal emergencies will be illustrated and explained including proper scan protocols and analysis of imaging findings. Imaging diagnosis of blunt and penetrating abdominal injuries, urinary tract obstruction, infection, bowel obstruction, and ischemia will be emphasized.

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**SPSH50**

**Hot Topic Session: Advances in Prostate Cancer Imaging**

**Special Courses**

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AMA PRA Category 1 Credits ™: 1.00
ARRT Category A+ Credit: 1.00
Thu, Dec 4 7:15 AM - 8:15 AM Location: E351

**Participants**

Moderator
David M. Schuster MD: Research funded, Nihon Medi-Physics Co, Ltd Expert Advisory Committee, AIM Specialty Health

**LEARNING OBJECTIVES**

1) New developments in molecular imaging for the detection, staging, and restaging of prostate cancer.
2) The potential role of PET imaging with acetate for prostate cancer.
3) The potential role of amino acid imaging including FACBC PET in prostate cancer.
4) The contribution that PET-MR can make to the evaluation and understanding of prostate cancer.
5) New developments in PSMA imaging beyond ProstaScint
6) The role of choline based PET in the evaluation of prostate cancer including details of FDA approval.

**Sub-Events**

**SPSH50A Choline PET**

Val John Lowe MD (Presenter): Research Grant, General Electric Company Research Grant, Siemens AG Research Grant, Eli Lilly and Company Advisory Board, Bayer AG

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**SPSH50B Amino Acid PET Imaging with FACBC**

David M. Schuster MD (Presenter): Research funded, Nihon Medi-Physics Co, Ltd Expert Advisory Committee, AIM Specialty Health

**LEARNING OBJECTIVES**

1) The molecular basis of acetate imaging of prostate cancer.
2) The diagnostic performance and potential role of acetate PET in prostate cancer.
3) The molecular basis of amino acid based imaging and FACBC PET in prostate cancer.
4) The diagnostic performance and potential role of FACBC PET for prostate cancer.
5) Current status of clinical trials for acetate and FACBC PET.

**SPSH50C Prostate-specific Membrane Antigen and PET/MR**

Matthias Johannes Eiber MD (Presenter): Speaker, Siemens AG Speaker, Astellas Group Speaker, Johnson & Johnson

**LEARNING OBJECTIVES**

View learning objectives under main course title.
1) The molecular basis of prostate cancer imaging targeting the prostate-specific-membran antigen (PSMA), review of the various PSMA-tracers 2) The diagnostic performance and potential role of PSMA PET/SPECT for primary and recurrent prostate cancer (including the comparison to other tracers) 3) Discuss non-routine applications (e.g. biopsy targeting, radioguided surgery)

MSES51

Essentials of Genitourinary Imaging

Multisession Courses

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AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Thu, Dec 4 8:30 AM - 10:00 AM  Location: S406B

Sub-Events

MSES51A  Urinary Stone Disease
Parvi Ramchandani MD (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

1) Familiarize attendee with the radiologic features of the spectrum of urinary stone disease. 2) Familiarize attendees with the role of imaging in the management of patients with stone disease. 3) Familiarize attendees with the role of the different imaging modalities in diagnosis of urinary stone disease.

ABSTRACT

Imaging is crucial in the diagnosis and management of urinary stone disease. Abdominal radiography, ultrasound and CT all continue to be important modalities in detecting urinary stone disease, determining stone composition, determining the best management strategy, and in detecting complications due to stone disease. In this presentation, the role, advantages and pitfalls of the different imaging modalities available to evaluate stone disease will be discussed.

MSES51B  Endometriosis Imaging
Andrea Grace Rockall MRCP, FRCR (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

1) To be familiar with the typical clinical presentations of endometriosis. 2) To know the imaging features of endometriosis on ultrasound. 3) To know the imaging features of endometriosis on MRI. 4) To be aware of the potential serious complications of endometriosis and the accompanying imaging findings.

MSES51C  Ectopic Pregnancy: Challenges and Pitfalls
Genevieve Louise Bennett MD (Presenter):  Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the role of imaging in evaluation and management of the patient with suspected ectopic pregnancy. 2) Recognize the imaging findings in both common and uncommon manifestations of ectopic pregnancy, including unusual sites of pregnancy implantation. 3) Avoid common pitfalls in diagnosis of ectopic pregnancy.

ABSTRACT

Ectopic pregnancy is the leading cause of first trimester maternal morbidity and mortality, and the diagnosis may often be challenging. In this course, the role of imaging in evaluation and management of patients with suspected ectopic pregnancy will be reviewed. Both common and uncommon manifestations of ectopic pregnancy will be discussed, including unusual sites of pregnancy implantation. Diagnosis of C-section scar implantation and early detection of placental implantation disorders will be reviewed. Throughout the course, common diagnostic pitfalls and strategies to avoid these pitfalls will be emphasized.

RC607

Bladder, the Forgotten Organ: Role of CT, MRI, and PET in Diagnosis, Staging, and Surveillance of Cancer

Refresher/Informatics

NM | MR | CT | GU
Participants
Andrew B. Rosenkrantz MD (Presenter): Nothing to Disclose
Homer Aquino Macapinlac MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Learn the latest developments on the role of CT, MRI, and PET/CT in the detection, diagnosis, staging, and surveillance of patients with bladder cancer. 2) Learn currently recommended CT, MRI, and PET/CT techniques and protocols and how to implement them in clinical practice. 3) Learn how to interpret CT, MRI, and PET/CT scans of the bladder with an emphasis on case review and diagnostic pitfalls.

ABSTRACT
The urinary bladder is the most common site of malignancy of the urinary tract and is imaged by radiologists on many abdominal imaging exams. However, historically the bladder has been a ‘forgotten’ organ and thought to be largely the purview of the urologist due to the central role that cystoscopy has played in both the diagnosis and local staging of bladder cancer. Recent advances in CT, MRI, and PET have emerged that now allow radiologists to play an important role in the detection, diagnosis, staging, and surveillance of patients with or suspected of having bladder cancer. This course will detail these advances and explain how, when, and why radiologists should be using these three modalities in clinical practice today. Using illustrative case examples, advances in knowledge such as how CT urography can be used to detect bladder cancer, how MR urography can be used to distinguish muscle-invasive from superficial tumors and evaluate the upper tracts, and how PET/CT (and the newly introduced PET/MRI) can be used to stage and follow patients. With additional advances in low dose CT emerging MRI techniques, and novel PET agents, radiology will play an increasingly vital role in the care of patients with bladder cancer in the future.

SSQ09

ISP: Genitourinary ( Functional and Vascular Imaging of the Kidneys )

Scientific Papers

US MR CT GU

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Thu, Dec 4 10:30 AM - 12:00 PM Location: E353B

Participants
Moderator
Hakmin Park MD : Nothing to Disclose
Moderator
Ruth P. Lim MBBS, MMed : Nothing to Disclose

Sub-Events
SSQ09-01 Genitourinary Keynote Speaker: Renal CTA and MRA—When and How?
Ruth P. Lim MBBS, MMed (Presenter): Nothing to Disclose

SSQ09-02 Cortical and Medulla Oxygenation Evaluation of Kidneys with Renal Artery Stenosis by BOLD MRI Comparing with Healthy Volunteers
Zhao Long (Presenter): Nothing to Disclose , Jiayi Liu : Nothing to Disclose , Zhanming Fan : Nothing to Disclose

PURPOSE
The purpose of this study was to compare R2* value of renal artery stenosis (RAS) patients with the degree of RAS of its own and R2* value of control group respectively, and therefore evaluate different levels of renal hypoxia by BOLD MRI.

METHOD AND MATERIALS
We compared 51 renal arteriosclerosis kidneys with 32 healthy kidneys of volunteers. We also compared 4 subgroups of renal arteriosclerosis kidneys, 16 without obvious RAS, 6 with mild RAS, 9 with moderate RAS and 20 with severe RAS. BOLD signal was measured in the cortex and medulla by a 3.0T MR scanner. The severity of vascular occlusion was determined by intervention.

RESULTS
For all groups, medulla R2* values, reflecting the deoxyhemoglobin, were higher than cortex R2* values. Both cortex and medulla R2* values of renal arteriosclerosis kidneys (21.14±4.90/s, 36.25±8.04/s) were higher than corresponding R2* values of control group (18.23±1.77/s, 29.61±2.26/s) (P<0.05), and a more sensitive change was found in medulla. For RAS subgroups, medulla R2* values for severe RAS (44.20±6.01/s) elevated as compared with unobstructed, mild, moderate stenosis subgroups (29.87±3.92/s, 33.15±2.42/s, 31.98±4.28/s) (P<0.05), but cortex R2* values for severe RAS(24.06±5.94/s) were found no significant difference from mild, moderate stenosis subgroups(20.20±2.01/s, 19.14±1.86/s) while it was higher than unobstructed subgroup(18.96±3.62/s) (P<0.05). Besides, combing mild and moderate RAS as one group, both cortex and medulla R2* values of this group (19.56±1.92/s, 32.44±3.59/s) elevated as compared with control group (P<0.05).
CONCLUSION

This study shows that BOLD MR can noninvasively detect different levels of renal hypoxia induced by RAS with different severities of vascular occlusion. It can play an important role in estimation of kidney oxygenation changes when vascular occlusion overcomes the capacity of the kidney to adapt to reduced blood flow. R2* value may become an index to identify the severity of renal hypoxia and parenchymal injury.

CLINICAL RELEVANCE/APPLICATION

BOLD MRI is an effective and noninvasive method to evaluate the oxygenation state of kidney. It can play an important role in estimation of kidney oxygenation changes when RAS exists. BOLD MRI is a sensitive tool which can be used to detect ischemia and anoxia of medulla of kidney.

SSQ09-03

The Comparative Study on Image Quality of Renal Artery CT Angiography by Iterative Reconstructions and Filtered Back Projection


PURPOSE

The purpose of this study was to evaluate the image quality and image noise of artery CT angiography with iterative reconstructions which based on the original data from dual-source dual-energy CT.

METHOD AND MATERIALS

Fourteen consecutive patients underwent dual-energy (DE) renal artery CTA examination [Somatom Definition FLASH, (Siemens Healthcare, Germany)] were analyzed retrospectively. Tube voltage 80 kV and Sn140kV; tube current 250mAs and 106mAs; collimation 128×0.6mm. Data sets were reconstructed with Sinogram Affirmed Iterative Reconstruction (SAFIRE) and filtered back projection (FBP) base on original data. CTDIvol and SSDE were recorded and calculated. Image quality was evaluated by two experienced radiologists. For qualitative assessment, the whole quality of imaging, detail quality of imaging (sharpness of main renal artery and segmental vessels, segmental vessels displayed in MPR and MIP) were evaluated with 5 scale method (1=poor to 5=excellent). For quantitative assessment, attenuation values were measured in the vascular lumen of aorta, renal arteries and erector spinae major at almost same level, and contrast-to-noise ratio (CNR), signal-to-noise ratio (SNR) were calculated.

RESULTS

The mean value of CTDIvol and SSDE of renal CTA were (10.15±2.32) mGy and (12.93±1.82) mGy. There was significant difference in the whole imaging quality between 2 groups (Z=-3.61, P<0.05). There was no significant difference in the sharpness of vessels between the 2 groups (Z=-2.00, P=0.05); Whereas the segmental vessels displayed in MPR and MIP were not statistically different (Z=-0.00, P>0.05; Z=-0.00, P>0.05), respectively. The attenuation values of abdominal aorta and renal artery in two groups were [(211±34) HU vs. (213±34) HU, P>0.05] and [(196±38) HU vs. (193±36) HU, P=0.05]. The CNR and SNR in two groups were (14±6 vs. 9±4, P

CONCLUSION

Compared with standard FBP reconstruction, SAFIRE improve image quality and has the potential to decrease radiation dose.

CLINICAL RELEVANCE/APPLICATION

Compare with FBP, SAFIRE reconstruction can achieve better image quality, which help its clinical diagnosis and treatment.

SSQ09-04

Non Invasive Evaluation of Elasticity of Renal Parenchyma by Acoustic Radiation Force Impulse Imaging

Vivek Kishor Pargaonkar MBBS (Presenter): Nothing to Disclose, Sudhakar K: Nothing to Disclose

PURPOSE

Prospective evaluation of diagnostic efficacy of acoustic radiation force impulse(ARFI) imaging to test the elasticity of renal parenchyma by measuring the shear wave velocity(SWV) which might be used to detect chronic kidney disease(CKD).

METHOD AND MATERIALS

Fifty patients(age range 18-78yrs) with CKD were enrolled. Seventy three subjects(age range 18-71 yrs) without clinical, biochemical or ultrasound evidence of renal disease were also included and served as control group. An ARFI value, expressed as speed (m/s) of wave propagation through the tissue, was calculated for each patient by calculating the mean of values obtained in both kidneys. The results were compared with the subjects in the control group. The potential influencing factors and measurement reproducibility were evaluated. Correlations between SWV and laboratory tests were analyzed in CKD patients. Receiver-operating characteristic curve (ROC) analyses were performed to assess the diagnostic performance of ARFI. P value < 0.05 was considered statistically significant.
RESULTS

The mean SWV in control group was 2.93±0.58m/s, while 1.95±0.21, 1.6±0.62, 1.78±0.42, 1.81±0.36 and 1.63±0.27m/s for stage 1, 2, 3, 4 and 5 CKD patients respectively. The SWV was significantly higher for subjects in the control group compared with each stage in CKD patients. ARFI could not predict different stages of CKD. The SWV of subjects in control group differed significantly between men and women (2.82±0.61 vs 3.08±0.50 m/s, P=0.025, n=73). In CKD group also, the mean SWV was higher in women compared to men (1.83±0.32 vs 1.71±0.40 m/s, P=0.35, n=50). The SWV showed negative correlation with age in the control as well as CKD group. The Inter-observer agreement expressed as intraclass coefficient correlation was 0.65 (95% CI 0.4368-0.8054, P=< 0.05, n=40). In CKD patients, SWV correlated to e-GFR (r=0.113, P=0.435), urea nitrogen (r=-0.155, P=0.283), and creatinine (r=-0.240, P=0.093). ROC analyses indicated that the area under the ROC curve was 0.974 (95% CI: 0.952-0.997, P< 0.001). The cut-off value for predicting CKD was 1.85 m/s (sensitivity 97.3%, specificity 64%).

CONCLUSION

A significant difference in the SWV in the control group compared to CKD group by ARFI indicates its potential role in the detection of CKD.

CLINICAL RELEVANCE/APPLICATION

ARFI can be a potential diagnostic, prognostic, simple, inexpensive, easily available, repeatable and accurate tool for non-invasive evaluation of CKD.

SSQ09-05

Radiation Dose and Contrast Reduction during UFE Using 3D MRA Guidance versus Conventional 2D Technique

Nishad Nadkarni MD (Presenter): Nothing to Disclose, Vikram S. Dravid MD: Nothing to Disclose, Anil Syal MD: Nothing to Disclose, Atul Gupta MD: Nothing to Disclose

PURPOSE

To compare physician dose, patient dose, procedure time, contrast and fluoroscopy time using the conventional 2D technique for uterine fibroid embolization (UFE) versus a novel 3D MRA guided UFE technique.

METHOD AND MATERIALS

Ten UFE procedures were performed at 2 hospitals in the same health system by 2 interventional radiologists, each with over 10 years of experience using the same imaging equipment and protocols. 5 of these cases were performed using the conventional 2D guidance technique and 5 were performed using a novel 3D MRA guidance technique, which allows real-time fusion of a preexisting MRA with the live fluoroscopy stream to create a visual roadmap during UFE. The physician dose (Sv), patient dose (DAP), procedure time (min), non-embolic contrast (mL), and fluoroscopy time (min) were compared.

RESULTS

There was a 94% reduction in average physician dose using 3D MRA guidance (18.6 Sv) versus the conventional 2D technique (308.6 Sv). There was an 83% reduction in average patient radiation dose using 3D MRA guidance technique, which allows real-time fusion of a pre-existing MRA with the live fluoroscopy stream to create a visual roadmap during UFE. The physician dose (Sv), patient dose (DAP), procedure time (min), non-embolic contrast (mL), and fluoroscopy time (min) were compared.

CONCLUSION

There is a notable and statistically significant reduction (p < 0.05) in physician and patient radiation dose, procedure time, non-embolic contrast utilized and fluoroscopy time using 3D MRA guidance for UFE.

CLINICAL RELEVANCE/APPLICATION

Radiation exposure not only to patient, but also to physician is of great concern. The novel 3D MRA guidance technique not only reduces radiation to physician and patient, but also reduces procedure time, contrast utilized and fluoroscopy time.

SSQ09-06

Refining the Role of Contrast Enhanced Ultrasound in the Characterisation of Renal Lesions

Claire Cuscaden MBBS (Presenter): Nothing to Disclose, Alain M. Lavoipierre MD: Nothing to Disclose, Mark Frydenberg MBBS: Nothing to Disclose, Daniel Moon MBBS: Nothing to Disclose, Mark Smyth: Nothing to Disclose, Melissa Scott: Nothing to Disclose

PURPOSE

The aim of this study was to assess further the role of contrast enhanced ultrasound (CEUS) in the characterisation of renal lesions, with an emphasis on Bosniak 2F lesions.

METHOD AND MATERIALS

Over a 40 month period, a total of 90 CEUS examinations were performed at our institution, involving 65 patients with a total of 77 lesions. All patients had had prior CT, MRI or, less commonly, US examinations. All patients were examined on Philips iU22 equipment, with the administration of intravenous boluses of intravenous perflutren (Definity TM). The examinations were all performed by a single radiologist. In those patients who subsequently underwent core biopsy 18G Bard Biopsy equipment was used. Sonographically, the lesions were classified as cystic or solid, and the cysts characterised according to the Bosniak classification.

RESULTS

In total, 77 lesions were examined after CT Bosniak grading. Of these, the CT graded Bosniak 2F lesions
been debated and we have also assessed the value of routine RI measurement. The resistive index, which is a measure of pulsatile flow affected by vascular resistance, heart rate and pulse pressure, is measured in all patients however its predictive relationship to post-operative complications has not been established.

The schedule of scans has been based on historical practice and many patients have multiple scans. Ultrasonography is routinely performed following renal transplantation to assess for early complications including acute tubular necrosis, accelerated rejection, obstruction or collections and renal vein/renal artery thrombosis. The purpose of the protocol is to develop a clinical decision-making tool that will improve the care of these patients. We present a preliminary analysis of the early experience. The protocol for RI measurement is as follows:

- Measurement of RI is performed on all grafts at 3 and 7 days post-transplantation.
- RI is measured on the radial, common and external iliac arteries.
- RI is measured on the venous outflow from the renal transplant.
- RI is measured on the iliac veins.

**CONCLUSION**

CEUS offers improved contrast resolution relative to CT or MRI and plays an important role in the characterisation of renal lesions by: • Helping to visualise vascularity in solid lesions or in solid components of cystic lesions with borderline or difficult to assess enhancement on CT or MRI • Upgrading or downgrading lesion as a consequence of the improved contrast resolution which therefore allows better visualisation of lesion vascularity

**CLINICAL RELEVANCE/APPLICATION**

- Virtually abolishing the Bosniak 2F category
- Allowing assessment or follow up of renal lesions, particularly in patients with impaired renal function or allergy to iodinated contrast medium, and also to avoid excessive radiation in patients requiring longer term follow up.

**RESULTS**

Responders (n=14) - defined by their best overall response according to RECIST - showed significantly higher baseline values of BF and BV as well as a significantly higher reduction of BF/BV parameters after 8 weeks of AAT than those with stable disease (n = 21) or progressive disease (n=4), (all p-values <0.05). A definition of >50% reduction of BF and BV after 8 weeks of antiangiogenic therapy as a cut-off value was identified to optimally discriminate patients with favorable outcome (median PFI of 10 months) from those with early progression (median PFI of 4 months) and enabled with a sensitivity and specificity of 75%, respectively 90% identification of poor responders with a PFI of < 7 months.

**CONCLUSION**

In patients with mRCC relative changes of tumor BF and BV assessed with CTP after 8 weeks of antiangiogenic MKI-treatment may allow prognostic estimations of early therapy failure.

**CLINICAL RELEVANCE/APPLICATION**

Perfusion-CT predicts response to MKI-therapy in patients with mRCC allowing identification of poor responders with early therapy failure and therefore might help to optimize oncologic treatment in this tumor entity.

**METHOD AND MATERIALS**

48 mRCC patients were prospectively enrolled of which 38 were included in the current study. CT perfusion imaging of representative metastatic lesions was performed before and 8 weeks after start of treatment with Sunitinib (n=28) or Pazopanib (n=10). The DCE-CT protocol included a targeted dynamic acquisition starting 4 - 8 s after injection of 50 ml of contrast media at 6 ml/s using a 4D spiral mode technique (10 cm z-axis coverage, scan duration 44sec, 100 kVp (abdomen), 80 kVp (chest), 100 mAs) on a dual source scanner (Siemens Somatom Definition Flash). Blood flow (BF), blood volume (BV) and permeability-surface area product (PS) were calculated for the entire tumour volume. DCE-CT results were correlated with Response Evaluation Criteria in Solid Tumors response (RECIST) and with progression-free interval (PFI) using Spearman rank correlation, Wilcoxon test, Mann-Whitney U test and Kaplan-Meier statistics.

**RESULTS**

Responders (n=14) - defined by their best overall response according to RECIST - showed significantly higher baseline values of BF and BV as well as a significantly higher reduction of BF/BV parameters after 8 weeks of AAT than those with stable disease (n = 21) or progressive disease (n=4), (all p-values <0.05). A definition of >50% reduction of BF and BV after 8 weeks of antiangiogenic therapy as a cut-off value was identified to optimally discriminate patients with favorable outcome (median PFI of 10 months) from those with early progression (median PFI of 4 months) and enabled with a sensitivity and specificity of 75%, respectively 90% identification of poor responders with a PFI of < 7 months.

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**CLINICAL RELEVANCE/APPLICATION**

Perfusion-CT predicts response to MKI-therapy in patients with mRCC allowing identification of poor responders with early therapy failure and therefore might help to optimize oncologic treatment in this tumor entity.
METHOD AND MATERIALS

Data from a prospectively maintained transplant surgery database was analysed and correlated with the ultrasound scan findings over a 4-year period from January 2010 to December 2013. Initially a retrospective audit of all data was performed between January 2010 and December 2012. This was used to identify potential areas for service improvement. This included a review of the referral pattern and development of an optimal schedule for imaging as well as issues such as patient transportation and service provision in the out-of-hours setting. These factors were subsequently addressed by a prospective audit performed immediately over the following 4 month period. As a consequence of this second audit, a protocol was then introduced to optimise service provision for all renal transplant patients. All subsequent transplant patients up until December 2013 were prospectively audited to ensure protocol safety. The timing of renal transplant ultrasonography (by post-operative day), CFUS, R.I. and significant renal and extra-renal findings were recorded. The R.I. of patients requiring post-operative biopsy, post-operative haemodialysis or prolonged sonographic investigation (>5 days) were also analysed for significance.

RESULTS

Total number of patients (n=324). Mean age = 44 years (range 3-73 years). Living related/unrelated donor (n=204) versus cadaveric donor (n=120). Within the initial audit period January 2010 -December 2013:

Transplant cases, n = 223. Mean number of ultrasound exams performed per patient, n=6.1 (4 - 14). Number of acute transplant rejections (n=3, 1.6%), RI >1 (n=2). There was no significant difference in RI within surviving grafts (live or cadaveric donor) assessed at days 1, 3, 4 or 5 (p=0.69, 0.5, 0.71 or 0.83 respectively). RI was not significantly different in patients requiring biopsy or post-operative haemodialysis (p=0.71, 0.82).

For low-kV with ASiR group, the enhancement of aorta , artery and left renal artery and right renal artery were calculated respectively.

CONCLUSION

Renal transplant patients in the immediate post-operative period do not routinely require multiple CFUS with RI calculation. RI does not reliably predict patients requiring biopsy or prolonged post-operative dialysis. Patients with elevated RI’s (>1) have an increased association with acute rejection, and a low threshold for performing ultrasound is indicated when graft rejection is suspected. In those patients who have undergone uncomplicated surgical and who have a smooth post-operative course we have successfully introduced a protocol within our institution to perform CFUS on Day 1 and 3 (living donor) and Day 1, 3 and 2 (cadaveric donor). This enables a more efficient use of the ultrasound department and our out of hours service with no detriment to patient care. Those patients who are at increased risk are also better identified as the request forms have been re-designed to ensure that all relevant clinical details are available to the radiologist. An additional benefit is a significant cost saving (annual reduction in CFUS examinations of approximately 2.7 scans per patient with approximately 100 transplants per year), with much of the reduction being in out of hours scanning.

BMI-based Tube Kilovolt Selection Combined with Iodixanol (270 mg I/mL) and iohexol (350 mg I/mL) in Achieving Coherent Vascular Enhancement in Renal Artery CT Angiography

Yan   Liang  MMed (Presenter):  Nothing to Disclose , Zhiren  Chen  MD :  Nothing to Disclose , Chuang  Yi : Research Grant, General Electric Company , Bin 00617875.  Li :  Nothing to Disclose , Dongbin  Shi :  Nothing to Disclose , Yongfang  Yin :  Nothing to Disclose

PURPOSE

To compare vascular enhancement between a low-kilovoltage renal artery CT angiography (CTA) protocol using a low-concentration iodixanol(270mgI/mL) and routine 120kV protocol with high-concentration iohexol(350 mg I/mL) contrast medium .

METHOD AND MATERIALS

30 patients (body mass index, ≤ 23 kg/m(2)) with suspected renal artery stenosis underwent renal artery CTA with a 64-MDCT scanner using a tube voltage of 80 kV. Patients were received 70 mL of iodixanol (270 mg I/mL) injected at a rate of 5 mL/s. And 32 patients(BMI>23 kg/m(2)) were administered an equal volume of iomeprol (350 mg I/mL) at a delvery rate of 5 mL/s. Images of 80kVp group were post-processed with adaptive statistical iterative algorithm(50%ASiR). For both groups, the CT values and SD values of aorta, subcutaneous fat and the erector spine muscle were measured, and the averaged SD value was calculated as the image noise. The signal-noise-ratio (SNR) and contrast-noise-ratio (CNR) for aorta, artery and left renal artery and right renal artery were calculated respectively.

RESULTS

For low-kVwith ASiR group, the enhancement of aorta , artery and left renal artery and right renal artery (223.4±23.8, 261.0±32.2 and 267.2±31.0) were compatible with those in routine120 kV group(271.3±30.4, 223.9±25.6 and 256.3±32.1)(each p>0.05). The CNR of aorta , artery and left renal artery and right renal artery (32.1±7.8, 32.4±6.7 and 31.8±4.7) in low-kVCTA group was slightly higher than those in conventional CTA group(28.6±6.4, 29.9±6.1 and 29.3±9.4)(each p>0.05). Enhancement homogeneity was good with both contrast agents, with no statistically significant difference between them (p>0.05)

CONCLUSION

In 80-kV renal artery CTA of lean patients, higher intravascular enhancement can be achieved with iodixanol(270 mg I/mL), with good vessel conspicuity down to the sub-segmental level.
**CLINICAL RELEVANCE/APPLICATION**

In patients of BMI≤23 with reduced contrast medium, low-kV (80kV) renal artery CTA provides compatible image quality with conventional (120kV) renal artery CTA.

### SSQ10

**ISP: Genitourinary (Intervention in the GU Tract)**

**Scientific Papers**

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**Thu, Dec 4 10:30 AM - 12:00 PM   Location: E450B**

#### Participants

**Moderator**
- Cary Lynn Siegel MD : Nothing to Disclose
- Parvati Ramchandani MD : Nothing to Disclose

**Sub-Events**

**SSQ10-01**

**Genitourinary Keynote Speaker: Fibroid Expert Topic—MR Guided Focal Cryoablation for Native and Recurrent Prostate Cancer**

**David Arthur Woodrum MD, PhD (Presenter):** Nothing to Disclose

**Abstract**

In 2014, the American Cancer Society (ACS) estimates that 233,000 new cases of prostate cancer will be diagnosed in the United States. Most men are managed with either radiation therapies or surgery with recurrence rates as high as 25-40%. No matter how expertly done, these therapies carry significant risk and morbidity to the patient’s health related quality of life with impact on sexual, urinary and bowel function. For this reason, focal or regional treatments for low risk native and recurrent prostate cancer patients is beginning to be adopted. Although questions remain, focal therapies are becoming more attractive to patients who are demanding more options. MR imaging provides the best lesion visualization for both native and recurrent prostate cancer. However, until recently treatment in the MR suite has not been possible. Now MR guided cryoablation, laser ablation and focused ultrasound are possible. We will discuss the use of MR guided cryoablation in treatment of native and recurrent prostate cancer.

**SSQ10-02**

**MRI-Guided Transurethral Ultrasound Ablation for Treatment of Localized Prostate Cancer**

**Maya B. Mueller-Wolf MD (Presenter):** Nothing to Disclose, Matthias Roethke MD : Nothing to Disclose, Sascha Pahernik MD : Nothing to Disclose, Boris Hadaschik : Nothing to Disclose, Timur Kuru MD : Nothing to Disclose, Gencay Hatiboglu : Nothing to Disclose, Ionei Valentín Popeneu MD : Nothing to Disclose, Joseph Chin MD : Nothing to Disclose, Michele Billia MD : Nothing to Disclose, James D. Relle MD : Nothing to Disclose, Jason M. Hafron MD : Nothing to Disclose, Kiran R. Nandalur MD : Nothing to Disclose, Mathieu Burtnyk DIPLPHYS : Nothing to Disclose, Heinz-Peter Schlemmer MD : Nothing to Disclose

**PURPOSE**

MRI-guided transurethral ultrasound ablation (MR-TULSA) is a novel minimally-invasive technology to treat organ-confined prostate cancer (PCa), aiming to provide local disease control with a low side-effect profile. Directional plane-wave high-intensity ultrasound generates a continuous volume of thermal coagulation shaped accurately to the prostate using real-time MR-thermometry and active temperature feedback control. A prospective, multi-institutional Phase I clinical study investigated safety, feasibility, and assessed efficacy of MR-TULSA treatment for PCa.

**METHOD AND MATERIALS**

30 patients with biopsy-proven, low-risk prostate cancer (age ≥ 65y, T1c/T2a, PSA ≤ 10ng/ml, Gleason 6 (3+3)) were enrolled. MR-TULSA was performed for whole-gland prostate ablation using the PAD-105 (Profound Medical Inc., Canada) and a 3T MRI (Siemens, Germany). One treatment session was delivered under general anaesthesia and 3D active MR-thermometry feedback control. Thermal coagulation was confirmed on CE-MRI immediately after MR-TULSA and at 12 months.

**RESULTS**

MR-TULSA was well-tolerated by all patients. There were no intraoperative complications. Normal micturition resumed after catheter removal. Median (range) treatment time and prostate volume were 36 (24-61) min and 44 (21-95) ml, respectively. Maximum temperature measured during treatment depicted a continuous region of heating shaped accurately to the prostate to within 0.1 ± 1.3 mm, with average over- and under-targeted volumes of 0.8 and 1.0 ml, respectively. Immediate post-treatment cell kill, visualized by the peripheral region of enhancement surrounding the non-perfused volume, correlated well with the acute cell kill regions on MR-thermometry. Successful treatment was further indicated by a median PSA decrease from 5.8 to 0.7 ng/ml at 1 month (n=24), remaining stable to 0.7 ng/ml at 6 months (n=12).

**CONCLUSION**
MRI-guidance enables accurate treatment planning, real-time dosimetry and control of the thermal ablation volume. The Phase I clinical trial showed that whole-gland ablation of the prostate for localized PCa is feasible, safe, and accurate using MR-TULSA.

**CLINICAL RELEVANCE/APPLICATION**

Whole-gland ablation can be safely and accurately achieved using MR-TULSA, which represents a minimally-invasive treatment option for organ-confined prostate cancer.

**Non-invasive Focal Therapy of Organ Confined Prostate Cancer: Phase I Study Using Magnetic Resonance Guided Focused Ultrasound Technology and Excision Pathology for Efficacy Assessment**

**SSQ10-03**

Pier Luigi Di Paolo MD (Presenter): Nothing to Disclose, Gaia Cartocci MD: Nothing to Disclose, Fulvio Zaccagna MD: Nothing to Disclose, Gianluca Caliolo: Nothing to Disclose, Valeria Panebianco MD: Nothing to Disclose, Alessandro Napoli MD: Nothing to Disclose

**PURPOSE**

To assess safety and initial effectiveness of non-invasive high intensity 3T MR guided focused Ultrasound (MRgFUS) treatment of localized prostate cancer in a phase I, treat and resection designed exploratory study.

**METHOD AND MATERIALS**

On the basis of a power analysis, 11 patients with biopsy proven focal T2 prostate cancer (low-to-intermediate risk: PSA max 12 and Gleason max 3+4), confirmed on a previous multiparametric MR exam (Discovery 750, GE) including dynamic contrast enhanced (DCE) imaging (Gd-BOPTA, Bracco), underwent MRgFUS ablation (ExAblate, InSightec). All patients were scheduled to radical laparoscopic prostatectomy; MRgFUS treatment was carried out on the MR identifiable lesion (max 2) using a patient specific energy (3000-8500 J) and real time MR thermometry monitor for correct treatment location. Non-perfused volume (NPV) in the post-ablative MRI was than compared with excision pathology for necrosis assessment.

**RESULTS**

No significant complications were observed in all subjects during or immediately after the procedure. Procedure was validated by pathologist, that demonstrated extensive coagulative necrosis at the site of sonication surrounded by normal prostatic tissue with inflammatory changes; these features positively compared with immediate post-ablative MRI scan and NPV. At histology 10 patients were free of residual viable tumor within the treated area; in the remaining patient, 10% of residual tumor was observed within the NPV. There was a variable amount of isolated cancer tissue (Gleason max 7, 3+4) within the non-treated parenchyma that was neither identifiable at MRI nor at biopsy.

**CONCLUSION**

Results of our Phase I study suggest MR guided Focused Ultrasound as a safe and effective modality to determine >90% necrosis of identifiable prostate cancer; other prospective studies are needed to extend success rate in larger cohort.

**CLINICAL RELEVANCE/APPLICATION**

MR guided Focused Ultrasound is a safe and effective modality to determine >90% necrosis of identifiable prostate cancer.

**Long Term Results Of Optimized Focal Therapy Of Prostate Cancer: Average 10-Year Follow-up in 70 Patients**

**SSQ10-04**

Gary Mark Onik MD (Presenter): Nothing to Disclose

**PURPOSE**

Following the lead of lumpectomy for breast cancer, focal therapy for prostate cancer was introduced in order to limit morbidity while providing good cancer control. Focal therapy is now an established trend in prostate cancer management, but long term data has not been available. This report presents results on 70 patients treated with focal cryoablation, followed for an average of 10 years.

**METHOD AND MATERIALS**

Between May 7, 1996 and December 28, 2005 70 patients were treated with focal cryoablation. All patients were staged using an additional prostate biopsy. Transperineal 3D Prostate Mapping Biopsy (3D-PMB) was used in 63 patients. All patients were then treated with percutaneous focal cryoablation of all known tumor(s). All known cancers regardless of tumor size or Gleason score were treated. Biochemical disease free status was determined by the Phoenix criteria. Potency was determined by ability to have vaginal penetration and satisfaction with sexual functioning. Continence was determined by pad free status.

**RESULTS**

Disease specific survival was 64/64(100%). Overall biochemical disease free survival (BDFS) was 62/70 (89%). BDFS results stratified according to the D’Amico criteria were: 8/9 (89%) high risk; 28/32 (88%) medium risk; 26/29 (90%) low risk. There was no statistically significant difference between the risk levels. 19/20 (95%) bilaterally but focally treated patients were BDF. In total 10/70 (14%) patients had a local recurrence that...
needed re-treatment (none in the treated area), and 9/10 (90%) remain BDF. Continence after the first treatment was 100% (no pads). Potency including re-treatments was 74%. No other complications occurred. There was no instance of significant bleeding and no instance of rectal damage.

CONCLUSION

Within the limitations of our study, the long term cancer control results of focal therapy using cryoablation appears competitive with radical whole gland treatments in low risk patients and superior in medium and high risk patients in achieving cancer free status. It achieves this with extremely low morbidity compared to whole gland treatments. If these results are confirmed, focal therapy as we have outlined could significantly lower the morbidity and mortality associated with prostate cancer.

CLINICAL RELEVANCE/APPLICATION

Focal therapy has the potential to completely change the paradigm of prostate cancer management.

SSQ10-05

Cryotherapy for Renal-cell Cancer: Evaluation of the Efficacy of the Treatment with Contrast-Enhanced Ultrasonography (CEUS)

Michele Bertolotto MD (Presenter): Nothing to Disclose, Fulvio Stacul MD: Nothing to Disclose, Calogero Cicero: Nothing to Disclose, Francesca Cacciato: Nothing to Disclose, Salvatore Siracusano MD: Nothing to Disclose, Maria Assunta Cova MD: Nothing to Disclose, Matilde Cazzagon: Nothing to Disclose, Antonio Celia: Nothing to Disclose.

PURPOSE

To evaluate the diagnostic accuracy of contrast enhanced ultrasound (CEUS) in the early detection of residual tumor after cryoablation.

METHOD AND MATERIALS

Twenty-six patients with 31 renal tumors (20 men, 6 women; mean age, 69 years; range, 52-81 years) underwent percutaneous cryoablation between August 2011 and July 2013. All tumors were treated with CT guidance. Patients underwent CEUS before, within 1 day (early follow-up CEUS), 1 month and 3 months after the ablation. In patients with persistent lesion vascularity at early follow-up CEUS the test was repeated also 1 week after the treatment. Reference standard was MRI/CT performed every 6 months after cryoablation for the first two years, and then yearly.

RESULTS

The mean tumor size was 20 mm (range, 6-37 mm). One patient was lost to follow up. Twenty-five patients with 30 renal tumors were followed-up for at least 6 months and all underwent CEUS. MRI was performed in 21 patients, CT in 4 patients who had contraindications to MR scanning. The mean follow-up period was 15 months (range, 6-24 months). Early CEUS follow-up displayed a completely avascular lesion in 24/30 renal lesions. Minimum to mild perilesional enhancement was present in 4 cases, which disappeared progressively during the follow-up. One type IV cystic tumor had two intrallesional vegetations (10 and 20 mm, respectively), which were still vascularized early after cryoablation and during the follow-up and were categorized as residual tumor. Severe comorbidities precluded from repeated cryoablation. Two lesions were vascularized in the early CEUS follow-up while the CEUS investigation repeated 1 week and 1 month after the treatment documented progressive devascularization of the mass.

CONCLUSION

CEUS is an effective alternative to CT and MRI for the early diagnosis of residual tumour after renal percutaneous cryoablation. Care should be taken, however, in interpreting persistent vascularity in the early CEUS follow-up as residual tumor. Repeated CEUS investigations allow to differentiate between a late devascularization of a successfully ablated tumor and persistent disease.

CLINICAL RELEVANCE/APPLICATION

CEUS is able to monitor the result of cryoablation of renal tumors. Early features after the treatment, however, should be interpreted with caution to avoid misdiagnosis of persistent disease.

SSQ10-06

CT-guided Biopsy for the Entirely Endophytic Small Renal Mass: Comparison of Diagnostic Rate and Complication Between Standard-dose and Low-dose Protocol Group

Mi-Hyun Kim (Presenter): Nothing to Disclose, Jeong Kon Kim MD: Nothing to Disclose, Myung-Won You MD: Nothing to Disclose, Hyuck Jae Choi MD: Nothing to Disclose, Kyoung-Sik Cho MD: Nothing to Disclose.

PURPOSE

To compare the diagnostic rate and complication between standard-dose and low-dose protocol group in the CT-guided biopsy for the entirely endophytic small renal masses (SRM)

METHOD AND MATERIALS

A total of 56 patients underwent CT-guided biopsy for the entirely endophytic SRM (≤ 4 cm) from May 2011 to March 2014. Biopsy was performed with standard-dose protocol (reference mAs, 210) in 37 patients and low-dose protocol (reference mAs range, 40-80; mean±standard deviation, 43±9.5) in 19 patients. The diagnostic rate, histologic finding, radiation dose, complication rate, and procedure time were assessed from the
RESULTS

In the low-dose protocol group, all 19 patients had diagnostic results (14 renal cell carcinomas, 2 metastases, 1 urothelial carcinoma, 1 oncocytic neoplasm, and 1 angiomyolipoma). In the standard-dose protocol group, 36 (97%) patients had diagnostic results (24 renal cell carcinomas, 2 metastases, 1 lymphoma, 4 angionmyolipomas, 4 inflammations, and 1 cyst) and one patient had non-diagnostic result. No serious complication such as active bleeding was occurred in two groups. The standard-dose protocol group had statistically greater value of the dose length product (DLP) than low-dose protocol group (560±221 vs. 180±61 mGy*cm, P < .05). Mean procedure time was equally 21 minutes in two groups.

CONCLUSION

Low-dose protocol CT-guided biopsy for the entirely endophytic SRM has comparable diagnostic result to the standard-dose protocol group without increasing complication rate or procedure time.

CLINICAL RELEVANCE/APPLICATION

Endophytic renal tumors have been related to higher surgical complexity and higher postoperative complication rate than exophytic lesions, and the number of biopsies in these endophytic lesions is increasing in our institution. Low dose protocol CT-guided biopsy may be sufficient for the histologic diagnosis of the endophytic SRM and can reduce the radiation dose to the patient.

SSQ10-07

Ultrasound-guided Transvaginal Core Biopsy of Pelvic Masses: Feasibility, Safety and Short-term Follow-up

Jung Jae Park MD (Presenter): Nothing to Disclose, Chan Kyo Kim MD, PhD : Nothing to Disclose, Byung Kwan Park MD : Nothing to Disclose

PURPOSE

Although several previous studies reported the utility of transvaginal approach for endometrial biopsy or fine needle aspiration of pelvic lesions, few studies have demonstrated the feasibility of transvagal technique for biopsy of pelvic masses. The aim of our study was to evaluate the diagnostic accuracy and safety of ultrasound (US)-guided transvaginal core biopsy for pelvic masses.

METHOD AND MATERIALS

Forty-nine pelvic masses (mean size, 4.2 ± 2.8 cm) in 49 women (median age, 59 ± 12.7 years) who received US-guided transvaginal core biopsy between 2009 and 2013 were enrolled in this retrospective study. On pre-biopsy CT or MR imaging, the lesions were identified in vaginal stump (n = 25), rectovaginal or vesicovaginal pouch (n = 11), adnexa (n = 8), or distal ureter (n = 5). The biopsy was performed using a probe equipped with a guide and an 18 gauge Tru-cut needle with an automatic biopsy gun (Ace-cut) after local anesthesia. We evaluated the diagnostic accuracy and complication rate of the procedure.

RESULTS

All acquired specimens were adequate and sufficient for pathologic analysis. Overall diagnostic accuracy of US-guided transvaginal core biopsy was 91.8% (45/49 patients). Of these, 39 lesions were diagnosed as malignancies and five lesions that revealed active or chronic inflammation without evidence of malignancy regressed spontaneously on follow-up imaging. The remaining one lesion was diagnosed as ovarian sex cord-stromal tumor. Of the four non-diagnostic lesions, two were identified as fibrothecoma and recurrent leiomyosarcoma after surgery, respectively and the remaining two were clinically regarded as recurrent ovarian and endometrial cancer due to increases in size on follow-up imaging, respectively. None of these biopsies resulted in major complications. As minor complications, vaginal bleeding immediately after the biopsy and gross hematuria were found in 10 patients (20.4%) and three patients (6.1%), respectively, but these complications were stopped spontaneously in all 13 patients without further treatment or transfusion.

CONCLUSION

US-guided transvaginal core biopsy appears to be reliable and safe procedure for the histologic diagnosis in patients with pelvic masses.

CLINICAL RELEVANCE/APPLICATION

As a reliable and safe technique, US-guided transvaginal core biopsy can be used for clinical decision making and selecting optimal treatment strategies in patients with pelvic masses.

SSQ10-08

Retrospective Study of Uterine Fibroid Treatment Using MRgFUS: Correlations between Age, Recurrence Rate and Clinical Outcomes

Fabiana Ferrari MD (Presenter): Nothing to Disclose, Anna Miccoli MD : Nothing to Disclose, Francesco Arrigoni : Nothing to Disclose, Eva Fascetti MD : Nothing to Disclose, Antonio Barile MD : Nothing to Disclose, Carlo Masciocchi MD : Nothing to Disclose

PURPOSE

To evaluate the efficacy of MRgFUS in the uterine fibroids treatment analysing the recurrence rate after 12 months from the treatment. This study correlates the age of patients to the clinical and imaging results.
METHOD AND MATERIALS

38 patients, with symptomatic uterine fibroids were treated using MRgFUS from September 2011 to December 2012. Twenty-two of them were aged between 40 and 50 (group 1), 10 patients between 30 and 40 (group 2) and 6 patients between 20 and 30 (group 3). Single fibroids were found in 13 patients while 25 patients presented multiple fibroids. Patients were submitted to one treatment alone. We submitted the patients to c.e. MRI respectively before treatment, after 10 days, 3 months, 6 months and 12 months. We made a morphological analysis of the images, an evaluation of the treated volume extension and the possible recurrence of the pathology in the area of the treatment. Clinical evaluation was performed by SSS-questionnaire, comparing the pre-treatment score to the one obtained after 12 months.

RESULTS

All patients had a non-perfused-volume mean value of 91.5 %. Thirty-four women belonging to Group 1, Group 2 and Group 3 (89.5% of patients) showed a complete reabsorption of the necrotic area without any fibrotic tissue in the treatment area after 12 months. Four younger women (10.5 % of patients) belonging to Group 3, aged between 24 and 30 years, showed hypointense tissue in the peripheral part of the treated area after 3-6 months from the treatment. One of them, who underwent myomectomy, showed a mixed tissue made of necrotic cells and fibrotic tissue. Clinically, after 12 months from the treatment, Group 1, Group 2, and Group 3 showed a SSS-Q mean value of 7.8, 8.1, and 6.4, respectively. We did not appreciate clinical differences of statistical relevance between the groups.

CONCLUSION

MRgFUS is an effective technique in younger and older women. We found excellent morphological results and clinical outcomes in patients belonging to group 1 and 2. In Group 3, the excellent clinical response was not associated to significant morphological results, this however not impairing the final response to the treatment.

CLINICAL RELEVANCE/APPLICATION

We evaluate the efficacy of the uterine fibroid treatment using MRgFUS correlating the morphological and clinical results in younger and older women obtaining in both groups good therapeutic results.

SSQ10-09  Genitourinary Keynote Speaker: Oncologic Applications of HIFU in 2014—Current State-of-the Art and Future Directions

Aradhana Mukherjea Venkatesan MD (Presenter): Institutional research agreement, Koninklijke Philips NV

Abstract

High intensity focused ultrasound (HIFU), also known as focused ultrasound (FUS) is a non-invasive image-guided therapy, which has been primarily employed in the clinical realm for non-invasive thermal ablation of benign and malignant neoplasms. Real time imaging guidance, treatment monitoring and therapy control is achieved with ultrasound (US) or magnetic resonance imaging (MRI) guidance. Clinical experience in the GU tract has been described in the treatment of leiomyomata, adenomyosis, prostate and renal tumors, although, to date, widespread adoption of HIFU thermoablation remains limited. Ongoing technical challenges include the feasibility of treating large tumors within a finite treatment time, treating targets prone to motion or those for which the acoustic window is restricted by intervening anatomy. A range of provocative bio-effects of therapeutic ultrasound beyond thermoablation also have the potential to be leveraged in the care of the oncology patient. Hyperthermic effects can potentiate the release of thermosensitive drugs, enhance the permeability and retention of chemotherapeutic agents, and potentially enable gene delivery within tumors. Mechanical effects of HIFU, including stable and inertial cavitation play a role in heat sensitive drug and gene delivery and have the potential to be employed as adjuvant effects for more efficient ablation of large tumors. Ongoing and promising oncologic research is directed toward optimization of HIFU's thermoablative capabilities and greater elucidation of its non-thermal effects. This keynote presentation will describe the principles governing oncologic applications of HIFU and present current state-of-the art and future GU interventional applications of this innovative image-guided therapy.

SSQ12

ISP: Molecular Imaging (Prostate Cancer/Bone Metastases)

Scientific Papers

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ARRT Category A+ Credits: 1.50

Thu, Dec 4 10:30 AM - 12:00 PM  Location: SS04CD

Participations

Moderator
Ambros Johannes Beer MD: Nothing to Disclose

Moderator
Yasuhisa Fujibayashi PhD: Nothing to Disclose

Sub-Events

SSQ12-01  Molecular Imaging Keynote Speaker: PET and/or MR Imaging of Bone Metastases
Ambros Johannes Beer MD (Presenter): Nothing to Disclose

SSQ12-02  A Phase 2 Study of 99mTc-trofolastat Chloride SPECT to Identify and Localize Prostate Cancer (PCa)
**SSQ12-03**

**A Novel Phase Transition-activatable Multi-Modal Imaging Agent for Prostate Cancer**

Shadi A, Esfahani MD, MPH (Presenter): Nothing to Disclose, Pedram Heidari MD: Nothing to Disclose, Nazife S. Turker: Nothing to Disclose, Omar Mahmood MD, PhD: Research Grant, Sabik Medical Inc

**PURPOSE**

We assessed the ability of a novel phosphatase activatable agent, selective for Prostate Specific Acid Phosphatase (PAP) for the detection of prostate cancer (PCa). Cleavage by PAP results in increased fluorescence and radioactive signal due to a local phase change at sites overexpressing the enzyme.

**METHOD AND MATERIALS**

In vitro, 3 PCa cell lines (AT3-B, LNCaP and PC-3) were incubated with 0.1 mg/ml of the soluble probe 2-(2'-phosphoryloxyphenyl)-6-iodo-4-(3H)-quinazolinone (127IQ2-P). Dephosphorylation and extracellular precipitation of the probe was assessed using confocal microscope over 24 hrs. PC-3 cells were implanted in nu/nu mice. Epifluorescence imaging (excitation/emission, 480/530 nm) was performed 1 and 24 hrs after IV injection of the probe with concentrations of 1 and 0.1 mg/ml (n=8 each). Signal intensity in xenografts, and tumor to background ratio (TBR) were measured. Biodistribution and histopathologic studies were performed at each time point.

**RESULTS**

In vitro incubation of the probe with all PAP-overexpressing cell lines resulted in phase transition and formation of the corresponding water-insoluble compound in the extracellular space over 24 hrs. In vivo, rapid hydrolysis of the probe within the tumor resulted in peak fluorescence signal intensity and high TBR 1 hr post injection, with non-significant difference between the mean TBR using 2 different probe concentrations ([TBR with 0.1mg/ml: 4.12±0.2 at 1hr vs. 2.45±0.12 at 24 hrs] and [TBR 1mg/ml: 3.44±0.12 in 1 hr, vs. 2.42±0.08 in 24 hrs]). Biodistribution studies showed rapid probe accumulation in xenografts, fast probe clearance from the background tissues and its excretion through the kidneys.

**CONCLUSION**

Rapid activation, multimodal detection, and high TBR suggest that this phase transition PAP-activatable probe is
promising for imaging PCA. This multimodal probe may be employed in early detection of primary and metastatic prostate cancers, treatment response evaluations, and selective image-guided interventions.

**CLINICAL RELEVANCE/APPLICATION**

The phase-transition activatable probe has the potential in early detection and treatment response evaluation of prostate cancer by targeting the diagnostic marker prostate specific acid phosphatase.

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**SSQ12-04**

First Demonstration of Hypofractionated Volumetric Modulated Arc Therapy Dose Painting with Unflattened Beams for Bone Metastases Using 18F-NaF PET/CT scan

Yu Kuang PhD (Presenter): Nothing to Disclose, Lili Wu MS: Nothing to Disclose, Mei Li MD: Nothing to Disclose, Liangxi Xie MD, PhD: Nothing to Disclose, Hui Wang PhD: Nothing to Disclose, Xia Li PhD: Nothing to Disclose

**PURPOSE**

Higher radiotherapy (RT) doses delivered to bone metastases would result in a higher local control rate. However, such a high dose is impossible to achieve using conventional RT without an unacceptably high risk of severe toxicity. In this study, we propose, for the first time, to utilize 18F-NaF PET/CT to identify regions within the conventional bone metastasis target volumes that may have different biology and thus allowing RT dose escalation (i.e. dose painting) to attain tumor control.

**METHOD AND MATERIALS**

Nine patients with bone metastases from prostate cancer who had 18F-NaF PET/CT scan prior to treatment were retrospectively included in this study. Two gross tumor volumes (GTV) were generated for each patient: $GTV_{\text{reg}}$ was delineated according to the regular tumor boundary shown in PET/CT images; $GTV_{60\%}$ was contoured based on 60% of the maximum SUV values. The planning target volumes (PTVs) were defined as respective GTVs with a 3-mm isotropic expansion margin. Two hypofractionated Volumetric Modulated Arc Therapy (VMAT) plans with 6 MV flattened filter free (FFF) beams (1400MU/min) were generated for each patient based on PTV$_{\text{reg}}$ and PTV$_{60\%}$ respectively. The standard plan (Plan$_{\text{reg}}$) included a dose of 24 Gy prescribed to PTV$_{\text{reg}}$ and a boost dose of 30 Gy prescribed to the PTV$_{60\%}$. TCP and the NTCP were also compared between the plans.

**RESULTS**

In all 18 VMAT plans generated, the target volume objectives and the organs-at-risk (OARs) dose constraints were met. The use of pre-treatment 18F-NaF PET/CT led to a better estimate of the dominant lesion areas within routine GTV, which translated into an advantageous escalation of target dose while maintaining normal tissue sparing.

**CONCLUSION**

This study demonstrates the technical feasibility of 18F-NaF PET/CT-based dose painting for hypofractionated VMAT with FFF beams in patients with bone metastases from prostate cancer.

**CLINICAL RELEVANCE/APPLICATION**

This molecular image guided VMAT approach, with exquisite tumor metabolic activity arising from 18F-NaF PET, would offer therapeutic insight impossible with the current design. Given the higher dose responsive nature in cancer and the facts that the proposed method requires only minimal protocol modification in routine care, it could have major therapeutic value for the clinical outcome in the long term patient care in the future.

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**SSQ12-05**

Recurrent Prostate Cancer Detection with Anti-3-[18F] FACBC PET-CT: Comparison with CT


**PURPOSE**

To compare the diagnostic performance of the synthetic amino acid analog PET radiotracer anti-3-[18F] FACBC (FACBC) with computed tomography (CT) in the detection of recurrent prostate carcinoma.

**METHOD AND MATERIALS**

86 patients with suspected recurrent prostate carcinoma after definitive therapy for localized disease and negative bone scan underwent routine diagnostic CT scan and FACBC PET-CT. Correlation to ground truth was made to histology and clinical followup by a multidisciplinary board. Diagnostic performance and scan positivity rates were calculated for both FACBC PET-CT and CT.
RESULTS
83 out of 86 (97%) patients and 67 out of 86 (78%) patients had a reference standard sufficient to determine the presence of prostatic or extraprostatic disease respectively. Mean PSA (±SD) was 6.7 (±6.3) ng/ml. 70 of 86 (81.4%) FACBC scans versus 16 of 86 (18.6%) CT examinations had positive findings suspicious for recurrent disease. At a PSA <1 ng/ml, scan positivity rate for FACBC was 38.5% and CT was 7.7%, while for PSA ≥ 1 scan positivity rate for FACBC was 89.0% and CT was 20.5%. In the prostate bed, FACBC correctly identified 40 more true positive patients than CT (47 vs 7) with a sensitivity of 90.4% for FACBC compared with a sensitivity of 13.2% for CT and a similar positive predictive value (PPV) of 71.2% and 70.0%, respectively [Table1]. For extra-prostatic disease detection, FACBC correctly identified 16 more true positive patients than CT (21 vs 5) with a sensitivity of 51.2% for FACBC compared with a sensitivity of 12.5% for CT and a similar PPV of 95.5% and 100%, respectively [Table 1].

CONCLUSION
Anti-3-[18F]FACBC detects more patients with recurrent prostate cancer than CT scan and can better delineate prostatic from extra-prostatic recurrence.

CLINICAL RELEVANCE/APPLICATION
Anti-3-[18F]FACBC is useful for restaging of patients with suspected prostate cancer recurrence.

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SSQ12-06
Detection of Intra-pelvic vs Extra-pelvic Lesions with Carbon-11 Acetate Positron Emission Tomography/Computed Tomography Imaging in the Evaluation of Recurrent Prostate Cancer: Interim Results from the AMIC-AC-001 Clinical Study

Fabio Almeida MD (Presenter): Nothing to Disclose, Steven Eric Finkelstein MD: Nothing to Disclose, Mark Scholz MD: Nothing to Disclose, Richard Lam MD: Nothing to Disclose, Jeffrey Turner MD: Nothing to Disclose, Elisa Blackwell: Nothing to Disclose

PURPOSE
A rising PSA after definitive therapy possess a significant problem, as it represents a large group of prostate cancer (PCa) patients. These patients often have the absence of sufficiently detectable disease on standard imaging studies, thereby limiting treatment options.

METHOD AND MATERIALS
373 C11-Acetate (CA) PET/CT studies were reviewed in an ongoing single site FDA/IND clinical study. Male patients with histologically proven PCa and biochemical recurrence (BCR) were imaged. Imaging was performed from vertex - thighs on an integrated PET/CT scanner with imaging 3 to 7 minutes post injection. Detected lesions were defined as moderate-intense focal areas of increased metabolic activity over background in the prostate, bed, nodes and bone.

RESULTS
PSA ranged from 0.2 - 148 ng/mL (mean 6.3, median 2.7). The overall detection rate was 87%. At various PSA subgroups the detection rates were: 0.2-0.4 = 50%, 0.41 - 1.0 = 77%, >1.1 90%. True positive (TP) studies were defined as those with positive biopsy, confirmatory imaging or where radiotherapy (RT) was directed at the detected site with a resultant drop in PSA. 145 patients have thus far met criteria for TP analysis, with a PPV of 94%. Focal lesions were detected only in the prostate or bed in 28% (post prostatectomy [RP]: 32%, post RT: 31%, post RP-RT: 11%). In 24% of studies, only focal pelvic nodal lesions were detected (RP:32%, RT:13%, RP-RT: 41%). Lesions where detected in both the prostate/bed and pelvic nodes in 7%. Metabolic lesions were detected in both the pelvis and abdomen in 7% and isolated to abdominal nodes in 3%. Bone lesions were found in 28% of the studies (71% in bone only and 29% with soft tissue lesions). In 3%, lesions where detected in the other areas such as the lungs, mediastinal nodes or in supraclavicular nodes (particularly on the left).

CONCLUSION
In patients with BCR of PCa, CA PET/CT imaging demonstrates a high detection rate and PPV for the site(s) of recurrence/metastasis. Particularly evident is the high detection of locally recurrent and intra-pelvic nodal disease (59%), which may be amenable to focal therapy with a curative intent. CA PET/CT was also able to better identify those with distant metastases, whom would most benefit from systemic therapy.

CLINICAL RELEVANCE/APPLICATION
Conventional imaging is of limited value in BCR PCa and CA PET imaging appears to help differentiate those with local-regional disease from distant metastasis.

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SSQ12-07
Comparison of [18F]DCFBC PET/CT to Conventional Imaging Modalities in the Detection of Metastatic Prostate Cancer

Steven Patrick Rowe MD, PhD (Presenter): Nothing to Disclose, Katarzyna J. Macura MD, PhD: Nothing to Disclose, Anthony Ciarallo MD, MSc: Nothing to Disclose, Esther Mena: Nothing to Disclose, Amanda Blackford MSc: Nothing to Disclose, Daniel Holt PhD: Nothing to Disclose, Ronnie Mease PhD: Nothing to Disclose, Robert F. Dannals PhD: Nothing to Disclose, Martin Gilbert Pomper MD, PhD: Grant, Eisai Co, Ltd Grant, Eli Lilly and Company Founder, Cancer Targeting Systems, Inc Board of Directors, Cancer Targeting Systems, Inc Founder, Theraly Pharmaceuticals Inc , Steve Cho MD: Nothing to Disclose
PURPOSE

Improved methods of imaging metastatic prostate cancer (PCa) are needed given limitations in the conventional imaging modalities (CIM) of bone scan and CT. [18F]DCFBC is a positron-emitting, urea-based small molecule inhibitor of prostate-specific membrane antigen (PSMA) that has been demonstrated to target PCa specifically and can be imaged with PET.

METHOD AND MATERIALS

14 patients with recurrent (PCa) and imaging findings diagnostic of and/or indeterminate for radiographic recurrence were imaged with [18F]DCFBC PET/CT and CIM. Central review was performed with lesion-by-lesion analysis of the PET and CIM. Lesions were scored as positive, equivocal, or negative on each modality. GEE intercept-only regression models that accounted for intra-patient correlation of multiple lesions were used to estimate proportion of agreement in lesion detection between [18F]DCFBC PET/CT and CIM.

RESULTS

673 lesions were identified on at least one modality. Of those lesions that were positive with PET, 45% (95% CI, 28-65%) were negative or equivocal with CIM. This includes 89% (71-96%) of identified lymph node lesions, 24% (13-39%) of bone lesions, and 39% (14-71%) of visceral lesions (though only 24 such lesions were identified).

Of those lesions that were positive on CIM, only 6% (2-14%) were negative or equivocal on PET. This includes 8% (1-42%) of lymph node lesions, 8% (3-17%) of bone lesions, and no identified visceral lesions.

CONCLUSION

[18F]DCFBC PET/CT identified more potential sites of metastatic PCa than CIM. The majority of lymph node lesions with PET uptake were negative or equivocal with CIM, often due to size <1 cm and hence not deemed definitely pathologic by CT size criteria. Some bone lesions with PET uptake were also not identified on CIM, apparently as a result of lack of significant associated sclerosis. Planned analyses will include clinical and imaging follow-up to diagnose all sites of true PCa metastases definitively in these patients to further assess the utility of this new PET radiotracer.

CLINICAL RELEVANCE/APPLICATION

[18F]DCFBC is a novel PET imaging agent that promises to be more sensitive than CIM for detection of metastatic disease in patients with prostate cancer.

SSQ12-08

Optimization of Fluorescence Detection Improves Sentinel Node Localization in Prostate Cancer Patients

Nynke S. Van Den Berg MSc (Presenter): Nothing to Disclose, Gijs Kleinjan MD: Nothing to Disclose, Oscar Brouwer: Nothing to Disclose, Cenk Acar: Nothing to Disclose, Esther Wit: Nothing to Disclose, Erik Vegt: Nothing to Disclose, Renato Valdes Olmos: Nothing to Disclose, Fijis Willon Bernard van Leeuwen PhD: Nothing to Disclose, Henk G. Van Der Poel: Nothing to Disclose

PURPOSE

In 2011 the hybrid tracer indocyanine green (ICG)-99mTc-nanocolloid was introduced for sentinel node (SN) biopsy in prostate cancer patients. This tracer, being both radioactive and fluorescent, the radioguided approach was complemented with fluorescence guidance towards the SN(s). The current study evaluated how intraoperative fluorescence guidance during the hybrid SN procedure could be further optimized, by improving the tracer and by upgrading the fluorescence imaging hardware.

METHOD AND MATERIALS

40 patients with >10% risk of lymph node metastasis (based on Briganti nomogram) were included for a combined SN, extended pelvic lymph node dissection (ePLND) and robot-assisted radical prostatectomy procedure. The hybrid tracer was injected into the peripheral zone of the prostate under transrectal ultrasound guidance. Following preoperative SN mapping (lymphoscintigraphy and SPECT/CT), intraoperative SN identification was achieved using radiotracing and fluorescence imaging. Three patient groups were evaluated:

In group 1 (n=11) the "old" tracer formulation was used for injection combined with the intraoperative use of the Tricam SL II + D-light C system (KARL STORZ). In group 2 (n=13), an increased particle concentration of the hybrid tracer was injected with reduced volume. In group 3 (n=16) the fluorescence laparoscope was upgraded to an Image HUB 1 HD + D-light P system (KÄRL STORZ).

RESULTS

Fluorescence-based SN identification increased from 64% in group 1 to 85% in group 2 and 93% in group 3 (p-value=0.004). On follow-up, there were fewer N0 patients with a R0 margin with biochemical recurrence (PSA>0.1 ng/mL) in group 3 (Fig. 1).

CONCLUSION

By introducing a new tracer formulation and new fluorescence imaging hardware, intraoperative fluorescence SN detection improved significantly. This contributes to the refinement of the SN procedure, which in turn may improve regional staging in prostate cancer patients.

CLINICAL RELEVANCE/APPLICATION

Improved intraoperative SN identification may lead to improved regional lymph node staging prostate cancer patients, resulting in better patient-tailored therapy planning and possibly improved survival.
Impact of 68Ga-PSMA PET/CT in Staging of Prostate Cancer Patients prior to Radiotherapy

Frederik Lars Giesel MD, MBA (Presenter): Nothing to Disclose, Hanna Fiedler: Nothing to Disclose, Clemens Kratochwil MD: Nothing to Disclose, Ali Afshar-Oromieh: Nothing to Disclose, Uwe Haberkorn MD: Nothing to Disclose, Florian Sterzing MD: Nothing to Disclose, Juergen Debus MD, PhD: Nothing to Disclose

PURPOSE
Prostate cancer risk stratification is based on PSA, T-stage and Gleason score and results in improved therapeutic decision-making. The purpose of this retrospective investigation is to evaluate the impact of 68Ga-PSMA PET as a novel pre-treatment staging method prior to radiotherapy.

METHOD AND MATERIALS
56 patients with prostate cancer were retrospectively analyzed with conventional CT and 68Ga-PSMA PET/CT imaging. 15 patients presented at diagnosis, while 41 patients presented with recurrence after total prostatectomy; 71% had high risk and 29% intermediate risk cancer according to the d’Amico criteria. On conventional CT, lymph nodes were regarded as pathologically involved if their short axis diameter was ≥10mm. Lymph node involvement in 68Ga-PSMA PET was diagnosed when a node on CT demonstrated a maximum standardized uptake value (SUVmax) >2. TNM-classification was performed by two experienced readers in consensus.

RESULTS
26 of 56 (46.4%) patients was changed after 68Ga-PSMA PET imaging. This included 8 patients with changes at initial diagnosis and 18 patients at the time of recurrence. 13/26 patients (50%) with recurrence were changed from N0 to N1, 9 patients (34.6%) were changed from M0 to M1a, 4 patients (15.4%) were changed from M0 to M1b and 1 patient (3.8%) was changed from T1 to T2a. In 7/15 patients (46.6%) at initial diagnosis no metastases were detected in 68Ga-PSMA PET/CT. Among the 26 patients in whom 68Ga-PSMA PET upstaged their disease, all patients underwent modification of their therapy. Nodal upstaging resulted in individualized simultaneous integrated boost IMRT. With detection of distant metastases, patient management was changed from local radiotherapy to systemic therapy.

CONCLUSION
These results suggest that 68Ga-PSMA PET/CT can more accurately stage patients with prostate cancer than conventional CT leading to changes in therapy. This agent could therefore, become important for more precise treatment of patients with primary or recurrent prostate cancer.

CLINICAL RELEVANCE/APPLICATION
68Ga-PSMA PET/CT can more accurately stage patients with prostate cancer than conventional imaging modalities resulting in changes of the treatment regime.

GUS-THA
Genitourinary/Uroradiology Thursday Poster Discussions

Diagnostic Imaging in Patients with Primary Hyperaldosteronism: Correlation of MDCT Findings with Adrenal Vein Sampling (Station #1)


PURPOSE
Primary hyperaldosteronism usually results from an aldosterone-secreting adenoma (ASA) or bilateral adrenal hyperplasia (BAH), and adrenal vein sampling (AVS) is considered the goal-standard for differentiating these two possibilities. This study compares MDCT with adrenal vein sampling, and seeks to determine whether MDCT alone may be sufficient in some patients.

METHOD AND MATERIALS
MDCTs of 43 adult patients with biochemical evidence of hyperaldosteronism and who had undergone AVS were reviewed retrospectively by 2 radiologists blinded to AVS results. Readers recorded the presence/size of adrenal nodules and measured adrenal gland limbs. AVS results and MDCT findings were then correlated.

RESULTS

13 patients had bilateral adrenal nodules, 14 had unilateral nodule on the right, 14 had unilateral nodule on the left, and 2 had no nodule on either side. AVS suggested ASA on the right in 22, ASA on the left in 19, and BAH in 3 subjects. The presence of a nodule was associated with sensitivities of 82-88%, specificities of 57-72% and accuracy of 47-81% for predicting positive AVS. Of the 28 patients with a single unilateral nodule on MDCT, the side of the nodule correctly correlated with AVS in 24 (86%). In all of the 4 incorrect cases, the nodule measured < 2 cm, and in 2 cases AVS suggested BAH, while the wrong side was localized on CT in 2 cases. Of the 13 patients with bilateral nodules, 12 localized unilaterally to one side on AVS, while 1 had BAH. Of these 13 cases, there was significant discrepancy in size of the bilateral nodules (>1 cm) in 5 cases, in all of which AVS localized to the side of the larger nodule. In the right adrenal gland, functioning nodules (mean 21.8 mm) were significantly larger than nonfunctioning nodules (8.3 mm) (p=0.002). On the left side, there was no difference in nodule size between functioning and nonfunctioning lesions (17.1 mm vs 18 mm, p=0.852).

CONCLUSION

In primary hyperaldosteronism, MDCT can accurately predict the presence of a unilaterally ASA in cases with a unilateral nodule measuring > 2 cm, or in cases with bilateral adrenal nodules where there is a size discrepancy of the nodules of > 1 cm.

CLINICAL RELEVANCE/APPLICATION

In certain limited cases, it might be possible to perform adrenalectomy based on MDCT results alone without AVS. However, in cases with a unilateral small nodule or bilateral nodules without a size discrepancy, AVS is critical for correct localization and diagnosis.

The Value of Spectral CT Imaging in Differentiating Lipid-poor Adrenal Adenomas from Metastatic Lesions (Station #2)

Ye Ju (Presenter): Nothing to Disclose, Ailian Liu MD: Nothing to Disclose, Yijun Liu: Nothing to Disclose, Jinhong Liu: Nothing to Disclose, Renwang Pu MBCh, FRCP: Nothing to Disclose, Longmin Zhang: Nothing to Disclose

PURPOSE

To evaluated the value of spectral CT in differentiating lipid-poor adenomas from metastases in adrenal glands.

METHOD AND MATERIALS

This retrospective study was approved by the Institutional Review Board of the participated hospital and written informed consent was waived. From August 2011 to December 2013, 69 patients (49 M: 20 F, mean age=59.4 ± 11.9 years, range 24.0~84.0 years) with 73 adrenal nodules (53 clinically proven metastases and 20 histopathologically proven adenomas) underwent spectral CT imaging through fast kVp-switching technique. The virtual monochromatic images (40~140keV), fat(water) density images and effective atomic number (eff-Z) were reconstructed. The difference of CT values, fat (water) concentration and eff-Z between adrenal metastases and adenomas were compared statistically by independent-samples t test.

RESULTS

1) The mean CT values of metastases [(53.00±15.12)~(33.38±5.67) HU] were significantly higher than those of adenomas [(26.90±26.94)~(28.77±10.66) HU] under 40~80 keV level (P<0.05). 2) Fat(water) concentration of metastases (-193.43±173.44 ug/cm3) was statistically lower than that of adenomas (-45.32±253.63 ug/cm3) (P<0.05). 3) The eff-Z of metastases (7.76±0.15) was significantly higher than that of adenomas (7.50±0.25) (P<0.05).

CONCLUSION

The spectral CT provides a multi-parameter approach for identifying lipid-poor adenomas from metastases.

CLINICAL RELEVANCE/APPLICATION

Lipid-poor metastases and adenomas in adrenal glands could be differentiated through multiple parameters of spectral CT.

Novel Organ Preserving Treatment Option—MR Guided Focused Ultrasound Surgery (MRgFUS) in Adenomyosis: Initial Forebode Results (Station #3)

Bhawna Dev MD (Presenter): Nothing to Disclose, Sameera Gaddam MBBS: Nothing to Disclose

PURPOSE

To determine the efficacy of MRgFUS ablation in organ-preserving treatment of adenomyosis.

METHOD AND MATERIALS

We describe a small group of 14 patients (median age 31 years-old, range 36-44), treated for adenomyosis and followed up for six months. For each patient we had collected the Symptom Severity Score (SSS) as well as the Visual Analog Scale (VAS) and the number of reported pads replaced by the patient.
RESULTS

The SSS had significantly decreased from a median of 56 (range 19 to 65) to 16 (range 0 to 34), by the six months follow-up visit. In addition, the VAS had decreased from a median of 7 (range 5 to 8) prior to treatment to 2 (range 2 to 6). Finally, the number of pads had decreased from a median of 7 (range 4 to 9) to 4 (range 3 to 5) six months post treatment. No adverse events were observed during the treatments or the follow-up period.

CONCLUSION

MRgFUS can significantly increase the quality of life for patients suffering from adenomyosis. Symptom relief is also accompanied by a reduction in pain and a lessening of the associated bleeding during the menstrual period.

CLINICAL RELEVANCE/APPLICATION

MR guided focused ultrasound surgery (MRgFUS) is a newer organ preserving treatment option in Adenomyosis and is a good option for patients wanting to preserve their uterus.

Feasibility of Computed Tomography Perfusion Imaging of the Kidney Using a 320-detector MDCT Unit: Establishment of Normal Perfusion Parameters Values (Station #4)

PURPOSE

To determine the normal values of renal cortex and parenchyma perfusion parameters using a 320-detector MDCT including the entire kidney

METHOD AND MATERIALS

54 normal renal function patients underwent a renal perfusion imaging using a 320-slice dynamic volume CT unit (Aquilion One, Toshiba Medical Systems, Ottawara, Japan) including the whole organ without table movement. The dynamic CT protocol included 24 volumes with a total acquisition time until 90sec, a rotation time of 0.5sec, 0.5ml/kg of a highly concentrated contrast medium (Iomeprol 400 mg iodine/ml) with a flow rate of 5-6ml/sec pushed by 50 ml of saline serum. Perfusion parameters were calculated using the maximum slope and Patlak model from the dedicated software of our CT unit after a non-rigid motion correction. Mean blood flow (AF), blood volume (BV) and clearance (Cl) were recorded by mean of ROI located and included all the parenchyma and all the cortex. Measurements were performed in the three orthogonal plans. The resulting quantitative voxel values were transformed into 3D color maps for visual inspection and analysis. Whole kidney perfusion parameters were calculated after registration of the volume of each kidney. Radiation dose was recorded.

RESULTS

Imaging quality was satisfactory for a morphologic assessment. Radiation dose was between 7-10mSv (mean 8.3). Our results were for AF: 202±24, 315±29 ml/100g/min; BV: 42±18, 75±18 ml/100g and Cl: 47±26, 38 ± 12 ml/100g/min for whole parenchyma and cortex, respectively. By calculating the volume of each kidney, we obtained 229±45ml/min, 64±18 ml and 87±28ml/min for AF, BV and Cl, respectively. There was no significant difference of values between right or left kidney. The time for operator processing to record the data was between 2 to 3 min after the non-rigid automatic motion correction process which was taken approximately 10min. There was no impact on the working flow. CT perfusion parameters did not differ by using axial, sagittal or coronal or oblique plans.

CONCLUSION

320-Detector MDCT makes it possible to conduct perfusion measurements of the whole kidney without table displacement. Our preliminary results suggest that it is feasible in clinical practice without time consuming and a reasonable radiation dose.

CLINICAL RELEVANCE/APPLICATION

Contrast-enhanced dynamic MDCT of renal perfusion can be easily performed in a routine application, with a reasonable time for post processing and radiation dose.

Impact of Different Helical Pitch Selection on Spectral CT Imaging: Comparison of Image Quality and Radiation Dose (Station #5)

PURPOSE

To explore the impact of different helical pitch on spectral CT imaging in the urinary CT examination.

METHOD AND MATERIALS
Among 54 cases of urinary CT examination, 23 and 31 cases underwent single-source dual-energy CT (sDECT) at a helical pitch of 1.375:1 and 0.984:1, respectively. Monochromatic images of 65keV were reconstructed, and the image noise of renal parenchyma was evaluated. Signal-to-noise ratio (SNR) and contrast-noise-ratio (CNR) was calculated with ROI measurements. The figure of merit (FOM), calculated as CNR(2)/CTDI(vol), was used to quantify image quality improvement per exposure risk.

RESULTS

For 1.375 Group and 0.984 Group, the CNR of image was not significantly different (P>0.05) (2.45±0.70 Vs 2.48±0.68 ), and SNR was (4.34±1.24) and (4.57±1.20) respectively. Compared with that in 0.984 Group (25.53mGy), the CTDI was significantly lower in 1.375 Group (18.28mGy). FOM of 1.375 (0.33) was higher than 0.984 Group (0.24), increased by 38%.

CONCLUSION

Conclusion: At a high scanning helical pitch of spectral CT imaging, the radiation dose is significantly lower, but the image noise is not significantly different. Therefore, the urinary system CT examination could be scanned at a large pitch.

CLINICAL RELEVANCE/APPLICATION

Spectral CT imaging is always associated with a high radiation dose, and high pitch protocol could increase the efficiency of radiation dose without sacrificing image quality.

URE178

Anterior and Posterior Pararenal Spaces: Comprehensive Review of Anatomy and Pathology (Station #6)

Rafel Tappouni MBBCh, FRCPC: Nothing to Disclose, Katryana Mary Hanley-Knutson MD (Presenter): Nothing to Disclose

TEACHING POINTS

1. Review the normal retroperitoneal anatomy and radiologic signs to localize pathology to the anterior and posterior pararenal spaces
2. Illustrate the common pathology and ways of disease spread in the anterior and posterior pararenal spaces with a series of cases

TABLE OF CONTENTS/OUTLINE

We present, describe and analyze CT anatomy and pathology of the anterior and posterior pararenal spaces with Multidetector CT and multiplanar reformations. Cases will include, but not limited to pancreatitis, diverticulitis, retroperitoneal gas dissecting through facial plances, malignancies including primary and neoplastic disease. Detailed description and demonstration of disease and it’s spread will be demonstrated to include: Anterior pararenal space spread to lateral edge of the quadratus lumborum muscle Retromesenteric plane role in spread of disease accross midline Gerota (Retromesenteric) and Zuckerkandl(retrorenal) facial plance fusion Subperitoneal spread from retroperitoneum along the peritoneal ligaments Interfacial spread along the retromesenteric, retrorenal, and interfascial planes to bare area of liver, liver hilum and left diaphragm.

GUS-THB

Genitourinary/Uroradiology Thursday Poster Discussions

Scientific Posters

AMIA PRA Category 1 Credits™: .50
Thu, Dec 4 12:45 PM - 1:15 PM Location: GU Community, Learning Center

GUS150

Diagnostic Efficacy of Urothelial Phase of CT Urography for Detection of Recurred Bladder Cancer after Transurethral Resection of Urinary Bladder (TURB) (Station #2)

Young Sup Shim MD (Presenter): Nothing to Disclose, Hyuck Jae Choi MD : Nothing to Disclose, Kyoung-Sik Cho MD : Nothing to Disclose

PURPOSE

To assess the efficay of urothelial phase of CT urography for detection of recurred bladder cancer in patients performed previous transurethral resection of urinary bladder in comparison with excretory phase of CT urography.

METHOD AND MATERIALS

272 CT urography examinations were performed in biopsy proven recurred cancer patients (n=67) and patients without tumor recurrence pathologically and clinically (n=205) after transurethral resection of urinary bladder (TURB) for bladder cancer. CT urography protocol consisted of urothelial phase (70-80 seconds after injection of contrast material) and excretory phase. Two radiologists independently reviewed these two phases of CT urography and evaluated suscets of recurred bladder cancer.
**RESULTS**

The sensitivity was higher for the urothelial phase (reader 1, 74.6%; reader 2, 55.2%) than excretory phase for detection of the recurred bladder cancer, in all of both readers (reader 1, 34.3%; reader 2, 32.8%). The specificity was a little higher for excretory phase (reader 1, 95.1%; reader 2, 93.2%) than urothelial phase (reader 1, 80.5%; reader 2, 90.7%). The AUCs of ROC analysis were larger for urothelial phase (reader 1, 0.755; reader 2, 0.812) than excretory phase (reader 1, 0.633; reader 2, 0.650).

**CONCLUSION**

The urothelial phase of CT urography shows relatively high diagnostic performance in detection of recurrence of bladder cancer than excretory phase.

**CLINICAL RELEVANCE/APPLICATION**

In patients with routine follow up after TURB, Radiation reduction was possible by CT urography without excretory phase.

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**GUS151**

**Objective and Subjective Image Quality of Renal Parenchymal Masses with Virtual Monoenergetic Dual-energy CT Reconstructions (Station #3)**

Jian Jiang (Presenter): Research Grant, General Electric Company

**PURPOSE**

To compare in dual-energy CT (DECT) conventionally reconstructed polyenergetic images (PEIs) at 120 kVp to virtual monoenergetic images (MEIs) at different kiloelectron volt (keV) levels for evaluation of renal parenchymal masses in regard to objective image quality and subjective image quality.

**METHOD AND MATERIALS**

We prospectively evaluated 128 row dual-source DECT studies. Twenty patients who had renal parenchymal masses underwent abdominal DECT. On the basis of the Data of the 80 and 140 kVp tube using dual-source CT technology, PEIs and MEIs in 10-keV intervals from 40 to 120 keV were reconstructed. Renal parenchymal masses and soft tissue attenuation and image noise were measured in various regions of interest and the Signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) were subsequently calculated. MEI reconstructions with the highest CNR, SNR and the subjective image quality by two experienced readers were compared to PEI for those.

**RESULTS**

Good inter-reader agreement of the subjective score was noted (k = 0.782, p = 0.000). The mean score of subjective image quality of 70 keV was the highest in the MEIs, which was significantly higher than that of PEI (P=0.020). MEI at 60 keV had the highest CNR compared to PEI. There was no significant difference in CNR between 60 keV and 70 keV (P=0.693). The SNR of 70 keV was higher compared to PEI. The image noise of 70 keV was lower than that of the other MEIs, which was no significantly higher than PEI.

**CONCLUSION**

These results highlighted that MEI at 70 keV provided a better image quality in diagnostic levels comparing with PEI, which improve their diagnostic confidence in the assessment of renal parenchymal masses by evaluating MEI reconstructions at 70 keV.

**CLINICAL RELEVANCE/APPLICATION**

The aim is to improve radiologists’ diagnostic confidence in the assessment of renal parenchymal masses by evaluating MEI reconstructions at 70 keV.

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**GUS152**

**Assessment of Acute Kidney Injury in Patients after Lung Transplantation Using Diffusion Weighted Imaging (Station #4)**


**PURPOSE**

Following lung transplantation (lutx) a majority of patients develop acute kidney injury (AKI), which is associated with an increased risk of chronic kidney disease (CKD) and poor outcome. Our purpose was to evaluate diffusion weighted imaging (DWI) for detection of AKI.

**METHOD AND MATERIALS**
In the study 22 lung transplant patients and 9 age-matched healthy volunteers were included. Renal function was monitored by s-creatinine measurement, and presence and severity of AKI was diagnosed according to AKIN criteria. Patients underwent MRI 14±2 days after lungx using a 1.5 T magnet. A respiratory-triggered, fat-saturated echoplanar diffusion-weighted sequence was acquired with 10 b-values (b=0-1000 s/mm²). Maps of diffusion parameters were calculated using mono-exponential (ADC mono) and bi-exponential models (ADC d, ADC p, Fp). ROIs were placed manually into the upper, middle and lower third of renal cortex and medulla and mean±SD of diffusion parameters were calculated. MRI and clinical parameters were compared between groups using unpaired t-test and ANOVA.

**RESULTS**

77% (17/22) of lung transplant patients developed AKI (36% AKIN1 = mild, 32% AKIN2 = moderate, 9% AKIN3 = severe). Maximum s-creatinine was reached 1-2 days after lungx and it was significantly higher in AKI-patients compared to patients without AKI (156±70 vs 80±17 μmol/L, p<0.01). Pre-operative s-creatinine was normal in both groups. Mean age was not different when comparing patients with and without AKI (45±12 vs 55±6 y, p=0.10). ADC mono was significantly lower in patients with AKI compared to patients without AKI (cortex: 1.95±0.14 vs 2.19±0.04 x10⁻³ mm²/s, p<0.01; medulla: 2.01±0.15 vs 2.16±0.08 x10⁻³ mm²/s, p<0.05) and to healthy volunteers (cortex: 1.95±0.14 vs 2.16±0.16 x10⁻³ mm²/s, p<0.01; medulla: 2.01±0.15 vs 2.20±0.09 x10⁻³ mm²/s, p<0.01). No difference between patients without AKI and healthy subjects was observed. Similarly, cortical and medullary ADC d were significantly lower in AKI-patients than in controls (p<0.05, p<0.01). ADC p and Fp were not different.

**CONCLUSION**

DWI allows detection of AKI in the early period following lungx. It may also be useful as a biomarker to monitor renal function and to predict progression to CKD.

**CLINICAL RELEVANCE/APPLICATION**

Early diagnosis of AKI is important to improve patient management and therapy monitoring in patients at risk of AKI. Functional MRI such as DWI enables assessment of renal function and pathology.

**Molecular Imaging of Prostate Cancer (Station #5)**

Andreas Georg Wibmer MD (Presenter): Nothing to Disclose, Irene Andrea Burger: Nothing to Disclose, Hebert Alberto Vargas MD: Nothing to Disclose

**TEACHING POINTS**

Molecular imaging of prostate cancer goes beyond the detection, localization and staging of the cancer but must also be capable of non-invasively providing insights into tumor biology. This information can be used to better understand the nature of prostate cancer, to support treatment decisions, and estimate the prognosis of patients. In this educational exhibit, we give an overview of the molecular imaging methods that are presently applied or are under clinical evaluation. We also refer to emerging techniques that are currently in the state of preclinical development (Figure 1).

**TABLE OF CONTENTS/OUTLINE**

**RADIONUCLIDE IMAGING**

IMAGING OF CELL METABOLISM Glucose, Choline, Acetate, Amino Acids (Leucine, Methionine, Tryptophan), Nucleosides

**RECEPTORS AND MEMBRANE PROTEINS** Androgen receptor, Gastrin Releasing Peptide Receptor, PSMA, Others

**BONE MATRIX REPORTER** GENE IMAGING MOLECULAR MAGNETIC RESONANCE IMAGING

**Oddballs: Unusual Testicular Lesions (Station #6)**


**TEACHING POINTS**

Describe the embryology, anatomy, and histology of the testis. Review unusual testicular neoplasms and become familiar with the epidemiology, clinical presentation, imaging characteristics, and management of each lesion. Identify the clinical presentations and imaging findings that can help differentiate benign from malignant testicular masses. Understand the management implications of the imaging findings and radiologist’s report.

**TABLE OF CONTENTS/OUTLINE**

**Introduction and epidemiology**

Sub-Events

MSCA51A Imaging of Acute Abdomen
Stephan W. Anderson MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1. The participant will be exposed to the current literature related to imaging of acute abdominal pain using CT.
2. The participant will be able to apply an evidence-based approach to CT protocol development in the imaging of acute abdominal pain.
3. The participant will be able to independently evaluate the published literature in this area in a critical fashion and continue to apply recent developments to their own practice.

MSCA51B Imaging of Abdominal Trauma
Savvas Nicolaou MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Review the technique and protocols, with an emphasis on MDCT, for imaging of blunt and penetrating abdominal trauma. 2) Demonstrate examples of the spectrum of injuries associated with abdominal trauma, including splenic, hepatic, kidney, pancreate and bowel injuries. 3) Demonstrate significance of arterial and portal venous phase imaging in the setting blunt abdominal trauma (BAT), and the role of whole body imaging in the setting of BAT. 4) Review the new imaging applications and techniques such as iterative reconstruction and dual-energy CT which can help better image abdominal injuries post-trauma.

MSCA51C Imaging of the Acute Abdomen and Pelvis in Pregnancy
Puneet Bhargava MD (Presenter): Editor, Reed Elsevier

LEARNING OBJECTIVES
1) To understand imaging related radiation risk to the fetus. 2) Exam appropriateness in right upper quadrant, mid-abdominal and flank pain. 3) Role of CT contrast media and its associated risk in pregnancy.

Active Handout

MSCA52

Case-based Review of the Abdomen (An Interactive Session)

Multisession Courses

LEARNING OBJECTIVES
Several speakers will be presenting case-based reviews of topics of relevance for imaging of the abdomen and pelvis. Brief discussions with focused reviews of the literature will follow for each case.

Sub-Events

MSCA52A Pitfalls and Pearls in Abdominal Sonography
Terry S. Desser MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Correctly identify common and uncommon sonographic pathology in the abdomen. 2) Use your understanding of basic sonographic and physiologic principles to infer the correct diagnosis in unusual ultrasound cases.

MSCA52B Genitourinary Tract Imaging
**LEARNING OBJECTIVES**

1) Apply practical approach to diagnose common and uncommon pathology of genitourinary tract. 2) Learn to avoid pitfalls and misdiagnosis of genitourinary tract pathology.

**ABSTRACT**

Imaging plays a central role in the detection, diagnosis and treatment planning of abdominal malignancies. Proper imaging begins with protocol selection. Knowledge of imaging pitfalls helps the radiologist avoid diagnostic errors. Recognition of complications due to tumor effects and treatment effects is important to minimize morbidity and mortality in patients undergoing treatment for abdominal malignancies. Through case-based discussion, we will review tactics to optimize imaging and management for patients with abdominal malignancies.

**Active Handout**

Participants

Evis Sala MD, PhD (Presenter): Nothing to Disclose
Mitchell E. Tublin MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

1) The participant will be introduced to a series of Genitourinary case studies via an interactive team game approach designed to encourage “active” consumption of educational content. 2) The participant will be able to use their mobile wireless device (tablet, phone, laptop) to electronically respond to various Genitourinary case challenges; participants will be able to monitor their individual and team performance in real time. 3) The attendee will receive a personalized self-assessment report via email that will review the case material presented during the session, along with individual and team performance. This interactive session will use RSNA Diagnosis Live™. Please bring your charged mobile wireless device (phone, tablet or laptop) to participate.

ABSTRACT

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

RC850

Fallopian Tube Catheterization (Hands-on Workshop)

Refresher/Informatics

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Fri, Dec 5 8:30 AM - 10:00 AM Location: E260

Participants

Amy Suzanne Thurmond MD (Presenter): Nothing to Disclose
Ronald Jay Zagoria MD (Presenter): Nothing to Disclose
Lindsay S. Machan MD (Presenter): Medical Advisory Board, Boston Scientific Corporation Medical Advisory Board, Arsenal Medical Inc Steering Committee, Cook Group Incorporated Stockholder, Analytics 4 Life Stockholder, Calgary Scientific, Inc Stockholder, Harmonic Medical Stockholder, IKOMED Technologies Inc Stockholder, Nitinol Devices & Components, Inc
Arl Van Moore MD (Presenter): Nothing to Disclose
Anne C. Roberts MD (Presenter): Researcher, Elbit Imaging Ltd Research Consultant, Guerbet SA Research Consultant, General Electric Company
David M. Hovsepian MD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES

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

ABSTRACT

Fallopian tube catheterization using fluoroscopic guidance is a relatively easy, inexpensive technique within the capabilities of residency trained radiologists. Fallopian tube catheterization can be used to dislodge debris from the tube in women with infertility, or to place FDA-approved tubal occlusion devices in women who do not desire fertility. The fallopian tube is the 1 mm gateway between the egg and the sperm. Noninvasive access to this structure for promoting, and preventing, pregnancy has been sought for over 160 years. This hands-on course allows participants use commercially available catheters and devices in plastic models for fallopian tube catheterization, and to speak directly to world experts about this exciting procedure.

RC851

CT/PET in the Abdomen and Pelvis: How and When (How-to Workshop) (An Interactive Session)

Refresher/Informatics

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Fri, Dec 5 8:30 AM - 10:00 AM Location: E450B

Sub-Events

RC851A

CT/PET: Metabolic Assessment in Reporting

Eric Michael Rohren MD, PhD (Presenter): Nothing to Disclose

LEARNING OBJECTIVES
1) Discuss the role of metabolic parameters in response assessment using FDG-PET/CT. 2) Compare the use of anatomic and metabolic response evaluation systems in the evaluation of patients with malignancy.

**RC851B**

**Artifacts/Pitfalls/Incidentals**

Terence Zekon Wong MD, PhD (Presenter): Advisory Board, Eli Lilly and Company Consultant, Koninklijke Philips NV Advisory Board, Bayer AG

**LEARNING OBJECTIVES**

1) Recognize and address common benign findings on FDG-PET / CT scans that can simulate malignancy. 2) Understand technical factors that can influence interpretation and quantification of FDG-PET studies.

**ABSTRACT**

Diagnostic accuracy of FDG-PET/CT scans can be degraded by potential technical artifacts during imaging acquisition as well as interpretive pitfalls encountered when evaluating regions of tracer accumulation. Technical artifacts occur relatively frequently due to the complexity of the PET and CT image acquisition and reconstruction; examples of important artifacts will be presented, along with potential solutions. Thoughtful design of PET/CT imaging protocols and attention to detail during image acquisition can reduce the incidence of artifacts. In addition, interpretive pitfalls due to false positive and false negative FDG accumulation is a major source of angst in interpreting oncologic PET/CT studies. Examples of common interpretive pitfalls will be presented along with approaches to distinguish malignant from benign FDG accumulation.

**RC851C**

**Select Issues in Abdominal and Pelvic CT/PET**

Andrea Grace Rockall MRCP, FRCR (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) To know the indications for PET/CT in pelvic malignancy. 2) To recognize the typical findings on FDG-PET/CT in pelvic malignancies, including gynaecologic and urologic cancers. 3) To be aware of some new tracers that are being used in pelvic malignancy.

**SST07**

**Genitourinary (New Technology for Imaging the GU Tract)**

**Scientific Papers**

CT GU

AMA PRA Category 1 Credits ™: 1.50
ARRT Category A+ Credits: 1.50
Fri, Dec 5 10:30 AM - 12:00 PM Location: E351

**Participants**

Moderator
Paul Nikolaidis MD : Nothing to Disclose
Moderator
Harriet Carolina Thoeny MD : Nothing to Disclose

**Sub-Events**

**Perfusion Quantification Using Dynamic Contrast–enhanced US: Which File Format Should We Use?**

Rana Al Rouhban MD (Presenter): Nothing to Disclose, Sebastien Mule: Nothing to Disclose, Stephane Oudard MD, PhD: Nothing to Disclose, Anne-Marie Tissier MD: Nothing to Disclose, Olivier Helenon: Nothing to Disclose, Jean-Michel Correas MD: Advisory Board, Koninklijke Philips NV Speaker, Bracco Group Investigator, Bracco Group Speaker, SuperSonic Imagine Speaker, General Electric Company

**PURPOSE**

To evaluate the correlation between perfusion parameters estimated from raw data (linear data; device-specific format) and AVI and DICOM files (compressed data; device-free format) in dynamic contrast-enhanced ultrasound (DCE-US) studies, knowing that raw data format requires processing with proprietary software while DICOM and AVI format can be processed using independent software.

**METHOD AND MATERIALS**

The therapeutic response of 15 patients with metastatic renal cell carcinoma treated with sunitinib was assessed using DCE-US in this prospective study, after signing the approved consent form. 151 cineloops were acquired after a 2.4 mL bolus injection of BR1 (SonoVue®, Bracco, Milano, Italy) and simultaneously stored in RAW data, DICOM and AVI formatted files. A specific version of the "EchoPerf" software was developed to simultaneously adjust perfusion kinetics (bolus) from three regions-of-interest (ROI) by a simple mathematical model (gamma-variate) and to estimate four perfusion parameters (Area under the curve = AUC, Mean transit...
time=MTT, Peak enhancement=PE, and Perfusion index=PI) from the three file formats. Data provided by the DICOM and AVI formats were linearized according to the US manufacturer recommendations. Correlation between functional perfusion parameters was calculated using the Pearson correlation test. A p-value below 0.05 was considered significant.

RESULTS
Correlation between raw data-derived estimates and AVI and DICOM-derived estimates was >= 0.94 for all perfusion parameters (p< 0.05). Higher values were found using DICOM files versus AVI files, without any statistical significance. The amplitude of the signal obtained and thus the values of the perfusion parameters for the RAW format were consistently higher due to increased dynamic range with 2 additional bits.

CONCLUSION
Functional perfusion parameters estimated with DCE-US from different file formats are strongly correlated when the appropriate linearization function is used. However, the same format should be kept for the entire follow-up study. The use of raw data is not mandatory and third-party quantification softwares can be developed.

CLINICAL RELEVANCE/APPLICATION
Any file format (raw, DICOM or AVI) can be used in recording digital cineloops for further perfusion quantification in DCE-US as long as the appropriate linearization function is used and the same format kept identical in all follow-up evaluation studies.

SST07-02 Testis Shear Wave Elastography: Preliminary Experience Based on 200 Patients
Laurence Marie Rocher MD (Presenter): Nothing to Disclose , Vincent Izard : Nothing to Disclose , Mickael Tanter PhD : Co-founder, SuperSonic Imagine , Jean Luc Gennisson MD, PhD : Consultant, SuperSonic Imagine , Aline Criton : Employee, SuperSonic Imagine , Marie-France Bellin MD : Nothing to Disclose, Jean-Michel Correas MD : Advisory Board, Koninklijke Philips NV Speaker, Bracco Group Investigator, Bracco Group Speaker, SuperSonic Imagine Speaker, General Electric Company

PURPOSE
To establish normal testis shear wave elastography (SWE) findings, including artifacts and limits and to illustrate the several patterns and elasticity values found in the case of testis tumors, infertility and varicocele.

METHOD AND MATERIALS
200 patients referred for a testis ultrasound examination were studied using B-mode harmonic imaging, color-Doppler US (CDUS) and dynamic SWE using the Aixplorer platform (Supersonic Imaging, Aix-en-Provence, France) with a high-frequency linear transducer (SL15-4 MHz). For each patient and testis, the following data were collected: testis volume, echogenicity, presence of varicocele (with and without valsalva maneuver), stiffness with 3 quantitative measurements using a Region-of-Interest (ROI; in kPa) - in the presence of a mass: size, echogenicity, vascularity and the highest stiffness value measured in the lesion. A Student's t-test was performed to compare each pathological group; p < 0.05 was considered to represent a statistically significant difference.

RESULTS
In the normal population, the color coding inside the SWE ROI was homogeneous using a scale of 30 kPa. The normal testis stiffness was very low: 2.4±0.5 kPa. The periphery of the gland and the hilum exhibited higher stiffness values. In the case of lesions, the mean ± SD stiffness values were for: malignant tumors (n= 7) 61.6±46.7 kPa; burned out tumors (n=4) 18±8.7 kPa; benign proved tumors (n=2) and nodules with benign features and follow-up period over 1 year (n=6) 4.1±1.9 kPa; infertility and severe testis hypotrophy (n= 40, testis volume <10 mL) 2.2±0.94 kPa; obstructive status (n=7) 2.4±0.43 kPa; varicocele (n=30) 2.4±0.6 kPa and 2.3±0.6 kPa with and without Valsalva maneuver respectively. No statistically significant difference was found between varicocele and normal testis. Stiffness values were significantly higher in malignant tumors and burn-out tumors compared to that of normal testis stiffness (p=0.026 and p=0.018 respectively) and benign tumors (p=0.030 and p=0.024 respectively). Limitations included stiffness assessment in cryptorchidism.

CONCLUSION
SWE of the testis is a novel imaging technique that can be used for stiffness measurement. Despite the limited number of benign and malignant lesions, a statistically significant difference was found between these populations.

CLINICAL RELEVANCE/APPLICATION
SWE will be helpful to discriminate benign from malignant testis tumors.

SST07-03 Hemodynamic Features from Corpus Cavernosum Perfusion CT for Additional Diagnostic Information in Patients with Erectile Dysfunction: Initial Experience
Yong Sun (Presenter): Nothing to Disclose , Zhiqin Du : Nothing to Disclose

PURPOSE
To evaluate the value of penis perfusion CT for providing hemodynamic features information in patients with erectile dysfunction.

METHOD AND MATERIALS
17 patients (average 36.3 years) with clinically suspected vascular erectile dysfunction underwent penis perfusion imaging by using a 256-slice CT scanner. All images were transferred to a commercially available workstation (Extended Brilliance Workspace) for analysis. 3D CT angiographic images generated from perfusion source data were obtained in all patients. The hemodynamic changes of corpus cavernosum were analyzed on perfusion parameter maps.

RESULTS

Penile arterial vascular abnormalities including stenosis, interruption and occlusion were observed in 11 patients. Bilateral hypo-perfusion was observed in 1 case with bilateral vascular abnormality, 1 case with unilateral penile vascular abnormality, and 1 case without penile vascular abnormality. Ipsilateral hypo-perfusion was observed in 6 cases with unilateral penile vascular abnormalities, bilateral hyper-perfusion was observed with 1 case of unilateral penile vascular abnormality.

CONCLUSION

Hemodynamic features of corpus cavernosum can be assessed by CT perfusion method, and can provide additional diagnostic information to penile vascular changes for erectile dysfunction patients.

CLINICAL RELEVANCE/APPLICATION

Perfusion CT is a noninvasive, quantitative assessment method, and providing the corpus cavernosum microcirculation hemodynamic information.

SST07-04

Application of Gemstone Spectral Imaging in Differential Diagnosis of Bladder Cancer and Prostate Hyperplasia

Chen Anliang (Presenter): Nothing to Disclose, Ailian Liu MD: Nothing to Disclose, Jinghong Liu: Nothing to Disclose, Shifeng Tian: Nothing to Disclose, He Qing Wang MSc: Nothing to Disclose, Ye Ju: Nothing to Disclose, Yijun Liu: Nothing to Disclose, Renwang Pu MBCh, FRCP: Nothing to Disclose

PURPOSE

To explore the application value of gemstone spectral imaging (GSI) in the differential diagnosis of bladder cancer and prostate hyperplasia.

METHOD AND MATERIALS

This study was approved by the Ethics Committee in our hospital and all patients provided the informed consent. A retrospective analysis was performed in 118 male patients who received pelvic GSI in our hospital from July 2011 to February 2013. Polychromatic CT value and 40~140keV (interval: 10keV) monochromatic CT values were measured in both groups, and then get GSI curves, the effective atomic number and its distribution peak value. The results were analyzed with independent sample t-test. The ROC curve was generated using the monochromatic energy level (keV) at which the biggest difference in CT value was observed between two groups, then the area under curve (AUC) was calculated, and analyzed the diagnostic performance of AUC.

RESULTS

There was a statistically significant difference in CT value between bladder cancer and prostate hyperplasia group at 40~90keV, which was biggest at 40keV ((84.67±21.38)HU vs. (62.86±13.99)HU). The AUC, maximum Youden index and diagnostic threshold of CT value were 0.817, 0.595 and 73.365HU, and the sensitivity and specificity were 77% and 82.5% (40keV). The slope of bladder cancer GSI curve was markedly greater than that of prostate hyperplasia (k=-0.51 vs. -0.30); the differences in effective atomic number((8.00±0.20) vs. (7.82±0.14)) and peak value((8.00±0.21) vs. (7.83±0.17)) were significant statistically.

CONCLUSION

The bladder cancer and prostate hyperplasia had different characteristic on spectral CT imaging. Low keV energy image of CT values play an important role in the identification, and the larger spectral curve slope point out the lesions from the bladder. Effective atomic number and its peak value in the differential also has a certain role. And spectral CT imaging with multiple parameters can distinguish these two types of disease with a higher accuracy compared to the hybrid energy CT imaging.

CLINICAL RELEVANCE/APPLICATION

HDCT-GSI post-processing data have a good clinical application in the differential diagnosis of posterior wall bladder cancer and prostate hyperplasia with intravesical protrusion.

SST07-05

Evaluation of Intra and Extratesticular Lesions with Real TiMe Elastography (RTE): Comparison of Strain Ratio (SR) versus Colour Map Visual Elasticity Score (VES)

Eleni Konstantatou MD, MSc (Presenter): Nothing to Disclose, Asif Iqbal MBBS: Nothing to Disclose, Cheng Fang MBBS, BSC: Nothing to Disclose, Paul Singh Sidhu MRCP, FRCR: Speaker, Bracco Group
The aim is to illustrate whether a correlation exists between the SR and the VES of the RTE colour map for testicular and extratesticular lesions and whether a statistical significant difference between SR calculated in benign versus malignant lesions occurs.

METHOD AND MATERIALS

The scrotal lesions analyzed were retrieved from a departmental database of testicular sonographic investigations. All patients were examined by a single experienced operator in accordance to departmental protocol, employing standard techniques for RTE, using a linear 9MHz transducer Preirus, Hitachi Inc, Tokyo. The RTE images were retrospectively reviewed and the visual map was scored according to a grading scale (1-soft to 6-hard). The SR of the lesions stiffness was calculated at the time of scanning. Pearson’s correlation coefficient (PCC) was calculated.

RESULTS

Over a 4-year period, 88 patients (median age 37.5y, range18-83y) underwent testicular sonographic evaluation for acute (n=21) and non-acute (n=67) conditions. There were intratesticular malignant lesions (n=25), benign intratesticular lesions (n=50) and benign extratesticular lesions (n=15) with size range 2-50mm. The diagnosis was confirmed with histology (n=51) or follow up (n=37) which showed resolution or stability of the lesion. The calculated mean SR for the benign lesions was 8.68 (range 0.37-89.92) and the mean VES was 4 (range1-6, ≤3 n=24 and >3 n=41). The mean SR for the malignant lesions was 13.74 (range 1.44-92.6) and the mean VER was 4.6 (range 1-6, ≤3 n=6 and >3 n=19). The strength of correlation between SR and colour map VER was summarized by PCC with the following values: for all lesions the r= 0.38; for malignant the r=0.40 and for benign lesions the r=0.36. All Pearson’s correlation coefficients proved to be statistically significant.

CONCLUSION

RTE is a useful adjuvant tool to B-Mode imaging of scrotal pathology, but it is not possible to stand alone with B-mode to improve diagnostic accuracy. There may be a need to add further techniques of parametric ultrasound imaging to the evaluation to improve the accuracy.

CLINICAL RELEVANCE/APPLICATION

Elastography is a relatively new adjuvant sonographic technique which improves diagnostic accuracy, but it cannot stand alone in clinical practice.

Diffusion Imaging of Gynaecological Neoplasms as Aids to Characterization

Emily Lemoniati MBBS (Presenter): Nothing to Disclose, Tina Mistry MBBS, FRCR : Nothing to Disclose, Vivek Malhotra MD : Nothing to Disclose, ANDY COADY MBBS : Nothing to Disclose, Malcolm Padwick MD : Nothing to Disclose, Anwar Roshanali Padhani MD : Advisory Board, Acuitas Medical Ltd Advisory Board, Siemens AG Speakers Bureau, Siemens AG Researcher, Siemens AG Speakers Bureau, Johnson & Johnson

PURPOSE

To describe and assess quantitative parameters derived from diffusion weighted (DWI), diffusion tensor (DTI) and diffusion kurtosis (DKI) imaging for characterization of gynaecological masses.

METHOD AND MATERIALS

Retrospective evaluation of 76 scans in women with gynaecological masses was performed. Multi-directional (b-values: 0 and 800 s/mm2) and 3 scan-trace (b-values: 100, 1100, 1600 s/mm2) DW sequences were evaluated. Regions of interest (ROI) measurements of muscle-normalized b800 signal intensity (nb800SI), apparent diffusion coefficient (ADC0-800), fractional anisotropy (FA0-800) and kurtosis coefficient (Kapp100-1600) of masses, urine and gluteal muscle were correlated with histology and compared using descriptive statistics and non-parametric distribution statistics (Kruskal-Wallis Test).

RESULTS

10 benign and 20 malignant endometrial lesions, 8 cervical cancers, 17 benign and 9 malignant ovarian lesions, 9 fibroids, 3 sarcomas were compared with 75 gluteus medius muscle and 73 urine measurements. Significant differences (p=0.003) in nb800SI values were identified between endometrial lesions (benign: mean 3.4 (±1.6) and malignant: mean 6.0 (±1.0)). Malignant endometrial and cervical lesions had lower ADC values than benign endometrial lesions (p<0.001). No ADC difference was seen between benign and malignant ovarian masses. Malignant lesions had lower FA values (endometrial cancer: mean 0.18 (±0.06), cervical cancer: mean 0.17 (±0.05)) in comparison to benign myometrial lesions (mean 0.22 (±0.15)) and muscle (mean 0.36 (±0.06)). Benign lesions had greater FA values in comparison to muscle (7 lesions) and malignant lesions (12 lesions). Malignant cervical and endometrial lesions had higher Kapp values than benign endometrial, myometrial and ovarian lesions (n=3). Significant Kapp differences for malignant versus benign endometrial lesions were noted (2.1 (± 0.04) and 1.2 (± 0.04); p=0.002).

CONCLUSION

Quantitative diffusion parameters have some discriminatory value for characterizing gynaecologic masses despite overlapping values related to necrosis and cystic change. The organised stroma of benign lesions is noted on DTI. DKI can reflect the high cellular complexity of malignant masses.
CLINICAL RELEVANCE/APPLICATION

Quantitative pelvic diffusion MRI using DWI, DTI and DKI is technically feasible. They should be evaluated for their ability to assist in the characterization of gynaecological masses.

SST07-07

Clinical Application of Low kVp from kV Assist in Combination with Adaptive Statistical Iterative Reconstruction (ASiR) in Computed Tomography Urography (CTU)

Zhiguo Zhou (Presenter): Nothing to Disclose
Qingguo Wang: Nothing to Disclose
Yan Feng: Nothing to Disclose

PURPOSE

To evaluate the image quality by low kVp from kV assist in combination with ASiR in CTU.

METHOD AND MATERIALS

We retrospectively analyzed 45 patients which underwent CTU with kV assist switched on, on a multi-detector CT scanner (Discovery CT750 HD, GE healthcare). Before confirming CT scan, kV assist software allowed optimal kVp being selected automatically according to the scout view. The patients were divided into 2 groups for analysis retrospectively. Group A took 80 or 100kVp (n=32, BMI<28) and images were reconstructed with 50%ASiR. Group B (n=13, BMI>=28) took 120kVp and images were reconstructed with FBP respectively. The main parameters of protocol were setup with a baseline of noise index at 12, auto mA range at 100-700mA and rotation time at 0.5s. Measure CT values and SD values of bilateral renal pelvis and subcutaneous fat tissue on abdomen, and calculate mean CNR and mean SNR of bilateral renal pelvis. Record CTDIvol and DLP of each patient. Use Student T test to analyze all data.

RESULTS

The mean CT value of bilateral renal pelvis in group A was significantly higher than in group B (271.35±57.60HU vs 221.80±35.28HU), (p

CONCLUSION

kV assist software allowed low kVp(80 or 100 kVp) apply for small patients. In combination with 50%ASiR, low kVp got better image quality and 44% radiation dose reduction than 120kVp with FBP in CTU.

CLINICAL RELEVANCE/APPLICATION

For small shape patients in CTU, low kVp token by kV assist combination with 50%ASiR, better image quality and lower radiation dose were accomplished than patients with 120 kVp and FBP. They simplified examination and improved quality.

SST07-08

Evaluation the Stretched Exponential Model of Non-Gaussian Analysis of Diffusion Weighted Imaging in the Grading of Cervical Cancer

Hui Li: Nothing to Disclose
Yuan Qu: Nothing to Disclose
JIE JIANG: Nothing to Disclose
LINCHUAN ZHANG (Presenter): Nothing to Disclose

PURPOSE

To investigate the utility of stretched exponential model with multi b-values DWI in the grading of cervical cancer.

METHOD AND MATERIALS

22 female patients with cervical cancer prior to the treatment were recruited and underwent pelvic MR examination in this study. 12 out of 22 patients were diagnosed with stage IIIB cervical cancer and 10 with stage IIB cervical cancer. DWI was acquired on the sagittal plane with 12 b values (0, 20, 50, 100, 200, 400, 800, 1200, 1800, 2500, 3000, 3500, 4000s/mm2). Parametric maps of distributed diffusion coefficient (DDC, a quantification of intravoxel distribution of apparent diffusion coefficients) and the stretching parameter (α, reflects the heterogeneity of intravoxel water diffusion rates) were generated. ROIs encompassed the whole tumor area. Mann-Whitney U-test was performed to determine if there was any statistically significant difference between the two parameters extracted from stage IIIB cervical tumors and those from stage IIB cervical tumors using a P-value level of 0.05.

RESULTS

Mean values of DDC and α showed significantly differences between IIIB cervical cancers and IIB cervical cancers (P<0.05). DDC was significantly higher in IIIB cervical cancers compared to the stage IIB tumor group (P<0.05), which suggested that IIIB cervical cancers contained a lower number of distinct intravoxel proton pools compared to IIB cervical cancers. The α value was significantly lower in IIIB cervical cancer group compared to IIB cervical cancer group.

CONCLUSION

Stretched exponential model demonstrated capability to differentiate cervical cancer, where the DDC and α value may be the considerable parameters for the grading of cervical cancer.

CLINICAL RELEVANCE/APPLICATION
Stretched exponential model of non-Gaussian analysis is a valuable approach for the grading of cervical cancer.

**SST07-09**

**Prevalence of Fallopian Tube Pathology in Infertile Women. CT Virtual Hysterosalpingography Findings**

Patricia M. Carrascosa MD : Research Consultant, General Electric Company, Carlos Capunay MD : Nothing to Disclose, Javier Vallejos MD, MBA (Presenter): Nothing to Disclose, Mariano Baronio : Nothing to Disclose

**PURPOSE**

Infertility has been assigned mainly to fallopian tube pathology. The objective of this presentation is to show the prevalence of tubal pathology in patients with diagnosis of infertility who has performed a CT virtual hysterosalpingography (CT-VHSG).

**METHOD AND MATERIALS**

We evaluated 10465 consecutive patients (age 35 +/- 4.7 years old) with diagnosis of infertility by CT-VHSG. Exams were carried out with a 64-, 128- and 256-slice CT scanners using the following technical parameters: slice thickness, 0.6 mm; reconstruction interval, 0.325mm; 100-150 mAs and 80-120 kV. After cleaning the vagina with povidone-iodine solution, a speculum was placed and a plastic cannula was inserted in the external cervical ostium. A volume of 10-20 ml of a hyposmolar dilution at 70% was instilled to the uterine cavity with a power injector. Once acquired images were reprocessed using 2D and 3D reconstructions. The fallopian tubes were classified as: 1) Normal, 2) Pathologic. The pathologic tubes were also subdivided in those with ampullar dilatation, hydrosalpinx, intratubal sinechiae, intratubal polyps, tubal pathologic displacement, negative peritoneal contrast spillage (negative Cotte test).

**RESULTS**

The scan time was 2.1 +/- 1.3 sec. The complete study duration was 27 +/- 8 minutes. The mean radiation dose was 0.7 mSv. From 10465 patients, a total of 20905 fallopian tubes were available for evaluation. There were 17548 (84%) normal and 3357 (16%) pathologic fallopian tubes. Pathologic findings included: occlusion, negative Cotte test, ampullar dilatation, hidrosalpinx, intratubal sinechiae, intratubal polyps, abnormal position, blocked peritoneal contrast spillage.

**CONCLUSION**

In patients with infertility referred to a CT-VHSG, only the 16% of the fallopian tubes were pathologic. For that reason, the importance of an integral diagnostic procedure that accurately evaluates the tubes but also the uterus (cervix and body) is mandatory to discard other pathologies. In the daily practice, there’s a general overestimation of fallopian tube pathology.

**CLINICAL RELEVANCE/APPLICATION**

CT Virtual Hysterosalpingography provides a complete, minimally invasive evaluation of the female reproductive system, with an accurate evaluation of the fallopian tubes, using bidimensional, tridimensional and endoscopic views.
To evaluate the effect of the degree of necrosis in patients with adenomyosis after uterine artery embolization (UAE) on symptom recurrence at mid-term clinical follow-up.

**METHOD AND MATERIALS**

Fifty patients who underwent UAE for symptomatic adenomyosis were retrospectively analyzed. All patients underwent contrast-enhanced magnetic resonance imaging (MRI) at baseline and 3 months after UAE, and were followed up clinically for at least 18 months. The embolic agent contained non-spherical polyvinyl alcohol particles. The percentage of necrosis was measured at the 3-month follow-up MRI using Aquarius iNtuition® software. Patients were divided into 3 groups according to the percentage of necrosis: group A (90-100%, n = 35), group B (10-89%, n = 7), and group C (0-9%, n = 8). The clinical recurrence was compared among groups for up to 48 months. The cut-off percentage of necrosis to predict clinical recurrence was estimated.

**RESULTS**

Among the 50 patients, 25 patients had focal adenomyosis and 25 patients had diffuse adenomyosis. The cumulative rates of symptom recurrence at 4 years were 14.3%, 14.3%, and 75% in groups A, B, and C, respectively. Group A had a significantly longer median recurrence-free time than group C (42.18 months vs. 12.88 months; p < 0.001). No significant difference in the recurrence-free time was noted between groups A and B (42.18 months vs. 41.50 months; p = 0.933). The hazard ratio for symptom recurrence between groups A and C was 16.7 (95% confidence interval [CI]: 4.24, 65.34; p >0.001). There was no significant difference in the hazard ratio for symptom recurrence between groups A and B (hazard ratio, 1.1; 95% CI: 0.13-9.37; p = 0.935). The cut-off point percentage of necrosis to predict symptom recurrence was estimated at 34.3% (sensitivity, 0.58 [95% CI: 0.28-0.85]; specificity, 0.87 [95% CI: 0.72-0.96]; area under the curve 0.721).

**CONCLUSION**

The percentage of necrosis in patients with adenomyosis after UAE may predict symptom recurrence at the mid-term follow-up. The cut-off percentage of necrosis to predict symptom recurrence was 34.3%, with 58.4% sensitivity and 86.8% specificity.

**CLINICAL RELEVANCE/APPLICATION**

Necrosis of adenomyosis after UAE is mandatory for durability. The percentage of necrosis of adenomyosis may predict symptom recurrence at the mid-term follow-up.

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**Endometrial and Myometrial Ischemia as a Form of None Target Embolization Following Uterine Artery Embolization: Incidence, Pattern, Extent and Fate**

Nagy Naguib Naeem  Naguib  MD, MSc (Presenter):  Nothing to Disclose,  Nour-Eldin Abdelrehim  Nour-Eldin  MD, MSc :  Nothing to Disclose,  Tatjana  Gruber-Rouh :  Nothing to Disclose,  Thomas  Lehnert  MD :  Nothing to Disclose,  Renate Maria  Hammerstingl  MD :  Nothing to Disclose,  Stefan  Zangos  MD :  Nothing to Disclose,  Thomas Josef  Vogl  MD, PhD :  Nothing to Disclose

**PURPOSE**

To study the incidence, pattern, extent and fate of endometrial and myometrial ischemia as one of the forms of none target embolization following successful uterine artery embolization (UAE) as detected on immediate post-embolization and 3 month follow-up contrast enhanced MRI examinations.

**METHOD AND MATERIALS**

The study was retrospectively performed on 43 females (Age Range: 33-52 years, Mean: 44.8 +/- 3.79). MRI was performed immediately after (within 6 hours) and 3 months after successful UAE. Areas of endometrial and myometrial ischemia were identified on the immediate post-embolization MRI as regions of newly developed (compared to pre-embolization MRI) absent enhancement within the uterus not corresponding to the location of the leiomyomas. The volume of the ischemic region was calculated using the formula for ellipsoid volumes (Height X Length X Width X 0.523). Possible change in volume of the ischemic area after 3 months was tested for statistical significance using One-Sample paired t-Test.

**RESULTS**

Of the included 43 patients; post-embolization endometrial and myometrial ischemia was encountered in 29 patients (incidence = 67.44%). In all cases the ischemic region was seen as a newly developed irregular centrally located region of absent enhancement involving both the endometrium and myometrium. The mean volume of the ischemic region immediately after UAE was 29.29 ml +/- 0.95 (Range: 0 - 3.5 ml) with 26 (86%) patients showing complete resolution of the ischemia. The mean reduction in the volume of the ischemic region at 3 month follow-up was 98.24% +/- 5.72 (Range: 72 - 100%). A statistically significant reduction in the volume of the endometrial and myometrial ischemic was noted (p < 0.0001).

**CONCLUSION**

Endometrial and myometrial ischemic regions as a form of none target embolization following UAE might be encountered in up to two thirds of patients in the form of irregular centrally located regions of absent enhancement. These ischemic areas are significantly reduced at 3 month follow-up with up to 86% of cases showing completely reversibility of the ischemia.

**CLINICAL RELEVANCE/APPLICATION**

The post-embolization ischemia of the endometrium and myometrium is not a rare encounter following uterine
artery embolization with excellent outcome and complete reversibility in up to 86% of cases.

**SST15-03**

**Normalized Relative Contrast May Improve the Power of Contrast-Enhanced MRI to Predict the Prognosis of Uterine Leiomyoma Treated with Uterine Artery Embolization**

**Kejia Cai PhD (Presenter): Nothing to Disclose, Karen Xie DO: Nothing to Disclose, Jillian A. Karow MD: Nothing to Disclose, Lauren Green MD: Nothing to Disclose, Alison Palumbo MD: Nothing to Disclose, Xiaohong Joe Zhou PhD: Nothing to Disclose, Grace Knuttinen: Nothing to Disclose**

**PURPOSE**

Uterine artery embolization (UAE) has emerged to be an effective treatment option for women with symptomatic uterine leiomyomas. Factors to predict treatment outcome before UAE is critical for patient selection, procedure planning and postprocedural follow up. Previous studies using MRI have shown variable correlations between MRI predictors and the responses to UAE. Our study is to investigate whether tumor MR contrast normalized to surrounding normal myometrium, the relative contrast, may predict the fibroid response to UAE given that both MR contrast enhancement and UAE are related to tumor vascularization.

**METHOD AND MATERIALS**

The study was performed under an approved IRB protocol. Eight patients (cumulative tumor number n = 42) completed pre and 3-6 months post treatment contrast-enhanced MRI of pelvis at 3T using a fat-suppressed 3D gradient-echo T1-weighted sequence pre and post administration of Gadolinium (0.01 mmol/kg). 100-200 axial slices were acquired with a slice thickness of 5mm,TR/TE=5.2/2.5 ms, and in-plane resolution less than 1 x 1 mm2. Tumor relative contrast and contrast to noise ratio (CNR) were quantified. Two-tailed unpaired Student's t tests were performed and a significance level was set at p<0.05.

**RESULTS**

After UAE treatment, 33/42 leiomyomas were found to be completely necrotic and considered to be fully responsive (group A). The remaining 9/42 leiomyomas showed partial or no necrosis, considered to be partial responsive or nonresponsive (group B). Group A exhibited significantly higher relative contrast than group B (1.6±0.4 vs. 1.0±0.4, *p<0.05). While, the conventional CNRs of these two groups were not significantly different (74.2±24.8 vs. 64.6±38.6, p=0.34). Using an optimum threshold of 1.3, pre-UAE tumor relative contrast correctly predicted 7/9 not-fully responsive tumors and 30/33 fully responsive tumors. On the other hand, tumor CNR correctly predicted 7/9 not-fully responsive tumors while only 22/33 fully responsive tumors at its optimum threshold of 70.

**CONCLUSION**

With a limited sample size, we demonstrated that pre-UAE highly enhanced leiomyomas were found more likely to have poor response to UAE presumably due to the presence of complex tumor vasculature, including existing collateral supplies in the poorly responsive tumors.

**CLINICAL RELEVANCE/APPLICATION**

Upon further validation, pre-UAE normalized relative contrast may help to predict UAE treatment outcome of leiomyomas.

**SST15-04**

**MR-Imaging Immediately after Uterine Artery Embolization: Post-embolization Leiomyoma Enhancement Patterns and Their Effect on the Leiomyoma Volume Change at Follow-up**

**Nagy Naguib Naeem Naguib MD, MSc (Presenter): Nothing to Disclose, Nour-Eldin Abdelrehim Nour-Eldin MD, MSc: Nothing to Disclose, Tatjana Gruber-Rouh: Nothing to Disclose, Thomas Lehnter MD: Nothing to Disclose, Renate Maria Hammerstringl MD: Nothing to Disclose, Stefan Zangos MD: Nothing to Disclose, Thomas Josef Vogl MD, PhD: Nothing to Disclose**

**PURPOSE**

To study the different post-embolization leiomyoma enhancement patterns on MRI and to test if the enhancement pattern correlates with the leiomyoma volume change at 3 month follow-up after successful uterine artery embolization (UAE), enabling its use as one of the parameters predicting embolization outcome.

**METHOD AND MATERIALS**

The study was retrospectively performed on 40 females (Age Range: 33-55 years, Mean: 45.6 +/- 4.48). MRI was performed immediately after UAE (within 6 hours) and the pattern of enhancement of the individual leiomyomas was identified. We identified 5 patterns of enhancement: total absence of enhancement (total devascularization), focal mural enhancement (subtotal devascularization), combined large areas of none enhancement and enhancement (partial devascularization), heterogeneous or mottled enhancement (inadequate devascularization) and homogenous enhancement (failed devascularization). Overall 116 leiomyomas were evaluated. The volume of each leiomyoma was calculated before and 3 months after UAE using contrast-enhanced MRI. Correlation was tested using Spearman Rank and analysis of variance (ANOVA) tests.

**RESULTS**

Before UAE the mean leiomyoma volume was 67.37 ml +/- 128.3 (Range: 1.32-987.34 ml). At 3 month follow-up the mean leiomyoma volume was 45.67 ml +/- 107.25 (Range: 0.15-875.05). The mean volume change percentage after 3 months was 50.81% [volume reduction] +/- 27.49 (Range: 40.05% [increase] -
Total devascularization was encountered in 73 leiomyomas and showed a mean volume reduction of 64.48%, subtotal devascularization (n=15) with 51.93% reduction, partial devascularization (n=8) with 31.95% reduction, inadequate devascularization (n=16) with 14.05% reduction and failed devascularization (n=4) with 18.12% volume increase. A statistically significant (p<0.0001) substantial correlation (rho= -0.7) between the post-embolization leiomyoma enhancement pattern and the percentage of volume change at 3 month follow-up was noted.

CONCLUSION

Five different patterns of leiomyoma enhancements can be encountered following UAE. A statistically significant substantial correlation was detected between the post-embolization leiomyoma enhancement pattern and the 3 month follow-up volume change.

CLINICAL RELEVANCE/APPLICATION

The post-embolization pattern of leiomyoma enhancement can predict the percentage of leiomyoma volume change at 3 month follow-up with total absent enhancement showing the most favorable results.

SST15-05 Prediction of Early Response to Uterine Artery Embolization in Fibroids: Value of MR Signal Intensity Ratio

Yoshifumi Noda MD : Nothing to Disclose , Satoshi Goshima MD, PhD : Nothing to Disclose, Akiko Kato MD (Presenter): Nothing to Disclose, Hiroshi Kondo MD : Nothing to Disclose, Haruo Watanabe MD : Nothing to Disclose, Hiroshi Kawada MD : Nothing to Disclose, Nobuyuki Kawai MD : Nothing to Disclose, Yukichi Tanahashi MD : Nothing to Disclose, Masayuki Kanematsu MD : Nothing to Disclose

PURPOSE

To assess magnetic resonance (MR) imaging findings that help predict early post-therapeutic response in uterine fibroids following uterine artery embolization (UAE).

METHOD AND MATERIALS

This retrospective study was approved by our institutional review board and written informed consent was waived. Fifteen patients with a total of 52 symptomatic uterine fibroids underwent UAE. Pelvic MR imaging was performed 1 month before and 3 months after UAE. The signal intensity ratio (SIR) was calculated by dividing the mean signal intensity of uterine fibroids by that of the abdominal rectus muscle. Changes in volume of each fibroid pre- and post-UAE were computed. Fibroids were divided into the two groups: affected (post-UAE volume reduction rate > median of all fibroids) and unaffected (< median rate). The SIRs were compared between the two groups. Multiple regression analysis was performed for the imaging predictors associated with the volume reduction rate. ROC analysis was used to evaluate the predictive performance for differentiating the affected from unaffected lesions.

RESULTS

The SIRs of the affected group were significantly lower on T1-weighted images (P = 0.0001), but higher on the gadolinium-enhanced images (P = 0.0002) than those of the unaffected group. The sensitivity, specificity, and area under the ROC curve (AUC) in the prediction of the affected lesions were 92%, 50%, and 0.712 with SIR on T1-weighted images, and 85%, 62%, and 0.731 with SIR on gadolinium-enhanced images, respectively. No significant difference in sensitivity, specificity, or AUC was found between these two sequences.

CONCLUSION

The SIRs on T1-weighted images and gadolinium-enhanced images were useful for the prediction of the changes in size of uterine fibroids responding to UAE.

CLINICAL RELEVANCE/APPLICATION

Our study demonstrated the possibility of the prediction of the therapeutic response to UAE even with non-contrast MR imaging.
parameters of screening MRI were evaluated. 1) Subcutaneous fat was measured as a thickness of the most compressed point (mm) on prone position. 2) Relative peak enhancement (%) was calculated based on time-signal intensity curve analysis of fibroid in perfusion MRI (100 dynamics, 3s time resolution), in which 0% refers the same signal intensity as in precontrast image. 3) Signal intensity was assessed as a ratio of T2 signal intensity of uterine fibroids to that of skeletal muscle. Those parameters were used to generate prediction models with regards to ablation efficiency (i.e., non-perfused volume/treatment cell volume) and ablation quality (grade 1~5, from poor to excellent), respectively, using generalized estimating equation (GEE) analysis. Then, cut-off values for successful treatment (ablation efficiency >1.0; ablation quality grade 4 or 5) were determined based on receiver operating characteristic (ROC) curve analyses.

RESULTS

GEE analyses produced the models of \( y_1 = 2.2637 - 0.0415x_1 - 0.0011x_2 - 0.0772x_3 \) and \( y_2 = 6.8148 - 0.1070x_1 - 0.0050x_2 - 0.2163x_3 \), where \( y_1 = \) ablation efficiency, \( y_2 = \) ablation quality, \( x_1 = \) subcutaneous fat thickness, \( x_2 = \) relative peak enhancement, and \( x_3 = \) T2 signal intensity ratio (p-values for \( x_1, 0.0068 \) and <0.0001; for \( x_2, 0.1952 \) and 0.0001; for \( x_3, <0.0001 \) and <0.0001, respectively). Cut-off values for successful treatments based on ROC curve analyses turned out to be 1.312 for of ablation efficiency (AUC, .7236; sensitivity, .6882; specificity, .7156; specificity, .9020).

CONCLUSION

Simple equation models to predict therapeutic responses of MR- HIFU ablation of uterine fibroids in terms of ablation efficiency and quality were generated, which are easily applicable to screening MRI.

CLINICAL RELEVANCE/APPLICATION

With regards to MR- HIFU ablation of uterine fibroids, there have been no screening MR criteria that comprehensively consider multiple influencing factors. These prediction models would contribute to reducing the risk of unsuccessful, thus wasteful procedures.

SST15-07

Postpartum Hemorrhage from Extravasation or Pseudoaneurysm: Efficacy of Transcatheter Arterial Embolization Using N-butyl-2-cyanoacrylate

Kye Jin Park MD (Presenter): Nothing to Disclose, Ji Hoon Shin MD: Nothing to Disclose

PURPOSE

To evaluate the safety and effectiveness of transcatheter arterial embolization (TAE) using N-butyl-2-cyanoacrylate (NBCA) for the treatment of active postpartum hemorrhage (PPH).

METHOD AND MATERIALS

From January 2004 to August 2013, 26 patients underwent TAE using NBCA for PPH. All of these patients were in an active bleeding state and seven patients (26.9%) were in a coagulopathic condition. Two patients underwent a second session of TAE due to the failed first TAE using a gelatin sponge. Their angiograms and medical records were retrospectively reviewed in order to obtain the patients' baseline characteristics, technical/clinical success information, and follow-up data regarding menstruation and fertility.

RESULTS

Angiograms demonstrated pseudoaneurysm, extravasation or artery cut-off, and NBCA was used as the primary (n=24) or a complimentary (n=2) embolic material. The technical and clinical success rates were 100% and 92.3% (24/26), respectively. Two patients with persistent bleeding after TAE with NBCA (clinical failure) were among the three patients with an overt DIC condition. One of them recovered through conservative management, while another patient died due to multi-organ dysfunction. Two patients who underwent two sessions of TAE failed to regain their normal menstruation, while three patients experienced successful deliveries after TAE.

CONCLUSION

TAE using NBCA as the primary or a complimentary embolic agent is an effective method for treating PPH with extravasation and/or a pseudoaneurysm. Overt DIC and its corresponding clinical situations could not be compensated for with the use of NBCA. Repeated TAE with NBCA could result in uterine dysfunction and amenorrhea.

CLINICAL RELEVANCE/APPLICATION

Transarterial embolization using NBCA can be an effective method for treating postpartum hemorrhage and be recommended when a pseudoaneurysm or active extravasation is uncontrolled despite using conventional embolic material.

SST15-08

Prophylactic Internal Iliac Balloon Placement prior to Caesarean Section In Patients with Placenta Accreta – Maternal & Foetal Outcomes

Patrick Nicholson MBCh (Presenter): Nothing to Disclose, Karl James MBCh, MRCS: Nothing to Disclose, Jennifer Murphy MBCh, MRCPi: Nothing to Disclose, John Gerard Buckley MD: Nothing to Disclose, Liam Dominic Spence MBCh: Nothing to Disclose, David James Tuite MBCh: Nothing to Disclose
PURPOSE
The incidence of abnormal placental implantation has been increasing steadily over recent years. The most serious clinical consequence is massive obstetric haemorrhage. Hysterectomy is commonly required to control such bleeding. In our institution, we prophylactically place internal iliac balloons in these patients, before an elective caesarean section. Following delivery, these are then inflated if needed to allow the obstetrician to gain control of the hemorrhage. We sought to to retrospectively assess both maternal and foetal outcomes from this procedure in our unit.

METHOD AND MATERIALS
A retrospective chart review of all patients with abnormal placentation who underwent prophylactic internal iliac balloon placement prior to elective caesarean section.

RESULTS
Over a 44-month period, 21 patients with placenta accreta or a variant thereof underwent caesarean section after first undergoing prophylactic placement of bilateral internal artery balloons. Technical success was achieved in 100%. The average gestational age was 37 weeks 6 days, and mean gravidity was 2.8. Mean number of previous caesarean sections was 2.4, while mean maternal age was 35 years. The mean intraoperative blood loss was 1.4 litres, and the mean number of blood units transfused was 2. Mean duration of surgery was 90 minutes, mean total length of hospital stay 7.5 days, while the mean duration of ICU/HDU stay was 1.2 days. The balloons were inflated in 80% of cases, and no patient underwent subsequent hysterectomy. There were no early or delayed maternal complications due to the procedure. A total of 23 live infants were delivered. Mean infant Apgar scores at 1 and 10 minutes were 8.9 and 9.6 respectively. There were umbilical cord pH values available in 11 of the cases - median cord pH was 7.27. None of the infants developed complications which could be attributed to maternal iliac balloon placement.

CONCLUSION
Prophylactic placement of arterial balloons prior to caesarean section in patients with placenta accreta is technically feasible, well tolerated and leads to satisfactory maternal and foetal outcomes with minimal complications.

CLINICAL RELEVANCE/APPLICATION
Prophylactic internal iliac balloon placement is a potentially life-saving, fertility preserving procedure which is safe for both mother and baby, and highlights the role of the interventional radiologist in the multidisciplinary management of these patients.

SST15-09 Effectiveness of Intraoperative Ultrasound Guidance in Certain Gynecologic Procedures in High Risk Patients
Duan Li MD (Presenter): Nothing to Disclose, Debra M. Sarasohn MD : Nothing to Disclose, Ariadne Maria Bach MD : Nothing to Disclose

PURPOSE
This study evaluates the effectiveness of intraoperative ultrasound guidance in certain gynecologic procedures among high risk patients.

METHOD AND MATERIALS
A retrospective analysis of data collected from a tertiary cancer center was performed. A total of 101 consecutive patients who underwent gynecologic procedures with intraoperative ultrasound guidance from 1999 to 2013 were included. The procedures include DandC, polypectomy, cone biopsy, IUD retrieval, and placement of intracavitary brachytherapy seeds. All intraoperative ultrasound exams were correlated with surgical pathology results. The following information was assessed: successful access to the endometrial cavity, adequate tissue sampling, and complications including bleeding and perforation.

RESULTS
Of 101 patients who underwent gynecologic procedures in the operating room with intraoperative ultrasound guidance, 75 patients previously had unsuccessful procedures in clinic. The failure in clinic was due to significant cervical stenosis caused by either trachelectomy for cervical cancer or pelvic radiation therapy for anal cancer. Among these 75 patients, 12 were diagnosed with endometrial polyps on imaging prior to the OR procedure. Of the 26 patients who went directly to the operating room, eight patients had GTD with increased HCG levels; six had partial or complete molar pregnancies; six required placement of intracavitary brachytherapy seeds; three had bicornuate uterus; two had IUDs in place for more than 40 years (in one of these two patients, the IUD device had deeply penetrated into the myometrium); and in one patient minimal cervical tissue remained after cone biopsy in clinic, making image-guided cervical tissue sampling essential to avoid perforation. In five of the 101 cases, intraoperative ultrasound guidance failed to provide access to the endometrial cavity. The overall success rate was thus 95%. In two cases, the peritoneal cavity was penetrated. However, in no cases was the uterus perforated.

CONCLUSION
The use of intraoperative ultrasound guidance for certain gynecologic procedures in high risk patients can increase the success rate of accessing the endometrial cavity and decrease complications.

CLINICAL RELEVANCE/APPLICATION
provide intraoperatived image guidance for gynecologic surgeon in high risk patients
Friday Imaging Symposium: A Guided Tour for Managing Incidental Findings: Adnexal, Thyroid, Pediatric, Adrenal and Chest

**Participants**

**Moderator**
Lincoln L. Berland MD: Consultant, Nuance Communications, Inc Stockholder, Nuance Communications, Inc

**LEARNING OBJECTIVES**

1) Appreciate the scope, variety and nature of the problem of incidental findings on imaging studies in multiple contexts and the special challenges each present. 2) Better apply a system for managing incidental adnexal lesions, including when to follow or further evaluate lesions based on their features, size and on patient factors. 3) Apply criteria for diagnosing and following incidental adrenal lesions, including when and how to reference information from an ACR White Paper addressing this topic. 4) Assess how new knowledge and techniques developed since publication of the Fleischner criteria in 2005 will lead to changes for managing incidental pulmonary lesions.

**Sub-Events**

**SPFR61A**

**Chest**
Reginald F. Munden MD, DMD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**SPFR61B**

**Adnexal**
Susan M. Ascher MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**SPFR61C**

**Adrenal**
William W. Mayo-Smith MD (Presenter): Author with royalties, Reed Elsevier Author with royalties, Cambridge University Press

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**SPFR61D**

**Thyroid Nodules**
Edward G. Grant MD (Presenter): Research Grant, Bracco Group Research Grant, General Electric Company Medical Advisory Board, Nuance Communications, Inc

**LEARNING OBJECTIVES**

View learning objectives under main course title.

**SPFR61E**

**Pediatrics**
R. Paul Guillerman MD (Presenter): Nothing to Disclose

**LEARNING OBJECTIVES**

1) Recognize common or vexing incidental findings encountered in pediatric body imaging, such as lymphoid hyperplasia, brown fat, ectopic thymus, pulmonary nodules, small bowel intussusceptions, duodenal inversum, intraperitoneal free fluid, infantile ovarian cysts, urachal remnants, renal cysts, renal collecting system ectasia, neonatal adrenal masses, testicular microlithiasis, osteochondral irregularities, and hypercellular marrow. 2) Understand the clinical implications of these incidental findings to distinguish which of them can be dismissed and which of them warrant additional investigation or follow-up.