Genitourinary Radiology
Small Renal Mass (<4 cm): Clues to Diagnosis

All Day Room: NA Hardcopy Backboard

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TEACHING POINTS
1. To illustrate various imaging features of US, CT and MR for differentiating small renal mass, with some radiologic-pathologic correlation
2. To show uncommon renal tumor with typical imaging or clinical features

TABLE OF CONTENTS/OUTLINE
Immune Disorders of the Genitourinary System: Multimodality Imaging Features

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TEACHING POINTS
1. Understanding imaging findings in immune-mediated genitourinary disease in the context of the patient’s entire clinical picture is paramount to making the correct diagnosis. Immune-related diseases may affect the kidneys, ureters, bladder, adrenal glands, uterus, ovaries, and prostate gland. 2. Various cross-sectional modalities such as ultrasound, computed tomography, nuclear medicine, and magnetic resonance imaging can be complementary in diagnosing immune-mediated genitourinary disease. 3. Key imaging features and patterns of various immune-mediated genitourinary disease will be discussed. Differential diagnosis will also be reviewed.

TABLE OF CONTENTS/OUTLINE
Introduction
Neoplastic disease: Lymphoma, Leukemia, Myeloma
Immunodeficiency associated lymphoproliferative disorder: Post transplant lymphoproliferative disorder (PTLD), Immunodeficiency associated lymphoproliferative disorder due to immunosuppressive and immunomodulatory medications
IgG4-related disease
HIV
Autoimmune diseases affecting the kidneys: Amyloidosis, Glomerulonephritis, Granulomatosis with polyangiitis
Granulomatous disease: Sarcoidosis, Xanthogranulomatous disease
Histiocytosis: Chester-Erdheim disease, Rosai-Dorfman disease

Honored Educators
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Renal Hemorrhagic/Proteinaceous Cysts (HPCs): Top Ten Imaging Pearls Every Radiologist Should Know

All Day Room: NA Hardcopy Backboard

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TEACHING POINTS
1. The viewer will appreciate that renal HPCs are commonly encountered at imaging studies; however, may overlap in appearance on US, CT and MRI with renal cell carcinomas (RCC).
2. The viewer will learn to apply US, non-contrast enhanced CT (NECT), contrast-enhanced CT (CECT), dual-energy CT (DECT) and MRI for confident and cost-effective diagnosis of HPC.

TABLE OF CONTENTS/OUTLINE
1. Homogeneous renal lesions measuring >70 HU at NECT is diagnostic of HPC. 2. 80% of HPCs detected at NECT or CECT appear simple on US. 3. DECT can characterize HPCs detected at CECT without recalling the patient. 4. HPCs may show pseudoenhancement which can be diagnosed with DECT or MRI. 5. HPCs appear solid on T2W-MRI and may show restricted diffusion. 6. A homogeneously markedly T1W hyperintense lesion is essentially diagnostic of HPC. 7. Subtraction MRI is critical for detection of non-enhancement in HPCs, misregistration can simulate enhancement. 8. Expiratory phase or novel free-breathing subtraction imaging improves quality of MR image subtraction. 9. HPCs are commonly incidentally discovered; however, HPCs may be symptomatic when they acutely hemorrhage. 10. HPCs are differentiate from RCC at biopsy, whenever possible imaging diagnosis is strongly preferred.
Update on CT and MRI Evaluation of Cystic Renal Masses with Radiological-Pathological Correlation

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TEACHING POINTS
After viewing this exhibit, the learner will: 1. Recognize the increasing evidence supporting surveillance of Bosniak Type III cystic renal masses. 2. Understand how dual-energy CT may characterize enhancement in some cystic masses which may be indeterminate at subtraction MRI. 3. Appreciate relatively newly described imaging appearances of cystic renal masses including: angiomyolipoma with epithelial cysts (AMLEC), mixed epithelial stromal tumors (MEST) and tubulocystic renal cell carcinoma (RCC) and RCC associated with end-stage renal disease.

TABLE OF CONTENTS/OUTLINE
1. US, CT (including DECT) and MR imaging of cystic renal masses. 2. Review of Bosniak Classification and where it stands in 2017 with emphasis on treatment strategies and shift towards surveillance of Bosniak III lesions. 3. US, CT and MR imaging features with pathologic correlation of cystic renal masses including: multilocular cystic nephroma, cystic RCC, multilocular clear-cell RCC, cystic variants of papillary RCC, and more recently described cystic masses such as: MEST, AMLEC, cystic RCC in renal failure and tubulocystic RCC.

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TEACHING POINTS
The purpose of this exhibit is: - To show common and unusual locations of metastatic prostate cancer through presentation of institutional imaging records in different medical imaging modalities. - To identify dissemination pathways and metastatic patterns of prostate cancer by literature review and radiological imaging support. Methodology. Based on imaging cases seen at our institution, a literature review on the different forms of local and distant dissemination, its pathophysiology and the typical and atypical metastatic patterns of prostate cancer was conducted.

TABLE OF CONTENTS/OUTLINE
Low Urine Output or Elevated Resistive Index after Renal Transplant: What Every Radiologist Should Know About It

All Day Room: NA Hardcopy Backboard

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TEACHING POINTS
This educational exhibit is intended: To discuss the usefulness of ultrasound as a first imaging approach in evaluating renal transplant To enumerate and illustrate most common complications findings after renal transplant

TABLE OF CONTENTS/OUTLINE
Introduction Ultrasound evaluation of renal transplants Common complications Vascular - renal artery stenosis, renal artery thrombosis, renal vein thrombosis, pseudoaneurysm, arteriovenous fistula, polar artery exclusion Perinephric - hematoma, urinoma, lymphocele, Renal - Acute tubular necrosis, rejection (acute and chronic), collecting system obstruction Sample cases
CT Evaluation of an Adrenal Mass: An Interactive Checklist Approach

All Day Room: NA Custom Application Computer Demonstration

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TEACHING POINTS
After reviewing this exhibit, the user will:
- understand the importance of a structured approach to the evaluation of an adrenal mass
- better understand the key features of various adrenal lesions that allow us to make a specific diagnosis
- understand the role of lab values and how they supplement imaging studies and provide a more definitive diagnosis
- improve your ability to analyze a range of Adrenal lesions and recognize the limitations of imaging as well as select pitfalls

TABLE OF CONTENTS/OUTLINE
The program is implemented on an iPad and is designed with an easy to use interface. The program will help the radiologist improve their diagnostic capabilities. The program design has four key sections:
A. Demographics
B. Clinical presentation
C. lab values
D. CT scan analysis
Each of these sections expands to provide a series of questions that allow the user to reach the correct diagnosis in most cases. For example under CT Scan Analysis we get this list in an interactive format (see attached slides):
- What is the scan protocol?
- What is the size of the mass?
- Is the mass unilateral or bilateral?
- What is the attenuation of the lesion on the non-contrast scan?
- What is the attenuation of the lesion on the contrast enhanced scan (60 seconds)?
- Adrenal Mass - Further Characteristics
- Are there significant extradrenal findings present?

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Elliot K. Fishman, MD - 2014 Honored Educator
Pamela T. Johnson, MD - 2016 Honored Educator
The Role of Contrast Enhanced Ultrasound (CEUS) in the Evaluation of Scrotal Trauma

Awards
Certificate of Merit

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TEACHING POINTS

Colour Doppler assessment has been the basis for determining the viability of testicular parenchyma following scrotal trauma. Contrast enhanced ultrasound (CEUS) of the testes is a convenient alternative method of determining parenchymal viability. The purpose of this exhibit is: To review the optimal method for performing CEUS in the context of scrotal trauma and to revise the normal contrast-enhanced ultrasound appearances of the testes and other scrotal structures. To demonstrate the CEUS appearances of various blunt and penetrating traumatic testicular injuries. To show the advantages of CEUS in determining the viability of testicular parenchyma when compared to traditional colour Doppler imaging.

TABLE OF CONTENTS/OUTLINE

Through a series of paired greyscale and contrast enhanced ultrasound examinations, the imaging appearances in various traumatic testicular injuries are reviewed including: Testicular rupture Testicular fracture Intratesticular hematoma Traumatic hematocele Penetrating testicular injury Iatrogenic injury (post-testicular biopsy) The exhibit details the advantages of CEUS and its influence on subsequent surgical management, as well as its role in post-surgical follow up.
Percutaneous Interventions for Ureteral Stent Dwelling

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Discussions may include off-label uses.

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TEACHING POINTS
To provide a basic understanding of various imaging-guided, nonvascular interventional techniques widely performed in the ureteral stent placement. To discuss the indications for ureteral stenting, management of stents and stent complication.

TABLE OF CONTENTS/OUTLINE
1. Indications for ureteral stent placement
   1) Ureteral obstruction
   2) Postoperative ureteral anastomosis
   3) Prophylactic
   4) Urine leakage: trauma, iatrogenic, ureteral fistula
2. Ureteral anatomy
3. Stent design, materials, coating, size, shape, strings
4. Stent placement
   1) Preparation
   2) Stenting technique
   3) Stent removal / exchange
5. Complications associated with ureteral stent placement
   1) Hematuria
   2) Urinary tract infection
   3) Stent migration
   4) Encrustation
   5) Ureteral fistulization
6. Conclusion
Diagnostic Imaging and Interventional Procedures in Complications of Kidney Transplantation

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TEACHING POINTS

1) To describe imaging findings (US, MRI and CT) of complications following kidney transplantation. 2) To describe interventional procedures performed for treatment of these complications.

TABLE OF CONTENTS/OUTLINE

- Outline of the surgical technique in kidney transplantation: what the radiologist needs to know.
- Cases demonstrating complications occurring in kidney transplant patients including: • peri-transplant fluid collections (hematomas, lymphoceles, abscesses and infection) • vascular complications (renal artery stenosis, infarction, arteriovenous fistulas and pseudoaneurysms, renal vein thrombosis) • urologic complications (urine leak and urinomas, urinary obstruction) • renal calculi • neoplasms
- Interventional procedures performed in the management of these complications.
Tumor, Trauma, and Tumescence: A Review of Penile Pathology

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TEACHING POINTS
1) Review anatomy and physiology of the penis. 2) Review normal imaging appearance of the penis on US and MRI. 3) Present case examples of common and uncommon entities of the penis with discussion of pathophysiology, clinical presentation, imaging findings, and management.

TABLE OF CONTENTS/OUTLINE
MDCT Imaging of Bladder Emergencies: The Gamut of Imaging Findings

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TEACHING POINTS

The purpose of this exhibit is illustrate and discuss MDCT findings in relation to acute bladder pathology including: 1) the demographics, CT cystographic technique and imaging findings in relation to bladder wall injury from interstitial contusion to intraperitoneal rupture. 2) the pathophysiology of mechanical and neurogenic bladder obstruction and supportive imaging findings as well as uncommon though characteristic etiologies such as urethral calculi and obstructing cystoceles/urethroceles. 3) commonly encountered causes of inflammatory and infectious cystitis as well as hemorrhagic and emphysematous variants.

TABLE OF CONTENTS/OUTLINE

Introduction: bladder trauma, inflammation and acute urinary retention
Bladder Injury - CT cystography, technique and performance metrics - bladder wall interstitial injury, intra and extraperitoneal rupture/ simple vs complex injury patterns Acute urinary retention - mechanical, iatrogenic and neurogenic etiologies and demographics - MDCT findings and examples Bladder inflammation - inflammatory and infectious cystitis etiologies - MDCT findings and variants - hemorrhagic cystitis - emphysematous cystitis - vesicointestinal fistula

Summary
The Male Urethrogram: Is There Room in the Lumen?

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TEACHING POINTS
The diagnostic urethrogram plays a crucial role in the preoperative assessment of suspected urethral abnormalities. Urethral stricture disease and trauma are the most common indications; however the urethrogram is also helpful in the assessment of hypospadias, syringocele, diverticulum, Mullerian duct remnant, urethral calculi and in the post-operative assessment of phalloplasty. High quality urethrograms are vital for planning urethral surgery. Understanding the clinical question and tailoring the examination to the patient’s pathology maximises the usefulness of the study. We present an educational case mix of a pre- and post-operative urethrograms from a urological reconstruction tertiary referral centre. We draw attention to the specific information that the surgeons required in each case and the treatment options available.

TABLE OF CONTENTS/OUTLINE
1. Normal anatomy and urethrogram appearances
2. Technical aspects
3. Diagnostic urethrogram appearances of: o Congenital, traumatic, surgical and radiotherapy-induced strictures o Transection o Calculi o Syringocele o Urethral diverticulum o Double urethra o Mullerian Duct remnant
4. Surgical treatment options
5. Post-operative appearances: urethroplasty, urethral anastomosis, phalloplasty, urethral leak and fistula.
MRI in Peyronie’s Disease: Technique and Interpretation

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
The purpose of this exhibit is: to review the MRI protocol; to show the findings of MRI on Peyronie’s disease; and to emphasize the utility of dynamic contrast-enhanced MRI on the characterization and staging of the plaque. We will be using case material from our center to illustrate the protocol (technique) and imaging findings.

TABLE OF CONTENTS/OUTLINE
Peyronie’s disease consists on a chronic inflammation that leads to fibrosis and focal thickening of the tunica albuginea, known as plaques. Contrast enhanced MRI with a dynamic acquisition allows a complete characterization of the plaques (active inflammation) Immature plaques are seen as an irregularity and a thickening of the tunica albuginea with replacement by isointense tissue on both T1 and T2 sequences. They have an early and intense enhancement with contrast Mixed plaque A plaque evolving to chronicity. The findings on T1 and T2 are variable, but on the same area of thickening of the tunica albuginea a differential enhancement is seen, with a combination of both early and delayed enhancement Mature plaque (chronic inflammation) Thickening of the tunica albuginea, hypointense on T2 sequence (isointense with the albuginea’s tissue), and poor or no enhancement with contrast as a representation of fibrotic tissue
Epididymal Abnormalities: A Case-Based Review of Scrotal Ultrasound and Epididymal Findings

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
Review the sonographic anatomy of the scrotum. Review key imaging findings of epididymal diseases and their differential diagnoses. While epididymal lesions are usually benign, they can be clinically important to patients as a source of pain or palpable abnormality.

TABLE OF CONTENTS/OUTLINE
Overview of scrotal ultrasound Case-Based Review of Important Epididymal Imaging Findings in Quiz Format Post-Treatment Change, including: Post-vasectomy and Prostatectomy Infectious/Inflammatory, including: Acute epididymitis, Chronic epididymitis, Epididymo-orchitis and Tuberculosis Benign and Malignant Epididymal Masses, such as: Adenomatoid Tumors, Epididymal Cyst, Spermatocele and Lymphoma Review of sonographic artifacts that can contribute to misinterpretation of the epididymis Discussion and Conclusions
Non-Conventional Contrast Multi-Detector Tomography Studies in the Urinary Tract: Pictorial Review

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
1. Non conventional contrast CT studies (i.e. CT conductography, CT fistulography, CT voiding cystourethrography, CT anterograde pyelography, CT colonography) in urological pathology improve the diagnostic accuracy rather than plain radiographic studies.
2. The knowledge of the urological surgery techniques and an accurate diagnostic impression is mandatory in order to decide the CT protocol to achieve an accurate diagnosis.
3. Expertise with contrast CT urinary protocols is required (type of contrast, amount of contrast and dilution, injection rate, route of administration and timing).

TABLE OF CONTENTS/OUTLINE
- Description of non conventional contrast CT protocols used in our urology referral center based on our experience in order to diagnose different urological entities.
- Guidelines and keys to improve the diagnostic urological imaging.
- Presentation of some representative cases of the different pathologies diagnosed with non conventional contrast CT.
UR108-ED-X

Be Aware of Tube Potential Setting When Interpreting Renal Masses on CT

All Day Room: NA Digital Education Exhibit

Awards
Magna Cum Laude

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TEACHING POINTS

Traditionally, most renal CT examinations in adults were performed with a fixed x-ray tube voltage setting at 120 kVp, and Hounsfield unit (HU) has been used as the standard number in evaluation of solid and cystic renal masses. However, recently, different energy levels are often used particularly in the setting of automated tube potential selection to lower patient radiation dose and to elicit enhanced contrast-to-noise ratio. Radiologists should be aware of the effect of tube potentials in the assessment of renal masses. 1. To review the effect of tube potentials on patient radiation dose and contrast-to-noise ratio. 2. To learn how CT attenuation of renal tissue and iodinated contrast material changes at different tube potentials. 3. To review effect of different kVp setting in evaluation of solid and cystic renal masses, and potential pitfalls.

TABLE OF CONTENTS/OUTLINE

1. Advantages and disadvantages using lower tube potential
   Lower patient radiation dose
   Improve contrast-to-noise ratio
   Increasing noise and beam hardening artifact
   2. Changes in CT attenuation of different material at different tube potential
   Water
   Solid tissue
   Iodinated contrast
   Other material
   3. To interpret renal masses correctly using CT with different kVp settings. Example cases

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Kidneys, Ureters, Bladders, Oh My! A Case-based Review of Genitourinary Mimics of Malignancy

Awards
Certificate of Merit

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TEACHING POINTS
Malignancy in the genitourinary tract can present with a variety of focal or diffuse imaging manifestations. Many non-neoplastic diseases can show similar patterns. An understanding of normal variants and alternate diagnoses can reduce the frequency of malignancy misdiagnoses. This case-based review will assist the radiologist at all levels of training in identifying key clinical and imaging features that help identify these non-neoplastic conditions and make appropriate recommendations to the referring clinician.

TABLE OF CONTENTS/OUTLINE
Not Only Bones Can Fracture: A Review of Penile Fractures and Associated Injuries

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
1) Penile fractures are a rare urological emergency involving rupture of the corpus cavernosum and its surrounding tunica albuginea. 2) We aim to educate radiologists on the normal anatomy, mechanisms of injury, clinical manifestations, and imaging findings of penile fractures. Additionally, MR imaging is very helpful in determining the necessity for surgical intervention.

TABLE OF CONTENTS/OUTLINE
Topics for discussion and review of original images include, but are not limited to: - Background - Normal Anatomy - Mechanism of Injury - Clinical Presentation - Need for Surgical Intervention - Imaging Findings - Treatment and Prognosis - Conclusion
Unpack That Sack: Multimodality Imaging of Paratesticular Scrotal Masses with Contrast-enhanced Ultrasound (CEUS) and Pathology Correlation

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
1) Ultrasound (US) and CT findings of paratesticular scrotal masses, including lipoma and liposarcoma (LS). 2) Technique of contrast-enhanced ultrasound (CEUS) in scrotal mass evaluation. 3) Distinguishing well-differentiated liposarcoma (WDLS) from dedifferentiated liposarcoma (DDLS) using CEUS enhancement pattern and quantitative analysis. 4) Histology examples of WDLS and DDLS for correlation.

TABLE OF CONTENTS/OUTLINE

Summary Upon completion, the participant will understand: 1. Conventional US and CT imaging features of masses including scrotal lipomas and LS. 2. CEUS as an adjunct in diagnosing scrotal LS. 3. How quantitative CEUS metrics and TICs can prospectively grade liposarcomas.
Bone Metastases from Prostate Cancer, Monitoring of Chemotherapy using of Whole Body MRI (WB-MRI), CT, Bone Scintigram: Which is the Standard?

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
The findings of bone metastases are traditionally classified into four types. Osteoblastic, osteolytic, mixed and intratrabecular type. The majority of bone metastases from prostate cancer reveal as osteoblastic type. However, osteolytic or intratrabecular types are also possible conditions. A finding of osteosclerotic change of metastatic lesions have two possibilities: one is osteoblastic metastases itself and the other is the reactive ossification of chemotherapy. Whole body diffusion-weighted images (WB-DWI) can differentiate these two conditions. The former reveals as high intensity but the latter reveals as decreased signal intensity. However it is difficult to differentiate these two conditions on CT. WB-MRI including diffusion-weighted images(DWI) combined with CT are exact evaluation for detecting the lesion and for monitoring the chemotherapeutic effect.

TABLE OF CONTENTS/OUTLINE
The purpose of our exhibit is to 1. to introduce the protocol of WB-MRI. 2. to review the basic typical findings of metastatic bone tumor. 3. to introduce the correlation between the therapeutic process and various modalities such as WB-MRI, CT, bone scintigram.
Sonography of Extratesticular Scrotal Pathology and their Mimics

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS

1. Most extratesticular pathologic processes are benign. Uncommon exceptions include sarcoma, mesothelioma and metastases. 2. Ultrasound is vital to differentiate intra from extratesticular masses, although the origin of very large scrotal tumors may be difficult to determine. 3. Torsion of scrotal appendages can clinically simulate testicular torsion; ultrasound is mainstay for the diagnosis and the treatment is non-surgical with non-steroidal anti-inflammatory drugs. 4. Not all serpiginous tubules in scrotum are varicoceles. Color and spectral Doppler should be used to differentiate varicocele from prominent tubules and arteries. 5. The epididymis can become prominent and cystic post-vasectomy.

TABLE OF CONTENTS/OUTLINE

Illustrated examples of the following will be provided: 1. Benign tumors such as lipomas, adenomatoid tumors, mesenchymal tumors, fibrous pseudotumors, epidermoid cysts, benign cystic mesothelioma. 2. Malignant tumors such as sarcomas, mesothelioma, and metastases. 3. Epididymal and testicular appendages and their complications such as torsion. 4. Epididymitis and its complications. 5. Fournier's gangrene. 6. Scrotal hernias and complications of inguinal herniorrhaphy. 7. Scrotal calcifications and mimics such as gas and foreign bodies. 8. Cysts and hydroceles. 9. Pearls and pitfalls in diagnosing varicoceles.
TEACHING POINTS

Ultrasonography (US) is the first line imaging technique to evaluate testicular and paratesticular diseases. Indications for scrotal US depend on the patient’s age, clinical pictures and medical history. The wide range of indications and the wide variation of the clinical pictures request radiologists to have knowledge on the normal anatomy, spectrum of testicular and paratesticular pathologies, and applied ultrasound standards, which allows for an assessment of all scrotal structures. This presentation displays essential equipment requirements for scrotal US with revision of the anatomy and the most common scrotal pathologies.

TABLE OF CONTENTS/OUTLINE

**Penile Doppler Ultrasound in Erectile Dysfunction: Technique and Interpretation**

All Day Room: NA Digital Education Exhibit

**Awards**
Certificate of Merit
Identified for RadioGraphics

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**TEACHING POINTS**
- To review the pathophysiology of erectile dysfunction and its correlation with the doppler ultrasound waveform.
- To describe and illustrate the specific technique and the role of doppler ultrasound in erectile dysfunction.
- To review the indications, sonographic findings and potential complications of penile doppler ultrasound.
- To emphasize the information that must provide an adequate radiology report.

**TABLE OF CONTENTS/OUTLINE**
1. Anatomy and vascularization of the penis
2. Pathophysiology of the erection
3. Indications of penile doppler ultrasound and correlation between erection physiology and doppler ultrasound waveform
4. How to do the study
5. Imaging findings
6. Limitations and potential complications
7. Structured radiology report
Postoperative Appearance and Complications of the Urinary Tract Following Surgery: A Comprehensive Review

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
- To demonstrate the appearance of the urinary tract, including the kidneys, ureters, and bladder after surgery.
- To illustrate a variety of postsurgical changes of the urinary tract including nephrectomies and urinary diversions.
- To demonstrate postoperative complications of the urinary tract.

TABLE OF CONTENTS/OUTLINE
A variety of pathologies, including but not limited to trauma, malignancy, functional abnormalities, congenital abnormalities, result in the surgical intervention of the urinary tract. The kidneys, ureters, and bladder are important components of the urinary tract, which are often involved. The resulting postsurgical changes of the urinary tract are of importance to clinicians in evaluating urinary system function. It is essential for the radiologist to have an understanding of the postoperative appearance of the urinary system to help identify normal appearance as well as complications. Complications of surgical intervention of the urinary system include both acute and chronic pathologies, including urinary leak, stone formation, and stricture that can result in significant morbidity for the patient. We will demonstrate the postoperative appearance of the urinary tract followed by a discussion of postoperative complications.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Pardeep K. Mittal, MD - 2016 Honored Educator
Problematic Renal Masses: Pitfalls and Pearls on Cross Sectional Imaging

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
- Describe most commonly encountered renal masses which could be potentially misinterpreted.
- Illustrate various pitfalls with imaging of renal masses that can lead to erroneous diagnoses.
- Describe relevant technical background, pathophysiology and hemodynamics of these pitfalls.
- Discuss helpful pearls which can point to correct diagnosis

TABLE OF CONTENTS/OUTLINE
1. Diagnostic pitfalls
   a. Mistaking benign lesions for malignant lesions
   b. Mistaking malignant lesions for benign lesions
2. Technical pitfalls
   a. CT, US, MR specific issues that create difficulties in diagnosis
   b. Technique pitfalls
3. Atypical presentations of common benign lesions
4. Atypical presentations of common malignant lesions
5. Organization according to imaging findings

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**Pheochromocytoma: The Great Masquerader**

**All Day Room: NA Digital Education Exhibit**

**Awards**

Identified for RadioGraphics

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**TEACHING POINTS**

The purpose of this exhibit is:  
1) To review the pathophysiology and clinical significance of pheochromocytoma.  
2) Review the typical features of pheochromocytoma and clarify what details should be included in the report.  
3) Highlight atypical imaging features of pheochromocytoma including cases complicated by hemorrhagic, cystic, calcific and necrotic changes and cases where the presence of fat mimics an adenoma.  
4) Discuss the role of computed tomography (CT), magnetic resonance imaging (MRI) and functional imaging (MIBG, PET) in the diagnosis of a pheochromocytoma.  
5) Review the corresponding macroscopic and microscopic pathological images to aid the reader understand the underlying physiology responsible for the variable appearance of pheochromocytomas.  

These atypical findings alongside the more classical picture will be presented as we highlight the diagnostic pearls and pitfalls of this great masquerader.

**TABLE OF CONTENTS/OPTION**

1) Clinical overview of pheochromocytomas.  
2) Typical imaging features- CT- MRI- functional imaging (MIBG, PET)- pathology.  
3) Atypical features- cases of cystic, necrotic, calcification and fatty changes where both benign and malignant processes are mimicked by a pheochromocytoma- CT, MRI, functional images and pathological images.  
4) Teaching pearls and summary.
UR122-ED-X

CT Laparoscopy Depicting Virtual Gross Pathology and Its Role in Surgical Management of Renal Masses

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
1. Introduce CT Laparoscopy & CT virtual gross pathology. 2. Discuss Imaging technique and 3D volume rendering. 3 Discuss robotic resection of renal masses 4. Discuss radiological information required by surgeon for surgical pre planning of renal masses, especially in reference to robotic resection. 5. Discuss interesting Imaging cases

TABLE OF CONTENTS/OUTLINE
1. CT Laparoscopy & CT virtual gross pathology. 2. Image acquisition 3. 3D VRT technique and challenges. 4. Robotic resection and challenges. 5. CT reporting relevant to surgical technique 6. Interesting cases
Diffuse Renal Parenchyma Diseases: Patterns on Gray-scale Ultrasound, Color Doppler Ultrasound, Contrast-enhanced Ultrasound and Ultrasound Elastography

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS

The purpose of this exhibit is: 1. To review the US appearance of the most common, and even less common, diffuse renal parenchyma diseases with particular emphasis to those renal diseases causing acute kidney injury; 2. To discuss the capabilities of gray-scale US and Doppler US in differentiating the different renal parenchyma diseases; 3. To explain the utility of US and Doppler US in the follow up of diffuse renal parenchyma diseases;

TABLE OF CONTENTS/OUTLINE

Abdominopelvic Solitary Fibrous Tumors with Radiologic Pathologic Correlation

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
1. Solitary fibrous tumor (SFT) is classified as a fibroblastic/myofibroblastic tumor by the World Health Organization. 2. Most SFT are benign, slow-growing masses with 50% exceeding 10 cm at diagnosis. Ninety percent of abdominopelvic SFT are symptomatic, resulting in pain, palpable mass, compressive symptoms or organ-specific symptoms. 3. SFT are usually large, well-defined masses with avid, sustained enhancement. Enlarged collateral vessels are common. Heterogeneity is seen on T2-weighted images due to hemorrhage, myxoid content, cystic degeneration and collagen deposition. 4. Abdominopelvic SFT can involve many anatomic sites including the liver, kidney, retroperitoneum, bladder, prostate gland and uterus. 5. Most SFT are treated effectively with surgery. Locally aggressive, recurrent or metastatic disease may be treated with novel targeted therapies.

TABLE OF CONTENTS/OUTLINE
1. Background including epidemiology and clinical presentation. 2. Review of the pathologic basis of disease including genetic alterations, gross pathology and histology. 3. Multimodality imaging of SFT with gross and histologic radiologic pathologic correlation. 4. Discussion of prognosis and current treatment options for SFT including novel targeted therapies.
Contrast-Enhanced Ultrasound: The New Magic Wand in Renal Sonography?

All Day Room: NA Digital Education Exhibit

FDA Discussions may include off-label uses.

Awards
Certificate of Merit

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TEACHING POINTS
The purpose of this exhibit is: 1. To review the potential off-label applications of renal contrast-enhanced ultrasound (CEUS), including evaluation of indeterminate renal lesions and transplant kidney perfusion as well as guidance for targeted biopsy and ablation. 2. To discuss emerging classifications of enhancement patterns. 3. To understand the advantages, safety profile and limitations of renal CEUS.

TABLE OF CONTENTS/OUTLINE
Augmentation Urethroplasty Repair for Anterior Urethral Stricture: Everything the Radiologist Needs to Know from Initial Imaging Evaluation to Post-operative Assessment and Patient Management

Awards
Cum Laude

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TEACHING POINTS
By viewing this exhibit, the learner should be able to: 1. Name the common causes of anterior urethral strictures, as well as describe how the stricture(s) can be repaired with augmentation urethroplasty utilizing a buccal mucosa graft. 2. Describe urethral anatomy as it is illustrated with urethrography. 3. Understand how retrograde urethrography and/or voiding cystourethrography are utilized to select proper patients for the urethroplasty procedure and guide postoperative management. 4. Describe the proper techniques of pericatheter retrograde urethrography and voiding cystourethrography in the postoperative setting.

TABLE OF CONTENTS/OUTLINE
Retrograde urethrography and voiding cystourethrography • Urethral anatomy as depicted on urethrography • Proper technique, including in the immediate postoperative setting Buccal mucosa graft urethroplasty • Pathophysiology of anterior urethral strictures • Indications and contraindications for augmentation urethroplasty • Description and illustration of surgical technique • Clinical outcomes Utilization of urethrography in patients undergoing urethroplasty • Guide to interpreting the initial urethrogram • How the interpretation guides patient selection • Guide to interpreting the postoperative urethra, including expected findings and complications • How the interpretation guides clinical management
Pi-RADS Version 2: A Pictorial Review with Radiopathologic Correlation Using a 3T MRI

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
Multiparametric MRI has become clinically significant for prostate cancer assessment. To achieve consistency in prostate MRI interpretations and reports, the ESUR created guidelines in 2012 that provide a score system known as PI-RADS. - PI-RADS v2 divides the prostate, seminal vesicles and the external urethral sphincter in 39 regions.- PI-RADS v2 defines a clinically significant cancer as Gleason score > 7, and/or volume > 0.5 cc, and/or extra prostatic extension. - PZ lesions are best measured on ADC, and PI-RADS is determined by the DWI. In case that DWI is a PI-RADS 3, DCE is used to determine the final category. Positive DCE results in a 4 category, while a negative DCE results in 3. - T2W is best for measuring TZ lesions and determining TZ PI-RADS categories. With category 3, DWI is used to determined overall category. DWI of <4 results in PI-RADS 3, while a DWI of 5 will result in a PI-RADS 4. - Using high b values of 1400 - 2,000 sec/mm2 or higher could be useful for better results.

TABLE OF CONTENTS/OUTLINE
- Prostate anatomy diagrams with corresponding MR appearance- PI-RADS update changes- Pertinent MRI findings used for PI-RADS 2.0 scoring- PI-RADS category Radiopathologic correlation (images with PI-RADS score correlating with biopsy and/or post surgical diagnosis)- Prostate MRI pitfalls - Quiz format case review
Transrectal Contrast-enhanced Ultrasound (CEUS) for Assessment of Ablation Zone after High-intensity Ultrasound (HIFU) for Prostate Cancer

All Day Room: NA Digital Education Exhibit

FDA  Discussions may include off-label uses.

Awards
Certificate of Merit

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TEACHING POINTS
1) Indications and technique of transrectal contrast-enhanced ultrasound (CEUS) during prostate high intensity focused ultrasound (HIFU). 2) Typical CEUS enhancement patterns of normal, ablated, and tumor prostate. 3) Time-intensity curves (TIC) as a quantitative adjunct. 4) Using CEUS during HIFU to distinguish ablated from viable prostate.

TABLE OF CONTENTS/OUTLINE

Contents/outline 1. Prostate HIFU indications 2. Review relevant imaging - pre-HIFU MRI - targeted MR/ultrasound fusion biopsy - intra-HIFU cavitation (tissue change matrix) under US - followup MRI 3. Transrectal CEUS technique, with imaging examples, during HIFU - pre-procedure (normal prostate versus tumor, with MR comparison) - end HIFU (normal prostate, tumor, and ablated tissue, with cavitation comparison) - delayed imaging follow-up (change in ablation zone, with MR comparison) 4. Examples of kinetics (TICs) of tumor, normal, and ablated prostate 5. Examples of superiority of CEUS over cavitation for real-time intra-HIFU assessment of ablation zone Summary 1. CEUS during HIFU distinguishes ablated from viable prostate, allowing immediate additional treatment when indicated 3. CEUS also offers quantifiable metrics (TICs) which distinguish normal, tumor, and ablated prostate tissue
MRI Spectrum of PI-RADS 5 Lesions with Emphasis on Invasive Features: A High-yield Case-based Review

All Day Room: NA Digital Education Exhibit

Participants
Kevin A. Zand, MD, Jackson, MS (Presenter) Nothing to Disclose
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TEACHING POINTS
The purpose of this exhibit is: To highlight key MRI features of PI-RADS 5 lesions To review early and advanced signs of invasion To emphasize value of MRI for risk stratification and guidance for surgical/nonsurgical treatment options

TABLE OF CONTENTS/OUTLINE
BACKGROUND: Prostate cancer is the second leading cause of death in American men TECHNIQUE: Multiparametric MRI using PI-RADS v2 REVIEW OF IMAGING FINDINGS: We will demonstrate 20 cases of PI-RADS 5 lesions with special emphasis on early and advanced invasive features Peripheral zone (PZ) cancer extending into transitional zone (TZ) TZ cancer extending into PZ Broad based contact with capsule (>1 cm) Irregular deformity/thickening/bulging/retraction/microlobulation of capsule Extracapsular soft tissue extension Asymmetric neurovascular bundle thickening Anterior fibromuscular stromal involvement Retropubic fat space extension Obliteration of rectoprostatic and vesicoprostatic angles Direct involvement of seminal vesicles Tumor extension along ejaculatory ducts Prostatic urethral, urinary bladder, rectal, and pelvic sidewall invasion SUMMARY: MRI is the imaging modality of choice for detection, characterization and risk stratification to guide for radical surgical and non surgical treatment options

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Duplex Doppler Ultrasound with Intracavernous Vasoactive Drugs in Evaluation of Erectile Dysfunction Prior to Peyronie's Disease Correction Surgery: Step-by-Step Guide and What to Expect

All Day Room: NA Digital Education Exhibit

Participants
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TEACHING POINTS
The aim of this educational is to demonstrate the main evaluation steps and expected findings of the Duplex Doppler Ultrasound with intravenous vasoactive drug injection in the hemodynamic assessment of individuals with Peyronie disease before correction surgery.  - Individuals with Peyronie disease selected for surgical correction should undergo DDUS evaluation prior surgery to qualify erectile function.  - B mode ultrasound evaluation prior drug induction is precise to measure cavernousal arteries diameters and to look for calcified plaques giving their number, size and location.  - After satisfactory erection, the curvature region must be studied in order to look for focal thickening in albuginea and possible venous leakage.  - Penile curvature can be measured with a goniometer.

TABLE OF CONTENTS/OUTLINE
I. RATIONALE II. PATIENTS III. STEP BY STEP ULTRASOUND TECHNIQUE IV. SONOGRAPHIC FINDINGS: * PRIOR VASOACTIVE DRUG INJECTION * AFTER VASOACTIVE DRUG INJECTION V. TUMESCEENCE AND RIGIDITY EVALUATION VI. CURVATURE MEASUREMENT V. CONCLUSIONS
Test Your Diagnostic Skills on Focal Renal Masses: Biopsy Yay or Nay?

All Day Room: NA Digital Education Exhibit

Awards
Certificate of Merit

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TEACHING POINTS
With advancements in radiologic technology, radiologists need not only differentiate solid renal masses into benign or malignant lesions, but also further characterize malignant lesions into their various subtypes. • Review CT and MR features of benign and malignant solid renal masses largely divided by tumefactive or infiltrative appearance. Pathologic correlations will be made for each case. • Describe imaging characteristics to aid differentiate renal cell carcinoma subtypes. • Illustrate renal manifestations of various syndromes.

TABLE OF CONTENTS/OUTLINE
Management decisions including biopsy will be presented in question and answer format for each case. - Tumefactive Solid Renal Lesions Renal cell carcinoma: clear cell, papillary, chromophobe, renal medullary carcinoma, collecting duct carcinoma Oncocytoma Angiomyolipoma and fat-poor subtype Metastases - Infiltrative Solid Renal Lesions Lymphoma Infiltrative renal cell carcinoma Invasive transitional cell carcinoma Metastases - Syndromes Von Hippel-Lindau Tuberous Sclerosis Acquired multicystic disease of uremia Birt-Hogg-Dube syndrome Erdheim Chester disease

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Calified Adrenal Masses; Pattern Recognition Approach on Computed Tomography with Pathologic Correlation

All Day Room: NA Digital Education Exhibit

Awards
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TEACHING POINTS
1. Discuss the spectrum of common and uncommon adrenal masses which demonstrate calcification
2. Describe typical and atypical imaging features of these masses with pathologic correlation
3. Illustrate a pattern recognition approach to help reach a specific diagnosis.

TABLE OF CONTENTS/OUTLINE
- Pathophysiology and etiology of calcified adrenal masses
- Classic and atypical calcific adrenal pathologies including: inflammatory (such as granulomatous infection and Echinococcal disease), traumatic (such as calcified organizing hematoma), vascular calcification, benign and malignant neoplasms (such as calcified cyst, adenoma, neuroblastoma and adrenocortical carcinoma), and metastatic.
- Current surgical and non-surgical management options of adrenal calcified entities
- Differential diagnoses and diagnostic approach.

Summary
Calcifications of the adrenal gland are rarely encountered at CT. Entities such as chronic granulomatous infection typically is the source. However, there are certain patterns of calcifications that manifest with adrenal lesions. The purpose of this exhibit is therefore to illustrate the key imaging features and patterns of adrenal calcifications with an emphasis on CT. In addition, this exhibit will explain the implications of these various imaging findings on patient management.

Honored Educators

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Multimodality Imaging Evaluation of Potential Renal Donors

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
The purpose of this exhibit is to: 1. Discuss the multimodality imaging approach used for assessment of the potential renal donor 2. Depict normal and variant renal parenchymal, vascular and collecting system anatomy and pathology 3. Review incidental findings encountered in the imaging evaluation.

TABLE OF CONTENTS/OUTLINE
1. Preoperative Imaging Evaluation and Role for Specific Imaging Modalities
   a. Chest Radiographs
   b. Renal Ultrasound
   c. CT Angiography of the Abdomen and Pelvis
   d. MR Angiography of the Abdomen and Pelvis
   e. Nuclear Medicine Renal Function Scan
2. Renal Parenchymal, Vascular and Collecting System Anatomy and Pathology
   a. Normal Anatomy
   b. Common Variants: Accessory Arteries and Veins, Anomalous Venous Course, Duplicated Collecting Systems
   c. Vascular disease: Vasculitis, Fibromuscular dysplasia
   d. Renal Parenchymal Findings: Cysts, Masses and Parenchymal Scarring
   e. Renal Congenital Anomalies: Horseshoe Kidney, Pelvic Kidney, Solitary Kidney, Malrotated Kidney
   f. Nephrolithiasis
3. Significance of Key Imaging Findings
   a. Implications for Surgical Approach and Planning
   b. Reasons for Exclusion of Renal Donors
4. Incidental Findings During Preoperative Work Up
   a. Non-Renal Neoplasm: Benign and Malignant
   b. Bowel Findings
Contrast-enhanced Ultrasound with Time-Intensity Curve Analysis: A Diagnostic Tool for Management of Indeterminate Cystic Kidney Lesions

All Day Room: NA Digital Education Exhibit

FDA Discussions may include off-label uses.

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TEACHING POINTS
We intend to: • Review the Bosniak criteria for classifying cystic kidney lesions • Review conventional imaging/diagnostic approaches to renal cysts • Demonstrate the diagnostic power of time-intensity curves (TIC) by quantitatively determining degree of septal enhancement which can aid in distinguishing between II, IIF and III cysts • Illustrate pictorial cases where CEUS with TIC analysis provides complimentary & supplementary information for management of indeterminate cystic kidney lesions

TABLE OF CONTENTS/OUTLINE
Bosniak Classification of Cystic Kidney Lesions Diagnostic power of conventional and newer imaging modalities -Comparative review classifying II, IIF & III cysts using CT and CEUS (sample cases) Quantifying septal enhancement to differentiate II, IIF and III Cysts: A role for TIC analysis -Sample studies showing qualitative visualization of the degree of septal enhancement compared to normal parenchyma on CEUS -Demonstration of TIC analysis for II, IIF & III cysts Role of TIC in follow up assessment of IIF lesions -Review of current literature for the follow-up of Bosniak IIF cysts -How CEUS has improved the classification of IIF & III lesions by increasing sensitivity -Future directions: How TIC may be used to surveil IIF lesions by screening for increasing enhancement & combined with other factors upgrade to Bosniak III
Measuring the Prostate: A Guide for the Perplexed

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
After reviewing this poster, the participant will be able to:
1. Understand the Gross and Histologic anatomy of the prostate in the mid-sagittal and cross-sectional planes.
2. Correlate the knowledge of anatomy to MRI image, finding boundaries in these planes.
3. Consistently apply measuring techniques to the MRI images.
4. Calculate volumes which will be clinically useful (accuracy) and show inter-observer correlation (precision) for research studies.

TABLE OF CONTENTS/OUTLINE
I. Introduction: Why yet another method of volume measurement?
II. Anatomy: Establishing identifiable and measurable boundaries with gross and histological sections.
III. MRI Boundaries: Identifying anatomical boundaries on T2-weighted MRI and unique new measurement techniques for inter-observer correlation (precision)
IV. Examples: Straightforward and challenging cases are presented.
V. Conclusions: New and unique techniques to measure prostate volume are presented based on accurate identification of anatomic-based boundaries that enhance intra- and interobserver concordance.
2017 AUA Renal Mass and Localized Renal Cancer Guidelines: Imaging Implications

All Day Room: NA Digital Education Exhibit

Awards
Certificate of Merit
Identified for RadioGraphics

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TEACHING POINTS
Management of renal cancer is in evolution. Recognition that many renal malignancies are indolent and that some incidentally detected masses are benign have led to increasing reliance on renal mass biopsy, active surveillance (AS), and when surgery is indicated PN to spare nephron mass. For example, guidelines now suggest that tumor ablation should now be considered in <3cm masses and that AS is an option for initial management especially masses <2cm. In this exhibit, we provide an imaging review of the new 2017 American Urologic Association renal mass and localized renal cancer guidelines.

TABLE OF CONTENTS/OUTLINE
1. Background - describe current kidney cancer milieu. 2. Review new guidelines regarding the role of imaging in management of small cystic and solid renal masses. 3. Describe the increased role of renal mass biopsy. 4. Management - provide a cased-based approach to demonstrate appropriate use of partial nephrectomy, radical nephrectomy, tumor ablation, and active surveillance 5. Conclusion
Urinary Diversion in the Treatment of Bladder Cancer: Beyond the Surgical Intervention

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
• To describe the main techniques of urinary diversion used in patients undergoing radical cystectomy. • To review the main complications secondary to urinary diversion

TABLE OF CONTENTS/OUTLINE
• Introduction: The importance of urinary diversion techniques in the treatment of bladder cancer • Surgical techniques (advantages and disadvantages) Incontinent cutaneous diversion (cutaneous ureterostomy, Bricker procedure) Continent diversion (continent cutaneous diversion, orthotopic bladder replacement) • Normal post-surgical imaging features • The importance of image test in the detection of post-treatment complications: Multidetector CT • Complications or urinary diversion Early complications (review and examples) 1. Fluid collections 2. Urinary leakage 3. Alterations in bowel function 4. Urinary obstructions 5. Fistulas Late complications (review and examples) 1. Calculi 2. Infections 3. Herniation 4. Ureteral stricture 5. Bladder cancer recurrence • In summary...: Our more representative cases • Conclusions
Adrenocortical Carcinoma: Pathology, Imaging Workup, Typical/Atypical Features, Pitfalls and Mimics - Does WEISS Pathology Score And Ki-67 Correlate with Imaging Features?

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
1. Describe the pathology, genomics and associated syndromes. 2. Review the spectrum of typical and atypical imaging features of adrenocortical carcinoma. 3. Illustrate most commonly encountered imaging pitfalls and mimics of adrenocortical carcinoma. 4. Discuss the role of WEISS pathology score and Ki-67 for pathological diagnosis of adrenocortical carcinoma and correlate imaging features with pathological findings

TABLE OF CONTENTS/OUTLINE
1. Pathology of adrenocortical carcinoma. Associated syndromes and genomic background. 2. Imaging workup and utility of various imaging modalities. 3. Typical Imaging features of adrenocortical carcinoma. 4. Atypical Imaging features of adrenocortical carcinoma, for example: - Small Adrenocortical carcinoma - Presence of fat cells (mimicking myelolipoma) - Presence of intracytoplasmic lipid (mimicking adenoma). 5. Mimics of adrenocortical carcinoma, for example: - Large atypical adenoma - Pseudocyst. - Pheochromocytoma. - Ganglioneuroma 6. WEISS Pathology score; Does it correlate with imaging features? 7. Ki-67 immunohistochemistry staining being the Ki67 index is the most powerful parameter to predict ACC recurrence after complete resection of localized ACC. Does it correlated with imaging features.

Honored Educators
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Misplaced/displaced Urinary Tract Stents and Catheters: A Pictoral Review

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
Urinary tract stents, nephrostomy catheters, and vesical catheters may be placed incorrectly or may subsequently move to an incorrect position. Proper recognition of these complications, distinguishing them from normal post-procedure findings and avoiding all potential interpretative pitfalls, is mandatory. The exhibit goal is to offer a comprehensive pictorial review to the wide spectrum of imaging features encountered in patients with iatrogenic abnormalities of the urinary tract, with special reference on catheters and stents.

TABLE OF CONTENTS/OUTLINE
Iatrogenic changes may be detected by using various different imaging techniques, including unenhanced and contrast-enhanced radiographic studies, sonography, CT, MRI, and nuclear medicine. Interpretation may be difficult, especially when a direct relationship with the diagnostic or therapeutic procedure in absent in the clinical history. We show a number of cases of urinary catheter and stent that were found misplacement or displacement at diagnostic imaging. Iatrogenic urinary tract injuries have a wide range of clinical and radiological presentations. Paradigmatic clinical histories are shown. Radiologists should be aware of the normal and abnormal appearance of urinary tract catheters and stents.
Spectrum of Ultrasound Imaging Findings in Different Scrotal Pathologies

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
This pictorial review describes the spectrum of ultrasound findings of different testicular and extra-testicular pathologies as well as post operative evaluation for some pathologies. To familiarize the radiologists with ultrasound characteristics and the examination pitfalls of scrotal ultrasound which is essential for establishing correct diagnosis and initiating treatment.

TABLE OF CONTENTS/OUTLINE
Ultrasonography plays an important role in the differential diagnosis of a variety of disease processes that have similar clinical manifestation (e.g. pain, swelling or mass). The ability of color and power doppler ultrasound to demonstrate testicular perfusion aids in reaching a specific diagnosis in patients with acute scrotal pain. Our exhibit will focus on the use of gray-scale, pulsed and color doppler ultrasound illustrating different radiological pictures of intra-testicular and extra-testicular pathologies and correlate that with histopathology, serology and other modalities like MRI. Review how to approach for evaluation of different scrotal conditions which includes: - Neoplastic etiologies. - Inflammatory and infectious etiologies (bacterial- parasitic granulomatous). - Torsion and infarction. - Post operative conditions. - Inguino-scrotal conditions.
Male Infertility: The Role of Ultrasound Imaging in Diagnosis and Management

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS

- The investigation of male infertility is assuming greater importance, with male factors implicated as a causal factor in up to half of infertile couples.
- Imaging plays a vital role in identifying potentially correctable causes of infertility especially congenital anomalies and disorders that obstruct sperm transport.
- Scrotal ultrasound is excellent for initial evaluation of the scrotum and can directly demonstrate abnormalities within the testis and the peritesticular structures, such as varicocele and epididymal abnormalities, as well as visualising secondary changes caused by distal genital duct obstruction.
- Transrectal ultrasound enables high-resolution imaging of the prostate, seminal vesicles and vas deferens and is the modality of choice in diagnosing congenital and acquired abnormalities implicated in the cause of obstructive azoospermia.
- Penile ultrasound is performed when evaluating physical causes of erectile dysfunction.

TABLE OF CONTENTS/OUTLINE

I. RATIONALE
II. CAUSES OF MALE INFERTILITY: OBSTRUCTIVE AZOOSPERMIA and NON-OBSTRUCTIVE AZOOSPERMIA
III. ULTRASOUND TECHNIQUES
IV. SONOGRAPHIC FINDINGS: TESTICLES ABNORMALITIES; EPIDIDYMAL OBSTRUCTION; VAS DEFERENS OBSTRUCTION; EJACULATORY DUCT OBSTRUCTION; CYSTS AND CYSTIC DILATATION OF THE PROSTATIC URETHRA; VARICOCELE; PRIMARY TESTICLES TUMOR; ERECTILE DYSFUNCTION
V. CONCLUSIONS
How to Assess/Manage Adrenal Incidentalomas Based on Current Guideline

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS

Incidentally discovered adrenal lesions known as adrenal incidentalomas are being encountered with increasing frequency due to the widespread use of CT and PET/CT. Although most of these lesions are non-functioning benign adenomas, but malignancy needs to be excluded. Knowledge of imaging features of adrenal lesions on each imaging technique will facilitate differential diagnosis and assessment of malignant potential. There are some guidelines for the management of adrenal incidentalomas, so we introduce radiological recommendations based on the recently issued guidelines with our own "incidentaloma" cases. The purpose of this exhibit is:

1. To review the typical imaging findings of benign adrenal incidentalomas.
2. To know the malignant adrenal lesions.
3. To know the radiological recommendations based on the recently issued guidelines.

TABLE OF CONTENTS/OUTLINE

1. Introduction
2. Image findings of Benign adrenal incidentalomas
   2.1. CT
   2.2. MRI
   2.3. PET/CT
3. Image findings of Malignancy adrenal lesions
4. Pitfalls
5. Diagnostic work-up strategy of the adrenal incidentalomas
6. Future directions
Direct and Indirect Imaging Features of Adrenohepatic Fusion

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS

1. To learn the definition of adrenohepatic fusion. 2. To show direct imaging features of adrenohepatic fusion. 3. To show indirect imaging features of adrenohepatic fusion. 4. To describe the clinical implications of adrenohepatic fusion for patient care.

TABLE OF CONTENTS/OUTLINE

1. Introduction stating why we know adrenohepatic fusion. 2. Direct CT and MR imaging features of adrenohepatic fusion. 3. Indirect CT, MRI and angiography imaging features of adrenohepatic fusion. 4. Clinical implications about how to influence diagnosis or treatment.
Primary urological lymphoma is exceedingly rare. The purpose of this exhibit is 1, To understand multimodality imaging and clinical manifestation of rare urological malignant lymphoma. 2, To discuss the differential diagnosis and to clarify the diagnostic clue.

TABLE OF CONTENTS/OUTLINE

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TEACHING POINTS
1) To describe the most frequent CT and MR patterns of renal AML with minimal fat. 2) To evaluate intratumoral fat content in renal AML, using Chemical-Shift MR imaging technique

TABLE OF CONTENTS/OUTLINE
1) Morphologic and pathologic characteristics of AML with minimal fat 2) CT and MR patterns of AML with minimal fat a) Morphologic characteristics b) Density (CT) c) Signal intensity (MR), d) Diffusion patterns (MR) e) vascularization (CT, MR) 3) Quantitative measurement of intratumoral fat content using Chemical-Shift MR imaging technique: (Signal intensity (SI) index > 25% was considered typical for AML). Using Chemical-Shift MR Imaging, all renal AML with minimal fat showed a SI index > than 25% (average SI 57%). RCC showed a SI index < than 25% in 94% of the cases (average SI 7%). Chemical-Shift MR Imaging is an effective tool in the evaluation of intratumoral fat content of renal masses, and SI index can be used to differentiate AML with minimal fat from other renal neoplasms.
Complications of Urinary Tract Surgical Procedures: CT-Urographic Patterns

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
1) To review the most frequent urinary tract postoperative complications. 2) To illustrate CT-Urographic patterns of urinary tract postoperative complications. 3) To describe the usefulness of CT-Urography in the diagnosis and follow-up of urinary tract postoperative complications.

TABLE OF CONTENTS/OUTLINE
1) Most frequent urinary tract postoperative complications: a) Urinary leaks b) Uretero-vesical anastomosis dehiscence c) Ureterocutaneous fistulas d) Bleeding / hematomas e) Peritoneal and retroperitoneal fluid collections f) Urinary tract stenosis
2) Best CT techniques in the evaluation of urinary tract postoperative complications
3) Conventional and urographic CT patterns of urinary tract postoperative complications
4) CT imaging follow-up of urinary tract postoperative complications
Ureteral lesions, retroperitoneal hematomas and/or bleeding and fluid collections are the most frequent urinary tract postoperative complications. Urographic images combined with conventional CT imaging allow an accurate diagnosis and follow-up of urinary tract postoperative complications. Source axial images and MPR of the urographic acquisition show a better identification of urinary tract lesions. 3D MIP reconstructions are useful in summarising urographic axial images
Incidental Prostate Cancer Detected after Holmium Laser Enucleation of Prostate (HoLEP): Multiparametric Magnetic Resonance (MR) Imaging Patterns

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
To illustrate the most frequent Multiparametric MR imaging appearance of the prostate, after Holmium laser enucleation of prostate (HoLEP) for BPH. To review the most frequent patterns of incidental prostate carcinoma detected after HoLEP.

TABLE OF CONTENTS/OUTLINE
1) Surgical treatments for BPH
2) Epidemiology of incidental prostate carcinoma after HoLEP
2) Multiparametric MR imaging techniques
3) MR imaging patterns of prostate after HoLEP
4) MR most frequent patterns of prostate cancer detected after Holmium laser enucleation of prostate (HoLEP).
a) Morphology
b) Signal intensity
c) Contrast enhancement (DCE)
d) Diffusion (DWI)
Multiparametric MR is an effective imaging technique in the evaluation of significant prostate cancer incidentally detected after Holmium Laser enucleation of prostate (HoLEP).
Retroperitoneal Cystic Lymphangiomas (RCL): CT and MR Patterns

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
1) To illustrate the most frequent CT and MR imaging appearance of retroperitoneal cystic lymphangiomas. 2) To evaluate the most effective CT and MR imaging examination techniques. 3) To describe advantages and disadvantages of CT and MR imaging in the retroperitoneal cystic lymphangiomas evaluation.

TABLE OF CONTENTS/OUTLINE
1) Epidemiology 2) CT and MR imaging techniques 3) CT and MR patterns of retroperitoneal cystic lymphangiomas: a) size b) morphology c) densitometry (CT) and signal intensity (MR) d) contrast enhancement patterns e) DWI patterns (MR) f) collecting system relations 4) Comparison between CT and MR imaging in the retroperitoneal cystic lymphangiomas evaluation. CT and MR were effective imaging techniques in the evaluation of RCL. The most effective techniques were multiphasic acquisition (CT) and TSE T2w, conventional dynamic ce-FS-GRE T1w and subtracted dynamic ce-FS-GRE T1w sequences (MR). The most important parameters in the evaluation of RCL were the topography and the lack of enhancement of the lesion. The high contrast resolution of MR allowed a better evaluation of cystic component and septa on subtracted ce images compared to CT.
Renal Oncocytomas: Computed Tomography (CT) and Magnetic Resonance (MR) Patterns

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS

1) To illustrate the most frequent CT and MR patterns of renal oncocytomas. 2) To evaluate the most effective CT and MR imaging examination techniques in the diagnosis of renal oncocytomas.

TABLE OF CONTENTS/OUTLINE

1) Epidemiology of renal oncocytomas 2) CT and MR imaging techniques 3) CT and MR patterns of renal oncocytomas a) size b) morphology c) evidence of the central scar d) densitometry (CT) and signal intensity (MR) e) Diffusion (MR) f) contrast enhancement patterns g) collecting system relations The most frequent CT patterns were isodensity on pre-contrast images, hyperdensity on early ce-images and relative hypodensity on late ce-images. The most frequent MR patterns were hypointensity with a hyperintense central scar on T2w images, hyperintensity with a hypointense central scar on early ce images and hyperintensity on late ce-images. The most effective techniques were multiphasic acquisition (CT) and TSE T2w, conventional and subtracted dynamic ce-FS-GRE T1w sequences (MR).
Postoperative complications after Robotic Assisted Laparoscopic Prostatectomy (RALP): Computed Tomography (CT) Patterns

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TEACHING POINTS
1) To illustrate the most frequent CT imaging appearance of the pelvis after Robotic Assisted Laparoscopic Prostatectomy (RALP).
2) To review the most common postoperative complications after Robotic Assisted Laparoscopic Prostatectomy.
3) To evaluate the most effective CT imaging examination techniques in the evaluation of patients treated with Robotic Assisted Laparoscopic Prostatectomy.

TABLE OF CONTENTS/OUTLINE
1) Robotic Assisted Laparoscopic Prostatectomy: technique 2) CT imaging techniques 3) Most common postoperative complications a) haematoma b) fluid collections and abscesses c) vesicourethral anastomotic leak and/or stricture d) lymphocele e) bowel stenosis and/or herniation 4) Conventional and urographic CT patterns of Postoperative complications after Robotic Assisted Laparoscopic Prostatectomy. CT-Urographic images combined with conventional morphologic CT imaging allowed an accurate evaluation of postoperative complications after Robotic Assisted Laparoscopic Prostatectomy. Most common postoperative complications after Robotic Assisted Laparoscopic Prostatectomy were: haematoma, fluid collections, vesicourethral anastomotic leaks and/or strictures, lymphocele, bowel stenosis and/or herniation).
MR Imaging Patterns of Unusual Adrenal Masses

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
1) To illustrate the most frequent MR patterns of unusual adrenal masses. 2) To demonstrate the most effective MR imaging examination techniques in the diagnosis of unusual adrenal masses.

TABLE OF CONTENTS/OUTLINE
1) Epidemiology and characteristics of unusual adrenal masses a) Adrenal carcinoma b) Myelolipoma c) Adrenal lymphoma d) Adrenal Histiocytosis e) Tuberculosis f) Adrenal hematoma g) Adrenal cyst h) Adrenal abscess 2) MR imaging techniques 3) MR patterns of unusual adrenal masses: a) Size b) Morphology c) Signal Intensity d) Contrast enhancement e) DWI

MR is an effective imaging tool for identification and characterization of unusual adrenal masses, in particular in the evaluation of myelolipomas and cysts. MR imaging technique must include Morphologic T1w-T2w images, Chemical Shift images and dynamic ce T1w FS GRE acquisitions.
The Treated Kidney: Computed Tomography (CT) and Magnetic Resonance (MR) Recurrence Patterns

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
To illustrate the most frequent CT and MR imaging appearance of the treated kidney, after surgical and ablative treatments. To review the most common CT and MR recurrence patterns after renal surgical and ablative treatments. To evaluate the most effective CT and MR imaging examination techniques.

TABLE OF CONTENTS/OUTLINE
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, DWI and dynamic ce-FS-GRE T1w sequences (MR).
3) The most frequent CT and MR recurrence patterns: a) morphology b) densitometry (CT) and signal intensity (MR) c) DWI (MR) d) contrast enhancement patterns CT and MR were effective imaging techniques in the follow-up of treated kidneys. 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). 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. DWI can be helpful in MR evaluation of patients with renal failure.
Multimodality Imaging of Common and Uncommon Adrenal Masses in Adults

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
A variety of modalities can effectively image the adrenals, including ultrasonography (US), computed tomography (CT), magnetic resonance imaging (MRI) and scintigraphy. By far, the multisequential imaging capabilities of CT supersede the rest in establishing a definitive diagnosis in adrenal mass, however, MR and US imaging do partake a complimentary role. The purpose of this exhibit is to:
1. To review the imaging characteristics of common and uncommon adrenal masses. 2. To explain the utility of various imaging modalities in establishing a diagnosis of an adrenal mass.

TABLE OF CONTENTS/OUTLINE
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TEACHING POINTS
To illustrate the most frequent Multiparametric MR imaging appearance of Benign Prostatic Hyperplasia. To describe the usefulness of Multiparametric MR Imaging in the characterization of BPH nodules. To evaluate the most effective prostate MR imaging examination techniques.

TABLE OF CONTENTS/OUTLINE
1) Morphologic and pathologic characteristics of BPH
2) Multiparametric MR imaging techniques
3) MR imaging patterns of glandular and stromal BPH nodules: a) Morphology b) Signal intensity c) Contrast enhancement patterns on dynamic studies d) Diffusion e) Spectroscopy
4) BPH nodules vs prostate carcinoma. Glandular BPH nodules demonstrated typical MR patterns (high signal on morphologic T2w images, no restricted diffusion and poor enhancement on DCE). Stromal BPH nodules demonstrated MR patterns similar to prostate carcinoma (low signal on morphologic T2w images, restricted diffusion and significant enhancement on DCE). In the differential diagnosis it is important evaluate position, size and morphology of the lesion on T2w images.
Urethral Lesions Revisited: The Role of Imaging in the Diagnosis, Staging, and Treatment

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
Location (posterior or anterior urethra) and size are two crucial factors for determining treatment modality and patients prognosis; Magnetic resonance imaging should be the method of choice for monitoring tumour response to neoadjuvant chemoradiotherapy and evaluating the extent of local disease prior to exenterative surgery; Surgical treatment options ranges from local resection to extensive exenterative surgery, depending on tumors characteristics.

TABLE OF CONTENTS/OUTLINE
Brief epidemiology review showing that primary urethral carcinomas (PUCs) are rare and account for less than 1% of genitourinary cancers and most data available come from small studies and case reports; Main risk factors involved in the development of PUCs; Main symptoms and imaging characteristics of PUCs; Principal histological types of PUCs; Prognostic factors and the role of imaging in determining location and tumors extension; Imaging evaluation of chemotherapy response; Treatment options and postoperative imaging; The role of imaging in the detection of complications; Examples of cases from our service: diagnosis, pre and postoperative images.
The Lowdown on Lower GU: Lower Urinary Tract Neoplasms, Preoperative and Postoperative Imaging

All Day Room: NA Digital Education Exhibit

Awards
Magna Cum Laude

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TEACHING POINTS
1. To review the imaging appearances and behavior of the most common bladder malignancy, urothelial carcinoma. 2. To discuss other less common lower GU cancers and cancer mimics. 3. To build awareness of postsurgical complications and instances of tumor recurrence seen on imaging status post treatment.

TABLE OF CONTENTS/OUTLINE

Summary
Non-Ischaemic Priapism: Role of Imaging in the Diagnosis, Treatment and Follow-up

All Day Room: NA Digital Education Exhibit

FDA Discussions may include off-label uses.

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TEACHING POINTS
Teaching points: 1. To review the subtypes and imaging diagnosis of priapism 2. To demonstrate the different appearances and treatment options of non-ischaemic priapism 3. To learn about post-embolization follow up imaging appearances and outcomes in non-ischaemic priapism

TABLE OF CONTENTS/OUTLINE
Subtypes of priapism
Non-ischaemic
Ischaemic including subtype "high-flow high-resistance"
Imaging in priapism
Ultrasound and Doppler thresholds in priapism
Use of CT + MRI in priapism
Non-ischaemic priapism treatment
Treatement options
Anatomy and approach to interventional techniques + selection of embolics
Pitfalls in pudendal angiography
Follow up of non-ischaemic priapism
Ultrasound and MRI follow up appearances
Considerations for retreatment
PI-RADS v2 for Transition Zone Lesions: Imaging Potholes and Pitfalls

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
PI-RADSv2 was developed for more accurate detection of clinically significant prostate cancers. However, evaluation of transition zone lesions according to the proposed scoring system based on imaging features can sometimes be tricky. This abstract presents a pictorial essay of lesions scored on PI-RADSv2 criteria with unexpected pathology.

TABLE OF CONTENTS/OUTLINE
• Imaging features on dominant sequence T2W • Imaging features on secondary sequence DWI for indeterminate lesions • Imaging potholes and pitfalls
Multimetric MR Imaging in the Setting of Prostate Cancer Recurrence

All Day Room: NA Digital Education Exhibit

Participants
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TEACHING POINTS
- Imaging is a critical part of patients with suspected recurrent prostate cancer. A good understanding of imaging choices as well as patterns/pitfalls in recurrent disease will improve the approach in these challenging patients. - DCE is usually the Imaging modality of choice, presenting with focal asymmetric enhancement in the area of suspected recurrence. - In the setting of prostatectomy, a number of pitfalls and confounders may also be seen in the prostatic bed. - It is important to check on pre-treatment studies, since the lesions tend to recur on the original sites. - Finally, one should not forget to check on the pelvic lymph-nodes and bones when looking for recurrence.

TABLE OF CONTENTS/OUTLINE
- Definition of recurrence based on the treatment modality; - Clinical Prognostic Factors; - Imaging modalities in the setting of PCa recurrence; - mpMRI acquisition protocol; - Anatomy of the prostate pre and post-treatment (prostatectomy, EBRT, Brachytherapy); - mpMRI findings after primary treatment; - Where to look for PCa recurrence; - Pitfalls and normal findings; - Checking on other sites in the pelvis; - Summary and practical tips.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Andrei S. Purysko, MD - 2017 Honored Educator
Differential Diagnosis of Solid Renal Tumors: A Pictorial Review

All Day Room: NA Digital Education Exhibit

Participants
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TEACHING POINTS

The purpose of this exhibit is:
1. To review the diagnostic approach of solid renal tumors
2. To review the characteristic imaging finding of CT and MR each of solid renal tumors
3. To highlight the practical imaging assessment for the differentiation from clear cell carcinoma

TABLE OF CONTENTS/OUTLINE

1. Brief overview of WHO classification
2. Review of the diagnostic approach include guidelines
3. CT and MR imaging findings each of solid renal tumors
4. Key points in the differential diagnosis.
Postoperative Imaging of Genital Reassignment

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
1. Examine indications for gender reassignment surgery
2. Review anatomy male and female genital anatomy
3. Discuss procedures for male to female and female to male gender reassignment
4. Identify appropriate imaging modalities and techniques for postoperative assessment
5. Evaluate normal postoperative findings in gender reassignment

TABLE OF CONTENTS/OUTLINE
1. Defining gender and gender reassignment
2. Issues leading to gender reassignment
3. Indications for gender reassignment
4. Male genital anatomy
5. Female genital anatomy
6. Gender reassignment procedures a. Male to Female i. Genital reassignment
7. Imaging techniques for assessing reassigned genitalia
8. Normal postoperative findings in genital reassignment
Incidental Findings at Multiparametric Prostate MRI

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
Review the MR imaging features of various extraprostatic incidental findings. Emphasize the importance of systematic evaluation of the whole male pelvis at multiparametric MR imaging of the prostate.

TABLE OF CONTENTS/OUTLINE
Describe the adequate prostate MRI protocol and the importance of the whole pelvic sequences. Review the benign and neoplastic findings on male pelvic MR imaging beyond the prostate. Illustrate the commonly extraprostatic incidental findings.
The Urinary Bladder: A Multimodality Review of Uncommon Pathology

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
To illustrate the multimodality imaging features of uncommon bladder pathology. To incorporate relevant histopathology. To highlight the clinical and management implications of these entities.

TABLE OF CONTENTS/OUTLINE
Pathology arising from adjacent structures: Urachal hemangioma Bladder invasion by regional malignancy Inflammatory or infiltrative processes: Bladder endometriosis Eosinophilic cystitis Amyloidosis Retroperitoneal xanthogranulomatosis Subepithelial hemorrhage Benign neoplasm: Leiomyoma Non-urothelial carcinoma malignant neoplasms: Neuroendocrine carcinoma Small cell carcinoma Squamous cell carcinoma Adenocarcinoma Paraganglioma Myoepithelial carcinoma Leiomyosarcoma Embryonal rhabdomyosarcoma Primary lymphoma Metastases

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Christine O. Menias, MD - 2013 Honored Educator
Inflammatory and Non-Neoplastic Pathology of the Bladder: When the Pathologic Evaluation is Required

Awards
Identified for RadioGraphics

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TEACHING POINTS
1. Discuss appropriate imaging techniques (with emphasis on CT) in the management of the nonneoplastic bladder pathology (that have imaging overlap with neoplasm). 2. Remind the existence of relatively frequent but insufficiently described conditions with radiologic and cystoscopic features similar to bladder neoplasm. 3. Be aware of potential imaging pitfalls to avoid misdiagnosis.

TABLE OF CONTENTS/OUTLINE
A variety of nonneoplastic disorders can cause either focal bladder masses or diffuse wall thickening and mimic malignancy. Pathologic evaluation is required for diagnosis. • Focal masses: such inflammatory pseudotumor, endometriosis, nephrogenic adenoma, malacoplakia, cystitis cystica, cystitis glandularis have imaging overlap with neoplasm and histologic evaluation is finally required. • Diffuse bladder wall thickening: can be secondary to infection with bacteria or adenovirus, tuberculosis, cystitis (cystica, glandularis) and secondary to chemotherapy or irradiation. In these entities the radiologic evaluation can help to the diagnosis but clinical and pathologic correlation is required. • Extrinsic inflammatory disease such as Crohn disease and diverticulitis may be associated with fistulas to the bladder and focal wall pathology. • Extrinsic mass (prostatic, ureterocele, urachal cyst...) can protrude into the bladder and mimic malignancy.
**Advanced Renal Cell Carcinoma: Role of Radiologist in the Era of Precision Medicine**

All Day Room: NA Digital Education Exhibit

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**TEACHING POINTS**

- To present different histologic subtypes of renal cell carcinoma (RCC), their molecular and genetic alterations, their imaging features and their specific metastatic pattern
- To review the main classes of molecular targeted therapies (MTT) used to treat advanced RCC, their mechanism of action, their pattern of response and their class-specific toxicity
- To review the criteria for response assessment in RCC in view of the new MTTs
- To present the future trends in diagnosis and treatment of advanced RCC

**TABLE OF CONTENTS/OUTLINE**

Benign to Malignant Adrenal Lesions on MRI: A Comprehensive Review

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
- To demonstrate the MRI characteristics of adrenal lesions
- To illustrate a variety of mimics of adrenal lesions on MRI
- To provide a differential diagnosis for adrenal lesions.

TABLE OF CONTENTS/OUTLINE

A variety of pathologies, including traumatic, infectious, malignant, hormonal, and syndromic affect the adrenal glands. MRI provides a noninvasive method for identifying these lesions. Adrenal lesions can vary from common adrenal adenomas to the less common foregut duplication cyst or even histoplasmosis infection. Being able to differentiate these lesions from each other can prove to be clinically important, especially in the case of mimics, which include metastasis and extra adrenal lesions. We provide a comprehensive MRI review of adrenal lesions and mimics.
Multiparametric Magnetic Resonance Imaging Findings in Granulomatous Prostatitis

All Day Room: NA Digital Education Exhibit

Awards
Certificate of Merit

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TEACHING POINTS
1. Granulomatous prostatitis (GP) can be idiopathic or can be caused by various inflammatory and infectious conditions such as intra-vesical BCG instillation, fungal and xantogranulomatous infections, sarcoidosis, Wegner's granulomatosis and several other vasculitides. 2. Several mp-MRI findings of GP overlap with those of prostate cancer, often mimicking a tumor with aggressive features such as invasive behavior and extra-prostatic extension. 3. Small granulomas can be seen as small (subcentimeter) well circumscribed lesions in the peripheral or transition zone, with low signal intensity on T2-WI, without significant restricted diffusion or enhancement. 4. Abscesses can be present and demonstrate a T2-WI isointense/hypointense rim, peripheral enhancement and central restricted diffusion. 5. Even though the patients' history and certain mp-MRI findings (i.e. granulomas and abscesses) can help raise the concern for GP, a biopsy is required in most cases to exclude the possibility to prostate cancer.

TABLE OF CONTENTS/OUTLINE
1. Objectives
2. Introduction
4. Conclusions
5. References
Scrotal Ultrasound Tutorial: Positive Results after just 6 Months

All Day Room: NA Digital Education Exhibit

Participants
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PURPOSE
To present our results concerning the evaluation of knowledge about scrotal ultrasound among radiologists and residents who used our Scrotal Ultrasound Tutorial (SUT). To demonstrate the usefulness of the SUT in the training of scrotal ultrasound images.

METHOD AND MATERIALS
The SUT is a teaching project presented initially at the 2011 Annual Meeting of the RSNA and the 2012 SERAM Congress, being awarded various Certificates of Merit. After reviewing over 8000 scrotal ultrasound images this PowerPoint presentation contains over 450 ultrasound images and 40 diagrams. A second version, transformed to Flash with iSpring®Pro7, was accessible on the Malaga University web page (Spain) from April to November 2016 for evaluation. Two 20-question tests were designed, one to answer before doing the SUT and the other afterwards. An assessment form was created where users scored different aspects: organization, presentation, image and diagram quality, texts, references, etc. The users (radiologists and radiology residents) accessed the SUT freely after completing the baseline test, after which they all did the second test and completed the questionnaire. The tests were sent via a specially designed e-mail.

RESULTS
The first test was done by 362 users. The mean number of correct answers to the 20 questions was 12.95±2.57. The minimum number of correct answers was 3 and the maximum 18. The second test (after doing the SUT) was done by 107 users. The mean number of correct answers rose to 17.03±2.62. The minimum number of correct answers was 7 and the maximum 20. On the questionnaire the users evaluated various aspects of the SUT very positively: Interface and visual 4.65/5.- Navigation 4.66/5.- Image quality 4.71/5.- Diagram quality 4.77/5.- Overall score for the whole SUT 8.85/10.

CONCLUSION
The SUT is a useful computer-aided learning tool (e-Learning) for scrotal ultrasound. The scores rose between the pre and post-tutorial tests. The users assessed various technical and content aspects positively, giving the SUT an overall score of 8.85/10.

CLINICAL RELEVANCE/APPLICATION
Scrotal Ultrasound Tutorial has proven useful in computer-aided learning of scrotal pathology for both radiologists and radiology residents, as see from the very good improvement on the questionnaire given to 362 users.

FIGURE
Venous Thrombosis Secondary to Renal Neoplasm: Radiological Assessment

All Day Room: NA Digital Education Exhibit

Awards
Cum Laude

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TEACHING POINTS

The objectives of this educational presentation are: • Remind the oncologic, prognostic and surgical implications of renal vein and inferior vena cava (IVC) tumor thrombosis in the context of renal neoplasm, according to the Mayo Clinic classification. • Review the radiological features to consider in such cases.

TABLE OF CONTENTS/OUTLINE

• Frequency • Relationship between renal tumor subtypes and venous thrombus • Clear cell renal carcinoma • Papillary renal cell carcinoma • Others • Non-renal tumors involving the IVC • Prognostic features • Clinical features • Clinical and surgical management • Levels of venous tumoral thrombosis and implications on management and prognosis • Predictors of extensive IVC resection • New methods for treatment • Follow-up • Imaging features (ultrasonography, CT, MRI, intraoperative, endocavitary imaging, biopsy) • Identifying the thrombus • Defining the extension • Tumor vs. bland thrombus • Predicting the need of extensive vascular resection • Describing associated findings • Avoiding pitfalls
Benign Renal Neoplasms: Unusual Findings and Uncommon Tumors

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
Although the majority of solid tumors arising in the kidney are renal cell carcinomas (RCCs), it is sometimes difficult to distinguish them from benign renal neoplasms. In particular, angiomyolipomas (AMLs) often manifest atypical findings, and are sometimes misdiagnosed as RCC. It is necessary to understand the spectrum of imaging findings of benign renal tumors for the correct diagnosis and avoiding an unnecessary treatment. The aims of this exhibit are 1. To review the atypical findings of AML. 2. To review the imaging findings of uncommon benign renal neoplasms. 3. To discuss the key points for distinguishing benign tumors from RCCs.

TABLE OF CONTENTS/OUTLINE
**Diseases of the Renal Hilum and Perinephric Space: Looking Beyond the Bleed**

All Day Room: NA Digital Education Exhibit

**Participants**
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**TEACHING POINTS**

Understand the anatomic relations of the renal hilum and perinephric space and how these may influence the pattern of disease presentation
Understand the implications of variants in vascular anatomy and their impact on surgical technique
Understand the role of embolisation in the management of perinephric hemorrhage

**TABLE OF CONTENTS/OUTLINE**

Introduction
A mix of common and challenging clinical cases - spontaneous perinephric haematomas (Wunderlich syndrome), angiomyolipomas, sarcomas, trauma, fulminant infections, local ablative changes will illustrate the learning objectives. Relevant anatomic considerations 1. Relations of the renal hilum and perinephric space 2. Vascular anatomy and common anatomic variants of the kidneys on renal CTA / MRA

Patterns of disease spread (image case examples) 1. From renal parenchyma 2. From renal hilum 3. From perinephric fat and associated structures

Therapeutic considerations 1. Surgery (open, laparoscopic and robotic partial and total nephrectomy) for perinephric and hilar disorders 2. Embolisation for active hemorrhage into the perinephric space

Conclusion
By the end of the exhibit, the learner will understand key diagnostic features that would aid appropriate treatment of diseases involving the renal hilum and perinephric space.
A Case-Based Approach to Differentiating Retroperitoneal Pathology

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
The purpose of this exhibit is to: Explore the imaging features of a diverse group of retroperitoneal disorders (non-perirenal) Review some of the common differential diagnoses we routinely sort through in evaluating the retroperitoneum Identify clues that can aid in differentiating between various imaging mimics

TABLE OF CONTENTS/OUTLINE
Retroperitoneal Anatomy
Differential diagnosis by Periaortic Location: Retroperitoneal fibrosis Lymphoma Retroperitoneal metastases
Aortitis
Differential diagnosis of Solid Retroperitoneal Masses: Mesodermal Neoplasms Neurogenic tumors Retroperitoneal metastasis
Castleman's disease
Differential diagnosis of Cystic Retroperitoneal Masses: Lymphangioma Lymphocele Urinoma Abscess
Pseudocyst
Differential diagnosis of Fat-containing Retroperitoneal Masses: Lipomatosis Liposarcoma Fat necrosis Extramedullary hematopoiesis
Differential diagnosis of Diffuse Infiltrative Retroperitoneal Masses: Retroperitoneal Fibrosis Lymphoma Amyloidosis
Erdheim Chester
A Tale of Two Tumors: Current Update in Genetics and Imaging of Pheochromocytomas and Paragangliomas

All Day Room: NA Digital Education Exhibit

Awards
Cum Laude

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TEACHING POINTS

Discuss hereditary conditions linked to pheochromocytomas (PCCs) & paragangliomas (PGLs) & elucidate possible oncogenic pathways with specific genes Describe cross-sectional imaging spectrum of PCCs/PGLs with role of different imaging techniques in the diagnosis and management. Review evolving clinical implications of genetic abnormalities in the development of novel, targeted drugs.

TABLE OF CONTENTS/OUTLINE

Introduction Hereditary conditions: MEN2 syndrome (RET), von Hippel-Lindau disease (VHL), neurofibromatosis type 1 (NF1) & hereditary PCC/PGL syndrome (succinate dehydrogenase genes) Novel Genes: KIF1B beta, MAX, TMEM127, EGLN1 & HIF2 Current Concepts in Oncogenesis: Cluster 1 (Pseudo-hypoxic response) & Cluster 2 (kinase signaling with protein translation) Role of Imaging: PCCs, Sympathetic PGLs/Parasympathetic PGLs, CT, MRI, FDG-PET, MIBG & Octreotide scan Predictors of Malignancy When to suspect genetic origin Management Implications Novel Therapies Conclusion Given the identification of at least 10 susceptibility genes, PCCs/PGLs are being called as '10 gene tumors' instead of traditionally known '10% tumors'. Up to 50% of PCCs/PGLs have a genetic origin. Recent advances in oncogenesis have opened new avenues for novel drugs & Imaging plays a pivotal role evaluation of treatment response & testing efficacy of new drugs
How Does the Fat Reach the Bladder? Chyluria: Lymphatico-urinary Fistula on CT

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TEACHING POINTS
Recognize the fat-fluid level sign within the bladder (or collecting system) on CT and not mistake it for the more common finding of air
Differentiate a thin intravesical fat-fluid level from benign intramural bladder fat
Review the causes of chyluria and describe the various management options

TABLE OF CONTENTS/OUTLINE
The cases will be presented in a quiz format. Chyluria is the urinary colloidal suspension of fat forming chylomicrons. Rare condition in which a lymphatic connection exists with the urinary collecting system. Most commonly occurs due to obstruction of the renal lymphatic vasculature by filariasis (tropical countries). In western countries chyluria is associated with renal trauma, neoplasm, abscess and congenital disorders (lymphatic system) Rarely chyluria has also been described after radical and partial (more often) nephrectomy, renal radiofrequency ablation therapy and extracorporeal shock wave lithotripsy. Some patients resolve spontaneously, but treatment may be required for persistent cases, including nutritional support, renal sclerotherapy/embolization and surgical ligation of lymphatic system. The lymphaticourinary fistula can be microscopic and not directly visualized by CT. However, CT provides evidence of chyluria when sufficient lipids accumulate to form a fat-fluid level.
T2-Hyperintense Retroperitoneal Lesions: Diagnostic Considerations and Imaging Findings

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
Discuss the differential considerations of retroperitoneal masses with high signal intensity on T2-weighted MR imaging. Describe typical and atypical imaging features of these masses with pathologic correlation. Illustrate a pattern recognition approach to help reach a specific diagnosis. Emphasis the impact of imaging findings on management options.

TABLE OF CONTENTS/OUTLINE
**Think Outside the Peritoneal Box: A Call for an Accurate Interpretation of Retroperitoneal Masses**

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**TEACHING POINTS**
Review imaging features of common and uncommon retroperitoneal masses on CT and MRI, illustrated with clinical cases from our radiology department; Propose a well-defined algorithm to narrow the differential diagnosis; Highlight the findings that should be reported due to their relevance in therapeutic planning.

**TABLE OF CONTENTS/OUTLINE**
1) Brief anatomical review of retroperitoneum and its spaces; 2) An illustrated review of retroperitoneal masses based on clinical cases: Cystic density Lymphocele Lymphangioma Pseudomyxoma retroperitonei Cystic mesothelioma Fat tissue density Lipoma Liposarcoma Teratoma Myelolipoma Angiomyolipoma Soft tissue density Lymphoproliferative disease Sarcoma Neurofibroma Paragangioma Extramedullary hematopoiesis Metastases Non-neoplastic Seroma Urinoma Abscess Hematoma Tuberculosis Sarcoidosis Retroperitoneal fibrosis Erdheim-Chester disease Vascular anomalies (e.g. duplication of inferior vena cava) Renal, pancreatic and adrenal masses simulating retroperitoneal lesions. 3) Imaging systematic assessment model focusing on lesion description (including its relations to adjacent organs), diagnostic clues and alarming signs of malignancy.
Renal Cell Carcinoma: Imaging Aspects from Diagnosis to Advanced Therapies

All Day Room: NA Digital Education Exhibit

Awards
Certificate of Merit

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TEACHING POINTS
• Review imaging aspects of renal cell carcinoma (RCC) • Briefly discuss its main differential diagnosis. • Present the essentials of preoperative imaging assessment regarding surgical planning, focusing on what the referring physician expects from your report • Comprehensively discuss imaging findings after surgical resection, ablative treatment and new systemic therapies
Lumps and Bumps: Imaging Evaluation of Palpable Scrotal Pathology

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
Palpable abnormalities are a common indication for scrotal imaging. After reviewing this exhibit, the learner will be able to:
- Recognize normal scrotal anatomy with ultrasound (US) and magnetic resonance imaging (MRI).
- Differentiate intra- and extratesticular lesions with US and MRI.
- Organize differential diagnosis by location and lesion characterization.
- Understand management options for palpable scrotal findings.

TABLE OF CONTENTS/OUTLINE
Intratesticular lesions: - Solid, with emphasis on malignancy. - Cystic.
Extratesticular lesions: - Solid masses. - Cystic lesions. - Pseudomasses (i.e. varicocele, hernia).
Perirenal Rind-like Lesions: A Pattern Approach

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS

There are numerous disorders than can involve the perinephric space in a rindlike fashion. Based on the attenuation on CT and other clinical and imaging features, radiologists can narrow the differential diagnosis.

TABLE OF CONTENTS/OUTLINE

1. Anatomy
2. Gas • Emphysematous pyelonephritis • Retroperitoneal necrotizing fasciitis • Retroperitoneal intestinal perforation
3. Fat • Perirenal retroperitoneal liposarcoma • Exophytic renal angiomyolipoma • Adrenal or extra-adrenal myelolipoma • Extramedullary hematopoiesis
4. Fluid • Renal lymphangiectasia • Plexiform neurofibromas • Calyceal rupture • Perirenal abscess • Peripyllic and proximal periureteric fluid collections associated with a pelvis stone
5. Soft tissue • Xanthogranulomatous pyelonephritis • Retroperitoneal sarcoma • Renal tumors invading the perirenal space • Non renal tumors involving the perirenal space • Urothelial carcinoma with perirenal space extension • Lymphoma • Leukemia • Periureteral metastases • Idiopathic retroperitoneal fibrosis • IgG4-related disease • Erdheim-Chester disease • Perirenal hematoma
Renal Tumor Structured Reporting Including Nephrometry Score and Beyond: What the Urologist Needs to Know

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
1. Illustrate the morphologic parameters that Urologists and Interventional Radiologists need to know in pre-procedural planning, which Radiologists tend to ignore in their reports. 2. Review of commonly used terms and descriptors of those parameters. 3. Suggest a comprehensive reporting system for detected renal masses on contrast enhanced abdominal CT scans.

TABLE OF CONTENTS/OUTLINE
Background Renal tumor complexity measures Variant anatomy Parameters pertinent to surgical intervention Parameters pertinent to percutaneous ablation Suggested reporting system Summary
Radiographic Evaluation of Scrotal Pain with Pathological Correlation: A Pictorial Review

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
At the end of this presentation, participants will be able to: 1. Identify normal scrotal anatomy on radiographic imaging primarily utilizing color duplex doppler sonography 2. Understand the role of the cross-sectional imaging in distinguishing the various etiologies of acute and chronic scrotal pain including: testicular torsion, epididymitis, post-traumatic causes, neoplasms, and infectious etiologies 3. Provide differential diagnosis from sonographic findings that would aid clinicians in prompt conservative or surgical intervention as determined by the clinical scenario

TABLE OF CONTENTS/OUTLINE
1. Review normal scrotal anatomy and benign incidental findings
2. Review common imaging features of various scrotal pathology and correlate with gross images
3. Discuss the clinical and surgical implications of imaging findings and their differential diagnoses
Incidental Findings on Prostate MRI: A Pictorial Review

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
• To improve search pattern on prostate MRI.
• To become familiarized with important non-prostatic pelvic pathologies in males.
• To learn how to use routine prostate MRI sequences in identifying extra-prostatic pathologies.
• To discuss limitations and pitfalls of prostate MRI for characterization of non-prostatic findings.

TABLE OF CONTENTS/OUTLINE
I. Routine prostate MRI protocols
   a. T2-weighted
   b. Diffusion-weighted
   c. Dynamic contrast-enhanced
II. Urethral pathologies
   a. Cystic lesions
III. Seminal vesicle pathologies
   a. Cystic lesions
   b. Agenesis
IV. Colorectal pathologies
   a. Rectal cancer
   b. Diverticular disease
V. Small bowel lesions
VI. Vascular pathologies
   a. Aneurysm
   b. Thrombosis
VII. Osseous lesions
   a. Metastatic disease
   b. Degenerative disease
VIII. Genitourinary lesions
   a. Pelvic kidney/other congenital findings
   b. Hydronephrosis
IX. Recommended search pattern
X. Technical considerations
XI. Limitations and pitfalls
XII. Conclusion
Scrotal Pathologies: MRI Manifestations

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
• To review normal anatomy of the scrotum on MRI
• To become familiarized with added value of MRI for diagnosis of indeterminate scrotal pathologies.
• To learn how to protocol MRI to identifying indeterminate scrotal pathologies not diagnosed by ultrasound.

TABLE OF CONTENTS/OUTLINE
I. Overview of the scrotal MRI protocol
II. Common scrotal pathologies: 1) Tumors 2) Inflammatory lesions 3) Benign findings 4) Inguinal hernia
III. INCIDENTAL findings
IV. Technical considerations
V. Limitations and pitfalls
VI. Conclusion
MR Case-based Review of Adrenal Pathologies

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
Case based review of the MRI features of various adrenal pathologies. After reviewing this exhibit, the reader will be equipped (1) to identify the distinguishing MRI characteristics of common adrenal lesions, (2) recognize mimics of adrenal pathology, and (3) understand the strengths and weaknesses of MRI for evaluating adrenal lesions.

TABLE OF CONTENTS/OUTLINE
Group 1: Pathognomonic lesions Adrenal adenoma Pitfall: Collision lesion Fat-containing metastasis Well-differentiated adrenocortical carcinoma. Myelolipoma Pitfall: Well differentiated liposarcoma adrenocortical carcinoma metastasis containing macroscopic fat Cyst Pitfall: cystic or necrotic tumor hydatid disease Hematoma Pitfall: Hemorrhage into tumor Adrenal hyperplasia
Group 2: lesions with non-specific MRI features. Adrenocortical Carcinoma Metastases Lymphoma Pheochromocytoma Ganglioneuroma and ganglioneuroblastoma Neuroblastoma
Group 3: Mimics Bilateral: Lymph nodes and exophytic renal masses Suprarenal masses Left adrenal mass: varices or splenic artery aneurysm gastric fundal diverticulum pancreatic tail mass splenule Right adrenal mass Exophytic hepatic mass
Anatomical and Molecular Imaging of Prostate Cancer

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
To review prostate anatomy on Magnetic Resonance Imaging (MRI) To review the recent advancements in molecular imaging in management of patients with prostate cancer, such as multiparametric magnetic resonance and combined positron emission tomography (PET)/CT with different tracers, such as 18F-FDG and 68Ga-PSMA.

TABLE OF CONTENTS/OUTLINE
I. Introductions II. Objectives III. Anatomy IV. Prostate MRI normal anatomy V. Protocol - prostate MRI a. Characterizing lesions in the prostate b. Determining extraprostatic extension VI. Molecular imaging a. Principles and basic concepts of molecular imaging b. Tracers (18f-fdg and 68ga-psma) VII. Conclusion VIII. References
Retrograde Urethrography: A Full-Length Review

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TEACHING POINTS
Retrograde urethrography continues to be the best initial diagnostic study for evaluation of urethral pathologies. Interpretation of these studies in both the pre and post-operative setting can be challenging and knowledge of normal and abnormal findings is essential. This pictorial review is designed for residents, fellows, general radiologists, abdominal radiologists, and non-radiology participants. The primary goals are to provide a thorough review of retrograde urethrography (RUG) including anatomy, technique, and imaging findings as well as pathologic and surgical correlation of multiple urethral pathologies from our patient database.

TABLE OF CONTENTS/OUTLINE
Illustrating both the normal and post-surgical anatomy of the male urethral system Describing the appropriate technique for performing a RUG with troubleshooting strategies and complications. Providing a thorough review of urethral pathologies with description of pathophysiology and practical tips for aiding in diagnosis. Pathologies include urethral transection, urethral fistula, post-traumatic urethral stricture, post-infectious stricture, and balanitis xerotica obliterans as well as post-surgical changes of stenting, urethroplasty, and phalloplasty Correlation with surgical outcomes and pathologic correlation from our patient database
**Imaging Features of Oncocytic Neoplasms of the Adrenal Gland: Experience with 11 Cases**

All Day Room: NA Digital Education Exhibit

**Participants**
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**TEACHING POINTS**
After reviewing this exhibit the reader will: 1. Become more familiar with the rare entity of oncocytic neoplasms of the adrenal gland (ONA) 2. Become more familiar with the imaging features that may be seen on CT and MRI of ONA 3. Have an understanding that there are a number of imaging features that may be seen with ONA that may overlap with other lesions 4. Highlight the imaging features that if present will help support including ONA in the differential for a given adrenal lesion

**TABLE OF CONTENTS/OUTLINE**
Background of oncocytic neoplasms of adrenal gland (ONA) Review of imaging findings (CT and/or MRI) in these 11 patients with surgically proven ONA Present cases of CT and MRI in patients with ONA Highlight imaging features that help you consider including ONA in the differential for indeterminate adrenal lesions
The Role of Imaging in Modern Prostate Cancer Care

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TEACHING POINTS
1. Show the reader the prostate cancer care pathway with multiple imaging touch points.
2. Review all imaging touch points in different phases of prostate cancer care, including diagnosis, staging, treatment, and surveillance.
3. Bring the readers up-to-date imaging values in prostate cancer care pathway, and help physicians from multidisciplinary prostate cancer care team to fully understand how imaging is used in prostate cancer care.

TABLE OF CONTENTS/OUTLINE
1. Diagrammatic overview: Describe and summarize the imaging touch points in each stage of prostate cancer care pathway from initial evaluation to diagnosis, staging, treatment, and surveillance.
2. Introduction of the role of imaging in different phases of prostate cancer care, including diagnosis, staging, treatment, and post-intervention surveillance.
3. Summarize the up-to-date role of imaging in modern prostate cancer care pathway.
Avoiding Suprarenal Slipups: Fundamentals of Adrenal MRI

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
1. To review the utility of MR imaging in characterizing an adrenal mass lesion, including the specific information regarding a lesion that the modality provides.
2. To become familiar with a step-by-step approach to assessing adrenal cases, particularly challenging ones.

TABLE OF CONTENTS/OUTLINE
Embryologic development Normal MR appearance of adrenal glands Utility of specific imaging sequences and quantitative variables for optimal characterization of an adrenal lesion (e.g., chemical shift artifact, calculation of adrenal-to-spleen chemical shift ratio and signal-intensity index) Practical approach for assessment of an adrenal mass on imaging Examples of adrenal pathology on imaging (e.g., adrenal adenoma, metastasis, pheochromocytoma, myelolipoma, adrenocortical carcinoma, hemorrhage, pseudocyst, hemangioma) Challenging cases, with utilization of aforementioned step-by-step approach Summary
UR209-ED-X

**Essentials for Establishing a Successful MR-US Fusion Biopsy Program**

All Day Room: NA Digital Education Exhibit

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**TEACHING POINTS**
After reviewing our exhibit, the radiologist will be able to: 1. Understand practical aspects of PI-RADS v2 and SAR-AUA guidelines. 2. Examine evidence supporting the ability of prostate MRI to detect cancer and evaluate the accuracy of MR/US fusion prostate biopsy in literature. 3. Implement a prostate MRI QA program.

**TABLE OF CONTENTS/OUTLINE**
1. Review PI-RADS v2 recommendations for multiparametric MRI (mpMRI) with a focus on the technical specifications, caveats and practical aspects with examples. 2. Evaluate literature supporting the ability of prostate mpMRI to detect clinically significant prostate cancer. 3. Review SAR/AUA prostate MRI and targeted biopsy guidelines. 4. Review the level of evidence supporting the efficacy of MR/US fusion biopsy, with particular focus on device types and the differences in efficacy between targeted, random or combined biopsy. 5. Describe implementation of a quality assurance program with integrated continued medical education.
Limitations of PIRADS Version 2

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
- To highlight the limitations of PIRADS version 2 in the characterization of significant prostate cancer
- To identify false positive and negative lesions in significant cancer detection using PIRADS version 2
- To review common and uncommon MRI pitfalls for significant prostate cancer detection

TABLE OF CONTENTS/OUTLINE
1. Introduction
2. Limitations of PIRADS version 2
   2.1 False negative lesions: - Low volume or small significant tumor - Significant tumor of the peripheral zone negative on DWI - Significant tumor of the transitional zone negative on T2-weighted images
   2.2 False positive: nonneoplastic abnormalities mimicking prostate cancer - Postbiopsy hemorrhage - Stromal BPH nodule - Acute and chronic prostatitis - Postinflammatory scars - Glandular atrophy - Granulomatous prostatitis
   2.3 Pitfalls related to anatomic structures: - Central zone - Thickening of surgical capsule - Periprostatic venous plexus - Neurovascular bundles
3. Conclusions
Retroperitoneal Masses: What Are the Diagnostic Clues?

All Day Room: NA Digital Education Exhibit

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TEACHING POINTS
Of the primary retroperitoneal neoplasms, 70-80% are malignant in nature. Because of the variable treatment options, making the differential diagnoses of these masses noninvasively is expected. CT and MR imaging play an important role in the characterization and the assessment of the extent of the disease and the involvement of adjacent and distant structures. The purposes of this exhibit are: 1. To review CT and MR imaging findings of retroperitoneal masses and their pathologic correlations. 2. To highlight key differential diagnostic points of imaging findings. 3. To discuss the differential diagnoses within the spectrum of retroperitoneal masses.

TABLE OF CONTENTS/OUTLINE
1. Clinical features - epidemiology, clinical symptoms and prognosis. 2. Characteristic findings - Fat-containing tumors (lipoma, liposarcoma, teratoma, angiomyolipoma, and myelolipoma) and other solid tumors (chondrosarcoma, undifferentiated pleomorphic sarcoma, synovial cell sarcoma, schwannoma, malignant peripheral nerve sheath tumor, paraganglioma, Castleman's disease, and lymphoma). 3. Key radiologic and pathologic feature correlations which are useful in making differential diagnosis.
Current Challenges in Assessing Response in Metastatic Renal Cell Carcinoma

All Day Room: NA Digital Education Exhibit

Awards
Identified for RadioGraphics

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TEACHING POINTS
Assessing for a treatment response in metastatic renal cell carcinoma is complicated by factors intrinsic to the primary tumor, such as intratumor heterogeneity, and extrinsic to the neoplasm, including type of treatment. Understanding tumor biology and knowledge of the treatment regimen is vital in accurately interpreting follow-up imaging. Quantitative imaging may play a role in predicting outcomes and assessing treatment response.

TABLE OF CONTENTS/OUTLINE
Progress in the Diagnosis of Upper Tract Urothelial Carcinoma: Advances and Remaining Hurdles

All Day Room: NA Digital Education Exhibit

Participants

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TEACHING POINTS

We focus on progress that has been reported in the diagnosis of upper tract urothelial carcinoma. First, we review both radiological and urological guidelines. Second, we describe CT protocol and its diagnostic capability when considering the problem of exposure. Third, we introduce upper tract urothelial carcinoma staging following TNM classification (8th edition, 2017) for using CT, MR, and PET-CT. Finally, we make clear the areas where advancements have been made and where hurdles still remain. We introduce trials for dealing with these remaining challenges and set a future perspective for research.

TABLE OF CONTENTS/OUTLINE

1. Critically review various guidelines
2. CT protocols and its diagnostic capability when considering the problem of exposure
3. Staging of upper tract urothelial carcinoma using CT, MR and PET-CT
4. Matters which have been solved and problems which remain
5. Trials for the remain problem and future perspective
Sonographic, Cross-Sectional and PET Imaging in Testicular Tumors Contributing to Male Infertility

All Day Room: NA Digital Education Exhibit

Participants
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TEACHING POINTS
1. Innumerate common testicular tumors contributing to male infertility
2. Highlight frequently seen US, MDCT and MRI imaging features
3. Correlation with PET imaging

TABLE OF CONTENTS/OUTLINE
Aim/Purpose: Incidentally detected testicular solid masses are increasingly being recognized as a cause of male infertility due to utilization of ultrasound in the diagnostic workup. The purpose of this study is to illustrate the radiological spectrum for testicular masses, particularly associated with infertility.
Content Organization: Incidence of seminomatous and non-seminomatous germ cell tumors in infertile men. Incidence of sex cord stromal tumors in the same patient population. Outline the initial clinical and radiological work-up of male infertility.
- Seminoma
- Yolk Sac tumor
- Choriocarcinoma
- Teratoma
Ultrasound Evaluation of the Epididymis

All Day Room: NA Digital Education Exhibit

Awards
Certificate of Merit

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TEACHING POINTS
Review of ultrasound technique in evaluation of the scrotum. Review of normal anatomy of the epididymis. Review of benign and malignant conditions occurring in the epididymis, including etiology, clinical presentation, and imaging characteristics. Review of imaging characteristics that can be used to help differentiate benign from malignant lesions. Delineate conditions in which a definitive diagnosis can be made with ultrasound, and those which require further evaluation.

TABLE OF CONTENTS/OUTLINE
Von Hippel-Lindau (vHL) Disease: A Comprehensive Review of Genetic, Clinical and Radiological Manifestations

All Day Room: NA Digital Education Exhibit

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Faraz Farhadi, Bethesda, VA (Presenter) Nothing to Disclose
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TEACHING POINTS

- To discuss genetic and molecular basis of vHL disease
- To describe clinical aspects with emphasis on the renal manifestations as the most common cause of mortality in vHL
- To comprehensively review renal and extra-renal radiological findings associated with vHL disease
- To define disease outcomes and treatment strategies

TABLE OF CONTENTS/OUTLINE

- Pathophysiology and molecular genetics: pattern of inheritance, VHL tumor suppressor gene, HIF-1 & 2 accumulation, increased angiogenesis, cell proliferation and tumorigenesis.
- Clinical presentations: renal cysts and clear cell renal carcinomas, hemangioblastomas in the central nervous system (CNS), retinal angiomas, pheochromocytoma, etc.
- Comprehensive review of radiological findings (including renal and extra-renal): on conventional CT and MRI
- Discuss sample cases
- Outcomes and treatment: Risk of bilateral recurrent renal tumors and metastasis, treatment options including observation without intervention, nephrectomy and subsequent renal replacement therapy, and parenchymal sparing surgery.
Extra-adrenal Retroperitoneal Paragangliomas: What the Radiologist Should Know

All Day Room: NA Digital Education Exhibit

Participants
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TEACHING POINTS
Paragangliomas are rare vascular neuroendocrine tumors of paraganglia that can be seen from the skull base to the pelvic floor. Extraadrenal paragangliomas of the abdomen arise predominantly from paraganglia located in the retroperitoneum, related to the sympathetic nervous system, symmetrically distributed along the abdominal aorta. The purpose of this exhibit is to review the different locations of retroperitoneal paragangliomas as well as the usual imaging features and locations of typical and challenging atypical retroperitoneal paragangliomas on CT, MRI and functional imaging techniques through select cases of our institution.

TABLE OF CONTENTS/OUTLINE
- Introduction and clinical presentation
- Distribution of retroperitoneal paragangliomas
- Important imaging features of paragangliomas on CT, MRI and nuclear medicine exams
- Select cases of retroperitoneal paragangliomas including: paraaortic, suprarenal, infrarenal, organ of Zuckerkandl, bilateral, familial and malignant cases with pathologic correlation
- Implications of the SDH mutation on patient management and outcome
Participants
Jeffry S. Kriegshauser, MD, Phoenix, AZ (Presenter) Research support, General Electric Company

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TEACHING POINTS
The audience will become aware of how and when to perform renal stone composition and quantification studies. Guidelines for interpretation and the pertinent literature will be discussed.

TABLE OF CONTENTS/OUTLINE
I. Composition
   A. Dual energy technique
   B. Virtual non-contrast issues
   C. Uric acid versus non-uric acid
   D. Differentiating non-uric acid stone types
II. Quantification
   A. Used to follow stone burden
   B. Methods- Agatston, volumetric
   C. Report template
   D. Interpretation and Current literature review
**SSA10-01**

**Intravenous Administration of Iodixanol is Not Associated with Increased Risk of Acute Kidney Injury, Dialysis, or Mortality: A Propensity Score-Adjusted Study**

**Sunday, Nov. 26 10:45AM - 10:55AM Room: E351**

**Participants**

Harriet C. Thoeny, MD, Bern, Switzerland (Moderator) Advisory Board, Guerbet SA
Zhen J. Wang, MD, Hillsborough, CA (Moderator) Stockholder, Nextrast, Inc

**Method and Materials**

Study design and implementation for our study were overseen by our institutional review board and conformed to HIPAA guidelines on patient data integrity. All patients who received an iodixanol-enhanced (IOCM group) or noncontrast (NCCT group) CT scan from January 2003 to December 2014 were identified. Patients were subdivided into CKD Stage I-II (eGFR > 60 ml/min/1.73m²), III (eGFR 30-59 ml/min/1.73m²), and IV-V (eGFR<30 ml/min/1.73m²) subgroups and separately underwent propensity score stratification and matching. Rates of AKI, emergent dialysis, and mortality were compared between IOCM and NCCT groups. Additional analyses incorporating IV fluid administration, including additional CT scans from other sites within our institution, and a paired analysis of patients that received both IOCM and NCCT scans during the study timeframe were also performed.

**Results**

A total of 5758 patients (1538 CKD Stage I-II; 2899 CKD Stage III; 1321 CKD Stage IV-V) were included in the study. Following propensity score adjustment, rates of AKI, dialysis, and mortality were not significantly higher in the IOCM group compared to the NCCT group for all CKD subgroups (AKI ORs 0.74-0.91, p=.16-.69; dialysis ORs 0.74-2.00, p=.42-.76, mortality ORs = 0.98-1.24, p=.39-.88). Sensitivity analyses yielded similar results.

**Conclusion**

Among patients at highest perceived risk of PC-AKI, intravenous administration of iodixanol for contrast-enhanced CT was not an independent risk factor for AKI, dialysis, or mortality.

**Clinical Relevance/Application**

Among patients at highest perceived risk of PC-AKI, intravenous administration of iodixanol for contrast-enhanced CT was not an independent risk factor for AKI, dialysis, or mortality.

**SSA10-02**

**Role of Renal Doppler and Shear Wave Elastography in Diabetic Nephropathy**

**Sunday, Nov. 26 10:55AM - 11:05AM Room: E351**

**Participants**

Venkatram Krishnan, MBBS, New Delhi, India (Presenter) Nothing to Disclose
Amita Malik, MD, New Delhi, India (Abstract Co-Author) Nothing to Disclose
**PURPOSE**

Currently albuminuria is used for diagnosis of diabetic nephropathy; this has poor sensitivity and specificity, especially in its early stages. A combination of intrarenal resistive index and renal shear modulus, which indirectly measures intrarenal fibrosis, may enable its early diagnosis, as this study attempts to evaluate. There have been virtually no studies on combination of the two in diabetic nephropathy.

**METHOD AND MATERIALS**

This cross-sectional study consisted of 260 consecutive consenting subjects - 130 cases of diabetic nephropathy (diagnosis confirmed by albuminuria >30 mg/24 hrs with highly sensitive Hemo-One analyzer) and 130 healthy non-diabetic controls, who underwent grey scale ultrasound, renal acoustic radiation force impulse elastography for average shear modulus, and renal doppler for average intrarenal resistive index, of both kidneys. The eGFR for each of the subjects was calculated from the serum creatinine value using modified MDRD formula.

**RESULTS**

The mean intrarenal resistive index of the cases was found to be higher than that of the controls (0.72 vs 0.62, p<0.001). A progressive rise in resistive index was found with each stage of diabetic nephropathy, highest in stage V (mean 0.78). The mean shear modulus of cases, overall and in each stage, was also found to be higher than that of the controls (8.59 vs 4.32 kPa, p<0.001). A significant rise in shear modulus was noted in the initial stages, highest in stage II (mean 10.76 kPa). In later stages, a progressive decrease in shear modulus was observed. Maximum accuracy for diagnostic performance of resistive index was at a cut off of 0.65 (sensitivity and specificity of 90% and 76.2% respectively), while that for shear modulus was at 5.31 kPa (90.8% and 84.6%). Combined use of both in parallel gave the highest accuracy (81.7% and 96.3%). Very good interrater agreement was present between resistive index and shear modulus (κ 0.85).

**CONCLUSION**

A combination of renal doppler and renal shear wave elastography provides an excellent, simple, accurate and noninvasive tool for the early diagnosis as well as assessment of stage of diabetic nephropathy.

**CLINICAL RELEVANCE/APPLICATION**

Early diagnosis of diabetic nephropathy and adoption of multifactorial interventions with renoprotective agents for its treatment can halt or slow its progression.

**SSA10-03  Functional MRI for Quantification of Renal Perfusion Changes After Pharmacological Intervention with an Angiotensin Converting Enzyme Inhibitor**

Sunday, Nov. 26 11:05AM - 11:15AM Room: E351

Participants

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**PURPOSE**

Evaluating the applicability of arterial spin labeling (ASL) and T1 mapping to quantify the effect of pharmacological intervention with the angiotensin converting enzyme (ACE) inhibitor Captopril on kidney perfusion and T1 relaxivity of renal tissue.

**METHOD AND MATERIALS**

15 healthy adults (22-50 years) were examined with a 1.5T MRI (Siemens Avanto), twice at baseline conditions and 60 minutes after a single oral dose of 50 mg Captopril. The MRI protocol consisted of flow-alternating-inversion-recovery (FAIR) true-FISP ASL, a modified look-locker inversion recovery (MOLLI) sequence and standard morphological sequences (12 minute scan time). Mean renal perfusion and T1-relaxation times were calculated for the renal cortex. Inter-study and inter-reader reproducibility of MRI parameters were tested in addition to the pharmacological effect of Captopril on MRI parameters.

**RESULTS**

Inter-study reproducibility of ASL-based perfusion analysis was excellent with an intraclass correlation coefficient (ICC) of 0.77. Mean perfusion and T1-values did not differ between the two examinations under baseline conditions (369±48 vs. 369±39 ml/min/100g; 1116±71 vs. 1100±45 ms). Inter-rater agreement of perfusion analysis was also excellent, with an ICC of 0.97. After application of Captopril, the mean cortical kidney perfusion increased significantly by 22% (369±48 vs. 452±56 ml/min/100g, p<0.001), while cortical T1 times remained stable (1116 vs. 1161 ms). Statistical power analysis showed that only a small sample size is necessary to capture a significant change in kidney perfusion after pharmacological intervention with a high statistical power (8 volunteers for a statistical power of 95%).

**CONCLUSION**

ASL and T1 mapping provide functional MRI parameters with high inter-study and inter-rater reproducibility and are useful to measure the effect of pharmacological intervention with a low number of study participants.

**CLINICAL RELEVANCE/APPLICATION**

We show that ASL can rapidly quantify pharmacologically induced changes in kidney perfusion and believe that fMRI can be a beneficial tool to study effects on the kidney in drug development trials.

**SSA10-04  Assessment of Renal Fibrosis with T1-mapping: An Experimental Study in a Rat of Unilateral Ureteral...**

Sunday, Nov. 26 11:20AM - 11:30AM Room: E351

Participants

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**PURPOSE**

Assessment of renal fibrosis with T1-mapping: An experimental study in a rat of unilateral ureteral...
To investigate the potential of magnetic resonance imaging (MRI) T1-mapping, using a look-locker inversion recovery sequence from 3.0T clinical MR scanner, in assessment of renal fibrosis using a rat model of unilateral ureteral obstruction (UUO).

**METHOD AND MATERIALS**

This study was approved by the institutional animal care and use committee. UUO was created in each of 36 rats. UUO-A group with 6 rats, longitudinal T1-mapping was performed before the UUO (day 0) and on days 1, 3, 5, 10, and 15 after the UUO and was followed by histopathologic analysis (one rat died on 11 days after the UUO). Six rats from UUO-B group (n = 30) were examined at each of five time points on days 0, 1, 3, 5, and 10 after the UUO. Four rats from Sham group (n = 12) were examined on days 1, 5, and 15 after UUO. Hematoxylin-eosin, Masson trichrome staining and a-smooth muscle actin (a-SMA) were performed. T1 relaxation times of renal parenchyma were analyzed and correlated with a-SMA expression level.

**RESULTS**

Histopathologic examination revealed typical renal fibrosis on the side with UUO. The T1 relaxation times increased over time on the UUO side, Mean T1 relaxation times with day 0, 1, 3, 5, 10, and 15 after the UUO were 1168.41 ±76.73, 1269.94 ±91.47, 1516.37 ±103.59, 1550.41 ±115.96, 1696.57 ±85.60, 1852.46 ±137.39 ms, respectively. Sham rats were 1215.13 ±80.77, 1194.47 ±51.51, 1232.28 ±57.48 ms, respectively. Mean T1 relaxation times associated positively (r =0.854 P < 0.001) with a-SMA expression level.

**CONCLUSION**

In this model, renal fibrosis was detected with T1 mapping; the degree of fibrosis was correlated with degree of increase in T1 relaxation times measurements.

**CLINICAL RELEVANCE/APPLICATION**

T1-mapping shows great potential in noninvasive assessment of renal fibrosis induced by UUO. T1-mapping may provide a useful tool in Assessment of renal fibrosis.

**SSA10-05 Glomerular Filtration Rate: CT Measurement from Fractional Renal Accumulation of Iodinated Contrast Material**

**PURPOSE**

To present a convenient, rapid CT measurement of split glomerular filtration rate (GFR) by using nephrographic phase CT acquisition, and compare it with renal dynamic imaging Gates method.

**METHOD AND MATERIALS**

This prospective study was approved by our institutional review board. Twenty patients with renal tumors referred for multiphasic CT and the 99mTc-DTPA renal dynamic imaging for preoperative evaluation were prospectively included. The multiphasic CT consisted of non-contrast, arterial, venous, and nephrographic phase acquisition. The latter was performed at 120 seconds after the arterial phase acquisition. The amount of the iodinated CM accumulated in the kidney (CMkidney) at the nephrographic phase was calculated as Volumekidney × (HUnephrographic - HUprecontrast) / F, in which the F is the conversion factor between the iodine concentration and the CT number enhancement. The total amount of the CM administration (CMtotal) was known and could be calculated as the product of the volume of the CM injection and the iodine concentration (370mgI/ml). The fractional renal accumulation (FRA) of the iodinated CM was calculated as the ratio of the CMkidney to the CMtotal (FRA= CMkidney / CMtotal). The FRA was then correlated with 99mTc-DTPA dynamic imaging single-kidney Gates-GFR. From this correlation a formula was derived for single-kidney CT-GFR calculation, which in turn was compared with single-kidney Gates-GFR by using correlation analysis and Bland-Altman plots, with employing a leave-one-out procedure to ensure robustness of our findings.

**RESULTS**

The FRA (x) in mean ± SD was 2.97% ± 1.04%, correlated well (r=0.90, p<0.001) with single-kidney Gates-GFR (y), producing regression equation: y=1452.6*x+1.36 for single-kidney CT-GFR calculation. Single-kidney CT-GFR (44.33±15.27ml/min) correlated
well (r=0.89, p<0.001) with single-kidney Gates-GFR (44.47±16.79 ml/min). Bland-Altman plots demonstrated that the 95%CI of measurement deviation of the FRA between the two methods is ±14.82 ml/min without systemic bias (p=0.902).

CONCLUSION
A convenient, rapid CT measurement of split renal function was presented, which correlates and agrees well with the reference standard, therefore could be used as a one-stop-shop technique for preoperative evaluation of renal morphology and split function of renal tumors, without additional radiation dose.

CLINICAL RELEVANCE/APPLICATION
A convenient, rapid CT GFR measurement without additional radiation dose

SSA10-06 Renal Size Measurements on Pre- TAVR CT Angiogram as a Predictor of Post Procedure Acute Kidney Injury

Sunday, Nov. 26 11:35AM - 11:45AM Room: E351

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Lauren Wehrmann, Dallas, TX (Abstract Co-Author) Nothing to Disclose

PURPOSE
We aimed to correlate renal size measurements such as renal length, renal parenchymal area and renal cortical area on pre-TAVR CT angiogram with post procedure acute kidney injury (AKI)

METHOD AND MATERIALS
This is a single-center retrospective cohort study of 101 TAVR patients (10/2013 to 5/2016). Post-TAVR AKI was defined by Kidney Disease: Improving Global Outcomes (KDIGO) SCr-based criteria. Demographic and clinical data were extracted from medical records. Pre-TAVR CT angiograms were analyzed using an Aquarius 3D Workstation (TeraRecon, San Mateo, CA). Various measurements including renal length, renal parenchymal area and renal cortical area were evaluated by 2 independent, blinded readers from a midline sagittal image reconstructed from axial and coronal images. Univariate comparisons between patients who did and did not develop AKI were made for radiologic measurements using t-test and Chi-square test as appropriate. Multivariable logistic regression was used to assess association of renal length, renal parenchymal area and cortical area with post-TAVR AKI with adjustment for pre-procedural renal function and other clinical predictors that were significant for association in univariate analysis (p<0.05).

RESULTS
Acute kidney injury, occurred in 20 of 101 patients after TAVR. Univariate assessments of characteristics of subjects who did and did not develop post-TAVR AKI are shown in Table1. Combined renal length of both kidneys (p-value 0.023, OR= 0.715, 95% CI 0.535.0.956), combined bilateral renal parenchymal area (p-value 0.025, OR= 0.955, 95% CI 0.918, 0.994) and combined bilateral renal cortical area (p-value 0.021 OR= 0.935, 95% CI 0.880, 0.993) were smaller in patients who developed post-TAVR AKI.

CONCLUSION
Predictors of post TAVR acute kidney injury include combined renal length, renal parenchymal area and renal cortical area.

CLINICAL RELEVANCE/APPLICATION
It is important to identify imaging characteristics that are associated with increased risk of AKI and other adverse post-procedural outcomes after TAVR so that better targeted preventions and interventions can be designed to mitigate these outcomes in the peri-procedural setting

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

SSA10-07 Dual Contrast K-Edge Renal Perfusion Imaging Using Spectral Photon-Counting CT

Sunday, Nov. 26 11:45AM - 11:55AM Room: E351

Participants
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PURPOSE
To perform quantitative dynamic iodine and gadolinium renal perfusion imaging in vivo using spectral photon-counting computed tomography (SPCCT)

**METHOD AND MATERIALS**

Dynamic renal perfusion imaging was performed in 2 rabbits using SPCCT with multiple energy bins (Philips Healthcare, Haifa, Israel), with a voxel size of 0.25*0.25*0.25 mm, every 1.5 seconds over a period of 45 seconds starting after a simultaneous intravenous administration of 9 ml of gadolinium (78.5mg of Gd/ml, 3 ml/kg, Dotarem, Guerbet), and 3 ml of iodine (400 mg of I/ml, 1 ml/kg, Iomerón, Bracco). Acquisition was performed under 2 conditions: baseline and dopamine infusion. SPCCT provided conventional CT, material decomposition water/iodine and gadolinium specific K-edge images. Aortic and cortical time-attenuation curves were modeled to measure time to peak (TTP) and mean transit time (MTT) using a validated gamma variate model. Measurements of Gd K-edge and iodine perfusion were compared using Pearson correlation analysis with the reference method using conventional CT images.

**RESULTS**

SPCCT provided high resolution conventional HU, specific gadolinium K-edge and iodine material decomposition images of the cortex and the medulla (Fig A). MTT and TTP using K-edge of gadolinium and iodine material decomposition images correlated significantly with HU images with a R=0.97 and R=0.99 for MTT and R=0.86 and R=1 for TTP respectively (p<0.05)(Fig B). Thus, increase of MTT from 9.1±0.3 seconds to 10.5±0.1 seconds after dopamine infusion could be quantified on both K-edge gadolinium specific perfusion images and conventional HU Images.

**CONCLUSION**

SPCCT allows high resolution dynamic dual contrast kidney perfusion imaging and quantification with gamma variate modeling using either conventional HU, iodine and gadolinium K-edge specific imaging.

**CLINICAL RELEVANCE/APPLICATION**

Spectral photon-counting CT allows to perform renal perfusion assessment using gadolinium K-edge images, iodine images as well as conventional CT images.

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**PURPOSE**

To present a single-kidney CT-GFR measurement by using images from CT urography, and compare it with renal dynamic imaging Gates method (Gates-GFR).

**METHOD AND MATERIALS**

This prospective study was approved by our institutional review board, and written informed consent was obtained from all patients. Thirty-six patients with hydronephrosis referred for CT urography and the 99mTc-DTPA renal dynamic imaging were prospectively included after informed consent. The CT protocol included non-contrast scan, nephrographic, and excretory phase. The CT-GFR was calculated by dividing the CT number increments of the urinary system between the nephrographic and excretory phase (CTNurinary-system) by the products of iodine concentration in the aorta and the time (Productsconcentr-time), then multiplied by (1- hematocrit), which was then split into single-kidney CT-GFR and compared with single-kidney Gates-GFR by using paired t-test, correlation analysis, and Bland-Altman plots.

**RESULTS**

Paired difference between single-kidney CT-GFR (45.02 ± 13.91) and single-kidney Gates-GFR (51.21 ± 14.76) was 6.19 ± 5.63 ml/min, p<0.001, demonstrating 12.1% systematic underestimation with ±11.03 ml/min (±21.5%) measurement deviation. A good correlation was revealed between both measurements (r=0.87, p<0.001).

**CONCLUSION**

The proposed single-kidney CT-GFR correlates and agrees well with the reference standard despite a systematic underestimation (12.1%), therefore could be used as an one-stop-shop CT technique for evaluating urinary tract morphology and split renal function without additional radiation dose.

**CLINICAL RELEVANCE/APPLICATION**

The proposed technique could be used as an one-stop-shop CT technique for evaluating urinary tract morphology and split renal function without additional radiation dose.

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**SSA10-09**  
**Multiparametric MRI (mpMRI) Of Renal Transplant: Preliminary Results and Repeatability Study in Patients with Stable Renal Function**

Sunday, Nov. 26 12:05PM - 12:15PM Room: E351
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PURPOSE
To assess feasibility and test-retest repeatability of quantitative mpMRI parameters of diffusion, perfusion and hypoxia in renal transplant (Tx).

METHOD AND MATERIALS
11 patients (M/F 5/6, mean age 57y), 10 with functional renal Tx (estimated MDRD serum eGFR 48-84 ml/min/1.73m2) and 1 with chronic renal dysfunction (GFR 24.6) were prospectively enrolled. All patients underwent mpMRI at 1.5T (Aera, Siemens) including intravoxel-incoherent motion DWI (IVIM-DWI), DTI, BOLD and DCE-MRI renography with injection of 4 ml macrocyclic gadolinium agent (Dotarem). IVIM-DWI and BOLD signal curves, and DTI FA values, were measured from circular ROIs placed at the upper, middle and lower renal Tx poles. IVIM-DWI parameters (true diffusion D, pseudodiffusion D*, perfusion fraction PF and ADC) were obtained by Bayesian fitting. R2* transverse relaxation rate was obtained by monoexponential fit. Volume-averaged concentration-time curves obtained from DCE-MRI data for Cx, Med, and iliac artery were analyzed according to a previously validated three-compartment model to extract GFR, Cx and Med renal plasma flow (RPF) and mean transit time (MTT). Test-retest repeatability was assessed in 5 patients (average scan delay 24d) by coefficient of variation (CV).

RESULTS
IVIM-DWI parameters were highly repeatable (CV<5%), except for PF (CV Cx/Med 7.8%/14.6%) and D* (CV Cx/Med 32.7%/20.3%). R2* and FA had acceptable repeatability (CV<15%). DCE-MRI had acceptable repeatability for GFR (CV 12.18%), and poorer repeatability for RPF and MTT (CV 14-30%). FA Med was significantly higher compared to Cx (0.37±0.08 vs 0.18±0.06, p=0.0039). Cx RPF was significantly higher compared to Med RPF (433.3±121.6 vs 84.8±20.5 ml/min, p=0.0156). There was no significant correlation between serum eGFR and MRI parameters, between IVIM-DWI or BOLD and DCE-MRI parameters.

CONCLUSION
Quantitative mpMRI is moderately-to-highly repeatable in renal Tx. All parameter values agreed with literature values for patients with functional renal Tx, except for D* and Cx R2*, which were higher than published values.

CLINICAL RELEVANCE/APPLICATION
Knowledge of test-retest repeatability allows identification of differences in mpMRI-derived parameters that reflect intrinsic renal dysfunction rather than normal physiological variation and measurement noise. The value of mpMRI-derived metrics for characterizing renal Tx dysfunction will be investigated in a larger study.
**SSA11-01 Evaluation of Renal Lesions Using Contrast-Enhanced Ultrasound (CEUS): A 10-Year Retrospective Mono-Center Analysis**

**Participants**
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**Sub-Events**

**SSA11-01 Evaluation of Renal Lesions Using Contrast-Enhanced Ultrasound (CEUS): A 10-Year Retrospective Mono-Center Analysis**

**Participants**
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**PURPOSE**
To investigate the usefulness of contrast-enhanced ultrasound (CEUS) in the evaluation of renal masses.

**METHOD AND MATERIALS**
This institutional review board approved retrospective study included a total of 255 patients with a single renal mass with imaging studies between 2005 and 2015. Patient ages ranged from 18 to 86 with (mean age 62 years; SD ± 13). CEUS was used for determining malignancy or benignancy and initial findings were correlated with the histopathological outcome. Out of the 255 renal masses a total of 212 lesions were malignant (83.1%) and 43 were found to be benign (16.9%). Diagnostic accuracy was tested by using the histopathological diagnosis as the gold standard.

**RESULTS**
CEUS showed a sensitivity of 99.1% (95% confidence interval (CI): 96.7%, 99.9%), a specificity of 80.5% (95% CI: 65.1%, 91.2%), a positive predictive value (PPV) of 96.4% (95% CI: 93.0%, 98.4%) and a negative predictive value (NPV) of 94.3% (95% CI: 80.8%, 99.3%). Kappa for diagnostic accuracy was κ= 0.85 (95% CI: 0.75, 0.94) Out of the 212 malignant lesions a total of 130 clear cell renal carcinomas, 59 papillary renal cell carcinomas, 7 chromophobe renal cell carcinomas, 4 combined clear cell and papillary renal cell carcinomas and 12 other malignant lesions, e.g. metastases, were diagnosed. Out of the 43 benign lesions a total 10 angiomylolipomas, 3 oncocytomas, 8 benign renal cysts and 22 other benign lesions, e.g. renal adenomas, were diagnosed. 10 lesions were falsely identified as malignant or benign, whereas 8 lesions were false-positive and 2 lesions false-negative. The 8 false-positive lesions included 5 oncocytomas or angiomylolipomas and 3 Bosniak category III cystic lesions.

**CONCLUSION**
CEUS is an useful method, which can be used to differentiate between malignant and benign renal lesions. In daily clinical routine, patients with contraindications for other imaging methods can particularly benefit using this method.

**CLINICAL RELEVANCE/APPLICATION**
CEUS can be used in daily clinical routine equipollent tool for the evaluation and diagnosis of renal masses and shows an excellent correlation to the histopathological outcome. In contrast to other imaging modalities like MRI and CT it is an easy, fast and cost-effective modality for the determination of renal masses and should be considered as an alternative for routine use.

**SSA11-02 Optimizing Diffusion-Weighted Imaging of the Kidneys: Comparison between Simultaneous Multi-Slice and Integrated Slice-By-Slice Shimming Echo Planner Sequence**

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For information about this presentation, contact:
PURPOSE
To compare the image quality of diffusion-weighted imaging (DWI) of the kidneys acquired using a simultaneous multi-slice (SMS) and prototypic ss-epi sequence with integrated slice-specific dynamic shimming (iShim) at 3T. To evaluate the geometric distortion of DW images. The SNR, CNR, and ADC calculated by using five b-values (0, 80, 400, 800, and 1600s/mm^2) of the kidney were measured. Compared to iShim, the length of distortion in SMS sequence is smaller in phase direction (2.1±1.19 vs 2.87±1.70 pixel) but larger in read direction (3.12±1.04 vs 2.87±1.71 pixel). The total length of distortion in SMS sequence is significantly smaller (3.87±1.23 vs 15.20±4.98 pixel, P<0.001). The AT was substantially decreased in SMS compared to iShim DWI (3:56 vs 8:28 min). Subjective image quality scores were not statistically different between the two sequences for both reviewers (SMS vs iShim, reviewer 1: 4.36 ± 0.68 vs. 4.32 ± 0.67, reviewer 2: 4.54 ± 0.64 vs. 4.29 ± 0.81, P > 0.05). Significantly fewer artifacts were observed in SMS DWI (8 vs. 21, P < 0.001).

CONCLUSION
Compared with the iShim DWI sequence, SMS DWI substantially reduced AT, distortion and artifacts while maintaining image quality and the stability of ADC values in kidney DWI.

CLINICAL RELEVANCE/APPLICATION
By considerably reducing the AT, distortion and artifacts while preserving image quality, SMS DWI may contribute to a more efficient and safer workflow in clinical practice.

EXHIBITION ABSTRACT 
SSA11-03 Noise Matters: Correction for Imaging Parameters Improves Performance of a Gaussian-Based Adrenal Nodule Characterization Algorithm

Sunday, Nov. 26 11:05AM - 11:15AM Room: E353B

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PURPOSE
Histogram analysis (HA) of indeterminate adrenal nodules has shown good sensitivity and high specificity for differentiating adenomas from nonadenomas, but requires post-processing that can hinder workflow. A Gaussian-based algorithm (GA) based on HA without the need for post-processing demonstrated similar performance. We sought to determine if normalizing noise can improve diagnostic performance of the GA in a biopsy-enriched sample of patients with either a history of cancer or a high risk of cancer.

METHOD AND MATERIALS
IRB-approved, HIPAA-compliant retrospective study evaluated 71 adrenal nodules (41 biopsied) on non-contrast CT using the GA based on region of interest histogram analysis with and without noise correction (normalization of effective mAs and slice thickness to published data). Two independent readers were blinded to final pathology. Lesions were characterized as malignant if biopsy-proven or likely benign due to pathology or imaging features (stability >1 year, adrenal CT washout, MRI signal loss, or negative FDG PET/CT with a FDG positive primary). 66/71 patients had a history of cancer and 5 were high-risk patients. Inter-reader agreement was assessed using intraclass correlation coefficient (ICC) and Cohen's kappa. Sensitivity, specificity, and accuracy were compared between algorithms using the bootstrap.

RESULTS
Mean size of the adrenal nodules was 3.0 cm ± 2.0. 35 biopsied nodules were metastases. Of the 36 benign nodules, 6 were characterized by pathology and 30 by imaging. Inter-reader agreement was good for mean and s.d. of nodule attenuation (ICC=0.91-0.97) and identification of adenoma by both GAs (kappa=0.84-0.88). The GA with correction had significantly increased overall accuracy for adenoma than the non-corrected GA (79% vs. 64%, p=0.005), with higher specificity (87% vs. 46%, p<0.001) and a trend toward lower sensitivity (71% vs. 82%, p=0.07).

CONCLUSION
Pre-surgical characterization of renal cancer histology and grade help to decide on treatment options, e.g., radical nephrectomy, nephron-sparing surgery, ablation or, in some cases, observation. We wanted to investigate the value of CT texture analysis in differentiating clear cell renal cancer (CCRCC) from papillary renal cell cancer (PRCC) and predicting the Fuhrman grade.

METHOD AND MATERIALS

In this IRB approved study, patients with a contrast enhanced CT prior to a CT-guided adrenal biopsy between 2006 and 2014 were included. Texture analysis was performed using a commercially available research software program (TexRAD) that applies a filtration-histogram technique for characterizing tumor heterogeneity. The filtration step selectively filters and extracts texture features at different anatomical scales varying from 2mm (fine features) to 5mm (coarse features). Receiver operating characteristics (ROC) curve analysis was performed to assess sensitivity and specificity for differentiating between benign and malignant lesions.

RESULTS

Of the 124 lesions included for analyses, 43 were benign and 81 malignant. Amongst the unfiltered texture features, standard deviation, entropy and skewness were excellent discriminators of lesions demonstrating areas under the curve (AUC) greater than 0.9 (p<0.0001). Of these, entropy was the best parameter for discrimination of lesions with an AUC of 0.95 Using a threshold value of 4.42, entropy had a sensitivity and specificity of 95% and 88%, respectively, for differentiating lesions. Amongst the filtered texture features, entropy was the best discriminator of lesions with an AUC of 0.97 (p<0.0001). Using a threshold value of 4.83, the sensitivity and specificity for differentiating lesions were 81% and 100%, respectively. Mean positive pixel (MPP) was an excellent discriminator of lesions across different spatial filter sizes with AUCs ranging from 0.89 to 0.92 (p<0.0001).

CONCLUSION

Results demonstrate the effectiveness of texture analysis as a radiomic marker for characterizing incidentally noted adrenal nodules.

CLINICAL RELEVANCE/APPLICATION

The growing use of CT has led to an increase in detection of incidental adrenal lesions. Use of texture analysis to characterize such lesions may reduce the need for follow up imaging and/or invasive tissue sampling.
characteristic (ROC) analyses were created.

**RESULTS**

There was no significant difference in age, or maximum tumor diameter between the CCRCC and PRCC groups (p= 0.076 and 0.936, respectively). Entropy with medium (SSF3) and coarse filters (SSF5) were significantly higher in CCRCC than PRCC (p=0.05 for both). High Fuhrman stage (3 & 4) cancers were associated with larger tumor diameter and high entropy value with coarse filter (SSF6) (p<0.001 and p=0.001, respectively). The area under ROC curve (AUC) of entropy at SSF3 and SSF5 were 0.843 (0.782-0.905) and 0.841 (0.780-0.902), respectively, for differentiating CCRCC from PRCC. Entropy greater than 5.36 at coarse filter (SSF5) had sensitivity and specificity of 74% and 88%, respectively, for CCRCC.

**CONCLUSION**

The CTTA parameter of entropy at coarse spatial scaling filter may help to differentiate CCRCC from PRCC and to predict the Fuhrman stage.

**CLINICAL RELEVANCE/APPLICATION**

CTTA parameters may help to determine tumor biology and change management in some cases.

**SSA11-06 Progression (Upgrade) Rate of Followed Bosniak Category IIF Complex Renal Cysts**

Sunday, Nov. 26 11:35AM - 11:45AM Room: E353B

Participants
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**PURPOSE**

To evaluate progression (upgrade) rate of followed Bosniak category IIF complex renal cysts and malignancy rate on surgically resected lesions.

**METHOD AND MATERIALS**

This was an institutional review board-approved retrospective study. Imaging department database system was searched from January 1, 2008, to April 1, 2016, for Bosniak category IIF complex renal cysts found on contrast enhanced computed tomography or magnetic resonance imaging. Exclusion criteria were lesions smaller than 1.0 cm or without follow-up study. Stability of Bosniak category IIF lesions required a minimum of 6 months follow-up. Progression was considered when the follow-up study indicated upgrade of Bosniak category to III or IV. Pathologic results were evaluated in patients submitted to surgery and follow-up to look for recurrent or metastatic disease.

**RESULTS**

A total of 152 lesions (size range, 1-16 cm; average 3 cm) in 143 patients (107 men, 36 women; age-range, 31-94 years; average, 63 years) were included in the final analysis. Follow-up studies were performed from 6 to 118 months (average 28 months). Seven of 152 lesions (4.6%) progressed to Bosniak category III or IV on follow-up studies in one month to 4 years (average 20 months). Three of those were surgically removed, all of them diagnosed as malignant renal cell carcinoma (one clear cell and two papillary subtypes). Follow-up after surgery ranged from 16 to 30 months (average 24 months) and there was no evidence of recurrence or metastasis. From the remaining, one patient with Bosniak category III lesion had concomitant hepatocellular carcinoma and the renal lesion showed stability in one year-follow-up; one patient with Bosniak category IV lesion had advanced age (86 years) and the renal lesion also showed stability in one year-follow-up; and two patients lost follow-up in our institution.

**CONCLUSION**

Progression rate occurred for 4.6% of followed Bosniak category IIF lesions in one month to 4 years. All resected lesions were diagnosed as renal cell carcinomas.

**CLINICAL RELEVANCE/APPLICATION**

Although Bosniak category IIF cysts have low upgrade rate on follow-up studies, all surgically resected lesions were malignant neoplasms.

**SSA11-07 Fat Quantification of Adrenal Masses Using 3D 6-point Dixon MR Imaging: Intermodality Agreement and Interobserver Reproducibility Study**

Sunday, Nov. 26 11:45AM - 11:55AM Room: E353B

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**PURPOSE**

Three-dimensional (3D) 6-point Dixon fat fraction (DFF) techniques may enable fat quantification of adrenal masses. The purpose of this study was to assess the intermodality and interobserver agreement of fat quantification of adrenal masses obtained with 3D 6-point DFF imaging and two-dimensional (2D) dual-echo chemical shift GRE imaging (CSI).
SSA11-08
Subtype Differentiation of Small (< 4 cm) Solid Renal Mass Using Volumetric Histogram and Texture Analysis of Reduced Field-of-View Diffusion Weighted MRI at 3-T

Sunday, Nov. 26 11:55AM - 12:05PM Room: E353B

METHOD AND MATERIALS
Two radiologists independently measured fat fraction in 27 mass lesions of 19 patients with adrenal masses. The adrenal lesions included 17 adrenal adenomas, 6 ACTH-independent macronodular adrenal hyperplasias, 2 metastatic adrenal tumors, 1 pheochromocytoma, and 1 myelolipoma. The CSI and DFF MR imaging were performed with a 3.0-T MR system. Quantitative measurements of signal intensity (SI) changes between in-phase and opposed-phase images were computed as follows: SI index = (SIin-SIop)/SIin, where SIin is SI on in-phase images and SIop is SI on opposed-phase images. Quantitative measurement of DFF was automatically calculated by proton density fat fraction (PDFF) maps. They placed regions of interest (ROI) in the mass on CSI and PDFF maps. Intermodality and interobserver agreement were determined by using 95% Bland-Altman limits of agreement and intraclass correlation coefficients (ICCs).

RESULTS
The intermodality agreement for fat quantification was good on CSI and PDFF maps; ICCs ranged from 0.62 to 0.64. The 95% limits of agreement ranged from 81.6% to 84.8%. ICCs for interobserver agreement in CSI and PDFF were 0.998 and 0.982, respectively. The 95% limits of agreement were 9.6% for CSI and 9.6% for PDFF.

CONCLUSION
In fat quantification of adrenal masses, 3D 6-point DFF technique at 3T yielded measurements and reproducibility similar to those of 2D dual-echo CSI.

CLINICAL RELEVANCE/APPLICATION
For fat quantification of adrenal masses on 3T MRI, 3D 6-point DFF technique is as useful as 2D dual-echo CSI.

SSA11-09
Prospective Evaluation of CT Size and Attenuation Measurement Agreement as Applied to Tumor Response Assessment in Metastatic Renal Cell Carcinoma Patients from Phase II of the Multi-Centre STAR Trial

Sunday, Nov. 26 12:05PM - 12:15PM Room: E353B

METHOD AND MATERIALS
In this institutional review board approved study, 70 patients with renal tumors were included in this retrospectively study. Volumetric apparent diffusion coefficient (ADC) maps were generated using all slices of the r-FOV DWI to obtain histogram and texture parameters, including the mean ADC, median ADC, 10th, 25th, 75th, 90th percentiles ADC, standard deviation (SD), skewness, kurtosis and entropy. Comparisons of above parameters were used by one-way analysis of variance, Student’s t test and receiver operating characteristic (ROC) curves analysis.

RESULTS
A total of 70 pathologically proven renal tumors including 38 clear cell (ccRCC), 8 papillary (pRCC), 6 chromophobe (chRCC), 13 minimal fat angiomyolipoma (MFAML) and 5 oncocytoma (Onc) were enrolled in our analysis. The mean ADC, median ADC, 75th, 90th percentiles ADC of ccRCC was significantly higher than pRCC, chRCC, MFAML and Onc (all \( P < 0.001 \)). The SD of Onc was significantly lower than that of ccRCC and pRCC (\( P = 0.015, 0.025 \), respectively). The entropy of MFAML was significantly lower than that of ccRCC and pRCC (\( P = 0.001, 0.009 \), respectively), and entropy of Onc was significantly lower than that of ccRCC, pRCC, and chRCC (\( P = 0.001, 0.004, 0.048 \) respectively). Mean ADC, median ADC, 10th, 25th, 75th, 90th percentiles ADC, SD and entropy of malignant tumors were significantly higher (all \( P < 0.001 \)) than those of benign tumors. The 90th percentiles ADC achieved the highest AUC (0.814; 95% CI: 0.713, 0.916) in differentiating malignant renal tumors from benign ones.

CONCLUSION
Our study demonstrated the combination of r-FOV DWI and volumetric histogram and texture analysis originated from reduced field-of-view (r-FOV) diffusion-weighted (DWI) imaging for small (< 4 cm) solid renal mass subtypes at 3-T MR.

CLINICAL RELEVANCE/APPLICATION
Quantitative volumetric ADC histogram and texture analysis may have the potential to preoperatively characterize various subtypes of small solid renal tumor, including benign and malignant lesions.

SSA11-09
Prospective Evaluation of CT Size and Attenuation Measurement Agreement as Applied to Tumor Response Assessment in Metastatic Renal Cell Carcinoma Patients from Phase II of the Multi-Centre STAR Trial

Sunday, Nov. 26 12:05PM - 12:15PM Room: E353B

Participants
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PURPOSE
Response assessment in the setting of anti-angiogenic therapies is challenging due to discrepancies in tumor devascularisation versus shrinkage. Assessment of both tumor size and enhancement change may be more valid but requires robust methodology. We aimed to prospectively assess the level of observer agreement relating size and absolute versus normalised enhancement at different post-contrast phases in metastatic renal cell cancer.

METHOD AND MATERIALS
Following IRB approval and informed consent, 104 target lesions in 44 patients enrolled in a prospective multicentre phase II/III trial comparing tyrosine kinase inhibitor treatment strategies in metastatic renal cell carcinoma were measured by two radiologists at baseline and 12 week follow-up CT. Percentage change in sum of TL longest diameters and percentage change in tumor enhancement, assessed both in the arterial and portal venous phases, and with normalised values relative to aortic attenuation were noted for each observer using semi-automated commercial software. Agreement between readings was assessed by intra-class correlation coefficients (ICC) and Bland-Altman plots.

RESULTS
Excellent inter-rater agreement was seen for target SLD measurements ICC 0.93[0.88-0.96] mean difference 1.68, 95% LOA [-39.22-42.58] with good agreement for percentage size change at follow up 0.60[0.38-0.76]1.52[-31.98-35.03]. Moderate agreement was seen for absolute and normalised mean arterial enhancement values 0.42[0.13-0.65]-9.8[-102.6-83.4], 0.58[0.33-0.76]-5.2[-49.3-38.9] with good agreement for percent change respectively 0.72[0.52-0.85],-5.2[-49.3-38.9] 0.89[0.79-0.94]-0.3[-29.1-29.4]. Agreement was higher for absolute 0.78[0.62-0.88],2.9[-30.6-36.4] and normalised mean venous enhancement values 0.63[0.38-0.79], 0.04[-0.39-0.43] and percent change: 0.89[0.798-0.947]-0.33[-29.13-29.4],0.79[0.62-0.89]2.9[-38-43.8].

CONCLUSION
Excellent agreement was noted for size change with moderate to good agreement for enhancement characteristics. Normalised enhancement values improved observer agreement which was higher for the venous phase. Concordance for percentage change in normalised enhancement was good irrespective of enhancement phase.

CLINICAL RELEVANCE/APPLICATION
Good to excellent inter-observer agreement for normalised tumor enhancement values is a further step to achieving more robust response evaluation of angiogenic tumors with size and enhancement criteria.
PURPOSE

The non-natural amino acid anti-1-amino-3-18F-fluorocyclobutane-1-carboxylic acid (FACBC, Fluciclovine, Axumin) is a PET tracer approved by the U.S. Food and Drug Administration (FDA) for the detection and localization of biochemically recurrent prostate cancer. While the performance of Axumin PET/CT imaging in clinical trials is well documented, its performance in clinical practice is unknown. We aim to evaluate the positivity rate for the patients scanned with Axumin PET/CT as part of their clinical workup.

METHOD AND MATERIALS

A retrospective review of patients who underwent 18F-Fluciclovine PET/CT (Axumin) imaging at our institution secondary to suspect prostate cancer recurrence based on rising prostate specific antigen (PSA) levels, was conducted between December 2016 through March 2017. Images were interpreted by nuclear medicine board certified and Axumin expert reader physicians. Patient demographics and positivity rate were evaluated.

RESULTS

37 patients (Pts) with a median age of 68 years (range 52-83 years) and most recent mean PSA level of 2.9 ng/ml underwent Axumin imaging. For their initial treatment, 10 pts underwent radical prostatectomy (RP), 7 pts had radiation (RT), 1 pt had hormonal therapy (HT), and 19 pts had combination (12 RP+RT, 4 RP+HT, 2 T+HT, 1 RP+RT+HT). 32/37 pts (86%) had positive Axumin PET/CT scan whereas 5/37 pts (14%) were described as negative. The scan was positive within the prostate bed in 12 pts (37.5%) and extraprostatic lesions were detected in 20 pts (62.5%). In 16 pts with PSA level < 1.0 ng/ml, positivity rate was 75% (12/16). Indolent suspicious bone lesions noted in 4/37 (11%) pts. Only 2 pts had available biopsy conformation; 1 true positive in the prostate bed and 1 was metastasis to deep pelvic lymph node. 2 pts with positive bone lesions were evaluated with MRI; 1 lesion was defined as false positive with a negative MRI and one defined as true positive with positive MRI. One patient had biopsy that was true positive for a second primary cancer.

CONCLUSION

Initial experience with commercial Axumin PET/CT scan was found to demonstrate high positivity rates in patients with suspected prostate cancer recurrence.
CLINICAL RELEVANCE/APPLICATION
Positivity rate has been described in a selected population under strict clinical trials. Evaluation of the commercially scanned patients will help understand the impact of the scan in clinical practice.

SSA16-03 Correlation of Intraprostatic 68Ga-PSMA11-PET/CT Tracer Uptake with PSA, Gleason Score and d’Amico Risk Classification in Treatment-Naive Men with Newly Diagnosed Prostate Cancer

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PURPOSE
68Ga-PSMA11-PET/CT is an uprising and promising diagnostic tool for patients in recurrent prostate cancer (PCa). However, only limited in vivo data is available evaluating PSMA uptake as a primary diagnostic tool and its correlation with several clinical parameters. Our study evaluates maximal standardized uptake values (SUVmax) in benign prostate tissue and malignant, intraprostatic tumor lesions and its correlation with several clinical parameters (PSA, Gleason Score, d’Amico risk).

METHOD AND MATERIALS
104 treatment-naive men with biopsy proven prostate carcinoma were included in this study. SUVmax of intraprostatic lesions was measured as indicated by biopsy and MRI-results. Data was compared with current prostate specific antigen (PSA) values, Gleason Score (GS), ISUP-grade and d’Amico risk classification. Furthermore, we evaluated SUVmax-values in patients with clearly delineated benign intraprostatic tissue to determine a cut-off-value for tumor lesion (n = 42).

RESULTS
We measured a mean SUVmax of 1.88 ± 0.44 in benign intraprostatic tissue compared to 10.77 ± 8.45 in malignant, intraprostatic lesions (p < 0.001). A significantly higher PSMA-uptake in PSMA-PET/CT for patients with higher PSA, higher GS and higher risk according to d’Amico was observed (p< 0.001, respectively).

CONCLUSION
68Ga-PSMA11-PET/CT is well suited for the detection of dominant intraprostatic tumor lesion of patients with primary staging. Our findings from a large cohort suggest a significant relation of intraprostatic PSMA-uptake with PSA, GS and d’Amico risk classification. These findings indicate that PSMA-PET/CT could be helpful in various clinical settings, such as biopsy guidance, radiooncological management and further treatment stratification.

CLINICAL RELEVANCE/APPLICATION
68Ga-PSMA-PET/CT offers an excellent diagnostic tool for prostate cancer patients. To our knowledge, there is still limited data regarding intraprostatic tracer uptake and clinical parameters, which might be very useful for treatment planning in radiation oncology or biopsy-guidance. Therefore, we evaluated differences of SUV measurements in malignant and healthy prostate tissue and correlated SUV with Gleason Score, PSA and d’Amico risk classification in a large cohort of treatment-naive men with prostate cancer.

SSA16-04 68Ga-PSMA-11 PET/MRI in Primary Intermediate/High-Risk Prostate Cancer

Sunday, Nov. 26 11:15AM - 11:25AM Room: S505AB

Awards
Student Travel Stipend Award

Participants
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PURPOSE
Extensive investigation of 68Ga-PSMA-11 PET has shown high detection rates in men with recurrent prostate cancer after treatment. However, data is limited for evaluation (alone or as a hybrid system) at initial diagnosis. We report the diagnostic performance of 68Ga-PSMA-11 PET/MRI prior to prostatectomy in patients with intermediate or high-risk cancer.

METHOD AND MATERIALS
We recruited twenty men without metastatic disease on conventional imaging (CT or MRI and bone scintigraphy) who were scheduled for radical prostatectomy with pelvic lymph node dissection. A mean dose of 4.2 ± 0.6 mCi (155.4 ± 22.2 MBq) of 68Ga-PSMA-11 was administered. Whole-body images were acquired starting 43-61 minutes post-injection using a GE SIGNA PET/MR, followed by an additional pelvic PET/MRI acquisition (including conventional multiparametric MRI sequences) 42-67 minutes later. PET/MRI findings were compared to preoperative diagnostic MRI and correlated with final pathology.
RESULTS
Preoperative 68Ga-PSMA 11 PET identified intraprostatic cancer foci in all 20 patients, whereas mpMRI alone identified PIRADS 4 or 5 lesions in 16 patients and PIRADS 3 in two patients. PET/MRI demonstrated focal uptake in pelvic lymph nodes in three patients. Final pathology confirmed cancer in the prostate of all patients, as well as nodal metastasis in two. No patient with normal pelvic nodes on PET/MRI had cancer in the nodes on final pathology. Tracer accumulation increased overall at later acquisition times, with higher SUVs (mean: 16.6 vs 13.4, P=0.006). However, no additional lesions were identified on delayed imaging.

CONCLUSION
68Ga-PSMA-11 PET/MRI correctly identifies foci of cancer within the prostate while MRI provides detailed anatomical guidance for the location of abnormal uptake. 68Ga-PSMA-11 PET/MRI provides valuable information even in the setting of negative conventional imaging, and may inform the need for and extent of pelvic node dissection.

CLINICAL RELEVANCE/APPLICATION
68Ga-PSMA-11 PET/MRI offers incremental value over a dedicated prostate MRI and bone scan, and is recommended in the pre-operative evaluation of prostate cancer patients.

SSA16-05 Incremental Diagnostic Value of 68Ga-PSMA-HBED-CC PET Imaging over Transrectal Ultrasound-Guided Prostate Biopsy for Prostate Carcinoma

Sunday, Nov. 26 11:25AM - 11:35AM Room: S505AB

Participants
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PURPOSE
Transrectal ultrasound-guided biopsy (TRUSGB) for evaluation of prostate carcinoma (PCa) is known to be operator-dependent and subject to sampling errors, sometimes leading to delayed diagnosis and misclassification. In this study, we aim to explore whether 68Ga-PSMA PET has an incremental value over TRUSGB for evaluation of PCa.

METHOD AND MATERIALS
Our study consecutively recruited 38 patients (mean age: 66+/−6 y, range: 55-80 y) to compare their 68Ga-PSMA PET/CT findings with TRUSGB results before radical prostatectomy. SUVmax ratio of lesion to background prostatic tissue (LB ratio) were measured and assessed by receiver-operating characteristic (ROC) curve analysis to determine the cut-off LB ratio for diagnosis of prostate cancer involvement on a lobar basis. The difference in diagnostic accuracy was based on the ability of TRUSGB or PET in diagnosing presence or absence of tumor, and in correct lobar lateralization of tumor when compared with the final gold standard of prostatectomy histopathology.

RESULTS
Prostatectomy histopathology confirmed PCa in 66/76 lobes. TRUSGB detected 49/66 (74.2%). 68Ga-PSMA PET, at a cut-off LB ratio of 1.4, identified 56/66 (84.8%) PCa lobes with specificity 90% (9/10), accuracy 85.5% (65/76) and AUC 0.88. 68Ga-PSMA PET identified 5 PCa lobes in 3 patients having negative TRUSGB results, which prompted for a 2nd biopsy guided by spatial localization with 68Ga-PSMA PET and confirmed the diagnosis of PCa. In addition, 68Ga-PSMA PET/CT identified 8 patients with bilateral PCa involvement who were initially diagnosed as unilateral PCa by TRUSGB. On a lobar bases, the incremental value of 68Ga-PSMA PET over TRUSGB was significant (93.9%, 62/66 vs 74.2%, 49/66, P<0.05). On a patient basis, combined use of two techniques could detect PCa in all patients.

CONCLUSION
Combined use of 68Ga-PSMA PET/CT has an incremental value over TRUSGB alone for diagnosis of PCa. It may also provide valuable localization information for targeted biopsy sampling, especially for the patients with negative initial biopsy or those who are reluctant for biopsy.

CLINICAL RELEVANCE/APPLICATION
68Ga-PSMA PET/CT might increase the accuracy of TRUSGB by providing more accurate PCa location, thus changing the management from passive surveillance to prostatectomy.

SSA16-06 Whole-Body 18F-PSMA-1007-PET/MRI with Integrated Multiparametric Prostate Imaging Protocol for Comprehensive Staging of Patients with Prostate Cancer

Sunday, Nov. 26 11:35AM - 11:45AM Room: S505AB

Participants
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Frederik L. Giesel, MD, MBA, Heidelberg, Germany (Presenter) Patent application for F18-PSMA-1007
PURPOSE
To explore the feasibility, reproducibility and PET-artifact presence of a 18F-PSMA-1007-PET/MRI protocol for imaging high-risk prostate cancer (PC) patients.

METHOD AND MATERIALS
After 18F-PSMA-1007-PET/CT was performed (1h p.i.) as reference, eight patients with proven high-risk PC underwent a whole-body PET/MRI (3h p.i.) including a multi-parametric Pi-RADS 2.0 compliant prostate protocol using a prototype CAIPIRINHA-accelerated attenuation compensation. SUVA acceleration was performed using a 3D-isocontour volume-of-interest. PET-artifacts (Cohen’s kappa), co-registration of prostate PET/MRI (3mm shift between bladder outline in PET and MRI) and prostate MRI (Pi-RADS 2.0) were assessed.

RESULTS
The examinations were well accepted by patients and comprised 1 hour. SUVmean-VOIs between PET/CT (1h p.i.) and PET/MRI (3h p.i.) were linear (PET/CT 9.0±5.0, PET/MRI 11.4±6.1, p<0.0001 pathological VOIs and PET/CT 19.6±7.5, PET/MRI 21.8±10.4, p<0.0001 physiological VOIs) demonstrating reproducibility. Mostly slight to moderate photopenic artifacts were noticed in PET/MRI in the abdomen, surrounding liver and kidneys (kappa 0.82 (CI 0.62-1.00)) with a mean of 1.13±0.99 (reader 1) and 1.38±0.74 (reader 2). Both readers agreed to 100% that the PET-component of the PET/CT did not reveal any artifacts in head/neck and thorax. Both readers agreed to 100% that the PET-component of the PET/CT did not reveal any artifact in the four compartments defined. All acquisitions of PET and MRI of the prostate fossa obtained simultaneously could be co-registered with optimal match of bladder volume between both modalities. All patients featured Pi-RADS 5 findings.

CONCLUSION
The presented 18F-PSMA-1007-PET/MRI protocol combines efficient whole-body assessment with high-resolution co-registered PET/MRI of the prostatic fossa, clinically feasible in 1 hour. Moderate photopenic artifacts were noticed surrounding high-contrast areas liver and kidneys. This promising protocol is proposed as a comprehensive staging for patients with prostate cancer exploiting the optimal tracer biodistribution of 18F-PSMA-1007 (low bladder clearance) and the combination of T-(MRI) and N-/M-staging (PET and MRI).

CLINICAL RELEVANCE/APPLICATION
We propose an innovative 18F-PSMA-1007-PET/MRI protocol that combines molecular and functional information for comprehensive staging of prostate cancer patients.

SSA16-07  Biochemical Recurrence of Prostate Cancer: Initial Results of 18F-PSMA-1007

Sunday, Nov. 26 11:45AM - 11:55AM Room: S505AB

Participants
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PURPOSE
The clinical introduction of 68Ga-PSMA-11 relevantly improved prostate cancer imaging. However, 68Ga-labelled tracers are limited by production capacity and short half-life. 18F-labelled ligands such as DCFPyL and PSMA-1007 have been developed to solve this limitation. Additionally, in the pelvis PSMA-1007 benefits from low kidney clearance resulting in almost no urinary bladder uptake of tracer-associated activity. In this study, we analyzed the diagnostic potential of PSMA-1007 in PCa patients with biochemical recurrence (BCR).

METHOD AND MATERIALS
Seven patients (median age 72) with BCR (PSA mean = 1.78 ng/mL) underwent PET/CT-scans 1h and 3h after injection of 18F-PSMA-1007 (mean injection activity: 247 MBq). Biodistribution in normal organs as well as tumor uptake and lesion morphology (size) were examined.

RESULTS
PSMA-1007 was tolerated well in all 7 patients without any adverse events. PSMA PET/CT detected local recurrence (n=2; PSA 1.9 and 3.6 ng/mL), lymph node metastases (n=2; PSA 0.16 and 2.0 ng/mL), and bone metastases (n=1; PSA 3.8 ng/mL). In two patients suspicious PET-Positive findings were not observed (n=2; PSA 0.4 and 0.5 ng/mL). In all tumor lesions tracer uptake increased from 1h p.i. (mean SUVmax 8.4) to 3h p.i. (mean SUVmax 14.1). Histological validation of one patient with LN-metastases and response to succeeding radiotherapy confirmed true-positive findings clinically; distant metastases were not confirmed and treated with androgen-deprivation therapy. The diagnosed LN-metastases were below radiological criteria (SAD median = 5.2 mm, minimum = 3.5 mm) and focal therapy would not have been an option with conventional staging alone.

CONCLUSION
In this pilot study 18F-PSMA-1007 PET/CT presented high potential for non-invasive localization diagnostics in prostate cancer patients with BCR. Local recurrence was well delineable due to the low urine activity background in bladder and urethra and might present advantageously in comparison to other PSMA radiotracers in this setting.

CLINICAL RELEVANCE/APPLICATION
18F-PSMA-1007 performs at least comparably to 68Ga-PSMA-11, but its longer half-life, superior energy characteristics and non-uranine excretion might overcome some practical limitations of 68Ga-labelled PSMA-targeted tracers.
SSA16-08 Quantitative Multiparametric MRI and DCFBC PET/CT in Primary Prostate Cancer: Combined Association for Identification of Aggressive Disease

Sunday, Nov. 26 11:55AM - 12:05PM Room: S505AB

Participants
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PURPOSE

Multiparametric MRI (mpMRI) is often used in diagnosing prostate due to its high sensitivity, but suffers from low specificity requiring assessment of disease aggressiveness. Molecular imaging agents such as Prostate Specific Membrane Antigen (PSMA) targeting by 18F-DCFBC PET/CT have shown progress in defining aggressive cancer phenotypes. The purpose of this study is to correlate quantitative information from MRI and PET data to determine if the combination can provide better characterization of the cancer phenotype.

METHOD AND MATERIALS

Thirteen patients with localized prostate cancer underwent both mpMRI and 18F-DCFBC PET/CT scans followed by targeted TRUS/MRI guided biopsy or radical prostatectomy. Registered PET/mpMRI images were correlated with pathology. For each lesion, mean and 10th percentile ADC from mpMRI, maximum and mean standardized uptake value (SUV) from 18F-DCFBC PET/CT were calculated. ADC and SUV values were correlated on voxel-level and ROI-level using spearman's rank and each with Gleason score using kendall's tau. Ability of mpMRI and 18F-DCFBC PET metrics to predict Gleason scores >=4+3 was assessed by logistic regression, using generalized estimating equation to account for intra-patient correlation.

RESULTS

Twenty-five lesions were identified by two blinded reviewers across both modalities with sensitivity in lesion detection on mpMRI superior to 18F-DCFBC PET/CT (96% vs. 36%). Quantitative analysis was feasible in 22 lesions. SUVmax and ADC10 showed moderate correlations with Gleason scores (τ=-0.36-0.4), additionally showing a weak correlation to one another (ρ=0.26). These metrics significantly distinguished between Gleason <=3+4 (N=10) or >=4+3 (N=12) in univariate logistic regression model. In a bivariate model, higher SUVmax remained significantly associated with Gleason >=4+3 (SUVmax log-odds ratio 1.84, p=0.02; ADC10 log-odds ratio -0.512, p=0.09).

CONCLUSION

18F-DCFBC PET/CT showed poor sensitivity in detecting all malignant lesions; however, when combined with mpMRI, SUV was significantly associated with aggressive prostate cancer (Gleason >=4+3). The results of this preliminary analysis form the basis for an expanded study with immunohistochemical staining for key driver proteins.

CLINICAL RELEVANCE/APPLICATION

Identification of aggressive phenotypes is critical for understanding prostate cancer progression, correlation of multiple staging scans can provide enhanced characterization beyond either alone.

SSA16-09 177Lutetium PSMA Radioligand Therapy in Patients with Metastatic Castration Resistant Prostatic Cancers: Assessment of Response, Clinical Evaluation, Toxicity - First Study in India

Sunday, Nov. 26 12:05PM - 12:15PM Room: S505AB

Awards
Trainee Research Prize - Resident

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PURPOSE

RLT with 177-Lu-DKFZ-617-PSMA is a novel targeted therapy for mCRPC. To assess the efficacy of single infusion of 177-Lutetium-DKFZ-617-PSMA Radioligand Therapy by prostate specific antigen (PSA), biochemical, clinical and radiological responses, and early side effects.

METHOD AND MATERIALS

RLT with 177-Lu-DKFZ-617-PSMA was performed in 11 mCRPC patients. 68GaHBED-CC PET-CT was performed in all patients prior to one cycle RLT (Mean administered activity 7.03 GBq and range 6.67 - 7.4 GBq). In addition, early response was evaluated by serum PSA levels, CBC, LFT, RFT, serum electrolytes, LDH, ionised calcium prior to and followed by 2, 4, 6 and 10 weeks post therapy.

RESULTS

All lesions detected by 68Ga-HBED-CC PSMA PET-CT exhibited high 177-Lu-DKFZ-617-PSMA uptake on post therapy planar and SPECT images. 10 weeks after therapy 7 patients (63.63%) experienced PSA decline of whom 2 patients (18.18%) experienced more than 50% PSA decline and 4 patients (36.36%) experienced rise in PSA out of which 3 patient (27.27%) experienced more than 30% raise in PSA. Relevant hematotoxicity (ECOG CTC and CTCAE) i.e. grade 3 / 4 anemia in 18.18% and grade 1 / 2 in 27.27%, and grade 3 / 4 thrombocytopenia in 18.18%, and grade 1 / 2 leucopenia in 27.27% has experienced. 3 patient (27.27%) experienced deranged LFT by grade 1 / 2. One patient (9.09%) has experienced grade 1 changes in RFT. Hyponatremia grade 3 / 4 experienced in 18.18%, and grade 2 in 9.09%, hypocalcaemia grade 2 in 9.09%, and hypophosphatemia grade 1 in 9.09% of patients. There is grade 4 raise in LDL seen in 9.09% patients, grade 3 raise in ALP in 18.18% and grade 1 in 27.27% patients are seen, whereas low ionized calcium with grade 1 changes are seen in 27.27% patients. Xerostomia was experienced by 4 patients (36.36%).

CONCLUSION

177-Lu-DKFZ-617-PSMA RLT is a novel and promising treatment for mCRPC. Our initial results indicate that 177-Lu-DKFZ-617-PSMA RLT is safe, effective and have low early side effect profile. A relevant PSA decline was detected in 63.63% of patients with six month progression free survival.

CLINICAL RELEVANCE/APPLICATION

(dealing with prostate cancer) ’68Ga-HBED-CC PSMA PET-CT study demonstrate upstaging as compared to conventional FDG PET CT. All lesions detected by 68Ga-HBED-CC PSMA PET-CT exhibited high 177-Lu-DKFZ-617-PSMA uptake on post therapy planar and SPECT images. This scan and therapy is highly recommended in the management of prostate cancer.
Pilot Study of Co-registration of Pre- and Post-treatment MRI for Predicting Treatment Adequacy of Prostate Cancer Focal Therapy

**Purpose**
To evaluate the feasibility of co-registration of pre- and one-week post-treatment MRI in the setting of prostate cancer focal ablation for assessing treatment adequacy.

**Method and Materials**
Nine men with organ-confined prostate cancer who underwent 3T MRI before and one week after focal radiofrequency ablation were included; two patients underwent bilateral focal ablations. All patients underwent biopsy six months after ablation, including targeted cores of the ablation sites. MRI examinations included both standard 2D TSE axial T2WI (0.7 x 0.7 x 3.0 mm) and 3D T2WI (SPACE; 0.6 x 0.6 x 1.0 mm). For both 2D and 3D T2WI, pre-ablation T2WI and post-ablation DCE were co-registered using a landmark approach (Mimics, Materialise), allowing simultaneous visualization of the pre-treatment lesion and the one-week post-treatment ablation cavity. The pre-treatment lesion and post-treatment cavity were segmented using the co-registered image sets, and the Dice coefficient was computed to determine the extent of overlap between these. This extent of overlap was compared with the six-month follow-up biopsy results. Lesion volumes were calculated from the segmented lesion volume meshes obtained from the axial 2D T2WI and 3D T2WI and compared using the Wilcoxon test.

**Results**
Two of eleven ablation cavities were positive for tumor at six-month targeted biopsy. At an 80% threshold in terms of the extent of overlap between the pre-treatment lesion on T2WI and the one-week post-ablation treatment cavity on DCE, co-registration using pre-ablation 2D T2WI correctly predicted the biopsy outcome in four of eleven ablation sites, whereas co-registration using pre-ablation 3D T2WI correctly predicted the biopsy outcome in seven of eleven ablation sites. Lesion volumes were significantly larger using 3D T2WI than 2D T2WI (707 mm³ vs. 410 mm³, p=0.010).

**Conclusion**
We piloted a novel methodology for co-registering distinct MRI sequences between pre-treatment and one-week post-treatment examinations in patients undergoing focal radiofrequency prostate cancer ablation. The co-registration performed better in predicting six-month post-ablation targeted-biopsy results when using pre-ablation 3D, rather than 2D, T2WI.

**Clinical Relevance/Application**
An accurate method for determining which patients have complete tumor destruction immediately following prostate cancer focal therapy would help identify at-risk patients for earlier re-treatment.

Evaluation of Complex Renal Cystic Lesions with Contrast Enhanced Ultrasound (CEUS) and Functional Magnetic Resonance Imaging (MRI) versus the Gold Standard: Computer Tomography (CT)

**Participants**
Dechen W. Tshering, MBBS, MD, Bern, Switzerland (Presenter) Nothing to Disclose
Spyridon Arampatzis, Bern, Switzerland (Abstract Co-Author) Nothing to Disclose
To compare the diagnostic performance of contrast enhanced ultrasound (CEUS) and magnetic resonance imaging (MRI) with computer tomography (CT) in the classification of complex cystic renal lesions according to the Bosniak system.

This prospective observational study has been approved by the institutional ethics committee. After signing informed consent, 40 patients, 13 women and 27 men with an age range from 36-91 and a median age of 63 years were included in this study. Patients were scanned with an Acuson S3000 ultrasound scanner (Siemens) after injection of SonoVue. MRI with diffusion weighted and dynamic contrast enhanced sequences were performed in a 3Tesla MRI machine, Skyra (Siemens). CT scans were performed during routine clinical workup.

There were a total of 42 complex cystic renal lesions. The Bosniak classification of these lesions were performed separately for CT, CEUS and MRI. On CT, the lesions were classified as Bosniak I (n=1), Bosniak II (n=15), Bosniak III (n=4) and Bosniak IV (n=12). Similar evaluation on MRI resulted in Bosniak I (n=1), Bosniak II (n=18), Bosniak III (n=4), Bosniak III (n=4) and Bosniak IV (n=11) and on CEUS as Bosniak I (n=0), Bosniak II (n=2), Bosniak II (n=17), Bosniak II (n=11) and Bosniak IV (n=12). Comparing MRI and CT, the classification was the same for both in 78% (33/42), 5 lesions had a lower scoring on MRI due to poorer visualisation of calcification on MRI as compared to CT and 4 lesions were scored higher on MRI due to better visualisation of enhancing and thickened septations. The Bosniak classification of CT and CEUS was the same in only 47% (20/42). CEUS classification of the lesions was higher than CT in 47% due to higher sensitivity of CEUS for septations and enhancement. Two lesions were classified lower with CEUS (BIII) due to better visualisation of the septations which appeared more solid on CT (BIV).

Bosniak classification of complex cystic lesions on MRI correlated well with CT (78%) and MRI is a promising alternative to CT in this regard. CEUS is more sensitive to enhancement and has better spatial resolution, generally resulting in higher Bosniak grading.

To present a single-kidney CT-GFR measurement by using images from CT urography, and compare it with renal dynamic imaging Gates method (Gates-GFR).

This prospective study was approved by our institutional review board, and written informed consent was obtained from all patients. Thirty-six patients with hydronephrosis referred for CT urography and the 99mTc-DTPA renal dynamic imaging were prospectively included after informed consent. The CT protocol included non-contrast scan, nephrographic, and excretory phase. The CT-GFR was calculated by dividing the CT number increments of the urinary system between the nephrographic and excretory phase (CTNIurinary-system) by the products of iodine concentration in the aorta and the time (Productsconcentr-time), then multiplied by (1- hematocrit), which was then split into single-kidney CT-GFR and compared with single-kidney Gates-GFR by using paired t-test, correlation analysis, and Bland-Altman plots.

Paired difference between single-kidney CT-GFR (45.02 ± 13.91) and single-kidney Gates-GFR (51.21 ± 14.76) was 6.19 ± 5.63 ml/min, p<0.001, demonstrating 12.1% systematic underestimation with ±11.03 ml/min (±21.5%) measurement deviation. A good correlation was revealed between both measurements (r=0.87, p<0.001).

The proposed single-kidney CT-GFR correlates and agrees well with the reference standard despite a systematic underestimation (12.1%), therefore could be used as an one-stop-shop CT technique for evaluating urinary tract morphology and split renal function without additional radiation dose.

The proposed technique could be used as an one-stop-shop CT technique for evaluating urinary tract morphology and split renal function without additional radiation dose.
Fat Quantification of Adrenal Masses Using 3D 6-point Dixon MR Imaging: Intermodality Agreement and Interobserver Reproducibility Study

Participants
Norihiro Shinkawa, MD, Miyazaki, Japan (Presenter) Nothing to Disclose
Toshinori Hirai, MD, PhD, Miyazaki, Japan (Abstract Co-Author) Nothing to Disclose
Tomohiro Namimoto, MD, Kumamoto, Japan (Abstract Co-Author) Nothing to Disclose
Mei Shimomura, Miyazaki, Japan (Abstract Co-Author) Nothing to Disclose
Minako Azuma, Miyazaki, Japan (Abstract Co-Author) Nothing to Disclose
Yasuyuki Yamashita, MD, Kumamoto, Japan (Abstract Co-Author) Consultant, DAIICHI SANKYO Group

PURPOSE
Three-dimensional (3D) 6-point Dixon fat fraction (DFF) techniques may enable fat quantification of adrenal masses. The purpose of this study was to assess the intermodality and interobserver agreement of fat quantification of adrenal masses obtained with 3D 6-point DFF imaging and two-dimensional (2D) dual-echo chemical shift GRE imaging (CSI).

METHOD AND MATERIALS
Two radiologists independently measured fat fraction in 27 mass lesions of 19 patients with adrenal masses. The adrenal lesions included 17 adrenal adenomas, 6 ACTH-independent macronodular adrenal hyperplasias, 2 metastatic adrenal tumors, 1 pheochromocytoma, and 1 myelolipoma. The CSI and DFF MR imaging were performed with a 3.0-T MR system. Quantitative measurements of signal intensity (SI) changes between in-phase and opposed-phase images were computed as follows: SI index = (SIin-SIop)/SIin, where SIin is SI on in-phase images and Slop is SI on opposed-phase images. Quantitative measurement of DFF was automatically calculated by proton density fat fraction (PDFF) maps. They placed regions of interest (ROI) in the mass on CSI and PDFF maps. Intermodality and interobserver agreement were determined by using 95% Bland-Altman limits of agreement and intraclass correlation coefficients (ICCs).

RESULTS
The intermodality agreement for fat quantification was good on CSI and PDFF maps; ICCs ranged from 0.62 to 0.64. The 95% limits of agreement ranged from 81.6% to 84.8%. ICCs for interobserver agreement in CSI and PDFF were 0.998 and 0.982, respectively. The 95% limits of agreement were 9.6% for CSI and 9.6% for PDFF.

CONCLUSION
In fat quantification of adrenal masses, 3D 6-point DFF technique at 3T yielded measurements and reproducibility similar to those of 2D dual-echo CSI.

CLINICAL RELEVANCE/APPLICATION
For fat quantification of adrenal masses on 3T MRI, 3D 6-point DFF technique is as useful as 2D dual-echo CSI.

Imaging Evaluation of T1a (<=4cm) Renal Cell Carcinoma on Non-Contrast CT: Can You Detect Small Renal Cell Carcinoma on Screening Non-Contrast CT?

Participants
Aiko Gobara, MD, Izumo, Japan (Presenter) Nothing to Disclose
Takeshi Yoshizaka, MD, Izumo, Japan (Abstract Co-Author) Nothing to Disclose
Hisatoshi Araki, Izumo, Japan (Abstract Co-Author) Nothing to Disclose
Rika Yoshida, MD, Izumo, Japan (Abstract Co-Author) Nothing to Disclose
Shinji Ando, Izumo, Japan (Abstract Co-Author) Nothing to Disclose
Megumi Nakamura, Izumo, Japan (Abstract Co-Author) Nothing to Disclose
Hajime Kitagaki, MD, Izumo, Japan (Abstract Co-Author) Nothing to Disclose

CT Dose Reduction Strategies in CT Urography

Participants
Sung Bin Park, MD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Eun Sun Lee, MD, PhD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
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Jong Beum Lee, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
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TEACHING POINTS
1. It is critical for radiologists to understand CT dose reduction strategies and successfully optimize protocols that produce high image quality with minimal dosage. 2. Familiarity with the practical approach in CT urography will both decrease radiation dose and optimize image quality for the specific clinical indication.

TABLE OF CONTENTS/OUTLINE
Introduction - Radiation exposure is dramatic growth in CT - Approximately 50% medical radiation from CT - ALARA principle - Optimization for Scans and Reconstruction Parameters - CT radiation dose estimate - CT radiation dose affecting factor - Control Z-axis: Scan range and Phase - Lower mAs - Lowering kVp - kVp and mAs setting - Automatic Tube Current Modulation (ATCM) - Noise Reduction Technique: Iterative reconstruction Practical Approach: Decreased radiation dose and Improved image quality - Is the CT exam really necessary? Risk vs. Benefit - ALARA principle - Optimization for scans and reconstruction parameters - Dose monitoring - Educating requesting physicians and CT technicians
TEACHING POINTS

1. To understand the mechanism of image generation in strain ultrasound elastography. 2. To recognize the utility of strain ultrasound elastography in the detection of prostatic lesions. 3. To demonstrate the correlation between strain ultrasound elastography with B-mode ultrasound and magnetic resonance in the approach of prostatic lesions.

TABLE OF CONTENTS/OUTLINE

Introduction to strain elastography: general concepts and image generation The role of strain ultrasound elastography in the assessment of prostatic lesions Correlation of ultrasound elastography with other imaging modalities in the evaluation of prostatic lesions: illustrative case examples Conclusion
**PURPOSE**

To prospectively determine the incidence of Nephrogenic Systemic Fibrosis (NSF) in patients with renal impairment after administration of the macrocyclic gadolinium-based contrast agent, gadoterate meglumine (Dotarem, Guerbet, France).

**METHOD AND MATERIALS**

NSsaFe is a worldwide post-marketing study including 540 patients with moderate, severe or end stage renal impairment, scheduled to undergo a routine contrast-enhanced Magnetic Resonance Imaging (MRI) using gadoterate meglumine. Medical history, MRI indication(s) and Adverse Events (AEs) occurring during MRI examination or usual follow-up period post-contrast agent administration were recorded. Patients were followed up over 2 years with three visits separated by at least 3 months in order to detect any occurrence of NSF.

**RESULTS**

Mean age of patients was 69.6±12.7 years [min-max: 21-95] with 58.5% of male. Renal impairment was graded as moderate for 69.3% of patients, severe for 16.1% and end-stage for 12.0%; 2.6% of patients had undergone a kidney transplant. The mean (±SD) estimated Glomerular Filtration Rate was 37.6±15.7 ml/min/1.73 m² [range: 4.0-74.2]. Main MRI indication was to assess suspected abnormalities of the central nervous system (34.6%). As of 29 November 2016, 448 patients completed at least one follow-up visit: 434 patients (96.9%) attended the first follow-up visit, 365 (81.5%) attended the second, and 280 (62.5%) attended the third. No AEs considered to be related to the administration of gadoterate meglumine were reported. No cases of NSF have been observed.

**CONCLUSION**

This interim analysis confirms the excellent safety profile of gadoterate meglumine in the high-risk population of patients with renal impairment.

**CLINICAL RELEVANCE/APPLICATION**

Interim analysis of this worldwide post-marketing study shows no cases of NSF after gadoterate meglumine administration in patients with at least moderate renal impairment.
WITH JUBL approval, an enriched retrospective case-control study of <4 cm solid renal masses (63 renal cell carcinomas [RCC; clear cell N=22, papillary N=28, chromophobe N=13] and 36 benign lesions (minimal-fat [mf] angiomyolipoma [AML] N=13, oncocytoma N=23) was performed. A power analysis using incidence of benignity in <4 cm solid masses in larger surgical series of 20% [1] with alpha value 0.05 and power of 80%; yielded estimated sample size requirement of 55. Two blinded radiologists (R1/R2) retrospectively assessed T2W-MRI for: 1) angular interface sign (AIS), 2) bubble over sign (BOS), 3) percentage (%) exophytic growth and, 4) long-to-short axis ratio. Comparisons were performed between groups using ANOVA, Chi-square and multi-variate regression.

RESULTS
AIS was present in 11.1%(7/63) R1 and 9.5%(6/63) R2 RCC compared to 13.9%(5/36) R1 and 19.4%(7/36) R2 benign lesions, (p=0.68 and 0.16). BOS was present in 11.1%(7/63) R1 and 3.2%(2/63) R2 RCC compared to 16.7%(6/36) R1 and 8.3%(3/36) R2 benign lesions, (p=0.432 and 0.261). Inter-observer agreement for AIS/BOS were both poor (K=0.13 and 0.16). mf-AML (66 ± 32% [Range 0-100%]) and oncocytoma (53 ± 26% [0-90%]) both had larger % exophytic growth compared to RCC (32 ± 23% [0-80%]), (p<0.0001). No RCC had >80% exophytic growth; however, this was present in only 38.5% (5/13) mf-AML and 17.4% (4/23) oncocytomas. Long-to-short axis ratio for benign lesions did not differ compared to RCC (p=0.053).

CONCLUSION
Greater percentage of exophytic growth was associated with benign diagnoses (both mf-AML and oncocytomas) among small <4 cm solid renal masses imaged with MRI but with overlap compared to RCC. No RCC showed >80% exophytic growth in this study. Other previously described growth patterns including: angular interface sign, bubble over sign and long-to-short axis ratio assessed in this study were not useful and subjective findings had poor inter-observer agreement.

CLINICAL RELEVANCE/APPLICATION
Of four previously described growth patterns in renal masses, only >80% exophytic growth may be useful to differentiate benign from malignant renal masses. Other patterns are not useful and had poor inter-rater agreement.

GU231-SD- SUB3 Role of Periodically Rotated Overlapping Parallel Lines with Enhanced Reconstruction (PROPELLER) DWI of the Prostate in Reducing Distortion Artefact from Total Hip Replacement Metalwork

Station #3

Awards
Student Travel Stipend Award

Participants
Marcin Czarniecki, MD, Warsaw, Poland (Presenter) Nothing to Disclose
Tristan Barrett, MBBS, Cambridge, United Kingdom (Abstract Co-Author) Nothing to Disclose
Iztok Caglic, MD, Cambridge, United Kingdom (Abstract Co-Author) Nothing to Disclose

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PURPOSE
To compare image quality, artefact, and distortion in echo-planar imaging (EPI) with periodically rotated overlapping parallel lines with enhanced reconstruction (PROPELLER) diffusion-weighted imaging (DWI) in patients with previous total hip replacement (THR).

METHOD AND MATERIALS
21 male subjects (mean age 70.3 ± IQR: 6) with a clinical suspicion of prostate cancer and previous THR were scanned on a 1.5T scanner using a [16]-channel phased array pelvic coil. DWI was obtained using a single shot EP- and PROPELLER-DWI technique. Qualitative measurements were obtained according to three categories: quality, artefact, and distortion. A two-sample Wilcoxon test was used to compare the qualitative scores, and inter-reader variability was calculated using Cohen's kappa. The images were then mapped to quantify distortion by computing the distance between centroids of the T2WI and DWI outlines. The resultant mean distortions were then compared using a sample t-test.

RESULTS
21 patients were included in the study, with an average age of 70.4 years and PSA 9.2ng/mL. The indications for MRI were either primary detection (n=6), staging (n=3) or active surveillance (n=12). Hip metalwork was present bilaterally in 3 patients, left-sided in 9, and right-sided in 9. PROPPELLER-DWI improved image quality (p=0.002), decreased artefact (p=0.18) and distortion (p<0.004) when compared to standard EP-DWI in the qualitative assessment. There was further improved image artefact in a subset of 5 patients undergoing PROPPELLER imaging without fat saturation (p<0.03), with good agreement between readers. Resultant computed distortion from standard T2 images was shown to be significantly lowered by using PROPPELLER with fat saturation (p<0.000003) and without fat saturation (p<0.002).

CONCLUSION
PROPPELLER-DWI is a promising alternative sequence to use in patients following THR, which demonstrates better image quality, decreasing the number of artefacts and distortion when compared to conventional echo planar sequences.

CLINICAL RELEVANCE/APPLICATION
An ageing population is leading to an increased incidence of prostate cancer patients following THR, which causes severe image distortion and artefact in pelvic MRI. Scanning of this patient cohort with the proposed method will decrease image artefact.

GU232-SD- SUB4 MRI-Based High Spatial Resolution Single Renal Oxygenation Imaging for Early Evaluation of Acute Kidney Injury

Station #4

Participants
Chengyan Wang, PhD, Beijing, China (Presenter) Nothing to Disclose
X-ray phase-contrast tomography (PC-CT) is an emerging imaging modality that has the potential to improve diagnostic accuracy. We evaluated the potential of grating-based PC-CT for visualization and differentiation of benign renal lesions such as low- and high-fat containing angiomyolipomas and oncocytomas from renal cell carcinomas.

METHOD AND MATERIALS

Eight New Zealand White rabbits (7–8 weeks, 2.5–3.5 kg) were included in the AKI study. A total of 5000 microspheres (acryl beads, 40 to 120 μm in diameter) were injected slowly into the ostium of the right renal artery under the guidance of digital subtraction angiography (DSA). MRI scans were conducted within one hour after the surgery. MRI scans were carried out on a 3.0 Tesla Philips Achieva MR scanner (Philips Medical Systems, Netherlands). T2-weighted images and diffusion-weighted (DW) images (b values of 0 and 1000 s/mm2) were acquired in the coronal plane. A targeted field-of-view asymmetric spin-echo (ASE) sequence, which is sensitive to the tissue oxygenation, was implemented for imaging. Scan parameters were: FOV = 65 × 110 mm2, matrix size = 80 × 75, TR = 2000 ms, TE1/TE2/TE3 = 60/93/121 ms, slice thickness = 5 mm. Blood samples were collected a day before, and once a week after surgery within a month. Four weeks after surgery, all the animals were sacrificed, and the kidneys were removed and embedded in paraffin for further histological examination.

RESULTS

Figure 1 demonstrated a representative case of ischemia-induced AKI. The AKI kidney showed the ischemic region with increased renal OEF, which was less obvious in both DW and T2w images within an hour after surgery. After 4 weeks, T2w image showed renal damage in the corresponding area. In all rabbits, renal OEF increased significantly from 0.35 ± 0.07 to 0.47 ± 0.07 after surgery (P < 0.01), which indicated the hypoxia condition of the AKI kidney. Significantly increased serum creatine was found the second day after surgery. Pathological findings showed that the glomeruli was ischemic with dilated change of Bowman’s capsule; vacuole degeneration and patchy necrosis of the renal tubular epithelial cells with cellular debris in tubular were observed; basement membrane was exposed; and interstitial showed edema.

CONCLUSION

This study demonstrates the feasibility of applying an MRI based oxygenation imaging to evaluate single renal ischemia in an AKI animal model.

CLINICAL RELEVANCE/APPLICATION

MRI based oxygenation imaging offers the capability to evaluate renal ischemia noninvasively, which could serve as an important biomarker for early prediction of renal damage after AKI.

X-Ray Phase-Contrast CT: A New Tool for Differentiation of Benign Lesions from Renal Cell Carcinomas

PURPOSE

To investigate the feasibility of using high spatial resolution single renal oxygenation imaging for early evaluation of ischemia-induced acute kidney injury (AKI).

METHOD AND MATERIALS

A laboratory setup with a conventional x-ray source was used to acquire conventional x-ray transmission and phase-contrast tomographies of 29 ex-vivo formalin-fixed kidney specimens at 40 kVp, containing 8 clear cell carcinomas (ccRCC), 7 papillary (pRCCs) and 5 chromophobe RCCs (chrRCC), 3 low-fat angiomyolipomas (AMLs), 2 high-fat AMLs and 4 oncocytomas. Three healthy kidneys were scanned for reference. Median conventional (HU) and phase contrast Hounsfield units (HUp) ± standard deviation for other renal cell carcinomas (p<0.05) (ccRCC: 45 ± 7.6 HUp, pRCC: 43 ± 6 HUp and chrRCC: 39 ± 7 HUp). High-fat angiomyolipomas (<40 ± 17 HUp) showed a very low PC signal and could be also clearly discriminated from renal cell carcinomas. Oncocytomas had a heterogenous appearance without the possibility to qualitatively or quantitatively differentiate from renal cell carcinomas in PC-CT and conventional CT.
CONCLUSION
Grating-based x-ray phase-contrast CT has the potential for non-invasive differentiation of benign lesions like low-fat AMLs from renal cell carcinomas.

CLINICAL RELEVANCE/APPLICATION
This new modality can be already implemented for improved histological sample evaluation and with further technical developments this laboratory-based approach holds potential for translation into clinical application.

UR102-ED-SUB6  Sonographic, MDCT and MRI Imaging of Renal Infection: Pathophysiology, Early Detection, Complications and Atypical Variants

Participants
Bashir Hakim, MD, Detroit, MI (Presenter) Nothing to Disclose
Matthew C. Rheinboldt, MD, Detroit, MI (Abstract Co-Author) Nothing to Disclose

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TEACHING POINTS

TEACHING POINTS
Though, uncomplicated lower urinary tract infection are typically diagnosed by clinical presentation and laboratory findings, cross-sectional imaging is indicated in the setting of persistent fever or recurrence, suspected obstruction or upper tract involvement and in immunocompromised cases. MDCT is the primary modality utilized and familiar with the features of early ascending infection as well as the gnat of findings seen in the setting of complicated and atypical cases including emphysematous infection, liquefactive necrosis, thrombophlebitis, xanthogranulomatous pyelonephritis, fungal and tubercular infection will allow for timely diagnosis and expeditious care. Sonography with the use of spectral and power Doppler interrogation has proven validity in the pediatric setting as well as within pregnant patients and for bedside evaluation in the critical care setting.

TABLE OF CONTENTS/OUTLINE
Introduction Pathophysiology clinical features Sonography grey scale Doppler features metrics vs CT/MRI MDCT early findings xanthogranulomatous infection Atypical infection fungal tuberculosis Differential diagnosis Conclusion

UR163-ED-SUB7  Complexity R.E.N.A.L. Nephrometry in Kidney Tumors: Ready? Score it!

Participants
Maria Augusta Serrano Cueva, MD, Distrito Federal, Mexico (Presenter) Nothing to Disclose
David Butron Hernandez, MD, Mexico City, Mexico (Abstract Co-Author) Nothing to Disclose
Ericka M. Leon, MD, DF, Mexico (Abstract Co-Author) Nothing to Disclose
Carlos Casian Ruiz Velasco, MD, Distrito Federal, Mexico (Abstract Co-Author) Nothing to Disclose
Ricardo Martinez Martinez, MD, Mexico City, Mexico (Abstract Co-Author) Nothing to Disclose
Yukiyoshi Kimura, MD, Mexico City, Mexico (Abstract Co-Author) Nothing to Disclose
Eva A. Izquierdo Echavarrí, MD, Mexico City, Mexico (Abstract Co-Author) Nothing to Disclose

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TEACHING POINTS
The purpose of this exhibition is to challenge colleagues to participate in a fun but enriching quiz to score different interesting cases of kidney tumors using the Complexing R.E.N.A.L nephrometry.

TABLE OF CONTENTS/OUTLINE

R.E.N.A.L Nephrometry Scoring System Several cases with the main imaging features of renal cancer will be presented in a quiz format to implement the score in mention. Scenarios will include special cases where the application of the score is not so simple. After finishing each case, key points and feedback will be highlighted.

UR204-ED-SUB8  The Value of Ultrasonography in Evaluating Stent Placement of Atherosclerotic Renal Artery Stenosis

Participants
Xueying Lin, MD, Fuzhou, China (Presenter) Nothing to Disclose
Qian Li, MD, PhD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Long Yang, MBBS, Zhengzhou, China (Abstract Co-Author) Nothing to Disclose
Anthony E. Samir, MD, Boston, MA (Abstract Co-Author) Consultant, Pfizer Inc; Consultant, General Electric Company; Consultant, PAREXEL International Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Siemens AG; Research Grant, Toshiba Medical Systems Corporation; Research Grant, General Electric Company; Research Grant, Samsung Electronics Co, Ltd; Research Grant, Analogic Corporation; Research support, SuperSonic Imagine; Research support, Hitachi, Ltd

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TEACHING POINTS
1. Show the reader the challenges of ultrasonography (US) in management of percutaneous transluminal renal angioplasty with stent placement (PTRAS) in patients with atherosclerotic renal artery stenosis (ARAS). 2. Review the value of US in each stage of PTRAS, including pre-, intra-, and post-stenting. 3. Bring the reader up-to-date value of US in PTRAS.
TABLE OF CONTENTS/OUTLINE

1. Brief Introduction of the epidemiology of ARAS, and overview of the status of multiple imaging modalities in evaluating PTRAS.
2. Detailed description of the value of US in different stages of PTRAS:
   - Pre-stenting: diagnose the stenosis severity and predict the stenting treatment response.
   - Intra-stenting: intravascular ultrasonography (IVUS) evaluates atherosclerotic plaque, provides precise measurement and position of lesion. IVUS confirms stent expansion, residual stenosis, stent apposition, and arterial dissection, then determines the need for additional intervention.
   - Post-stenting: assess restenosis after renal artery stenting. Follow up the treatment response. Predict restenosis after PTRAS.
3. Summarize the up-to-date ultrasound value in evaluating stent placement of ARAS.
Interventional Oncology Series: Lung, Kidney and Bone

Sunday, Nov. 26 1:30PM - 6:00PM Room: S405AB

AMA PRA Category 1 Credits ™: 4.00
ARRT Category A+ Credits: 4.75

FDA
Discussions may include off-label uses.

Participants
Christos S. Georgiades, MD, PhD, Baltimore, MD (Moderator) Consultant, Boston Scientific Corporation; Consultant, Galil Medical Ltd
Sean M. Tutton, MD, Milwaukee, WI (Moderator) Medical Director, Benvenue Medical, Inc; Consultant, Benvenue Medical, Inc; Researcher, Siemens AG; Consultant, BTG International Ltd

LEARNING OBJECTIVES
1) To show attendees the possible complications related to percutaneous ablation for Lung, Kidney and Bone tumors. 2) To present pre-ablation maneuvers that mitigate those risks. 3) To describe treatments/interventions that minimize the impact of those complications, once they occur.

Sub-Events

**VSIO11-01** Keynote and Series Opening: Interventional Oncology - Where We Stand and Where We Go

Saturday, Nov. 26 1:30PM - 2:00PM Room: S405AB

Participants
Stephen B. Solomon, MD, New York, NY (Presenter) Research Grant, General Electric Company

LEARNING OBJECTIVES
View Learning Objectives under main course title

**VSIO11-02** Evidence-Based Lung Cancer Ablation

Saturday, Nov. 26 2:00PM - 2:20PM Room: S405AB

Participants
Terrance T. Healey, MD, Providence, RI (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
View Learning Objectives under main course title

**VSIO11-03** Complications of Lung Cancer Ablation: Prevention & Treatment

Saturday, Nov. 26 2:20PM - 2:35PM Room: S405AB

Participants
Samdeep Mouli, MD, Chicago, IL (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
View Learning Objectives under main course title

**VSIO11-04** Histological Subtype as a Predictor of Localized Recurrence after Thermal Ablation of Lung Adenocarcinoma

Saturday, Nov. 26 2:35PM - 2:45PM Room: S405AB

Awards
Student Travel Stipend Award

Participants
Seth Stein, MD, New York, NY (Presenter) Nothing to Disclose
Song Gao, New York, NY (Abstract Co-Author) Nothing to Disclose
Waleed M. Shady, MBBCh, New York, NY (Abstract Co-Author) Nothing to Disclose
Elena N. Petre, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Jeremy C. Durack, MD, New York, NY (Abstract Co-Author) Scientific Advisory Board, Adient Medical Inc; Investor, Adient Medical Inc;
Carole A. Ridge, MD, Dublin 7, Ireland (Abstract Co-Author) Nothing to Disclose
Prasad Adusumilli, New York City, NY (Abstract Co-Author) Nothing to Disclose
Stephen B. Solomon, MD, New York, NY (Abstract Co-Author) Research Grant, General Electric Company
Etay Ziv, MD, PhD, New York, NY (Abstract Co-Author) Nothing to Disclose
PURPOSE
To investigate whether histologic subtyping from biopsies can predict local recurrence after thermal ablation for lung adenocarcinoma.

METHOD AND MATERIALS
Patients treated with percutaneous thermal ablation for lung adenocarcinoma that had pre-ablation needle biopsy with analysis of histological components were identified. Age, gender, smoking status, treatment indication (primary stage 1 tumor versus salvage), histologic subtype, ground glass radiographic appearance, tumor size, ablation modality, and ablation margin were evaluated in relation to time to local recurrence (TTLR). Cumulative incidence of recurrence (CIR) was calculated using competing risks analysis and compared across groups using Fine and Grey method with clustering. Multivariate analysis was conducted with stepwise regression.

RESULTS
There were 45 patients with 49 lesions diagnosed as adenocarcinoma on pre-ablation biopsy and with histologic subtype analysis. Of these, 22% (11) had micropapillary components, 14% (7) had solid components, and 37% (18) had high grade components (defined as presence of micropapillary, solid, mucinous, and/or cribiform components). In the univariate analysis, solid (subdistribution hazard ratio [SHR]=4.63, p=0.005, 95% confidence interval [CI]=1.56-12.5), and high grade (SHR=14.5, 95% CI=3.21-65.3) were significantly correlated with shorter TTLR. On multivariate analysis, high grade (SHR 14.5, 95% CI: 3.22-65.3, p=0.0005) was the only independent predictor TTLR. The 1, 2, and 3-year CIR in patients with high grade tumors was 29%, 45%, and 62% compared to 0%, 8% and 8% in patients with non-high grade tumors.

CONCLUSION
High grade histological components identified in pre-ablation biopsy are associated with shorter TTLR thermal ablation of lung adenocarcinoma.

CLINICAL RELEVANCE/APPLICATION
This study supports the utility of biopsy for histologic subtype as a prognostic indicator of faster local recurrence prior to lung ablation.

VSI011-05  Evidence Base for Kidney Cancer Ablation

Participants
David J. Breen, MD, Southampton, United Kingdom (Presenter) Proctor, BTG International Ltd; Proctor, Galil Medical Ltd; Proctor, Johnson&Johnson; Proctor, NeuWave Medical, Inc

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LEARNING OBJECTIVES
1. To appreciate the unique tumour biology and behavior of T1 a and b renal cancer and how this influences the outcome data.
2. To understand the relative merits and limitations of traditional, standard of care renal surgery and how partial, laparoscopic and robotic partial nephrectomy impinge influence the debate.
3. To gain insight into the relative merits and limitations of renal radiofrequency and cryoablation.
4. To appreciate the current standing of the evidence for image-guided ablation of both T1a and T1b renal tumours.
5. To understand how traditional cancer outcome metrics can be problematic in T1 renal cancer and how costs and complications also play a central role in the evidence for smaller renal cancer ablation.

LEARNING OBJECTIVES
1) To appreciate the natural history and epidemiology of T1 renal cell carcinoma (RCC) and how this impinges on the currently available oncolgical outcome data for image-guided ablation of RCC.
2) To clarify frailties of the currently available outcome data on RCC ablation.
3) To outline the currently available evidence base for renal tumour ablation, including the relative merits of radiofrequency versus cryoablation.
4) To understand how the evidence base might be forthcoming and underpinned by analysis of relative complications and cost-effectiveness incurred by surgical resection.

VSI011-06  Complications of Kidney Cancer Ablation: Prevention & Treatment

Participants
Kelvin K. Hong, MD, Baltimore, MD (Presenter) Scientific Advisory Board, Boston Scientific Corporation; Scientific Advisory Board, BTG International Ltd; Research support, Merit Medical Systems, Inc;

LEARNING OBJECTIVES
The participant will be exposed to common complications related to percutaneous renal ablation, and the participant will be introduced to strategies to recognize and mitigate/correct them.

LEARNING OBJECTIVES
View Learning Objectives under main course title

VSI011-07  3D Quantitative Imaging Biomarkers as Predictors for Systemic Disease Progression in Patients with Renal Cell Carcinoma Undergoing Ablation

Participants
Cementoplasty for Malignant Bone Lesions

Sunday, Nov. 26 4:05PM - 4:20PM Room: S405AB

Participants
Alexios Kelekis, MD, PhD, Athens, Greece (Presenter) Speaker, Toshiba Medical Systems Corporation

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LEARNING OBJECTIVES
1) To understand the complex anatomy related to treating by cementoplasty. 2) To distinguish the different types of malignant lesions and decide appropriate treatment. 3) To show technical approaches for the spine and peripheral skeleton. 4) To manage treatment and have appropriate strategy according to the malignant lesion at hand. 5) To learn how to manage complications.

ABSTRACT
Nearly 60% of oncologic patients will develop osseous metastasis with bone pain. A significant number of patients have intractable pain, unresponsive to medical treatment that will need complementary therapy. External beam radiation is part of the initial approach, but not always effective in providing complete or durable pain relief. It is also associated with neural damage and osteonecrosis of the irradiated area. In order to provide a more long-term and sustainable treatment, percutaneous approaches may lead to a more precise, personalized patient surveillance post ablation.

The enhancing tumor volume is a readily available imaging biomarker with a strong predictive value for therapeutic outcomes and may lead to a more precise, personalized patient surveillance post ablation.

RESULTS
Time to extra-renal metastases: While no significant difference was observed with stratification of the cohort according to TNM stage, R.E.N.A.L. score and tumor diameter, the stratification according to tumor volume and enhancing tumor volume of >= 5 cm3 versus < 5 cm3 resulted in a statistically significant stratification (p = 0.022 and p = 0.016, respectively) with an Odds ratio of 6.69 (95% CI, 0.33-134.4) and 8.48 (95% CI, 0.42-170.1). PFS: None of the conventional measures achieved significant separation of the survival curves. Only when stratified by enhancing tumor volume, did the survival differ significantly (p = 0.039) in both groups with an Odds Ratio of 2.25 (95% CI, 0.54-9.35) for patients with an enhancing tumor volume >= 5 cm3 versus < 5 cm3. Median PFS was 49.3 months (95% CI, 28.9-69.7) in the group with high enhancing tumor volume versus 68.2 months (95% CI, 53.8-82.7) in patient with lower enhancing tumor volume.

CONCLUSION
Quantification of enhancing tumor volume on baseline imaging demonstrated superiority over all other assessment techniques and can be used as a prognostic imaging biomarker for the development of extra-renal metastases and as an early surrogate for expected PFS in patients with RCC.

CLINICAL RELEVANCE/APPLICATION
The enhancing tumor volume is a readily available imaging biomarker with a strong predictive value for therapeutic outcomes and may lead to a more precise, personalized patient surveillance post ablation.

VSIO11-08 Bone Ablation: Technique & Outcomes

Sunday, Nov. 26 3:45PM - 4:05PM Room: S405AB

Participants
Anil N. Kurup, MD, Rochester, MN (Presenter) Research Grant, Gall Medical Ltd Royalties, UpToDate, Inc

LEARNING OBJECTIVES
View Learning Objectives under main course title
myeloma and lymphoma. Percutaneous cementoplasty is a term referring to the injection of substrates inside bone; usually polymers which pass from a liquid, injectable state, to a solid state. During the liquid phase the injection is being performed. The injectates have the advantage to stabilize the lytic lesion and at the same time provide a loco regional effect. Additionally they can be combined with other materials (metal or plastic) for structural support, as well as other treatments such as ablation or embolization, to enhance the loco-regional tumor effect. Nowadays, cementoplasty can be performed in most osseous sites, including spine, pelvis and long bones, using a variation of techniques and approaches. Imaging guidance is also very important. Correct alignment and image projection defines the approach and the delivery. Assessing imaging, recognizing vital structures, as well as technical and imaging skills in order to access the lesion, is part of the knowledge needed. Finally, the treatment goal should be related to the patient lesion type and survival probability. One should define whether treatment is associated with purely palliative or loco-regional tumor control. The choice will orientate the treatment strategy.

**VSIO11-10 Imaging Optimization by Twin-Beam Dual Energy Computed Tomography to Improve Visualization of Therapeutic Ice Ball Margins During Cryoablation of Musculoskeletal Malignancies**

Sunday, Nov. 26 4:20PM - 4:30PM Room: S405AB

Participants

Steven Yevich, MD, MPH, Houston, TX (Presenter) Nothing to Disclose
Gouthami Chintalapani, Hoffman Estates, IL (Abstract Co-Author) Nothing to Disclose
Rahul A. Sheth, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Steven Y. Huang, MD, Houston, TX (Abstract Co-Author) Scientific Advisory Board, Adient Medical Inc
Sharjeel Sabir, MD, Houston, TX (Abstract Co-Author) Travel support, Merit Medical Systems, Inc; Travel support, Boston Scientific Corporation; Travel support, NeuWave Medical, Inc
Alda L. Tam, MD, Houston, TX (Abstract Co-Author) Medical Monitor, Gallil Medical Ltd; Research Grant, AngioDynamics, Inc;

**PURPOSE**

To evaluate the applicability of twin-beam dual energy computed tomography (DECT) for improved assessment of therapeutic ice ball ablation margins during cryoablation of musculoskeletal malignancies.

**METHOD AND MATERIALS**

Twin beam DECT was acquired for 5 initial patients in a new ongoing initiative during cryoablation of musculoskeletal malignancies as a radiation dose neutral alternative to standard CT acquisition. All ablated masses were located in close proximity to bone (within 1 cm) or originated within bone, with or without extra-ossseous soft tissue extension. The original 120kV X-ray beam was pre-filtered into two X-ray spectra using gold (Au) and tin (Sn) filters. Specific post processing was applied to generate a spectrum of monochromatic images ranging from 40KeV to 190KeV. These images were manipulated to identify the appropriate kV that best characterized the margins of the therapeutic ice ball in order to assist the interventional radiologist in clinical assessment of lesional coverage.

**RESULTS**

Ability to quickly manipulate the post-processed monochromatic images along the 40-190 KeV spectrum allowed improved visualization of ice ball margins for musculoskeletal malignancies. The interface between ice ball and soft tissue was best depicted on the lower end of the energy spectrum of approximately 60-70KeV. In the immediate proximity to metallic needle artifacts or dense bony structure, a high energy spectrum of approximately 90-120KeV improved the ice ball margin visualization.

**CONCLUSION**

Early evaluation in this ongoing trial suggests a clinic advantage to dual energy CT with monochromatic spectral analysis to improve identification of the cryoablation ice ball margins and overcome substantial visibility challenges caused by relative density variability in musculoskeletal tissues and metallic needle artifacts.

**CLINICAL RELEVANCE/APPLICATION**

Substantial challenges are present when performing cryoablation musculoskeletal malignancy as ice ball margins prove difficult to visualize due to the high variability in relative density of the muscle, fat, and bone. In addition, metallic needle artifact from cryoablation probes also leads to ice ball margin obscuration. Twin beam dual energy CT may provide a real clinical advantage as a dose neutral post-processing application to assist the interventionalist in therapeutic decision making during cryoablation.

**VSIO11-11 Advantages of RFA vs MW vs CRYO: Physics Based Approach**

Sunday, Nov. 26 4:30PM - 4:45PM Room: S405AB

Participants

Matthew R. Callstrom, MD, PhD, Rochester, MN (Presenter) Research Grant, EDDA Technology, Inc; Research Grant, Gallil Medical Ltd; Consultant, Medtronic plc; Consultant, Endocare, Inc; Consultant, Johnson and Johnson; Consultant, Themedical, Inc;

For information about this presentation, contact:
callstrom.matthew@mayo.edu

**LEARNING OBJECTIVES**

After attending this lecture, the attendee should be able to describe the characteristics of different ablation systems. After attending this lecture, the attendee should be able to describe how different ablation systems can be applied to the treatment of tumors. After attending this lecture, the attendee should be able to describe unique advantages of different ablation systems for specific interventional oncology applications.

**VSIO11-12 Tumor Boards: Techniques and Challenging Cases in Lung, Kidney and Bone**

Sunday, Nov. 26 5:00PM - 6:00PM Room: S405AB
Participants
Debra A. Gervais, MD, Boston, MA (Presenter) Nothing to Disclose
Terrance T. Healey, MD, Providence, RI (Presenter) Nothing to Disclose
Samdeep Mouli, MD, Chicago, IL (Presenter) Nothing to Disclose
Muneeb Ahmed, MD, Wellesley, MA (Presenter) Research Grant, General Electric Company; Stockholder, Agile Devices, Inc;
Scientific Advisory Board, Agile Devices, Inc
David J. Breen, MD, Southampton, United Kingdom (Presenter) Proctor, BTG International Ltd; Proctor, Galil Medical Ltd; Proctor, Johnson & Johnson; Proctor, NeuWave Medical, Inc
Kelvin K. Hong, MD, Baltimore, MD (Presenter) Scientific Advisory Board, Boston Scientific Corporation; Scientific Advisory Board, BTG International Ltd; Research support, Merit Medical Systems, Inc;
Christos S. Georgiades, MD, PhD, Baltimore, MD (Presenter) Consultant, Boston Scientific Corporation; Consultant, Galil Medical Ltd
Anil N. Kurup, MD, Rochester, MN (Presenter) Research Grant, Galil Medical Ltd Royalties, UpToDate, Inc
Alexios Kelekis, MD, PhD, Athens, Greece (Presenter) Speaker, Toshiba Medical Systems Corporation
Matthew R. Callstrom, MD, PhD, Rochester, MN (Presenter) Research Grant, EDDA Technology, Inc; Research Grant, Galil Medical Ltd; Consultant, Medtronic plc; Consultant, Endocare, Inc; Consultant, Johnson and Johnson; Consultant, Thermedical, Inc;
Sean M. Tutton, MD, Milwaukee, WI (Presenter) Medical Director, Benvenue Medical, Inc; Consultant, Benvenue Medical, Inc;
Researcher, Siemens AG; Consultant, BTG International Ltd

LEARNING OBJECTIVES
1. To recognize some of the rare complications associated with percutaneous ablation
2. To learn mitigate maneuvers that minimize the risks of such complications
3. To learn how to address these complications should they occur

LEARNING OBJECTIVES

View Learning Objectives under main course title

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at:
https://www.rsna.org/Honored-Educator-Award/ Debra A. Gervais, MD - 2012 Honored Educator
RC107

**Imaging-based Diagnosis and Management of Urolithiasis (An Interactive Session)**

**Sunday, Nov. 26 2:00PM - 3:30PM Room: N228**

**GU**

**AMA PRA Category 1 Credits ™: 1.50**

**ARRT Category A+ Credit: 1.75**

**Participants**

Dushyant V. Sahani, MD, Boston, MA (Coordinator) Research support, General Electric Company; Medical Advisory Board, Allena Pharmaceuticals, Inc

Dushyant V. Sahani, MD, Boston, MA (Moderator) Research support, General Electric Company; Medical Advisory Board, Allena Pharmaceuticals, Inc

Brian H. Eisner, MD, Boston, MA (Presenter) Consultant, Boston Scientific Corporation; Consultant, Retrophin, Inc; Consultant, Allena Pharmaceuticals, Inc; Consultant, Kalera Medical, Inc; Consultant, SonoMotion, Inc; Consultant, Olympus Corporation; Consultant, C. R. Bard, Inc; Owner, Ravine Group

Jennifer W. Uyeda, MD, Boston, MA (Presenter) Nothing to Disclose

Dushyant V. Sahani, MD, Boston, MA (Presenter) Research support, General Electric Company; Medical Advisory Board, Allena Pharmaceuticals, Inc

Myles T. Taffel, MD, Washington, DC (Presenter) Nothing to Disclose

For information about this presentation, contact:

dsahani@mgh.harvard.edu

**LEARNING OBJECTIVES**

1) Review five most common kidney stone chemical compositions and recommended medical prophylaxis for each one. 2) Describe imaging techniques for stone diagnosis, including Dual Energy CT techniques. 3) Learn the information that urologists need to know for management and therapy of renal stones. 4) Review updated medical and surgical treatment of renal stones.

**Active Handout:** Dushyant V. Sahani


**Honored Educators**

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

Dushyant V. Sahani, MD - 2012 Honored Educator

Dushyant V. Sahani, MD - 2015 Honored Educator

Dushyant V. Sahani, MD - 2016 Honored Educator

Dushyant V. Sahani, MD - 2017 Honored Educator
**Pediatric Series: Fetal/Neonatal Imaging**

Sunday, Nov. 26 2:00PM - 3:30PM Room: S102CD

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**RC113-01 Imaging of Congenital Diaphragmatic Hernia**

Sunday, Nov. 26 2:00PM - 2:20PM Room: S102CD

Participants
Amy R. Mehollin-Ray, MD, Houston, TX (Moderator) Nothing to Disclose
Erika Rubesova, MD, MSc, Stanford, CA (Moderator) Nothing to Disclose

For information about this presentation, contact:
armeholl@texaschildrens.org

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**RC113-02 Gadolinium Dose Reduction and Fetal Sparing Using a Hyper-Relaxive T1 Contrast Agent**

Sunday, Nov. 26 2:20PM - 2:30PM Room: S102CD

Participants
Amy R. Mehollin-Ray, MD, Houston, TX (Presenter) Nothing to Disclose

For information about this presentation, contact:
armeholl@texaschildrens.org

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**LEARNING OBJECTIVES**

1) Distinguish the various subtypes of fetal diaphragmatic hernia using both ultrasound and MRI.
2) Learn to measure lung-head ratio, total fetal lung volume and percent liver herniation and apply those values to determine prognosis.
3) Utilize fetal imaging to identify candidates for fetal and postnatal therapies for congenital diaphragmatic hernia.
4) Review expected and unexpected postnatal radiographic findings in newborns with diaphragmatic hernia.

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**PURPOSE**

The recent PRAC recommendation to the EMA fortifies the wisdom of minimizing gadolinium (Gd) dose. This is of particular importance in pregnancy, where Gd contrast could be very useful in the diagnosis of morbidity adherent placenta, but is rarely used, due to the risks of fetal exposure. In this pre-clinical study, we investigated the minimum dose of a hyper-T1 relaxive liposomal-Gd blood-pool contrast agent, that has been shown to not permeate the placental barrier, for MRI of the placenta.

**METHOD AND MATERIALS**

In vitro studies were performed to compare T1 relaxivity of liposomal-Gd and a conventional Gd agent. In vivo studies were performed in pregnant rats on a 1T MR scanner. Non-contrast images were acquired followed by administration of liposomal-Gd (at doses from 0.05-0.15 mmol Gd/kg). Post-contrast images were obtained using a GRE sequence. Additionally, four consecutive high-resolution 3D images, with long scan times, were acquired for assessing improvement in placental margin visualization. SNR and CNR were calculated on all images. Images were reviewed and scored by a radiologist. Post-mortem tissue analysis was performed for determining transplacental permeation of liposomal-Gd.

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**RESULTS**
Liposomal-Gd demonstrated 5-fold higher T1 relaxivity compared to conventional Gd. In vivo MRI demonstrated visualization of placenta and retroplacental space, at dose as low as 0.05 mmol Gd/kg. Improvement in image quality was further evident from significantly higher post-contrast CNR values (Non-contrast = 2 +/- 1; 0.05 mmol Gd/kg= 17 +/- 6; 0.10 mmol Gd/kg= 23 +/- 4; 0.15 mmol Gd/kg= 25 +/- 7). The long blood circulation half-life of the agent enabled prolonged scanning without bolus-timing limitations. Multiple high-resolution images could be acquired without loss in image quality or the need for additional contrast agent dosing. Residual Gd analysis in placental and fetal tissues confirmed absence of transplacental transport of liposomal-Gd.

CONCLUSION
The high T1 relaxivity of liposomal-Gd agent enabled visualization of placenta and its margins, both at a lower dose and at higher spatial resolution. Contrast agent dose as low as 0.05 mmol Gd/kg was adequate for visualization of placenta.

CLINICAL RELEVANCE/APPLICATION
Placental imaging using a low dose of hyper-T1 relaxive liposomal-Gd agent that does not cross the placental barrier offers promise in clinical contrast-enhanced MRI evaluation of placenta accreta and its variants.

RC113-03  Postmortem MRI and Histological Correlation of the Rostral Migratory Stream in the Human Fetal Brain

Sunday, Nov. 26 2:30PM - 2:40PM Room: S102CD

Participants
Christian Mitter, MD, Vienna, Austria (Presenter) Nothing to Disclose
Peter C. Brugger, MD, PhD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Ivana Pogledic, MD, PhD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Gerlinde Gruber, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Dieter Bettelheim, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Johannes Hainfellner, MD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Daniela Prayer, MD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose
Gregor Kasprian, MD, Vienna, Austria (Abstract Co-Author) Nothing to Disclose

PURPOSE
The rostral migratory stream (RMS) projects along an extension of the lateral ventricle to the olfactory bulb and constitutes the main migration pathway of neural progenitor cells from the subventricular zone to the olfactory bulb. It has been extensively researched in the rodent brain due to its implication in adult neurogenesis and has also been described in histological studies of both the adult and fetal human brain. The purpose of our study was to investigate the MRI appearance of the RMS in the human fetal brain using postmortem 3T MRI and to correlate our imaging findings with histology in identical subjects.

METHOD AND MATERIALS
We included 10 human fetuses between 16 and 25 gestational weeks without gross cerebral malformations. Postmortem MR imaging was performed within 24h after fetal demise as part of routine virtual autopsy examinations. The RMS was delineated on orthogonal T2w sequences. Neuropathological autopsy was available in 6/10 cases, which enabled correlation of imaging findings with histology.

RESULTS
The RMS was identified in all 10/10 subjects as a T2-hypointense extension of the ganglionic eminence. It was found to project as a flattened structure rostral of the caudate nucleus from the bottom of the anterior horn of the lateral ventricle ventrocaudal towards the base of the olfactory peduncle where it angulated rostral into the horizontal plane to continue into the olfactory bulb. Histological sections at multiple levels confirmed the postmortem MR findings of a flattened RMS configuration, its projection path and its high cell density, as indicated by its low signal on T2w images.

CONCLUSION
The RMS is a prominent structure in the second trimester human fetal brain and can be reliably depicted as a T2-hypointense extension of the ganglionic eminence on 3T postmortem MRI due to its high cell density.

CLINICAL RELEVANCE/APPLICATION
The postmortem MR anatomy of the RMS may be of value as a reference for in vivo studies, as early trials indicate that the RMS could potentially be depicted in utero by 3T fetal MRI.

RC113-04  MR Imaging of Retroplacental Clear Space in a Pregnant Rat Model

Sunday, Nov. 26 2:40PM - 2:50PM Room: S102CD

Participants
Ketan B. Ghaghada, PhD, Houston, TX (Presenter) Nothing to Disclose
Zbigiwn Starosolski, PhD, Houston, TX (Abstract Co-Author) Stockholder, Alzeca Biosciences, LLC
Igor Stupin, Houston, TX (Abstract Co-Author) Nothing to Disclose
Chandresh Patel, BS, Houston, TX (Abstract Co-Author) Nothing to Disclose
Rohan Bhavane, PhD, Houston, TX (Abstract Co-Author) Stockholder, Sensulin, LLC
Flavia Lea Barbosa, PhD, Houston, TX (Abstract Co-Author) Nothing to Disclose
Hailun Gao, PhD, Houston, TX (Abstract Co-Author) Nothing to Disclose
Chandra Yallampalli, DVM, PhD, Houston, TX (Abstract Co-Author) Nothing to Disclose
Verghesse George, MBBS, Houston, TX (Abstract Co-Author) Nothing to Disclose
Ananth Annnapragada, PhD, Houston, TX (Abstract Co-Author) Stockholder, Alzeca Biosciences, LLC; Stockholder, Sensulin, LLC; Stockholder, Abbott Laboratories; Stockholder, Johnson & Johnson;

For information about this presentation, contact:
kbgghagha@texaschildrens.org
PURPOSE
Clear visualization of placental margins, specifically the retroplacental clear space, is critical to the accurate diagnosis of invasive placentation. Consistent and reproducible visualization of retroplacental space in clinical subjects has not been reported in the literature. In this pre-clinical study, we investigated if a liposomal-Gd blood-pool contrast agent, that has been shown to not penetrate the placental barrier, would enable MR visualization of the retroplacental space. Non-contrast MRI and contrast-enhanced MRI using a clinically approved contrast agent, gadoterate meglumine, were used as comparators.

METHOD AND MATERIALS
Studies were performed in pregnant rats on a 1T MRI scanner. DCE-MRI with gadoterate meglumine was performed using a GRE sequence. Non-contrast images were acquired followed by bolus administration of gadoterate meglumine and 20 minutes of post-contrast imaging. Liposomal-Gd was administered and imaging was performed a minimum of three hours later, insuring clearance of gadoterate meglumine. CNR were calculated for non-contrast, conventional Gd and liposomal-Gd enhanced images. A radiologist reviewed the images to score the visualization of the retroplacental space.

RESULTS
Non-contrast images demonstrated poor visualization of the placenta; the retroplacental space was not visible. DCE-MRI with the conventional Gd demonstrated retrograde opacification of placenta from fetal edge towards myometrium. However, no consistent and reproducible visualization of space was demonstrated in conventional Gd images acquired over 20 minute. Liposomal-Gd demonstrated clear visualization of placenta and retroplacental space. CNR analysis demonstrated significantly improved placenta and its margin visualization with liposomal-Gd compared to conventional agent (25 +/- 7 vs. 15 +/- 3). The prolonged opacification of blood pool facilitated longer acquisition of high-resolution 3D images that further enabled excellent visualization of the retroplacental clear space.

CONCLUSION
CE-MRI using liposomal-Gd enabled clear visualization of the retroplacental clear space in a pregnant rat model; the clear space was otherwise undetectable on non-contrast or conventional Gd-enhanced MRI.

CLINICAL RELEVANCE/APPLICATION
Visualization of retroplacental space using a liposomal-Gd blood-pool contrast agent that does not cross the placental barrier offers promise in clinical contrast-enhanced MRI evaluation of morbidly adherent placenta.

Evaluation of Brain Injury in Neonates by Magnetization Transfer Imaging Combined Amide Proton Transfer Imaging: A Preliminary Study

Sunday, Nov. 26 2:50PM - 3:00PM Room: S102CD

Participants
Yang Zheng, Shenyang, China (Presenter) Nothing to Disclose
Xiaoming Wang, MD, Shenyang, China (Abstract Co-Author) Nothing to Disclose

PURPOSE
To evaluate neonatal brain injury at the internal environmental level with the application of amide proton transfer (APT) imaging and magnetization transfer imaging by measuring the APT and MTR values of the brain.

METHOD AND MATERIALS
A total of 38 neonatal patients who underwent MR examination were enrolled in the study. Among them, there were 25 newborns with no abnormalities and 13 cases with brain injury who underwent conventional MR (T1WI, T2WI, DWI) examination. After obtaining informed consent and permission of clinicians, routine MR was followed by additional APT/MT scan. APT/MT imaging is single slice scanning, performed at the basal ganglia level in all neonates, and in the case group, with increased localization at the level of lesion, and with the contralateral relatively normal area as self-control. The APT/MTR values of bilateral frontal subcortical white matter, basal ganglia and occipital subcortical white matter were measured for all neonates, as well as the APT/MTR values of the lesion and contralateral areas. Several statistical methods were used for statistical analysis.

RESULTS
In the control group, bilateral frontal subcortical white matter, basal ganglia and occipital subcortical white matter had no significant difference in APT/MTR value (P>0.05). Between the different parts of the brain, the differences among the APT/MTR of the frontal lobes, basal ganglia, and occipital lobes were significant, P<0.05. In addition, the APT/MTR of the above brain regions were found to have a positive correlation with gestational age. In the case group, there were significant differences in APT values between the lesion side and contralateral area, being significantly lower in lesion side than the contralateral side (P<0.05).

CONCLUSION
From changes in the pH level in the neonatal brain, APT/MT imaging can help understand neonatal brain injury.

CLINICAL RELEVANCE/APPLICATION
Magnetization transfer (MT) imaging amide proton transfer (APT) imaging is a noninvasive imaging method of MR, and it is capable of detecting mobile cellular proteins and peptides and monitoring pH effects.

Real-Time Virtual Sonography: A New Integrated Approach for the Evaluation of Fetal Cerebral Pathologies?

Sunday, Nov. 26 3:00PM - 3:10PM Room: S102CD

Awards
PURPOSE

Real-time virtual sonography (RVS) is a new technique that uses magnetic navigation and computer software for the synchronized display of real-time US and multiplanar reconstruction MRI images. The purpose of this study was to evaluate the feasibility and ability of RVS to assess the main cerebral pathologies in fetuses with suspected US anomalies.

METHOD AND MATERIALS

This is a prospective study. Fusion imaging (Hitachi HI Vision Ascendus) was offered to 35 patients undergone Fetal MRI for a US suspicion of cerebral pathology. The MRI image dataset acquired was loaded into the fusion system using a CD support and displayed together with the US image. Both sets of images were then manually synchronized and images were registered. The possibility to record the images in a video format allowed, however, the possibility to re-evaluated the examination.

RESULTS

RVS was technically possible in all cases. Data registration, matching and fusion imaging were performed in 25 minutes at the beginning and in less than 15-20 minutes after practice. The ability of RVS imaging to assess the main anatomical sites and fetal anomalies was evaluated and compared with standard US and MRI images. The principal application of RVS was the study of midline, cerebral gyration and vascular malformations because it also allowed adding a real time Doppler signal on MRI images. Fusion imaging helped the diagnosis in 25%. In the 25/35 cases of encephalic pathology, fusion imaging improved the diagnosis; in the other cases MRI was superior to US even using the RVS.

CONCLUSION

This is a preliminary study on the feasibility and practical use of a Fetal MRI-US real-time fusion imaging. Both techniques are complementary but still independent and the retrospective synthesis of these exams allows optimal analysis of fetal cerebral anomalies.

CLINICAL RELEVANCE/APPLICATION

This technique has many advantages especially on the pedagogic plan. However, RVS is currently limited to the research area.

LEARNING OBJECTIVES

The objective of this talk is to present the most common and some rare manifestation of bowel obstruction in the fetus and in the neonate. After the talk, the learner should be able to recognize normal appearance of bowel in the fetus and neonate from abnormal fetal bowel distention on ultrasound, MRI and plain films. The course will provide tools to differentiate proximal form distal obstruction in the fetus on prenatal ultrasound and MRI. The course will be illustrated by examples of common and less common bowel obstructions and their radiological presentations in the fetus and neonate.

LEARNING OBJECTIVES

1) To explain the developmental and acquired mechanisms for bowel obstruction in the fetus and the neonate. The speaker will cover the imaging manifestation of various common and rare etiologies of bowel obstruction. The most appropriate modalities to diagnose and localize the obstruction will be discussed, including fetal ultrasound, fetal and fluoroscopic studies and postnatal MRI. The speaker will also cover the advances in these modalities to better diagnose and predict outcome of the fetus/neonate.
RC129

MR Imaging of the Female Pelvis for Planning Fertility Preservation Therapy, and the Appearance of the Pelvis Post Therapy (An Interactive Session)

Sunday, Nov. 26 2:00PM - 3:30PM Room: S402AB

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

Participants
Hero K. Hussain, MD, Ann Arbor, MI (Moderator) Nothing to Disclose

Sub-Events

RC129A  MR Imaging for Planning Fertility Preservation Therapy in Gynecologic Malignancies

Participants
Katherine E. Maturen, MD, Ann Arbor, MI (Presenter) Nothing to Disclose

For information about this presentation, contact:
kmaturen@umich.edu

LEARNING OBJECTIVES
1) Appreciate low risk imaging features of adnexal masses, supporting potential management with surveillance, cystectomy, or oophorectomy rather than complete surgical staging. 2) Recognize imaging features of non myoinvasive endometrial cancer, for both diagnosis and surveillance if managed conservatively. 3) Understand imaging guidelines supporting surgical choice of trachelectomy in cervical cancer.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Katherine E. Maturen, MD - 2014 Honored Educator

RC129B  MR Imaging for Planning Fertility Preservation Therapy in Benign Gynecologic Diseases

Participants
Jessica B. Robbins, MD, Madison, WI (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Discuss the spectrum of benign uterine and adnexal pathology. 2) Describe the fertility sparing procedures that can be performed for such conditions. 3) Explain the role of MRI in planning for these procedures.

RC129C  MR Imaging of the Pelvis Post Therapy of Benign Gynecologic Conditions

Participants
Susan M. Ascher, MD, Washington, DC (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Improve knowledge of therapies for symptomatic gynecologic conditions with a focus on leiomyomas treated with uterine artery embolization (UAE). 2) Provide an efficient protocol for MRI surveillance post treatment of benign gynecologic conditions. 3) Improve knowledge of the MRI appearance of the female pelvis post treatment to include features of success and failure.

RC129D  MR Imaging of the Pelvis Post Therapy of Gynecologic Malignancies

Participants
Liina Poder, MD, San Francisco, CA (Presenter) Nothing to Disclose

For information about this presentation, contact:
liina.poder@ucsf.edu

LEARNING OBJECTIVES
1) To become familiar with most current various treatment options for gynecologic malignancies as well as expected imaging appearance of post treatment female pelvis. 2) To understand the expected and some unexpected imaging appearances as well as common pitfalls.
Prostate MRI (Hands-on) Course will be repeated Monday, Tuesday, Wednesday and Thursday from 8am-10am

Monday, Nov. 27 8:00AM - 10:00AM Room: S401CD

AMA PRA Category 1 Credits ™: 2.00
ARRT Category A+ Credits: 2.25

Participants
Jelle O. Barentsz, MD, PhD, Nijmegen, Netherlands (Presenter) Advisor, SPL Medical BV
Jurgen J. Futterer, MD, PhD, Nijmegen, Netherlands (Presenter) Research Grant, Siemens AG
Roel D. Mus, MD, Nijmegen, Netherlands (Presenter) Nothing to Disclose
Geert M. Villeirs, MD, PhD, Ghent, Belgium (Presenter) Nothing to Disclose
Marloes van der Leest, MD, Nijmegen, Netherlands (Presenter) Nothing to Disclose
Rianne R. Engels, Cuijk, Netherlands (Presenter) Nothing to Disclose
Renske L. van Delft, Nijmegen, Netherlands (Presenter) Nothing to Disclose
Joseph J. Busch, MD, Chattanooga, TN (Presenter) Nothing to Disclose
Baris Turkbey, MD, Bethesda, MD (Presenter) Nothing to Disclose
Daniel J. Margolis, MD, Los Angeles, CA (Presenter) Nothing to Disclose
Antonio C. Westphalen, MD, Mill Valley, CA (Presenter) Scientific Advisory Board, 3DBiopsy LLC ; Research Grant, Verily Life Sciences LLC
Philippe A. Puech, MD, Lyon, France (Presenter) Nothing to Disclose

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

ABSTRACT
In this Hands-on Workshop, the participants will able to review up to 30 multi-parametric MRI cases with various prostatic pathology using a dedicated workstation. Focus will be on the overall assessment of PI-RADS v2 category, which enables them to score the probability of the presence of a significant cancer in patients with elevated PSA and/or clinical suspicion. All cases are from daily non-academic practice, and have various levels of difficulty. The cases include: easy and difficult significant peripheral-transition- and central zone cancers, inflammation, BPH, and the most common pitfalls. Internationally renowned teachers will guide the participants during their PI-RADS v2 scoring. PLEASE NOTICE: Based on our experience we expect this course to be very popular. We only have 50 computers, and two spots per computer. Only the first 100 people will be accepted in the room. The front rows are reserved for beginners. In case you have experience with prostate MR: Please take a seat at the computers in the back of the room. We will not have space for any additional listeners this year. The coursebook can be found as handout to this course, please download it and take it with you on your tablet or other device.

Active Handout: Renske Lian van Delft
Renal Cell Carcinoma: How Imaging Can Be Used To Select Among Treatment Options and Monitor Response

Monday, Nov. 27 8:30AM - 10:00AM Room: N226

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

Participants
Erick M. Remer, MD, Cleveland, OH (Coordinator) Nothing to Disclose
Erick M. Remer, MD, Cleveland, OH (Moderator) Nothing to Disclose
Steven S. Raman, MD, Santa Monica, CA (Presenter) Nothing to Disclose
Raghunandan Vikram, MBBS, FRCR, Houston, TX (Presenter) Nothing to Disclose

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LEARNING OBJECTIVES

1) The attendee will learn how CT and MRI are used to distinguish indolent and aggressive renal tumors, including identification of tumor subtypes. 2) Imaging findings that guide renal tumor management toward percutaneous tumor ablation, partial, and radical nephrectomy will be described. 3) The use of imaging to evaluate patients after tumor ablation and nephrectomy will be reviewed. Assessment methods, including MRI with DWI, CT, and contrast-enhanced US will be compared and treatment complications will be illustrated. Imaging appearances of post therapy complications will be reviewed.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Raghunandan Vikram, MBBS, FRCR - 2012 Honored Educator
**Interactive Game: When Do Imaging Findings Make a Difference? (An Interactive Session)**

**Monday, Nov. 27 8:30AM - 10:00AM Room: E352**

**AMA PRA Category 1 Credits ™**: 1.50

**ARRT Category A+ Credit**: 1.75

**Participants**
David M. Panicek, MD, New York, NY (Moderator) Nothing to Disclose

**For information about this presentation, contact:**
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**LEARNING OBJECTIVES**

1) To recognize and review a range of potential interpretive pitfalls in oncologic imaging of the nervous, gynecologic, and musculoskeletal systems, using an interactive audience response system.

**SAM**

New in 2017: PLEASE NOTE - All courses designated for SAM credit at RSNA 2017 will require attendees bring a personal device e.g. phone, iPad, laptop to complete the required test questions during the live session.

**Sub-Events**

**RC218A Neuro**

Participants
Birgit B. Ertl-Wagner, MD, Munich, Germany (Presenter) Author, Springer Nature; Author, Thieme Medical Publishers, Inc; Author, Bracco Group; Spouse, Stockholder, Siemens AG; ;

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**LEARNING OBJECTIVES**

1) To comprehend the importance of signs in neuroimaging for diagnostic decision making. 2) To understand in which instances imaging findings have a direct consequence for therapeutic decision making. 3) To appreciate the therapeutic consequences of selected neuroimaging findings.

**RC218B Musculoskeletal**

Participants
David M. Panicek, MD, New York, NY (Presenter) Nothing to Disclose

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**LEARNING OBJECTIVES**

1) Assess imaging features that facilitate specific diagnoses of musculoskeletal lesions. 2) Describe scenarios in which various imaging features of musculoskeletal lesions lead to more accurate tumor staging and treatment response assessment. 3) Detect musculoskeletal complications of tumors and their treatment.

**RC218C Pelvis**

Participants
Caroline Reinhold, MD, MSc, Montreal, QC (Presenter) Consultant, GlaxoSmithKline plc

**LEARNING OBJECTIVES**

1) Understand the role of imaging in the management of gynaecological malignancies. 2) Assess imaging features that allow accurate staging of gynaecological malignancies. 3) Be familiar with pitfalls that can result in staging errors using imaging. 4) Understand the changes in imaging appearance post treatment.

**Honored Educators**

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Caroline Reinhold, MD, MSc - 2013 Honored Educator Caroline Reinhold, MD, MSc - 2014 Honored Educator Caroline Reinhold, MD, MSc - 2017 Honored Educator
Fallopian Tube Catheterization (Hands-on)

Monday, Nov. 27 8:30AM - 10:00AM Room: E260

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

FDA Discussions may include off-label uses.

Participants
Amy S. Thurmond, MD, Portland, OR (Presenter) Nothing to Disclose
Ronald J. Zagoria, MD, San Francisco, CA (Presenter) Consultant, ReCor Medical, Inc
A. Van Moore Jr, MD, Charlotte, NC (Presenter) Nothing to Disclose
Anne C. Roberts, MD, La Jolla, CA (Presenter) Nothing to Disclose
David M. Hovsepian, MD, Stanford, CA (Presenter) Nothing to Disclose
James E. Silberzweig, MD, New York, NY (Presenter) Nothing to Disclose
Lindsay S. Machan, MD, Vancouver, BC (Presenter) Stockholder, Analytics for Life, Inc Stockholder, Calgary Scientific, Inc Stockholder, Endologix, Inc Stockholder, Harmonic Medical Stockholder, IKOMED Technologies Inc Stockholder, Innovere Medical Inc Stockholder, NDC, Inc
Maureen P. Kohi, MD, Tiburon, CA (Presenter) Research Grant, Boston Scientific Corporation; Consultant, Sirtex Medical Ltd; Consultant, LaForce;

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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.
MSRO26

**BOOST: Gynecologic—Oncology Anatomy (An Interactive Session)**

Monday, Nov. 27 10:30AM - 12:00PM Room: S103CD

**Participants**

Aoife Kilcoyne, MBCh, Boston, MA (Presenter) Nothing to Disclose

Akila N. Viswanathan, MD, Baltimore, MD (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Describe the gynecologic anatomy on MRI and PET-CT that is relevant to treatment planning in gynecologic oncology. 2) Report the salient MR and PET-CT findings that direct therapy in gynecologic oncology patients. 3) Avoid technical and anatomical imaging pitfalls related to normal anatomy and anatomical variants on MRI and PET-CT.

**ABSTRACT**

The purpose of this course is to provide attendees with a practical working knowledge of gynecologic anatomy to optimise a multidisciplinary approach to treatment planning.

**Active Handout:** Aoife Kilcoyne

**SSC06-01**  
**Prospective Comparison of RECIST and Alternative Response Assessment Criteria Using Normalized Enhancement Values in the Evaluation of Metastatic Renal Cell Cancer Patients from Phase II of the Multi-Centre STAR Trial**

**Participants**
- Vinay A. Duddalwar, MD, FRCR, Los Angeles, CA (Moderator) Nothing to Disclose
- Mitchell E. Tublin, MD, Pittsburgh, PA (Moderator) Nothing to Disclose

**Sub-Events**

**Participants**
- Jim Zhong, Leeds, United Kingdom (Abstract Co-Author) Nothing to Disclose
- Christian Kelly-Morland, FRCP, MBBS, London, United Kingdom (Presenter) Nothing to Disclose
- Tze Min Wah, PhD, FRCP, Leeds, United Kingdom (Abstract Co-Author) Nothing to Disclose
- Lucy McParland, MSc, Leeds, United Kingdom (Abstract Co-Author) Nothing to Disclose
- Fiona Collinson, Leeds, United Kingdom (Abstract Co-Author) Nothing to Disclose
- Walter Gregory, PhD, Leeds, United Kingdom (Abstract Co-Author) Nothing to Disclose
- Janet E. Brown, MD, MBBS, Sheffield, United Kingdom (Abstract Co-Author) Nothing to Disclose
- Vicky J. Goh, MBBCh, London, United Kingdom (Abstract Co-Author) Research Grant, Siemens AG Speaker, Siemens AG

**Purpose**
Size and enhancement response criteria have been advocated for tumor assessment in metastatic renal cancer with the potential to predict earlier response or progression. We aimed to assess the difference in categorical response using RECIST 1.1, Choi and modified Choi criteria with normalized enhancement values between different readers on Computed Tomography (CT) as part of a prospective multicentre study.

**Method and Materials**
Following IRB approval and informed consent, 44 prospective patients enrolled in phase II of the STAR trial comparing treatment strategies of tyrosine kinase inhibitor therapies in metastatic renal cell carcinomas were assessed at baseline, 12 and 24 weeks post therapy commencement. Contrast enhanced CT scans were assessed by 2 radiologists: 104 target lesions were assessed using commercial semi-automated software. The sum of longest diameter of tumor target lesions and tumor normalized enhancement values (calculated relative to aortic attenuation) and subsequent percentage change at 12 week and 24 week CT were measured. Response categorization by RECIST, Choi and mChoi criteria into stable disease (SD), partial response (PR) or progressive disease (PD) was undertaken, and discrepant cases identified. Cohen's kappa coefficients were calculated to assess reader agreement.

**Results**
26 patient at 12 weeks had discrepant categories of response: PR by Choi/mChoi criteria but SD by RECIST. 13 became PR by RECIST at 24 weeks and 13 patients remained discrepant: PR by Choi/mChoi but SD by RECIST. At 12 week follow up, there was excellent reader concordance for RECIST (k 0.9 n=44) and modified Choi categorisation (k 0.9 n=43), decreasing for Choi criteria (k 0.76 n=42). At 24 weeks there was substantial agreement for RECIST (k 0.8 n=44) and modified Choi categorisation (k 0.79 n=40) with complete agreement of Choi categorisation (k 1 n=41). 5 patients had PD at 24 weeks, with complete agreement.

**Conclusion**
Early tumor response, confirmed on 24 weeks, was noted more frequently for Choi/mChoi than RECIST criteria. Substantial to excellent agreement was observed in response categorization across all criteria.

**Clinical Relevance/Application**
Choi/mChoi criteria using normalized enhancement values predict tumor response at 12 weeks, confirmed at 24 weeks with excellent observer agreement.
Amicus Therapeutics, Inc; Travel support, sanofi-aventis Group; Travel support, Shire plc; Travel support, Amicus Therapeutics, Inc
Massimo Imbriaco, MD, Napoli, Italy (Presenter) Nothing to Disclose

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PURPOSE

Fabry Disease (FD) is a rare inherited multi-systemic lysosomal storage disorder, related to a lack of activity of a-galactosidase. Kidney involvement in FD is common and linked to globotriaosylceramide deposition in all types of renal cells, with subsequent progression in untreated patients to end stage renal failure. Parapelvic cysts (PC) have been already described in literature as a possible feature of FD; nevertheless, their exact prevalence and their meaning in renal FD involvement remain uncertain. Aim of this study is to assess the actual prevalence of PC in a representative cohort of FD patients by renal ultrasound.

METHOD AND MATERIALS

We performed a retrospective multicentric study on 173 FD patients (Study 1), comparing the results with a second group of 67 FD patients analysed by the same ultrasonographer in a single center (Study 2). Age- and renal function-matched healthy controls (HC) were selected for comparison. Inclusion criteria were genetically proven FD and age ≥ 18y, while exclusion criteria were renal replacement therapy and presence of renal malformations. Clinical and biochemical data concerning renal impairment were collected by trained physicians. Ultrasonographic examination included determination of renal diameters, presence of PC and cortical cysts or other renal abnormalities.

RESULTS

In Study 1, PC were detected in 28.9% of FD subjects and in 1.1% of control subjects (p<0.001); presence of other renal abnormalities and biochemical alterations did not differ between groups. In Study 2, prevalence of PC raised from 29.8% to 43.3% (p<0.05), due to a better accuracy in US examination. In both studies, no correlation was detected between PC. Finally, no difference was found between FD patients with and without PC.

CONCLUSION

Our results confirm the higher prevalence of PC in classical FD subjects compared to HC, highlighting the role of accurate US renal examination in their detection. Resort to CT or MRI should be considered only in case of ambiguous US findings.

CLINICAL RELEVANCE/APPLICATION

Although to date parapelvic cysts cannot be considered a pathognomonic sign of FD, their presence should induce to consider FD among differential diagnosis in subjects with unclear personal and family history of renal disease, in order to prevent disease progression.

SSC06-03  Clear Cell Renal Cell Carcinoma Treated by Antiangiogenic Therapy: Distribution of Metastatic Sites at Baseline and at Time of Progressive Disease Determination

Monday, Nov. 27 10:50AM - 11:00AM Room: N230B

Participants
Elodie Pace-Soler, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Heidi Coy, Los Angeles, CA (Presenter) Nothing to Disclose
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Maitraya K. Patel, MD, Sylmar, CA (Abstract Co-Author) Nothing to Disclose
Victor F. Sai, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Daniel J. Margolis, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
David Ashen-Garry, DO, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
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PURPOSE

Clear cell renal cell carcinoma (ccRCC) is the most prevalent and one of the most lethal RCC subtypes with a high potential for distant metastases. Angiogenesis influences hematogenous dissemination and metastatic distribution. Because anti-angiogenic therapy is first-line therapy for metastatic ccRCC, it is necessary to understand if sites of metastatic disease vary in patients treated with this treatment modality. The purpose of this study was to evaluate alterations in metastatic disease distribution between initial presentation and at time of progressive disease (PD) in a cohort of patients with metastatic ccRCC treated with VEGFR tyrosine kinase inhibitors.

METHOD AND MATERIALS

With IRB approval, we analyzed a cohort of patients enrolled in a Phase III multi-center open label trial who were randomized 1:1 to open label anti-VEGFR tyrosine kinase therapies. All patients had previously progressed after having received, at a minimum, first line VEGFR tyrosine kinase inhibitor therapy and had measurable metastatic disease at screening. A chest CT, and either a CT or MRI of the abdomen and pelvis were acquired at screening and every eight weeks, from over 150 global sites, and processed and interpreted at an imaging core laboratory for radiological progression using RECIST 1.1.

RESULTS
The study cohort included 397 patients (297 (75%) men and 100 (25%) women) with confirmed PD on imaging, with a mean age of 60.7 years (+/- 10.0). The four most common sites of metastatic spread at baseline and at the time of progression were lymph nodes (29.8%, 29.1%), lung (27.1%, 25.4%), liver (10.9%, 11.2%), and bone (8.6%, 11.5%), respectively. The most common sites of new lesions were bone (31.8%), lymph nodes (21.5%), liver (14.0%), and lung (13.3%).

CONCLUSION
The four most common sites for ccRCC metastatic disease are the lymph nodes, lungs, liver, and bones. Over the course of a clinical trial the overall sites at time of disease progression are the same as at screening, but the most common site for new lesions to develop is bone.

CLINICAL RELEVANCE/APPLICATION
Knowing common sites of metastatic disease in patients with ccRCC treated with targeted therapy can improve lesion detection in clinical practice and in therapeutic trials.

**SSC06-04 Wavelets Analysis for Differentiating Solid, Non-Macroscopic Fat Containing, Enhancing Renal Masses: A Pilot Study**

Monday, Nov. 27 11:00AM - 11:10AM Room: N230B

Participants
Bino A. Varghese, PhD, Los Angeles, CA (Presenter) Nothing to Disclose
Darryl Hwang, PhD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Bavrina Bigjahan, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Steven Cen, PhD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Inderbir Gill, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Vinay A. Duddalwar, MD, FRCR, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose

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PURPOSE
To evaluate potential use of wavelets analysis in discriminating benign and malignant renal masses (RM)

METHOD AND MATERIALS
In this IRB approved study, we evaluated 144 patients with predominantly solid, non-macroscopic fat containing, enhancing RM. 98 cases were malignant renal cell carcinoma (RCC) and 46 cases were benign RM: oncocytoma, lipid-poor angiomylipoma. The Haar wavelet was used to analyze the grayscale images of the largest segmented tumor in the axial direction using Matlab® (Mathworks, Natick, MA) software. Six metrics (energy, entropy, homogeneity, contrast, standard deviation (SD) and variance) derived from 3-levels of image decomposition in 3 directions (horizontal, vertical and diagonal) respectively, were used to quantify tumor texture. Independent t-test or Wilcoxon rank sum test depending on data normality were used as exploratory univariate analysis. Stepwise logistic regression and ROC curve analysis were used to select predictors and assess prediction accuracy, respectively.

RESULTS
Consistently, 5 out of 6 wavelet-based texture measures (except homogeneity) were higher for malignant tumors compared to benign, when accounting for individual texture direction. Homogeneity was consistently lower in malignant than benign tumors irrespective of direction. SD and variance measured in the diagonal direction on the cortico-medullary phase showed significant (p<0.05) difference between benign versus malignant tumors. The multivariate model with average variance (across all 3 directions) and SD (along the vertical direction) extracted from the excretory and pre-contrast phase, respectively showed an AUC of 0.7 (p < 0.05) in discriminating malignant from benign. Additionally, AUC of 0.86 (p < 0.05) was obtained in discriminating oncocytoma (26) from clear cell RCC (68). The top predictors in the latter model discriminating RM subtypes included variance and homogeneity in the pre-contrast phase (diagonal) and, SD and entropy in the cortico-medullary phase (horizontal).

CONCLUSION
Wavelet analysis is a valuable texture evaluation tool to add to radiomics platforms geared at reliably characterizing and stratifying renal masses.

CLINICAL RELEVANCE/APPLICATION
Improved differential diagnosis based on better discrimination of the tumor types will provide patient-specific care-management options.

**SSC06-05 Variability of Texture Features Extracted from Contrast-Enhanced Computed Tomography Images of Renal Tumors: Role of Necrosis**

Monday, Nov. 27 11:10AM - 11:20AM Room: N230B

Participants
Passant Mohamed, MBBS, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
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Tania Gill, BS, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Bhushan Desai, MBBS, MS, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Steven Cen, PhD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
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Inderbir Gill, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Vinay A. Duddalwar, MD, FRCR, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
CT texture analysis (CTTA) is a popular tumor stratification tool. CTTA assumes CT attenuation patterns (image) depend on tumor-type, microvessel density, intratumoral necrosis and thus, indicative of tumor heterogeneity. Here we evaluate the effect of necrosis on CTTA features in differentiating benign from malignant renal masses (RM).

METHOD AND MATERIALS
In this retrospective study, we identified 144 patients with non-macroscopic lipid containing, predominantly solid, enhancing renal tumors based on post-surgical pathology examination (98 malignant renal cell carcinoma and 46 benign RM: oncocytoma, lipid-poor angiomyolipoma). CECT images of RM were used as inputs to a CTTA panel. The panel comprised of 29 different texture metrics derived using 6 methods: histogram analysis, gray-level co-occurrence matrix method and gray-level difference matrix method, spectral (fast fourier analysis), in both 2D and 3D. Tumor necrosis ranged from 1-30% of tumor volume (-10 to +15 HU; non-enhancing areas). Data normality was examined using D'Agostino's K2 test. Generalized linear model with an interaction term was used to test the difference of the difference (benign vs. malignant; with and without necrosis).

RESULTS
Histogram-based: variance and spectral-based: entropy of spectral magnitude, entropy of spectral phase, and complexity index (sum of spectral harmonics between 25-75% of the maximum frequency) showed significant (p < 0.01) difference between the benign and malignant group while taking into account the necrotic regions. Similar results were obtained while removing necrotic regions but the results were significantly (p < 0.01) different from those when necrosis was included. The results were consistent across all 4 CECT phases. In general, the malignant tumors showed higher variance, complexity index and entropy of spectral-magnitude, all of which are indicative of increased heterogeneity compared to benign tumors. Other metrics had mixed results with variable significance depending on necrosis status.

CONCLUSION
Standardized methods of identifying CT-based necrosis are warranted in lesions analysis particularly in whole lesions, where the analysis cannot be limited to non-necrotic region.

CLINICAL RELEVANCE/APPLICATION
The removal of necrotic tumor regions allows better representation of the radiomic signal from the remainder of the lesion leading to improved accuracy rate of differentiating benign and malignant enhancing RM.

SSC06-06 Subjective and Quantitative Computed Tomography (CT) Analysis to Differentiate Low Grade from High Grade Chromophobe Renal Cell Carcinoma

Monday, Nov. 27 11:20AM - 11:30AM Room: N230B

Participants
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Nicola Schieda, MD, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
Trevor A. Flood, MD, FRCP, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
Satheesh Krishna, MD, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
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Rebecca Thomhill, PhD, Ottawa, ON (Abstract Co-Author) Nothing to Disclose

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PURPOSE
This study evaluates the ability of unenhanced CT to differentiate low versus high grade ch-RCC using subjective and quantitative analyses.

METHOD AND MATERIALS
With IRB approval, 37 ch-RCC (high grade N=13, low grade N=24) with pre-operative unenhanced CT were identified between 2012-2016. Two blinded radiologists (R1/R2) subjectively evaluated: tumor margin (smooth or irregular/spiculated), homogeneity (homogeneous, mildly or markedly heterogeneous) and calcification. A third blinded radiologist measured unenhanced CT attenuation (Hounsfield Units [HU]) and contoured tumors so that previously described texture analysis features studied in RCC could be extracted. Quantitative variables in this study were selected to potentially correlate with the histological grading system for ch-RCC proposed by Paner et al. which includes nuclear-to-cytoplasmic ratio (attenuation) and anaplasia (heterogeneity). Comparisons were performed using chi-square, independent t-tests and logistic regression. Accuracy for diagnosis was assessed using ROC. Inter-observer agreement was calculated with Cohen's kappa statistic.

RESULTS
There were no differences in patient age or gender between groups (p=0.65 and 0.07). High grade tumors were larger (62.6 ± 34.9 mm [17.0-141.0]) than low grade tumors (39.0 ± 17.9 mm [16.0-72.3]) and showed higher attenuation (45.5 ± 8.2 HU [29.0-55.0] versus 35.3 ± 8.5 HU [14.0-51.0]), (p=0.01 and <0.01). Higher grade tumors were more frequently calcified (38.5% [5/13] R1 and 46.2% [6/13], p=0.03) and showed irregular/spiculated margins (46.2% [6/13] R1 and 69.2% [9/13], p=0.02). Agreement was moderate (K=0.47 and 0.36). Higher grade tumors were more frequently heterogenous (30.8% [4/13] R1 and 23.1% [3/13] R2 considered homogeneous, p=0.01). Agreement was also moderate (K=0.57). Quantitatively, run-length nonuniformity and gray-level nonuniformity (as described in the article by Schieda et al. who assessed texture analysis in CT to diagnose sarcomatoid RCC) were higher in high grade RCC (p<0.05) and could diagnose high grade tumors with moderate-to-good accuracy (area under curve 0.80).

CONCLUSION
Size, calcifications, irregular/spiculated margins, attenuation and heterogeneity at unenhanced CT are features associated with...
Differentiation of Clear Cell Papillary Renal Cell Carcinoma from Clear Cell and Papillary Subtypes on Multiphasic Computed Tomography

Monday, Nov. 27 11:30AM - 11:40AM Room: N230B

**Participants**
Samuel J. Galgano, MD, Birmingham, AL (Abstract Co-Author) Research Support, Blue Earth Diagnostics Ltd
Alana L. Bates, MD, Birmingham, AL (Presenter) Nothing to Disclose
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Soroush Rais-Bahrami, MD, Birmingham, AL (Abstract Co-Author) Nothing to Disclose
Mark E. Lockhart, MD, Birmingham, AL (Abstract Co-Author) Author, Oxford University Press; Author, JayPee Brothers Publishers; Deputy Editor, John Wiley & Sons, Inc
Jessica G. Zarzour, MD, Birmingham, AL (Abstract Co-Author) Nothing to Disclose

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**PURPOSE**
To determine if clear cell papillary renal cell carcinoma (ccpRCC) can be differentiated from clear cell (ccRCC) and papillary renal cell carcinoma (pRCC) on computed tomography (CT).

**METHOD AND MATERIALS**
An IRB-approved, retrospective review of our institutional surgical pathology database identified 23 ccpRCC, 46 ccRCC, and 51 pRCC from 2011-2016. Pre and post operative CT scans were reviewed and imaging features were compared. Statistical analysis was performed by ANOVA, sensitivity and specificity by ROC, and cutoff points established via a maximum Youden index.

**RESULTS**
Compared to ccRCC, ccpRCC was more likely to have smooth rather than heterogeneous margins (p=0.012), less avid arterial attenuation (79.9±45.4 HU) (125.0±45.9 HU, p=0.002), and progressive enhancement (rather than washout) on nephrographic phase. ccpRCC can be distinguished from ccRCC using an attenuation cutoff of 76 HU on arterial phase (sens 0.91, spec 0.64, p=0.005) and 45 HU enhancement between unenhanced and arterial phase (sens 0.85, spec 0.65, p=0.009). Compared to pRCC, ccpRCC was more likely to be heterogeneous (p=0.002), have higher nephrographic attenuation (88.8±35.8 HU) than pRCC (65.7±17.8 HU, p=0.031), and show similar progressive enhancement on nephrographic phase. There was no difference in unenhanced attenuation between the 3 subtypes. ccpRCCs were significantly smaller (2.8±1.5cm) than either ccRCC (5.6±3.4cm, p=0.001) or pRCC (5.6±4.6 cm, p=0.004). None of the ccpRCC demonstrated calcification, macroscopic fat, adenopathy, venous invasion, or metastatic disease. At pathologic analysis, ccpRCC was more likely to have low Fuhrman grade, stage T1, no renal vein involvement, no lymphovascular invasion, no sarcomatoid features and no necrosis. ccpRCC subtype is more often associated with African American race, history of chronic renal disease, and more likely to present as an incidental finding.

**CONCLUSION**
ccpRCC is a newly recognized subtype of RCC that is an indolent tumor with low malignant potential. It has imaging features of both ccRCC and pRCC and ccpRCC may potentially be characterized on preoperative imaging on the basis of tumor composition and enhancement patterns.

**CLINICAL RELEVANCE/APPLICATION**
ccpRCC is a newly recognized subtype of RCC with low malignant potential and may warrant nephron sparing surgery if accurately characterized on preoperative imaging.

Correlation of Qualitative Enhancement Features on Multiphasic MDCT with CAIX Expression in Patients with Clear Cell Renal Cell Carcinoma to Predict Prognosis

Monday, Nov. 27 11:40AM - 11:50AM Room: N230B

**Participants**
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**PURPOSE**
Qualitative assessment of ccRCCs on multiphasic MDCT images may have potentially predictive information about tumor behavior and influence patient management. Low carbonic anhydrase IX (CAIX) expression has been identified as predictor of poorer oncological outcome in patients with ccRCC, but requires additional expense and subspecialty expertise. The primary objective of
our study was to determine which MDCT qualitative imaging features correlate with CAIX expression in patients with ccRCC.

**METHOD AND MATERIALS**

With IRB approval for this HIPAA-compliant retrospective study, our pathology and imaging databases were queried to obtain a cohort of ccRCC with preoperative multiphase multidetector CT imaged with a four-phase renal mass protocol (unenhanced (U), corticomedullary (C), nephrographic (N), excretory (E)). CT examinations were reviewed independently by two abdominal fellowship-trained genitourinary radiologists. Each lesion was evaluated for enhancement pattern; presence of necrosis; pattern of; tumor margin; tumor-parenchymal interface, tumor-parenchymal interaction; intratumoral vascularity; collecting system infiltration; renal vein invasion; and calcification. Immunohistochemistry was performed on the resected specimens to assess the degree of CAIX expression. Comparisons between variables included chi-square, kappa and McNemar’s test. P values less than 0.05 were considered to be significant. Inter-reader agreement was obtained with the Gwet agreement coefficient (AC1). Multivariate analysis was performed to find independent predictors of low CAIX expression.

**RESULTS**

We analyzed 108 patients (81 (64%) men and 46 (36%) women) with 108 ccRCC lesions (53 low CAIX and 55 high CAIX). Overall agreement between the two readers had a mean AC1 of 0.8172 (SE 0.0235). Low CAIX expression was significantly associated with the presence of necrosis (odds ratio=2.696, 95% CI=1.034-7.032, p=.038). ROC analysis showed an AUC of .621 (95% CI=.488-.754) in predicting low CAIX expression with qualitative assessment of necrosis.

**CONCLUSION**

Qualitative assessment had high inter reader agreement for determination of necrosis and was a significant independent predictor of low CAIX tumors.

**CLINICAL RELEVANCE/APPLICATION**

Qualitative assessment of necrosis on CT may help predict potentially prognostic tumor microenvironment information such as CAIX expression. This may provide a more robust assessment of ccRCC behavior and improve patient outcomes.

**FOR INFORMATION ABOUT THIS PRESENTATION, CONTACT:**

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GU234-SD-MOA1

Useful Objective and Subjective Criteria for Prostate Cancer Detection on Multiparametric MRI

Purpose

To identify objective and subjective criteria on multiparametric prostate magnetic resonance imaging (mpMRI) for detection of prostate cancer.

Method and Materials

IRB approved. We searched in our database for patients who had a prostate mpMRI report of high or very high probability for clinical significant prostate cancer (PIRADS 4 and 5), and who were also submitted to prostate biopsy with real-time US/MRI imaging fusion in our institution. We found 60 patients who had positive results for cancer in the suspicious lesion and 62 patients who had negative biopsy results (control group). All images were randomized and evaluated independently by two radiologists (with 5 and 2 years of experience in prostate mpMRI), blinded to the clinical and histopathological results. The following variables were analyzed: morphology, contours, T2 signal-intensity, diffusion restriction (subjective impression and objective values), early enhancement, contact with the surgical capsule, contact with the prostatic contours and capsular retraction. Statistical significance was set at 5%.

Results

For both readers the numeric variable that best correlated with positive biopsy results was objective ADC-value; for reader 1, median ADC-value for negative and positive biopsies results were 1.08 and 0.81 mm²/sec respectively, with an AUC of 0.82; and for reader 2 were 1.09 and 0.84 mm²/sec, with an AUC of 0.80. For categorical variables, the criteria that best correlated with the biopsy results were subjective impression for reader 1 (AUC of 0.74) and early enhancement for reader 2 (AUC of 0.65). The variables that worse correlated were contact with prostatic contours for reader 1, and heterogeneity on T2-signal, contact with the transition zone capsule and capsular retraction (AUC of 0.51 in all cases). In the multivariate analysis the ADC value (subjective for reader 1 and objective for reader 2) remained the best predictive finding for positive biopsy.

Conclusion

Diffusion restriction with lower ADC-values showed to be the best parameter to predict cancer on suspicious lesion on multiparametric MRI prior to biopsy. Efforts to establish an ADC cutoff value would improve cancer detection, especially for less experience readers.

Clinical Relevance/Application

Measurement of ADC-values is helpful to differentiate between benign and malignant lesions. There is no study in literature including this item as predictor of clinically significance tumor on MRI.

GU235-SD-MOA2

Objective Differentiation of Clear Cell and Papillary Renal Cell Carcinoma (RCC) and Oncocytoma through Whole Lesion Volumetric ADC Measurement

Purpose

To differentiate between benign and malignant lesions in the kidney using whole lesion volumetric ADC measurement.

Method and Materials

Objective differentiation of clear cell and papillary renal cell carcinoma (RCC) and oncocytoma through whole lesion volumetric ADC measurement.

Results

The objective differentiates between clear cell RCC and papillary RCC using whole lesion volumetric ADC measurements.

Conclusion

Whole lesion volumetric ADC measurement is a useful tool in differentiating between clear cell RCC and papillary RCC.

Clinical Relevance/Application

The ability to differentiate between clear cell RCC and papillary RCC using whole lesion volumetric ADC measurement can aid in the clinical management of renal tumors.
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PURPOSE

Traditional expect-based single region-of-interest (ROI) apparent diffusion coefficient (ADC) measurements have limited reproducibility and do not account for lesion heterogeneity within renal cell carcinomas (RCCs). The purpose of this study was to investigate whether histogram-derived whole lesion ADC measurements could be used to improve RCC subtype characterization.

METHOD AND MATERIALS

This HIPAA-compliant study prospectively enrolled 55 patients (21 males, 34 females; 53±13 years) with a total of 152 tumors. All scans were performed on a 1.5T system (Aera, Siemens Healthcare). The lesions were marked for surgical resection, excised, and sent for pathology. Diffusion-weighted imaging (DWI) was acquired at b values of 0, 250, and 800 s/mm². Whole lesion volumetric analysis was performed by a research fellow and reviewed by an experienced radiologist. Mean, median, and every 5th percentile ADCs were determined from the whole-lesion histogram. Linear mixed models that account for within-subject correlation of lesions were used to compare ADCs among RCC subtypes. Receiver operating characteristic (ROC) curve analysis was used to test the ability of ADCs to differentiate RCC subtypes.

RESULTS

Pathologic diagnoses of the 152 tumors were clear cell (cc) RCC for 83 lesions, papillary (p) RCC for 29 lesions, and oncocytoma for 26 lesions. Average pRCC ADC values (1.16±0.34 x 10⁻³ mm²/s) were significantly lower than ccRCC and oncocytoma ADC values (1.91±0.29 x 10⁻³ mm²/s and 1.81±0.21 x 10⁻³ mm²/s, respectively, both P<0.001). ROC analysis of the optimal percentiles demonstrated an area under the curve (AUC) of 0.95 for ccRCC vs pRCC, 0.97 for oncocytoma vs ccRCC, and 0.95 for oncocytoma vs pRCC. The sensitivities and specificities for best percentile of the models were as follows: 84.5% and 93.1% for ccRCC vs pRCC, 100.0% and 10.3% for oncocytoma vs ccRCC, and 88.5% and 93.1% for oncocytoma vs pRCC.

CONCLUSION

Volumetric whole lesion ADC analysis can improve characterization of RCC by accounting for lesion heterogeneity and minimizing observer bias. Validation studies including more classes of renal tumors are warranted.

CLINICAL RELEVANCE/APPLICATION

Improved RCC subtype characterization using histogram-derived whole lesion ADC measurements may reduce the use of invasive surgical excision for indolent/benign tumor subtypes.

GU236-SD- MOA3  Predicting Clinically Significant from Non-Clinically Significant Prostate Cancers: Evaluation of PIRADS-v2 in a Surgical Cohort

Participants

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PURPOSE

To determine if prostate mpMRI assessment with PIRADS-v2 can accurately distinguish clinically significant prostate cancer (csPCA) from non-csPCA in a large retrospective PCa population.

METHOD AND MATERIALS

This retrospective IRB-approved study identified 213 treatment-naive patients with pathology-proven PCa, and a 3T endorectal coil mpMRI followed by radical prostatectomy within 6 months. Tumors were pathologically classified into csPCA (Gleason pattern (GP) >= 4) and non csPCA (GP=3). Two radiologists, blinded to clinical/pathology data, separately reviewed mpMRIs to obtain a PI-RADS v2 overall assessment score. A 3rd radiologist adjudicated in cases of discordance. PI-RADS v2 score of 1-3 = negative, and 4-5 = positive, for csPCA. Sensitivity (SENS), specificity (SPEC), positive predictive value (PPV) and negative predictive value (NPV) of PI-RADS v2 for detecting csPCA were calculated as binomial proportions. 95% confidence intervals were calculated using Pratt’s approximation. The effect of MR-based tumor size stratification on accuracy was evaluated. Percentage of csPCA underestimated and non-csPCA overestimated by PI-RADS v2 were calculated. Cohen’s Kappa statistics assessed reader’s overall agreement.

RESULTS
Kidney involvement in FD is common and linked to globotriaosylceramide deposition in all types of renal cells, with subsequent progression in untreated patients to end stage renal failure. Parapelvic cysts (PC) have been already described in literature as a possible feature of FD; nevertheless, their exact prevalence and their meaning in renal FD involvement remain uncertain. Aim of this study is to assess the actual prevalence of PC in a representative cohort of FD patients by renal ultrasound.

**PURPOSE**

Fabry Disease (FD) is a rare inherited multi-systemic lysosomal storage disorder, related to a lack of activity of a-galactosidase. Kidney involvement in FD is common and linked to globotriaosylceramide deposition in all types of renal cells, with subsequent progression in untreated patients to end stage renal failure. Parapelvic cysts (PC) have been already described in literature as a possible feature of FD; nevertheless, their exact prevalence and their meaning in renal FD involvement remain uncertain. Aim of this study is to assess the actual prevalence of PC in a representative cohort of FD patients by renal ultrasound.

**METHOD AND MATERIALS**

We performed a retrospective multicentric study on 173 FD patients (Study 1), comparing the results with a second group of 67 FD patients analysed by the same ultrasonographer in a single center (Study 2). Age- and renal function-matched healthy controls (HC) were selected for comparison. Inclusion criteria were genetically proven FD and age>=18y, while exclusion criteria were renal replacement therapy and presence of renal malformations. Clinical and biochemical data concerning renal impairment were collected by trained physicians. Ultrasonographic examination included determination of renal diameters, presence of PC and cortical cysts or other renal abnormalities.

**RESULTS**

In Study 1, PC were detected in 28.9% of FD subjects and in 1.1% of control subjects (p<0.001); presence of other renal abnormalities and biochemical alterations did not differ between groups. In Study 2, prevalence of PC raised from 29.8% to 43.3% (p=0.05), due to a better accuracy in US examination. In both studies, no correlation was detected between PC. Finally, no difference was found between FD patients with and without PC.

**CONCLUSION**

Our results confirm the higher prevalence of PC in classical FD subjects compared to HC, highlighting the role of accurate US renal examination in their detection. Resort to CT or MRI should be considered only in case of ambiguous US findings.

**CLINICAL RELEVANCE/APPLICATION**

Although to date parapelvic cysts cannot be considered a pathognomonic sign of FD, their presence should induce to consider FD among differential diagnosis in subjects with unclear personal and family history of renal disease, in order to prevent disease progression.
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PURPOSE
The purpose of this study was to investigate on the possible factors influencing a favorable clinical outcome in patients affected by uterine fibroids and treated with MRgFUS.

METHOD AND MATERIALS
90 women with uterine fibroids treated with MRgFUS between March 2012 and December 2015 were retrospectively analysed. The ablation results were evaluated by the Non-Perfused Volume (NPV) on contrast-enhanced MR images acquired after the treatment; these data were coupled with clinical results (analyzed with a questionnaire about symptoms and health-related quality of life, UFS-QOL), patients' BMI and the quality of the acoustic window obtained the day of treatment.

RESULTS
70 women out of 90 (77.8 %) were followed (median follow-up: 2 years). The mean value of the NPV ratio was 68% assessed immediately after the treatment. In 77 patients (85,6%) an improvement in UFS-QOL was observed (50%); 64% of these were asymptomatic during the follow-up. Women with higher NPV ratio, best acoustic window and lower BMI, were more likely to achieve a clinical success.

CONCLUSION
MRgFUS ablation may be considered an effective uterus-conserving treatment for symptomatic uterine fibroids with an excellent success rate. Our experience shows that favorable conditions such as higher NPV ratio, appropriate acoustic window and lower BMI may be related to a good clinical success.

CLINICAL RELEVANCE/APPLICATION
To improve the effectiveness of MRgFUS in women with symptomatic uterine fibroids.

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TEACHING POINTS
(1) Prostate cancer is the most frequently diagnosed form of noncutaneous cancer in men and approximately 1 in 6 men will be diagnosed with prostate cancer during their lifetime. (2) Multiparametric Magnetic Resonance Imaging (MRI) has emerged as an important tool in the diagnosis of prostate cancer. But be careful because many benign entities can demonstrate diffusion restriction in the prostate that mimic prostate cancer and create diagnostic challenges. (3) The aim of this study is to discuss MR findings of benign diffusion restriction foci in the prostate and will focus on the clues that help differentiate these mimics from prostate cancer.

TABLE OF CONTENTS/OUTLINE
A quick review on prostate cancerKey MRI features of prostate cancerKey MRI features of benign causes of diffusion restriction foci in the prostate such as Chronic Prostatitis, Prostatitis with Abscess, Granulomatous Prostatitis, Post Biopsy, Hypertrophic Nodule, Hemorrhage, Thickened Surgical Capsule, Rectal Cancer Invading ProstateDescribe the clues that help distinguish benign causes of diffusion restriction foci from prostate carcinoma
Atypical Prostatic Lesions: The Uncommon Neoplasms and Periprostatic Mimickers

Awards
Certificate of Merit

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TEACHING POINTS
Review prostate anatomy and histology to allow understanding of the subtypes of rare prostate tumors. Describe the clinical and imaging features that distinguish non-adenocarcinoma lesions from adenocarcinoma acinar, the more common prostatic malignant tumor. To identify lesions that may mimic prostate malignancies, including cancers arising from surrounding organs.

TABLE OF CONTENTS/OUTLINE
Clinical and epidemiologic data of the rare prostatic malignancies. Review of imaging findings according to location and imaging pattern, including a didactic and compartmentalized approach. It will be demonstrated with ultrasound (US), computed tomography (CT), positron emission tomography (PET / CT) and magnetic resonance (MR) images how to approach a prostate tumor with atypical presentations and characteristic findings for diagnosis conditions such as sarcoma, lymphoma, carcinoid tumor, urothelial cancer and others. In the end of presentation the radiologist needs to be able to recognize the different image patterns in these conditions, that allows the radiologist to perform adequate reporting in cases of malignant prostate lesions with atypical and unusual characteristics.
**GU240-SD-MOB1**

**Color Doppler Ultrasound (CDUS) in Focal Testicular Lesions: Influence of Size and Pattern of Vessels in Malignant and Benign Lesions**

**Participants**
Vinay A. Duddalwar, MD, FRCR, Los Angeles, CA (Moderator) Nothing to Disclose

**Method and Materials**
A 10 year database identified 132 lesions (patients n=99) examined by a single observer using an Acuson Sequoia 512 and a 15MHz transducer. Grey scale and CDUS images in 2 planes were recorded. Images were stored on magnetic optical discs and retrospectively reviewed by 2 reviewers for size, B-mode features, CDUS appearances (increased/decreased) and distribution of vessels (linear/criss-cross/haphazard). All lesions had a histological diagnosis. The dimensions and volume of hyper- and hypovascular lesions were compared by means of the Wilcoxon Rank Sum test (with continuity correction).

**Results**
Median age was 35 yrs (range 14-76yrs). Median lesion volume was 1.4mls (range 0.006-195mls). 102 lesions were hypervascular; 28 lesions were hypovascular/avascular; 2 lesions had vascularity equal to the background testis. Median maximum length of hypervascular lesions was 1.50cm; median maximum length of hypovascular lesions was 1.55cm. No difference was found in the maximum length of hyper- and hypovascular lesions (p value=0.91). Benign and malignant lesions showed increased intralesional vascularity. Benign hypervascular neoplasms were smaller in maximum length than malignant hypervascular neoplasms (p value <0.01). No difference was detected in the maximum length of benign and malignant hypovascular neoplasms (p value=0.42). No relationship between the pattern of vascularity and the histological diagnosis was identified. Criss-crossing was found in 50/53 (94%) of seminomas; this alone did not differentiate seminomas from other neoplastic lesions. Avascular lesions with typical B-mode findings were correctly prospectively identified as benign ischaemic, fibrotic and cystic lesions.

**Conclusion**
Increased vascularity was found in testicular lesions of all sizes, including those <16mm. The pattern of vascularity could not reliably predict the underlying histology.

**Clinical Relevance/Application**
With modern ultrasound equipment, increased vascularity can be seen in testicular lesions of all sizes, including lesions <16mm in size. The criss-crossing pattern seen in seminomas is not specific.
To investigate the relationship between ADC values and tumor cellularity in serous carcinoma (SC), endometrioid carcinoma (EC) and clear cell carcinoma (CCC), and to compare ADC values in each histological subtypes for the differential diagnosis.

Diffusion-weighted (DW) MR imaging and pathological findings of 52 patients with primary ovarian carcinoma were retrospectively analyzed. The number of the patients with SC, EC and CCC were 21, 14, and 16. The ADC values of the solid portion of the tumor on DW imaging were calculated and the tumor cellularity was evaluated by counting cancer cells in 3 high-power cell (x400) fields. The correlation between ADC values and tumor cellularity was examined using Spearman's correlation coefficient test for statistical analysis. The difference of ADC values among each 3 subtypes of ovarian cancer was analyzed using Steel-Dwass test to distinguish each other.

The mean ± standard deviation (SD) ADC value (x10-3 mm2/s) of SC was 0.85±0.10 (range, 0.67-1.06), EC was 0.84±0.10 (range, 0.67-1.07) and CCC was 1.24±0.17 (range, 0.98-1.65). The mean ± SD tumor cellularity of SC was 446.5±120.0 (range, 204.6-655.6), EC was 461.0±81.9 (range, 333.3-602.3) and CCC was 162.9±63.3 (range, 90.3-305.7). There was a significant inverse correlation between ADC values and tumor cellularity in SC, EC and CCC. The ADC value of CCC was significantly higher than that of SC and EC. The ADC values showed statistically no significant difference between SC and EC.

The ADC values show a significant inverse correlation with tumor cellularity in SC, EC and CCC. The ADC value might be useful to distinguish CCC from SC and EC.

Clear cell carcinoma is known as a chemotherapy-resistant subtype of ovarian carcinoma, and also shows significantly poor prognosis as compared with serous carcinoma. The ADC value might be useful to distinguish clear cell carcinoma from serous carcinoma and endometrioid carcinoma.

**GU243-SD-MOB4** Imaging Assessment in Women Affected by Uterine Fibroids for Planning Type of Treatment: Surgery or Interventional Radiology?

**PURPOSE**
The management of uterine fibroids (UFs) requires an accurate selection of the more appropriate treatment in order to obtain the best result for the patients. A multiparameter retrospective evaluation was performed to evaluate the percentage of patients suitable for surgery or interventional radiology in order to optimize the selection of technique with the best cost/effectiveness ratio.

**METHOD AND MATERIALS**
228 patients with symptomatic UFs (aged between 38 and 52) were submitted to c.e. MRI to evaluate side, number, size and signal intensity of fibroids. Treatment options such as surgical treatment (myomectomy or radical hysterectomy) or mini-invasive procedures of interventional radiology (uterine artery embolization and magnetic resonance guided focus ultrasound surgery) were evaluated by our team of radiologists and gynecologists considering images, symptoms, patient age and fertility desires.

**RESULTS**
131/228 patients (57.5%) were candidates to a mini-invasive treatment. 68/131 were submitted to magnetic resonance guided focus ultrasound surgery (MrgFUS) reaching good clinical outcome in 86.7% of them; 16/131 patients have received a treatment of uterine artery embolization (UAE) and 75% of them achieved favorable results. 5/131 cases received a combination treatment of MrgFUS and UAE (good outcome: in 80% of cases). In 35 of 131 patients was not possible to perform the MrgFUS treatment, due to an inadequate acoustic window on the day of treatment. 7 women, selected for a mini-invasive treatment, refused it. 97/228 patients (42.5%) were candidates to surgery; 35/97 patients were submitted to myomectomy (good outcome in 82.9% of them); 42/97 women received hysterectomy (good outcome in 95.2% of patients) and 20 rejected a surgical treatment.

**CONCLUSION**
The correct selection of the most appropriate treatment in women with uterine fibroids is necessary to achieve the best cost/effectiveness ratio and is based on the imaging and symptoms.
An accurate selection of the more appropriate treatment is important to improve the best clinical outcome in women with uterine fibroids.

**GU244-SD-MOB5 In Vivo Multiparameter Quantitative Characterization of Sub-types of Upper Urinary Calcium Calculi on Dual-energy CT: A Pilot Study**

**Participants**
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**PURPOSE**
To investigate the value of dual-energy CT (DECT) in assessing various types of upper urinary calcium calculi in vivo, especially in detecting calcium-oxalate-monohydrate (COM) stones.

**METHOD AND MATERIALS**
Totally 43 patients with 55 calcium calculi underwent dual-source CT in dual-energy mode(100kV/140kV) were retrospectively analyzed. According to the result of infrared spectrometer, the calculi were divided into four groups: group1(COM, 12), group2(COM+COD, calcium oxalate dihydrate, 9), group3(COM+CaP, carbonate apatite, 8), group4(COM+COD+CaP, 26). For each stone, monochromatic images from 40keV to 190keV (interval of 10keV) had been reconstructed. Quantitative parameter including single spectral CT values, DEI (dual energy index) and the slope of spectrum curve at 40-100keV was computed respectively. Datas were compared using one-way ANOVE. Then combining the group 2, group 3 and group 4, named mixed calcium calculi group. Curve slope and DEI were compared between COM group and mixed calcium calculi group by T test. ROC curve was done to evaluate the diagnostic efficiency for detecting COM (vs mixed calcium calculi group).

**RESULTS**
The quantitative parameters of the different single spectral CT values, curve slope and DEI measured by four groups were statistically significant different. 110 keV can differentiation most groups. The COM group had significantly lower DEI and higher curve slope compared with mixed calcium calculi group, the diagnostic efficiency of DEI was better, ROC analysis for detection of COM calculi yielded AUC of 0.747 with cut-off 0.085 (sensitivity 58.3%, specificity 88.4%).

**CONCLUSION**
The spectral curve features parameters and DEI is helpful in the characterization of various types of calcium calculi and to detect relatively lithotripsy-resistant COM in vivo, has important significance in the preoperative assessment.

**CLINICAL RELEVANCE/APPLICATION**
The features parameters of monochromatic images and DEI may help the differential diagnosis of calcium calculi and the preoperative therapy selection.

**GU245-SD-MOB6 Utilization of Monochromatic Images at Higher Photon Energies to Reduce Pseudo-Enhancement of Renal Lesions Increases the Number of Missed Malignant Lesions**

**Participants**
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Daniele Marin, MD, Durham, NC (Abstract Co-Author) Research support, Siemens AG

**PURPOSE**
To investigate whether monochromatic images (MEI) at high energy and/or iodine quantification can preserve detection of subtle levels of enhancement, while decreasing the confounding impact of pseudo-enhancement for renal lesion characterization.

**METHOD AND MATERIALS**
Retrospective, HIPAA-compliant study was IRB approved. A phantom of unenhanced renal parenchyma (35 HU at 120 kVp) was equipped with water. Subtle enhancing lesions (10-30HU) were placed in phantoms of enhanced renal parenchyma (180&240 HU). 3 patient body sizes were simulated. 101 patients (70 men; age, 66.8 ± 12.9 years) with 111 hypo-attenuating lesions (69 cystic, 42 proven non-cystic lesions) were included. The CT protocol was an unenhanced and a post-contrast dual-energy scan. Lesion's attenuation was calculated between MEI (70-90 keV) and unenhanced images. Iodine maps (IM) were calculated. ROI analysis was performed. Receiver operating characteristics (ROC), sensitivity (sens), and specificity (spec) was calculated for a commonly used clinical threshold of 15 HU enhancement.

**RESULTS**
In the phantom, the area under the curve (AUC) was highest at 70keV and decreased towards 90 keV, 0.98 (95% CI 0.93-0.99) to 0.92 (0.87-0.96; p=0.03). Using 15 HU as a threshold, the sensitivity decreased and the specificity increased from 70 to 90 keV, 0.98 (0.94-1.00) to 0.45 (0.36-0.55) and 0.67 (0.45-0.84) to 0.96 (0.79-1.00), respectively. IM were not significantly different from 70 keV with an AUC of 0.94 (0.89-0.97; p=0.22). In patients, the AUC was highest at 70keV and decreased towards 90 keV,
0.98 (0.93-1.00) to 0.88 (0.81-0.94; p=0.003), respectively. Using a threshold of 15 HU for 70 and 90 keV, the sens decreased and the spec increased, 0.88 (0.74-0.96) to 0.67 (0.52-0.81) and 0.90 (0.80-0.96) to 0.97 (0.90-0.99), respectively. This caused false negative classifications in 5, 10, and 14 cases at 70, 80, and 90 keV, respectively. IM were not significantly different from 70 keV with an AUC of 0.95 (0.89-0.98; p=0.22).

CONCLUSION

MEI of higher energies may reduce pseudo-enhancement but also decrease contrast enhancement causing a reduced sens to detect subtle enhancing lesions. 70keV showed the best accuracy but was not significantly different from iodine maps.

CLINICAL RELEVANCE/APPLICATION

Monochromatic images of higher photon energies may reduce pseudo-enhancement but also decrease contrast enhancement resulting in a reduced sensitivity to detect subtle enhancing lesions.

CONCLUSION

MEI of higher energies may reduce pseudo-enhancement but also decrease contrast enhancement causing a reduced sens to detect subtle enhancing lesions. 70keV showed the best accuracy but was not significantly different from iodine maps.

CLINICAL RELEVANCE/APPLICATION

Monochromatic images of higher photon energies may reduce pseudo-enhancement but also decrease contrast enhancement resulting in a reduced sensitivity to detect subtle enhancing lesions.
Renal Tract Anomalies Related to the Disruption of Normal Embryological Development: What the Radiologist Needs to Know

Hardcopy Backboard

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TEACHING POINTS

The purpose of this exhibit is 1. To describe renal tract embryology detailing the stages of development. 2. To illustrate anomalies with regards to the positional and rotational phases of the developing renal tract with emphasis on common points of disruption. 3. To highlight the role of the ureteric bud and potential disturbance of normal development. 4. To recognize the development of the urinary bladder and associated anomalies.

TABLE OF CONTENTS/OUTLINE

**ABSTRACT**

**Purpose/Objective(s):** Historically, brachytherapy (BT) for cervical cancer is prescribed to Point A without reference to individual tumor extent. 3D treatment planning systems have allowed for more accurate definition of the high risk clinical target volume (HR-CTV) on CT or MRI acquired after BT applicator placement. We sought to determine the impact of prescribing to Point A versus HR-CTV in our patient population at a safety net hospital treating an underserved patient population.

**Materials/Methods:** Treatment data for 60 BT plans in 23 consecutive patients treated at a single high-volume safety net hospital from November 2014 to October 2016 was reviewed. All patients were implanted with a CT-compatible tandem and ovoid. After applicator placement, a 2.5-mm slice thickness CT scan was obtained. Point A was marked on the corresponding CT images per ABS guidelines. Organs at risk (OARs) including bladder, rectum, sigmoid, and small bowel were contoured. Dose was optimized within the treatment planning system to provide the prescription to Point A while minimizing dose to the OARs. For our study, a single physician retrospectively contoured a HR-CTV as per GEC/ESTRO consensus guidelines. A second physician confirmed these volumes. The dose volume histograms of HR-CTV and OARs were created for each application. We calculated the dose received by at least 90% of the HR-CTV (D90%) and the volume of the HR-CTV treated to the prescription dose or greater (V100%). The total volume of tissue receiving 100% of the dose was calculated for all patients. The student’s t-test was used to compare groups while a linear regression was used to assess correlation between continuous variables.

**Results:** Overall there were 12 patients with stage IB2, 7 patients with stage IIB and 4 patients with stage IIIB disease. On exam prior to first BT implant, 9 patients had parametrial extension with 3 of those extending to the pelvic sidewall. Median brachytherapy dose was 8Gy x 3 fractions. The median volume of the total tissue irradiated was 110.6 cc and median HR-CTV volume was 23.2 cc. With the dose prescribed to point A, the median HR-CTV V100% was 98.4% and the median D90% was 9.1 Gv. In 6 out of 60 insertions (10%), D90% was less than the prescription dose. The HR-CTV volume was smaller for implants where the V100% was greater than 95% (mean = 21.77 cc, n=49), compared to those that did not (mean = 28.3cc, n=11), with a P-value Conclusion: In our underserved patient population, prescribing to point A resulted in inadequate coverage of the HR-CTV, especially in larger tumors. Continued widespread implementation of CT-based treatment planning with HR-CTV may result in improved patient outcomes by allowing for assurance of proper applicator placement, improved and consistent coverage of the tumor volume, and delineation of OARs for volume-based dose calculations.
Purpose/Objective(s): Uterine papillary serous carcinoma (UPSC) represents less than 15% of endometrial cancers and is recognized as an aggressive tumor with poor prognosis. 50% of patient with Stage I UPSC will have extrauterine disease. UPSC contribute to advanced tumors and higher risk histologies. Patients with high risk early stage endometrioid adenocarcinoma, specifically FIGO Stage IB Grade 3 (IBG3) tumors, are at a high enough risk of regional recurrence to warrant pelvic radiation but may not derive as much benefit from systemic treatments. We have noted a growing trend towards the use of chemotherapy in these patients. The purpose of this study is to identify trends in the use of external beam radiation therapy (EBRT), vaginal brachytherapy (VBT), and chemotherapy for adjuvant treatment of FIGO Stage IB Grade 3 (IBG3) endometrioid adenocarcinoma in the United States.

Materials/Methods: Using the Surveillance, Epidemiology, and End Results (SEER) database, we identified 1383 patients with IBG3 endometrioid adenocarcinoma of the uterine corpus treated between 2004 and 2013. Patients were grouped based on the radiation treatment they received. Patients received either no radiation, EBRT alone, VBT alone, or both, or other (Results: For patients with Stage IBG3 endometrioid adenocarcinoma who have undergone definitive surgery, there has been a steady increase in the use of VBT alone from 9.2% of patients in 2004 to 36.4% in 2013 (an increase of 27.2%). Over this same period of time there has been a decrease in the use of either EBRT alone (32.8% to 14.4%; a decrease of 18.4%) or in combination with VBT (18.3% to 14.4%; a decrease of 3.9%). Overall, there has been a decline in any use of EBRT (51.2% to 28.8%; a decrease of 22.4%). When stratifying patients by age > 70 or age > 50 this trend persists (25.1% and 27.3% increase in VBT alone, respectively). Conclusion: This population-based analysis reveals a marked decline in the use of EBRT in patients with IBG3 endometrioid adenocarcinoma. While the SEER database does not include chemotherapy data, we hypothesize that this decline is due at least in part to the increasing use of chemotherapy. To date there have been no randomized trials showing a clear benefit to chemotherapy over EBRT in these patients. Furthermore, recent clinical trials have grouped these tumors with either higher stage disease or higher risk histologies when in fact the natural history may be very different. Our findings highlight a concerning trend towards undertreatment of regional disease in a population of patients with a high enough risk to warrant pelvic radiation. Additional work is currently under way to test this hypothesis with the National Cancer Database (NCDB) which captures chemotherapy data.

**MSRO27-05 Multi-institution Health Care Review of Uterine Papillary Serous Carcinoma**

**ABSTRACT**

Purpose/Objective(s): Uterine papillary serous carcinoma (UPSC) represents less the 15% of endometrial cancers and is recognized as an aggressive tumor with poor prognosis. 50% of patient with Stage I UPSC will have extrauterine disease. UPSC contribute to roughly 50% of endometrial cancer related mortality. While surgery is the cornerstone of treatment for UPSC, the optimal adjuvant treatments of USPC remains controversial given the lack of randomized trials. This retrospective study presents the patterns of...
Purpose/Objective(s): Gynecologic sarcomas, a group of rare tumors of the female reproductive tract, carry a relatively poor prognosis. This study identifies patient, disease and treatment characteristics across a prolonged time period and ascertains clinical outcomes at our major cancer referral center. Materials/Methods: Patients with gynecologic sarcomas in a ten year span from January 1, 2005 to January 1, 2015 were tabulated from a larger pool of 968 soft tissue tumors, with follow up data to ensure at least two years of post-treatment data collection. This was done via analysis of Electronic Medical Records, paper charts and contact with peripheral medical centers and family practitioners’ offices, especially for patients lost to follow up at the center. The inclusion criterion was age ≥ 18 years and histological diagnosis from the intermediate and malignant sections of the 2002 World Health Classification of Tumors. Carcinosarcomas (formerly known as Malignant Mixed Mullerian Tumors) and collision tumors (defined as two histologic tumor types originating in the same anatomic site) were also included in this analysis. The exclusion criterion was inadequate histological diagnosis. A literature review was also conducted to identify current outcomes trends. Overall survival was analyzed using Kaplan-Meier methodology. Results: One hundred and twelve patients meeting selection criteria were identified. Mean age at diagnosis was 65 years (Standard Deviation/SD: 12) with a median follow up of 30 months. The most common presenting symptoms were vaginal bleeding (50%) and mass ± pain (12%). Only 4 of the patients had no apparent clinical symptoms. Disease site was overwhelmingly of the uterine corpus (86%). The most common histologies were Carcinosarcoma (56%) and Leiomyosarcoma (37%). Mean tumor size was 10 cm (SD: 7) with a mean pre-treatment Hemoglobin value of 11.7 g/dl (SD: 2.1). A majority (88%) received treatment with curative intent. Radiation (49% of all patients) and chemotherapy were provided largely in an adjuvant setting. The most common fractionation regimen was 45 Gy in 25 fractions. From a surgical perspective, most patients were treated with a total abdominal hysterectomy with bilateral salpingo-oophorectomy. Bilateral lymphadenectomy was conducted in 31% of such surgeries and at least 18% had positive margins. Stage distribution by incidence was: Stage I 40%, Stage II 12%, Stage III 21% and Stage IV 24%. Forty percent of patients had a recurrence with 62% of patients still alive at time of latest follow up. Thirteen patients had a component of local disease progression or recurrence. Overall survival estimates at three and five years were 81% and 45% respectively. Conclusion: The creation of a gynecologic sarcoma database grants an array of details to be used when assessing pts with UPSC and which can be used to inform future clinical trials.

MSR027-06 Gynecologic Sarcomas: A Ten Year Demographics, Disease, Treatment and Outcome Analysis from a Large Tertiary Level Teaching Hospital

Monday, Nov. 27 2:20PM - 2:30PM Room: S103CD

Participants
Gaurav Bhattacharya, Ottawa, ON (Presenter) Nothing to Disclose
Matthew’ Tsang, MSc, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
Samy El-Sayed, MD, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
Ghufran A. Aljawi, MD, Ottawa, ON (Abstract Co-Author) Nothing to Disclose

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ABSTRACT

Purpose/Objective(s): Gynecologic sarcomas, a group of rare tumors of the female reproductive tract, carry a relatively poor prognosis. This study identifies patient, disease and treatment characteristics across a prolonged time period and ascertains clinical outcomes at our major cancer referral center. Materials/Methods: Patients with gynecologic sarcomas in a ten year span from January 1, 2005 to January 1, 2015 were tabulated from a larger pool of 968 soft tissue tumors, with follow up data to ensure at least two years of post-treatment data collection. This was done via analysis of Electronic Medical Records, paper charts and contact with peripheral medical centers and family practitioners’ offices, especially for patients lost to follow up at the center. The inclusion criterion was age ≥ 18 years and histological diagnosis from the intermediate and malignant sections of the 2002 World Health Classification of Tumors. Carcinosarcomas (formerly known as Malignant Mixed Mullerian Tumors) and collision tumors (defined as two histologic tumor types originating in the same anatomic site) were also included in this analysis. The exclusion criterion was inadequate histological diagnosis. A literature review was also conducted to identify current outcomes trends. Overall survival was analyzed using Kaplan-Meier methodology. Results: One hundred and twelve patients meeting selection criteria were identified. Mean age at diagnosis was 65 years (Standard Deviation/SD: 12) with a median follow up of 30 months. The most common presenting symptoms were vaginal bleeding (50%) and mass ± pain (12%). Only 4 of the patients had no apparent clinical symptoms. Disease site was overwhelmingly of the uterine corpus (86%). The most common histologies were Carcinosarcoma (56%) and Leiomyosarcoma (37%). Mean tumor size was 10 cm (SD: 7) with a mean pre-treatment Hemoglobin value of 11.7 g/dl (SD: 2.1). A majority (88%) received treatment with curative intent. Radiation (49% of all patients) and chemotherapy were provided largely in an adjuvant setting. The most common fractionation regimen was 45 Gy in 25 fractions. From a surgical perspective, most patients were treated with a total abdominal hysterectomy with bilateral salpingo-oophorectomy. Bilateral lymphadenectomy was conducted in 31% of such surgeries and at least 18% had positive margins. Stage distribution by incidence was: Stage I 40%, Stage II 12%, Stage III 21% and Stage IV 24%. Forty percent of patients had a recurrence with 62% of patients still alive at time of latest follow up. Thirteen patients had a component of local disease progression or recurrence. Overall survival estimates at three and five years were 81% and 45% respectively. Conclusion: The creation of a gynecologic sarcoma database grants an array of details to be used when assessing pts with UPSC and which can be used to inform future clinical trials.
BOOST: Gynecologic-Case-based Review (An Interactive Session)

Monday, Nov. 27 3:00PM - 4:15PM Room: S103CD

GU OI RO

AMA PRA Category 1 Credits ™: 1.25
ARRT Category A+ Credits: 1.50

Participants
Susanna I. Lee, MD, PhD, Boston, MA (Moderator) Editor, Wolters Kluwer nv
Aoife Kilcoyne, MBCh, Boston, MA (Presenter) Nothing to Disclose
Akila N. Viswanathan, MD, Baltimore, MD (Presenter) Nothing to Disclose
Marcela G. Del Carmen, MD, Boston, MA (Presenter) Nothing to Disclose
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LEARNING OBJECTIVES
1) Understand the role of the multidisciplinary team in diagnosis and treatment as outlined by a radiologist, radiation oncologist, surgeon and pathologist. 2) Analyze and avoid potential pitfalls in the diagnosis and management of gynecologic cancers. 3) Facilitate a multimodality approach to treatment planning.

ABSTRACT
Multidisciplinary discussion of 5 gynecologic oncology cases including experts from pathology, radiology, gynecologic oncology and radiation oncology.

Active Handout:Susanna I. Lee

Active Handout:Aoife Kilcoyne
SSE11

Genitourinary (GU Intervention: Non-prostate)

Monday, Nov. 27 3:00PM - 4:00PM Room: E351

Participants
Meghan G. Lubner, MD, Madison, WI (Moderator) Grant, Koninklijke Philips NV; Grant, Johnson & Johnson; K. Pallav Kolli, MD, San Francisco, CA (Moderator) Nothing to Disclose

Sub-Events

SSE11-01 Clinical Outcome of Uterine Fibroids Treatment: MR Guided High Intensity Focused Ultrasound Compared to Current Therapeutic Strategies

Monday, Nov. 27 3:00PM - 3:10PM Room: E351

Participants
Fabrizio Andrani, MD, Roma, Italy (Presenter) Nothing to Disclose
Alessandro Napoli, MD, Rome, Italy (Abstract Co-Author) Nothing to Disclose
Hans Peter Erasmus, Rome, Italy (Abstract Co-Author) Nothing to Disclose
Federica Fanto, Roma, Italy (Abstract Co-Author) Nothing to Disclose
Carola Palla, MD, Rome, Italy (Abstract Co-Author) Nothing to Disclose
Carlo Catalano, MD, Rome, Italy (Abstract Co-Author) Nothing to Disclose

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PURPOSE
To prospectively evaluate clinical outcome of Magnetic Resonance Focused Ultrasound (MRgFUS), Uterine Artery Embolization (UAE) and Surgery in the treatment of Symptomatic Uterine Fibroid.

METHOD AND MATERIALS
585 symptomatic uterine fibroids underwent to pre-treatment MR evaluation in order to assess myoma characteristics and MRgFUS eligibility. 187 (32%) were considered eligible to MRgFUS and treated in our department using ExAblate-InSightec, while 398 resulted ineligible and were directed toward other therapeutic strategies. Of these, 137 underwent to UAE, 143 to myomectomy and 61 to hysterectomy. Clinical outcome for each treatment was evaluated comparing pre-treatment Symptoms Severity Score (SSS) with post-treatment SSS at 3-month and 12-month follow-up. Data concerning number and type of complications, days of hospitalization and days of convalescence were also collected and compared.

RESULTS
SSS mean reduction at 3 and 12-months was of 27,4% and 56,3%, respectively, for MRgFUS group; 48,7% and 56,9% for UAE group; 69,8% and 67,1% for myomectomy group; 96,6% and 94,5% for hysterectomy group. MRgFUS group demonstrated fewer complications (4 patients, 2,3 %), while the major adverse events rate was reported in UAE group (33 patients, 25,4 %). All MRgFUS patients were treated in outpatient setting, while mean days for hospitalisation and convalescence for other groups were respectively 3,4±2 and 11,7±9 days for UAE group; 4,1±2 and 16,9±12 days for myomectomy group; 4,5±1 and 24,6±14 days for hysterectomy group.

CONCLUSION
Clinical efficacy of MRgFUS for uterine fibroids treatment is comparable to UAE but slightly lower than myomectomy. However, MRgFUS is feasible in an outpatient setting and adverse events rate is significantly lower than other therapeutic strategies.

CLINICAL RELEVANCE/APPLICATION
MRgFUS is a new therapeutic strategy for symptomatic uterine fibroids, representing a non-invasive, safe and effective choice for selected patients.

SSE11-02 Percutaneous Ablation Therapy of Small Renal Tumors in Healthy Patients: A First Line Treatment

Monday, Nov. 27 3:10PM - 3:20PM Room: E351

Participants
Renato N. Zangiacomo, MD, Sao Paulo, Brazil (Presenter) Nothing to Disclose
Marcos R. Menezes, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
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PURPOSE
The purpose of our study is to evaluate the oncolgic outcomes of ablative percutaneous therapies, such as radiofrequency (RFA) and cryoablation (Cry), used as first-line therapy for small renal masses (SRM) (T1a) in healthy/surgical patients.

METHOD AND MATERIALS
This study consisted of an institutional review board approved retrospective review at a multicentric center. Between November 2010 and July 2016, 85 healthy patients (those with an American Society of Anesthesiologists [ASA] physical status classification score of 1 or 2) with 95 SRM who underwent RFA (n=19) or cryoablation (n=76) were identified with a median largest tumor diameter of 2.4 cm (range 0.7 - 4.0 cm). Inclusion criteria were: American Society of Anesthesiologists [ASA] physical status classification score of 1 or 2; a diagnostic biopsy prior to the treatment; a malignant T1a renal tumor; and more than 6 months follow-up. Patients with an identified genetic disease predisposing them to RCC were excluded from the analysis. Patients who had undergone a previous intervention in the ipsilateral kidney were not excluded, based on ASA criteria. The minimally invasive approach, such as ablation therapies, was achieved either by the patient’s choice or after multidisciplinary discussion. Patients were followed up with contrast-enhanced CT or MRI at 3, 6, 9 and 12 months and every 6 months thereafter sequentially. Oncological outcomes were calculated from the time of the ablation therapy.

RESULTS
Technique effectiveness was almost 98% (93 of 95). Median follow-up was 19 months (range 6-77). LTP were found in two patients (2%) with a median follow-up time 11 months. All LTP were retreated successfully with ablation percutaneous therapy. Median LTPFS could not be calculated due to the fact that most of the patients in the study were still alive at the conclusion of the study period. No patient developed metastatic renal cell carcinoma (RCC) and none died from RCC.

CONCLUSION
Percutaneous ablations therapies seem to be a reasonable option to treat SRM as the first line due to the similarly oncological outcomes to the surgery in healthy patients.

CLINICAL RELEVANCE/APPLICATION
Percutaneous ablations therapies may be a reasonable treatment choice for the SRM in healthy patient.

SSE11-03 Percutaneous Microwave Ablation of Renal Cell Carcinoma

For information about this presentation, contact:
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PURPOSE
To assess the safety and efficacy of image guided Microwave ablation (MWA) in biopsy-proven renal tumors within a minimum of 1-year postablation follow-up.

METHOD AND MATERIALS
In this retrospective study, 95 biopsy-proven renal tumors in 73 patients who underwent the renal MWA procedure from 2013 to 2016 at our institution were evaluated. This was an institutional review board-approved study. Data collected included demographic data, tumor characteristic data, procedural protocols and clinical follow-up visits within a 1 year. Primary outcomes were assessed by technical success, local recurrence-free (LRFS), and complications. Technical success was evaluated with Imaging immediately after MWA. Presence LRFS was examined with Imaging at 3-month target intervals for the first 2 years. Complications were categorized using the Clavien-Dindo classification system.

RESULTS
73 patients with 95 biopsy-proven renal lesions within 1 year postablation follow-up were included. The mean patient age was 64 (27-93) years and 63% were male. The mean tumor size was 2.7cm (0.8-7.4). 19% were benign while 81 % were RCC with clear cell 61.5%(58/95), papillary 13%(12/95), chromophobe 1.2%(1/95), oncocytoma 15%(14/95) and the rest were metastatic, unclassified lesions and benign cyst. Tumors were located 56% in the left kidney and most 39%(37/95) in lower pole.89/95 lesions were treated in a single encounter with 94% technical success but 6%(6/95) required a second ablation which most was 83%(5/6) unclassified lesions and benign cyst. The local recurrence rate was10.5%(10/95) with mean tumor size of 3.2 cm and most 50%(3/6) had Interpolar location.The highest recurrence rate was in 70%(7/10) CC, 10% Papillary (1/10) and the rest were unclassified and metastatic tumors. The complication rate was 7%(6/95) with minor complication (hematoma and severe pain) and no major one. The mean cancer-free survival was 11.9 months. All patients (99.4%) are alive only one patient died with unrelated cause (Melanoma, metastasis RCC) to the MW ablation.

CONCLUSION
Image-guided MWA appears to be a reliable and effective treatment option with low recurrence and complication rates in early-stage renal cell carcinoma.
**SSE11-04**  The Increasing Utilization of Percutaneous Radiofrequency- and Cryo-ablation of Kidney Tumors in Recent Years

**PURPOSE**

Percutaneous microwave ablation (PRFA) and percutaneous cryoablation (PCRYO) have been billable since 2006 (PRFA) and 2008 (PCRYO). They are alternatives to surgical treatment. Our purpose was to study trends in their use compared with similar surgical approaches, and to determine the degree to which radiologists participate.

**METHOD AND MATERIALS**

The data source was the Medicare Part B Physician/Supplier Procedure Summary Master Files for 2003-2015. Procedure codes for PRFA, PCRYO, laparoscopic ablation, and open ablation were selected. Volumes for each of these ablative approaches were tracked. Medicare specialty codes were used to identify the specialty of the provider of each service. The code for partial nephrectomy was also studied for comparison.

**RESULTS**

Medicare volume of percutaneous ablation (both PRFA and PCRYO combined) was 927 in 2006. It then increased steadily, reaching 3378 in 2015 (+526%). Radiologists have always done the vast majority of these interventions; their share in 2015 was 89.9% while urologists’ share was 9.0%. Of the percutaneous procedures that year, 33% were PRFA and 67% were PCRYO. Laparoscopic ablation volume was 452 in 2003, peaked at 1691 in 2007, but then declined sharply over the ensuing years to 470 in 2015. Virtually all of these were done by urologists. Open ablation volume was 241 in 2006 (the first year a code was available), increased to 260 in 2007, but then declined sharply to 84 in 2015. Almost all were done by urologists. Partial nephrectomy volume hovered in the 3400-3700 range but then began to drop in 2013, 2014, and 2015. Volume in 2015 was 2540.

**CONCLUSION**

Use of percutaneous ablation of renal lesions (both PRFA and PCRYO) has grown rapidly in recent years. By comparison, laparoscopic ablation and open ablation volumes have dropped sharply. The percutaneous approach is now used with considerably greater frequency than even partial nephrectomy. Radiologists strongly predominate in the percutaneous procedures. PCRYO is used twice as often as PRFA.

**CLINICAL RELEVANCE/APPLICATION**

Percutaneous techniques now appear to be the preferred approach in many patients with renal tumors, outstripping all 3 surgical approaches.
Comparison of General Anesthesia and Conscious Sedation during Percutaneous Radiofrequency Ablation of T1a Renal Cell Carcinoma

Monday, Nov. 27 3:50PM - 4:00PM Room: E351

All treated patients showed a very good procedural outcome with a mean initial extension of the NPV about 80-90%. After 2 years from the MRgFUS, in the GROUP A, 8/13 showed progressive reduction of the UFs with a restoration of uterine wall morphology. Four/13 showed a complete disappearance of the UFs and in one patient, the fibroid of type 0 were partially expelled from the uterine cavity, without necessity of hysterectomy. Also in the GROUP B we recorded a reduction in UFs volume, (18/22 about 70%, and 4/22 about 90%). In addition, all the women experienced an improvement of UFS-QOL around 90%, when compared with the pre-MRgFUS and no severe adverse events were identified in these patients during and post the procedure.

CONCLUSION
A sustained symptomatic improvement may be observed in patients affected by both submucosal and intramural uterine fibroids that underwent to MRgFUS, along the 2 year-follow-up.

CLINICAL RELEVANCE/APPLICATION
To improve the management of the patients affected by symptomatic submucosal and intramural uterine fibroids with mini-invasive treatment.

SSE11-06 Comparison of General Anesthesia and Conscious Sedation during Percutaneous Radiofrequency Ablation of T1a Renal Cell Carcinoma

Participants
Byung Kwan Park, MD, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose

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PURPOSE
Percutaneous radiofrequency ablation (RFA) is so painful that this treatment requires pain control such as conscious sedation (CS) or general anesthesia (GA). It is still unclear which type of anesthesia is better for treatment outcomes of renal cell carcinoma (RCC). This study aimed to compare GA and CS in treating patients with RCC with RFA.

METHOD AND MATERIALS
Between 2010 and 2015, 51 patients with biopsy-proven 51 RCCs (<4 cm) were treated with CT-guided RFA. GA was performed in 41 and CS in 10 patients. Tumor size, local tumor progression, metastasis, major complication, effective dose, glomerular filtration rate (GFR) difference, and recurrence-free survival rate were compared between these groups.

RESULTS
The mean tumor size was 2.1 cm in both groups (p=0.673). Local tumor progression occurred in 0% (0/41) of GA group, but in 20% (2/10) of CS group (p=0.035). Metastases in these groups occurred in 2.4% (1/41) of GA group and 10% (1/10) of CS group (p=0.357). No major complications developed in either group after the first RFA session. The mean effective doses in these groups were 21.7 mSv and 21.2 mSv, respectively (p=0.868). The mean GFR differences in GA and CS groups were -13.5 mL/min/1.73m² and -19.1 mL/min/1.73m², respectively (p=0.575). Two-year recurrence-free survival rates in these groups were 97.5% and 78.8%, respectively (p=0.043).

CONCLUSION
GA may provide lower local tumor progression and better intermediate outcomes than CS in treating small RCCs with percutaneous RFA.

CLINICAL RELEVANCE/APPLICATION
GA instead of CS is recommended for pain control in treating a small RCC with image-guided RFA.
PURPOSE
Nephrolithiasis is associated with systemic conditions including low bone mineral density (BMD), which may correlate with hypercalciuria in kidney stone formers (KSF). Typically, low BMD is diagnosed with dual-energy x-ray absorptiometry. We evaluated the association of vertebral bone mineral density on CT with 24-hour urine parameters in KSF.

METHOD AND MATERIALS
99 KSF who had CT and 24-hour urine studies were retrospectively evaluated. BMD was estimated using an oval ROI on L1 trabecular bone. A literature-based threshold for a balanced sensitivity (73.9%) and specificity (70.6%) of 160 HU was used to distinguish normal from low BMD. Univariate and multivariate logistic regression analysis was performed to compare patients with low and normal BMD. Multivariate linear regression was performed to assess for variables associated with 24-hour urine parameters.

CONCLUSION
CT-based diagnosis of low mineral bone density is associated with larger urinary calculi and derangements in 24-hour urine calcium and citrate.

CLINICAL RELEVANCE/APPLICATION
CT-based diagnosis of low mineral bone density is associated with larger urinary calculi and derangements in 24-hour urine calcium and citrate.

SSE12-02  Comparison of Detection Rate for Uric Acid Uroliths among Variable Parameters of CT: Phantom Study

Monday, Nov. 27 3:10PM - 3:20PM Room: E353A

Participants
Jin Kyem Kim, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Young Taik Oh, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Sung Yoon Park, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Kyungwha Han, PhD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Dae Chul Jung, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

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PURPOSE
To investigate whether uric acid stone can be detected by reduced radiation dose using 160mm ultra-wide coverage CT after
loading uroliths collected from the human body into the phantom.

**METHOD AND MATERIALS**

This study was approved by IRB. Six uric acid stones (size range from 1.8mm to 11mm) derived from the patients were embedded into silicon cylinder model, and then it was inserted into the human phantom along the ureter course. CT scan was undertaken with two sessions (abdominal cavity and pelvic cavity, respectively) with the same silicon model by various combinations of different tube-voltage (100 kVp, 80 kVp, 70 kVp) and tube-current (300 mA, 250 mA, 200 mA, 150 mA, 100 mA) using 160mm ultra-wide coverage CT. Three radiologists evaluated the presence of uric acid stones in each data set. The radiation dose was reported on CT system after CT acquisition was finished. The reader-averaged detection rate was compared using logistic regression with generalized estimating equation.

**RESULTS**

The radiation dose was from 6.32 mGy (CTDIFORM) with 100kVp and 300mA, to 0.69 mGy (CTDIFORM) with 70kVp and 100mA. The overall reader-averaged detection rate was from 50.00 to 88.98. The reader-averaged detection rate showed significant different only in tube-voltage and tube-current of abdomen (p=0.0004, <0.0001). The stone over 4 mm was detected in all parameter sets except two parameter sets (70kVp with 100 and 150mAs).

**CONCLUSION**

Ultralow-dose CT showed the promising result for uric acid stone detection in a phantom study with profound radiation dose reduction.

**CLINICAL RELEVANCE/APPLICATION**

We present the detection rate of the uric acid stone in a variable parameter using a phantom. Our result showed the possible application of ultralow-dose CT, even with 70kVp, for the detection of uric acid stones and clinical study needs to be followed to confirm our results.

**SSE12-03  Uric Acid versus Non-Uric Acid Urinary Stones: Differentiation with CT Texture Analysis**

**Participants**

Gu Mu Yang Zhang, MD, Beijing, China (Presenter) Nothing to Disclose  
Bing Shi, BDS, Beijing, China (Abstract Co-Author) Nothing to Disclose  
Min Xu, Beijing, China (Abstract Co-Author) Research Consultant, Siemens AG;  
Hao Sun, MD, Beijing, China (Abstract Co-Author) Nothing to Disclose  
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Zheng Yu Jin, MD, Beijing, China (Abstract Co-Author) Nothing to Disclose

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**PURPOSE**

To investigate the diagnostic accuracy of CT texture analysis (CTTA) to differentiate uric acid (UA) from non-UA urinary calculi with ex vivo Fourier transform infrared spectroscopy (FT-IR) as the reference standard

**METHOD AND MATERIALS**

In this institutional review board-approved retrospective case-control study, 14 patients with 18 UA stones and 34 patients with 35 non-UA stones were identified from the database. All the patients had preoperative unenhanced CT evaluation and underwent surgical removal of the stones subsequently. CTTA was performed on unenhanced CT images by using TexRAD software. Receiver operating characteristic (ROC) curves were performed and the area under the ROC curve (AUC) was calculated for texture parameters that were significantly different. The optimal discriminative features were used to train support vector machine (SVM) classifiers. Diagnostic accuracy of textural features was evaluated and 10-fold cross validation was performed

**RESULTS**

Compared to non-UA stones, UA stones had significantly lower Mean at all texture scales, lower SD and MPP at all except coarse texture scales, lower skewness at no filtration and higher kurtosis at no filtration and fine texture scale (P<0.001). The average SVM accuracy of textural features for differentiating UA from non-UA stones ranged from 77.4% to 98.1% (after 10-fold cross validation). A model incorporating Mean, SD, MPP and kurtosis quantified from no filtration resulted in an AUC of 0.99 ± 0.01 with a SVM accuracy of 98.1%, sensitivity of 100% and specificity of 94.4%.

**CONCLUSION**

CTTA on unenhanced CT images could be used to accurately differentiate UA from non-UA urinary stones

**CLINICAL RELEVANCE/APPLICATION**

CTTA could help to characterize urinary stone composition beyond the basic evaluation and allow optimization of treatment options for patients with urolithiasis.

**SSE12-04  Low-Dose CT of Suspected Urolithiasis: Diagnostic Yield for Assessment of Alternative Diagnoses**

**Participants**

Frank Oliver G. Henes, MD, Hamburg, Germany (Abstract Co-Author) Nothing to Disclose  
Peter Bannas, MD, Hamburg, Germany (Abstract Co-Author) Nothing to Disclose  
Marc Regier, Hamburg, Germany (Abstract Co-Author) Nothing to Disclose  
Sarah Keller, MD, Hamburg, Germany (Abstract Co-Author) Nothing to Disclose  
Luis Kluth, Hamburg, Germany (Abstract Co-Author) Nothing to Disclose
Gerhard B. Adam, MD, Hamburg, Germany (Abstract Co-Author) Nothing to Disclose
Julius M. Weinrich, Hamburg, Germany (Presenter) Nothing to Disclose

PURPOSE
To assess the diagnostic yield of low-dose computed tomography (LDCT) for alternative diagnoses (AD) in patients with suspected urolithiasis.

METHOD AND MATERIALS
776 consecutive patients who underwent non-contrast enhanced abdominal CT for evaluation of suspected urolithiasis were included in this study. All examinations were performed with a low-dose CT protocol; images were reconstructed using an IR system (iDose4™, Philips Healthcare, Best, the Netherlands). The leading CT diagnosis was recorded for each patient and compared with the final clinical diagnosis, which was referred to as the reference standard. The final clinical diagnosis was determined by review of hospital discharge records and reports of surgical procedures.

RESULTS
The prevalence of urolithiasis was 82.5% (640/776). LDCT reached a sensitivity of 94.1% (602/640), a specificity of 100% (136/136) and an accuracy of 95.1% (738/776) for the detection of urolithiasis. In 91 patients without urolithiasis (66.9%) AD were established as final clinical diagnoses. AD were most commonly located in the genitourinary (n=51) and gastrointestinal tract (n=18). LDCT correctly provided AD in 57 patients (62.6%) and was false negative in 34 patients (37.4%). The most common clinical AD missed in LDCT were urinary tract infections (n=22). Seven diagnosis missed in LDCT were located outside of the scan-volume. In 43 patients neither LDCT nor clinical workup could establish a final AD (5.5%). Sensitivity, specificity and accuracy of LDCT for detection of AD was 62.6% (57/91), 95.6% (41/43) and 73.5% (100/136), respectively.

CONCLUSION
LDCT enables the diagnosis of the majority of AD in the setting of suspected urolithiasis. Most frequent alternative diagnoses missed by LDCT in this study were urinary tract infections or diagnoses located outside of the scan-volume.

CLINICAL RELEVANCE/APPLICATION
Although the prevalence of urolithiasis in patients undergoing CT is high, there is still the need to detect significant alternative pathologies by low-dose protocols. Besides genitourinary and gastrointestinal disorders osseous pathologies in this patient group are frequent findings.

SSE12-05 Urinary Stone Detection with Deep Convolutional Neural Networks on Unenhanced Computed Tomography Images

Monday, Nov. 27 3:40PM - 3:50PM Room: E353A

Awards
Student Travel Stipend Award

Participants
Anushri Parakh, MBBS, MD, Boston, MA (Presenter) Nothing to Disclose
Hyunkwang Lee, Boston, MA (Abstract Co-Author) Nothing to Disclose
Jung Hwan Cho, Boston, MA (Abstract Co-Author) Nothing to Disclose
Synho Do, PhD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Dushyant V. Sahani, MD, Boston, MA (Abstract Co-Author) Research support, General Electric Company; Medical Advisory Board, Allena Pharmaceuticals, Inc

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PURPOSE
The study aimed to determine if deep-learning models can perform detection of clinically relevant urinary stone disease on unenhanced CT images with high-fidelity.

METHOD AND MATERIALS
Retrospective identification of patients (n=289) who presented with suspected renal stone disease and underwent CT on Discovery CT 750 HD, GE Healthcare between January-December 2016 was performed. Patients were categorized according to presence (n=128) and absence (n=161) of stones. 13,278 image slices were first used to train for anatomy recognition. Of the 544 total image slices (ISf) each for stone and no-stone, 437 served as training (ISt) and 107 as validation (ISv) set for DL. Stones were grouped according to size: Group A < 4mm (ISf 89, ISt 72, ISv 17), Group B 4-9.9mm (ISf 287, ISt 230, ISv 57) and Group C > 10mm (ISf 168, ISt 135, ISv 33). Area (AUC) under the receiver-operating-characteristics curve analyses for total and size-based accuracy for stone detection was calculated in abdomen and bone windows.

RESULTS
The accuracy for stone detection was 91.12% with 0.964 AUC. DL correctly predicted 14/17 in Group A, 51/57 in Group B and 32/33 in Group C. No significant difference was found in detection results on abdomen and bone windows. The incorrectly classified cases were due to extremely small stones, presence of phlebolith along the ureter or anatomical misregistration.

CONCLUSION
DL has the potential to segment anatomy and detect urinary stone disease, irrespective of location in the urinary tract and stone size.

CLINICAL RELEVANCE/APPLICATION
There has been an increase in the utilization of CT for urinary stone disease. Being relatively task-specific, DL for stone detection has the potential to be applied in real-time as a diagnostic support by pre-analyzing and triaging positive cases for radiology read-
outs. This would improve workflow and patient management in an emergency setting.

SSE12-06  Prediction of Successful Shock Wave Lithotripsy: Potential of Texture Analysis and Machine Learning in Computed Tomography

Monday, Nov. 27 3:50PM - 4:00PM Room: E353A

Participants
Manoj Mannil, Zurich, Switzerland (Presenter) Nothing to Disclose
Jochen von Spiczak, MD, MSc, Zurich, Switzerland (Abstract Co-Author) Nothing to Disclose
Christian Fankhauser, Zurich, Switzerland (Abstract Co-Author) Nothing to Disclose
Hatem Alkadhi, MD, Zurich, Switzerland (Abstract Co-Author) Nothing to Disclose

PURPOSE
To apply texture analysis (TA) in computed tomography (CT) of urinary stones and to correlate TA findings with the number of required shockwaves for successful shock wave lithotripsy (SWL).

METHOD AND MATERIALS
CT was performed on thirty-four urinary stones in an in-vitro setting. Urinary stones underwent SWL, the number of required shockwaves for disintegration was recorded. TA was performed after postprocessing for pixel spacing and image normalization. Feature selection and dimension reduction were performed according to inter- and intrarater reproducibility and by evaluating the predictive ability of the number of shock waves along with the degree of redundancy between TA features using machine learning algorithms. Three regression models were tested: (1) linear regression with elimination of colinear attributes (2), sequential minimal optimization regression (SMOreg) using machine learning, and (3) simple linear regression model of a single TA feature with lowest squared error. Urinary stone samples were grouped using the median of required shockwaves. Correlation coefficients were calculated between each model and absolute number of shockwaves. Receiver operating characteristics (ROC) analysis was performed for dichotomized results, areas-under-the-curve (AUC) were calculated.

RESULTS
92 out of 308 TA features with excellent reproducibility (ICC > 0.8) remained. Highest correlations were found for the linear regression model (r=0.55): y=0.4892*Percentile10-37.6313*S33SumAverg+2023.7399, followed by the sequential minimal optimization regression model (r=0.51) and simple linear regression model (r=0.47). Using the median number of required shockwaves (n=72) as cutoff showed highest AUCs for the SMOreg model (AUC=0.838): y=0.4491*ZPercentile10+0.0044*ZS11InvDfMom-0.0294*ZS33SumAverg-0.0804*ZS4-4SumVarnc+0.0564.

CONCLUSION
Our in-vitro study indicates the potential of TA of urinary stone CT enabling the prediction of successful stone disintegration with SWL with high accuracy.

CLINICAL RELEVANCE/APPLICATION
Successful prediction of stone disintegration with SWL using TA in CT may prevent repeated SWL treatment or alternative, more invasive procedures associated with higher morbidity and costs.
**SPSH30**

**Hot Topic Session: Abbreviated Abdomen MRI Protocols**

**Tuesday, Nov. 28 7:15AM - 8:15AM Room: E450B**

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

Participants
Zhen J. Wang, MD, Hillsborough, CA (*Moderator*) Stockholder, Nextrast, Inc

For information about this presentation, contact:
Jane.Wang@ucsf.edu

**LEARNING OBJECTIVES**

1) Understand the workflow and finance issues related to implementing abbreviated MRI protocols in the clinics.
2) Describe the use of abbreviated MRI protocols for the evaluation of hepatocellular carcinoma, cystic pancreatic lesions, prostate cancer, and uterine cancer.

**Sub-Events**

**SPSH30A  Economic Rationale for Shorter MR Examinations**

Participants
Sanjay Saini, MD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:
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**LEARNING OBJECTIVES**

1) To understand long-term reimbursement trends for diagnostic imaging in general and MRI in particular.
2) To provide the clinical and economic rationale for shorter MR protocols made possible through recent technologic advances.

**SPSH30B  Abbreviated MRI for HCC Screening and Surveillance**

Participants
Bachir Taouli, MD, New York, NY (*Presenter*) Consultant, MEDIAN Technologies ; Grant, Guerbet SA

For information about this presentation, contact:
bachir.taouli@mountsinai.org

**LEARNING OBJECTIVES**

1) Review the current evidence on HCC screening and surveillance.
2) Introduce the concept of abbreviated MRI using gadoxetic acid for HCC screening.
3) Review early results of AMRI for HCC screening.

**ABSTRACT**

HCC is the fastest growing cause of cancer death in the United States. Practice guidelines recommend semi-annual HCC surveillance using ultrasound for high-risk patients to permit detection of HCC at an early stage, enabling effective treatment, and potentially improving survival. Due to known limitations of ultrasound, there is recent interest in developing fast MRI methods for HCC screening. In this presentation, we will discuss a novel abbreviated MRI (AMRI) exam designed to detect early-stage HCC in cirrhotic patients. AMRI is performed after gadoxetate disodium injection without the use of dynamic acquisitions, and combines only 3 sequences: T1 during the hepatobiliary phase, diffusion-weighted imaging and T2 SS FSE. The total exam time is <=15 min, thus potentially decreasing costs. We will discuss pros and cons of AMRI, future directions and other alternatives.

**SPSH30C  A 10-min MRI Protocol for Follow Up Incidental Cystic Pancreatic Lesions**

Participants
Ivan Pedrosa, MD, Dallas, TX (*Presenter*) Nothing to Disclose

For information about this presentation, contact:
ivan.pedrosa@utsouthwestern.edu

**LEARNING OBJECTIVES**

1) To recognize the role of MRI in the follow up of incidental cystic pancreatic lesions.
2) To understand the potential advantages and disadvantages of a short MRCP protocol for the follow up of incidental cystic pancreatic lesions.
**ABSTRACT**

The diagnosis of incidental cystic pancreatic lesions has increased dramatically in the last decades due to widespread use of cross-sectional imaging and improvements in image quality. While the vast majority of these lesions exhibit a benign behavior a minority of them can evolve into invasive malignancies. This has led to the development and implementation of practice guidelines for the follow up of these lesions by several major medical organizations, all of which recognize serial imaging as the pillar of such strategies. Magnetic resonance cholangiopancreatography (MRCP) offers several advantages for the follow up of incidental pancreatic cystic lesions including excellent soft-tissue contrast and sensitivity to detect fluid and delineate ductal structures of the pancreaticobiliary system, and the lack ionizing radiation. However, several qualities may challenge its broad implementation including long acquisition times, cost, and concerns about the repeated administration of gadolinium-based contrast agents during serial examinations. In this talk we will review the potential advantages and disadvantages of a short MRCP protocol for the follow up of incidental cystic pancreatic lesions.

**Active Handout:** Ivan Pedrosa


**SPSH30D Abbreviated MRI of the Uterus and Cervix: When and How**

Participants
Evis Sala, MD, PhD, New York, NY (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Discuss patient preparation and specific MRI protocols for imaging of various uterine conditions. 2) Emphasize the role and indications for abbreviated MRI of the uterus and cervix. 3) Review specific MRI reporting tips for uterine and cervical pathologies.

**URL**

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Evis Sala, MD, PhD - 2013 Honored EducatorEvis Sala, MD, PhD - 2017 Honored Educator

**SPSH30E Abbreviated Prostate MRI Protocols: Tips and Caution**

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

For information about this presentation, contact:
Andrew.Rosenkrantz@nyumc.org

**LEARNING OBJECTIVES**

1) Review the motivations for shortening standard protocols for prostate MRI. 2) Review various strategies for shortening prostate MRI protocols. 3) Consider pitfalls and published data relevant to shortened prostate MRI protocols.
Prostate MRI (Hands-on) Course will be repeated Monday, Tuesday, Wednesday and Thursday from 8am-10am

Tuesday, Nov. 28 8:00AM - 10:00AM Room: S401CD

AMERICAN MEDICAL ASSOCIATION CREDIT: 2.00
ARRT CATEGORY A+ CREDITS: 2.25

Participants
Jelle O. Barentsz, MD, PhD, Nijmegen, Netherlands (Presenter) Advisor, SPL Medical BV
Jurgen J. Futterer, MD, PhD, Nijmegen, Netherlands (Presenter) Research Grant, Siemens AG
Roel D. Mus, MD, Nijmegen, Netherlands (Presenter) Nothing to Disclose
Geert M. Villeirs, MD, PhD, Ghent, Belgium (Presenter) Nothing to Disclose
Marloes van der Leest, MD, Nijmegen, Netherlands (Presenter) Nothing to Disclose
Renske L. van Delft, Nijmegen, Netherlands (Presenter) Nothing to Disclose
Rianne R. Engels, Cuijk, Netherlands (Presenter) Nothing to Disclose
Leonardo K. Bittencourt, MD, PhD, Rio De Janeiro, Brazil (Presenter) Nothing to Disclose
Joseph J. Busch, MD, Chattanooga, TN (Presenter) Nothing to Disclose
Daniel J. Margolis, MD, Los Angeles, CA (Presenter) Nothing to Disclose
Antonio C. Westphalen, MD, Mill Valley, CA (Presenter) Scientific Advisory Board, 3DBiopsy LLC; Research Grant, Verily Life Sciences LLC
Philippe A. Puech, MD, Lyon, France (Presenter) Nothing to Disclose

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LEARNING OBJECTIVES

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

ABSTRACT

In this Hands-on Workshop, the participants will able to review up to 30 multi-parametric MRI cases with various prostatic pathology using a dedicated workstation. Focus will be on the overall assessment of Pi-RADS v2 category, which enables them to score the probability of the presence of a significant cancer in patients with elevated PSA and/or clinical suspicion. All cases are from daily non-academic practice, and have various levels of difficulty. The cases include: easy and difficult significant peripheral-transition- and central zone cancers, inflammation, BPH, and the most common pitfalls. Internationally renowned teachers will guide the participants during their Pi-RADS v2 scoring. PLEASE NOTICE: Based on last year's experience we expect this course to be very popular. We only have 50 computers, and two spots per computer. Only the first 100 people will be accepted in the room. The front rows are reserved for beginners. Do you have experience with prostate MR? Please take a seat at the computers in the back of the room. We will not have space for any additional listeners this year. The coursebook can be found as handout to this course, please download and take your tablet to view the coursebook during the course.

Active Handout: Renske Lian van Delft

Chronic Pelvic Pain: Added Value of MRI in Endometriosis, Fibroids, and Pelvic Floor Relaxation

Tuesday, Nov. 28 8:30AM - 10:00AM Room: E450B

AM APA Category 1 Credits ™: 1.50
ARRT Category A+ Credit: 1.75

Participants
Susan M. Ascher, MD, Washington, DC (Coordinator) Nothing to Disclose
Susan M. Ascher, MD, Washington, DC (Moderator) Nothing to Disclose
Elizabeth A. Sadowski, MD, Madison, WI (Presenter) Nothing to Disclose
Yuliya Lakhman, MD, New York, NY (Presenter) Nothing to Disclose
Gaurav Khatri, MD, Dallas, TX (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Improve knowledge of the economic and psychosocial impact of chronic pelvic pain. 2) Review the indications and MRI imaging protocols for endometriosis. 3) Recognize the MRI appearance of endometriosis. 4) Review the epidemiology and clinical presentations of leiomyomas. 5) Review current treatment options for symptomatic leiomyomas. 6) Recognize the MRI appearance of leiomyomas to include differentiating them from other myometrial masses. 7) Review common surgical interventions for stress urinary incontinence and pelvic organ prolapse. 8) Describe the MRI technique for imaging synthetic material in the pelvic floor. 9) Recognize normal and abnormal MRI appearances of synthetic materials used in pelvic floor dysfunction. New in 2017: PLEASE NOTE
- All courses designated for SAM credit at RSNA 2017 will require attendees bring a personal device e.g. phone, iPad, laptop to complete the required test questions during the live session.
Emerging Technologies: Prostate Cancer Imaging & Management

Tuesday, Nov. 28 8:30AM - 10:00AM Room: S505AB

Participants
Peter L. Choyke, MD, Rockville, MD (Moderator) Researcher, Koninklijke Philips NV; Researcher, General Electric Company; Researcher, Siemens AG; Researcher, iCAD, Inc; Researcher, Aspyrian Therapeutics, Inc; Researcher, ImaginAb, Inc; Researcher, Aura Biosciences, Inc

For information about this presentation, contact:
pchoyke@nih.gov

LEARNING OBJECTIVES
1) Understand current issues in prostate cancer relevant to imaging. 2) Understand the role of emerging technologies in the imaging and management of prostate cancer.

ABSTRACT
Prostate cancer is a major health issue. Imaging has made great strides in the last decade including the use of multiparametric MRI, MR-ultrasound fusion biopsies and most recently PET scanning. This refresher course explores emerging technologies in prostate cancer imaging and management.

Sub-Events
RC317A  Introduction to Imaging in Prostate Cancer

Participants
Peter L. Choyke, MD, Rockville, MD (Presenter) Researcher, Koninklijke Philips NV; Researcher, General Electric Company; Researcher, Siemens AG; Researcher, iCAD, Inc; Researcher, Aspyrian Therapeutics, Inc; Researcher, ImaginAb, Inc; Researcher, Aura Biosciences, Inc

For information about this presentation, contact:
pchoyke@nih.gov

LEARNING OBJECTIVES
1) Understand the impact of new screening guidelines on imaging of prostate cancer. 2) Understand the issues facing clinicians treating prostate cancer.

ABSTRACT
This talk will review the current status of screening for prostate cancer and how stage migration is beginning to be seen. The problems of early detection, early recurrence and early metastases will be discussed. This talk will serve as a starting off point for the subsequent talks on new technologies.

RC317B  Next Generation Prostate MRI

Participants
Baris Turkbey, MD, Bethesda, MD (Presenter) Nothing to Disclose

For information about this presentation, contact:
turkbeyi@mail.nih.gov

LEARNING OBJECTIVES
1) Understand current status and uses of multi-parametric MRI. 2) Understand role of MRI in assessment of prostate cancer aggressiveness and tumor heterogeneity. 3) Understand role of computer aided diagnosis systems in evaluation of prostate cancer aggressiveness and tumor heterogeneity.

RC317C  Molecular Prostate Imaging: Chemistry to Clinic

Participants
Martin G. Pomper, MD, PhD, Baltimore, MD (Presenter) Researcher, Progenics Pharmaceuticals, Inc; License agreement, Progenics Pharmaceuticals, Inc; Researcher, Advanced Accelerator Applications SA; License agreement, Advanced Accelerator Applications SA; Co-founder, Cancer Targeting Systems, Inc; Board Member, Cancer Targeting Systems, Inc; Researcher, Juno Therapeutics, Inc; Licensiing agreement, Juno Therapeutics, Inc; Co-founder, Neurly; Board Member, Neurly; Co-founder, Theraly
PET/MRI: Is Prostate Cancer a Perfect Fit?

Participants
Peter L. Choyke, MD, Rockville, MD (Presenter) Researcher, Koninklijke Philips NV; Researcher, General Electric Company; Researcher, Siemens AG; Researcher, iCAD, Inc; Researcher, Aspyrian Therapeutics, Inc; Researcher, ImaginAb, Inc; Researcher, Aura Biosciences, Inc

For information about this presentation, contact:
pchoyke@nih.gov

LEARNING OBJECTIVES
1) Understand the potential value of PET/MRI in prostate cancer. 2) Review potential pitfalls in the use of PET/MRI compared to PET/CT.

ABSTRACT
PET/MRI offers the sensitivity and specificity of PET with the high contrast resolution of MRI. In the prostate this can be very useful in identifying prostate cancers and recurrent disease after treatment. This talk will review the various features of PET/MRI that make prostate cancer a 'perfect fit' for it.

Hyperpolarized C-13 MR Molecular Imaging of Prostate Cancer

Participants
Daniel B. Vigneron, PhD, San Francisco, CA (Presenter) Research Grant, General Electric Company;

LEARNING OBJECTIVES
View learning objectives under the main course title.
Feasibility of Quantitative Dynamic Contrast Enhanced MRI Using Low Dose Gadolinium: Comparative Performance with Standard Dose in Prostate Cancer Diagnosis

**Purpose**

We investigated whether administration of low doses of Gd for dynamic contrast enhanced (DCE) MRI can be effective as a standard dose in distinguishing prostate cancer (PCa) from benign tissue.

**Method and Materials**

Patients (n=16) with histologically confirmed PCa underwent preoperative 3T MRI using endorectal and phased array surface coils. DCE-MR images were acquired using two mDixon sequences at 8.3s temporal resolution with a low dose 0.015 and standard dose 0.085 mmol/kg of gadobentate dimeglumine (Multihance, Bracco) bolus injections. Low dose images were acquired for 3.5 min, followed by a 5 min gap before acquiring high dose images for 8.3 min. The data was analyzed by fitting signal intensity with an empirical mathematical model to obtain maximum intensity projection (MIP) and signal enhancement rate (a). Correlations of these parameters between low and standard doses of Gd administered were calculated. Receiver operating characteristic (ROC) analysis was performed to evaluate whether these parameters could distinguish between PCa and benign tissue using whole mount prostatectomy specimens as reference standard.

**Results**

A moderately significant Pearson correlation for DCE parameters: MIP (0.53) and a (0.58) was found between low and standard doses of Gd. PCa showed significantly increased a compared to benign tissue for low (10.0±5.8 vs 5.1±2.9 s⁻¹), but not for standard dose (4.3±2.2 vs 3.4±1.5 s⁻¹). The ratio of low dose a to high dose a was significantly greater for PCa (2.8±2.3) than for normal prostate (1.6±0.9), suggesting changes in water exchange and T2* effects associated with cancer. Area under the ROC curve for differentiating PCa from benign tissue using a was higher for low dose (0.77, p<0.05) compared to standard dose (0.63, p>0.05). However, there were no significant differences between MIP calculated for PCa and normal tissue at both low (33±12 vs 29±16%) and standard doses (110±49 vs 94±43%).

**Conclusion**

Quantitative DCE-MRI with low Gd dose better distinguishes PCa from benign prostate tissue than standard Gd dose, based on signal enhancement rate. This may be due to water exchange and T2* effects. Further study is needed to find the optimal dose for PCa diagnosis using DCE-MRI.

**Clinical Relevance/Application**

Prostate cancer diagnosis may be feasible with quantitative DCE-MRI with low dose Gd contrast.
SSG05-02 Pharmacokinetics Analysis and Prognostic Implications of Hypovascular Prostate Adenocarcinoma on Multiparametric MRI

Tuesday, Nov. 28 10:40AM - 10:50AM Room: S102CD

Participants
Valdair F. Muglia, MD, PhD, Ribeirao Preto, Brazil (Presenter) Nothing to Disclose
Tamara O. Rocha, MD, Ribeirao Preto, Brazil (Abstract Co-Author) Nothing to Disclose
Rodolfo B. Reis, MD, PhD, Ribeirao Preto, Brazil (Abstract Co-Author) Nothing to Disclose
Alfredo R. Silva, MD, PhD, Ribeirao Preto, Brazil (Abstract Co-Author) Nothing to Disclose
Susan M. Noworolski, PhD, San Francisco, CA (Abstract Co-Author) Nothing to Disclose
Antonio C. Westphalen, MD, Mill Valley, CA (Abstract Co-Author) Scientific Advisory Board, 3DBiopsy LLC; Research Grant, Verily Life Sciences LLC

For information about this presentation, contact:
fmuglia@fmrp.usp.br

PURPOSE
To compare dynamic contrast-enhancement (DCE) parameters and pharmacokinetics analysis of hypo and hypervascular prostate cancer (PCa) as predictors of patient outcome.

METHOD AND MATERIALS
54 men who underwent 1.5T multiparametric (mp) endorectal prostate magnetic resonance imaging (MRI) from January/2012 to March/2014 were enrolled in this HIPPA-compliant, IRB-approved retrospective study. Lesions with signal intensity at least 10% lower than the normal peripheral zone on DCE analysis were called hypovascular (group-1); all others were consider iso or hypervascular (group-2). 2-compartment Tofts model was used for pharmacokinetics analysis. Patients’ outcomes (biochemical failure - BF, metastasis, death) were recorded after a minimum 3-year follow-up. Only the index lesion was analyzed. Demographics, Gleason score, PSA, lesion size, mean ADC, Ktrans, Kep, slope and patients outcomes between the groups were compared using the t-test or the Mann-Whitney test. Logistic regressions were used to compare how DCE characteristics, i.e. group-1 or group-2 features, predicted outcomes.

RESULTS
Twelve lesions (22.2%) were hypovascular and 42 (77.8%) were iso/hypervascular. Age (0.40), follow-up time (0.24), mean ADC, and Gleason score (0.08) did not differ between groups. Group-1 had a higher PSA (87.6 vs 24.8; p=0.01) and larger lesions (33.1 vs 19.1 mm; p<0.001). Pharmacokinetics parameters were lower for group 1, confirming their hypovascular nature (ktrans, 0.041 vs 0.083; p=0.03 and Kep, 0.067 vs 0.177; p=0.04). At multivariate analysis, the hypovascular pattern (group-1) was a predictor of poor outcome (BF or worse, OR=8.08, p=0.02 and metastases or death, OR=8.3, p=0.05).

CONCLUSION
Hypovascular tumors represent a small proportion of PCa, but the feature is an independent predictor of poor outcome.

CLINICAL RELEVANCE/APPLICATION
Hypovascular PCa have worse prognoses, indicating a major role for lesion characterization with dynamic contrast enhancement.

SSG05-03 3T Multiparametric MRI: Comparison of Performance With and Without Endorectal Coil for Prostate Cancer Detection, PI-RADS v2 Lesion Scoring and Staging with Whole Mount Histopathology Correlation in 429 Patients

Tuesday, Nov. 28 10:50AM - 11:00AM Room: S102CD

Participants
Sohrab Afshari Mirak, Los Angeles, CA (Presenter) Nothing to Disclose
Ely R. Felker, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Pooria Khoshnoodi, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Nazanin H. Asvadi, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Anthony Sisk, DO, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
Robert E. Reiter, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose
David S. Lu, MD, Los Angeles, CA (Abstract Co-Author) Consultant, Medtronic plc; Speaker, Medtronic plc; Consultant, Johnson & Johnson; Research Grant, Johnson & Johnson; Consultant, Bayer AG; Research Grant, Bayer AG; Speaker, Bayer AG
Steven S. Raman, MD, Santa Monica, CA (Abstract Co-Author) Nothing to Disclose

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PURPOSE
To investigate prostate cancer (PCa) detection & compare the radiological & pathological characteristics of the lesions on 3T multiparametric MRI (mpMRI) with & without endorectal coil (ERC) with whole mount histopathology (WMHP) correlation.

METHOD AND MATERIALS
In this HIPPA-compliant, IRB-approved case control study, we evaluated a cohort of 429 men with prostate cancer who underwent 3T mpMRI from 7/2009 to 12/2016, prior to robotic prostatectomy. The subcohorts with & without ERC were evaluated. Tumor
This study identifies PI-RADS lexicon strengths and weaknesses of PI-RADS terms to be addressed in further iterations of the lexicon to indicate areas of improvement, suggesting refinement of these terms.

CONCLUSION

3T mpMRI with & without ERC had similar performance for overall & index PCa detection, PI-RADS v2 scoring & staging. However, the ERC subcohort had significantly higher detection rates of clinically significant posterior & transition PCa lesions & lower detection rates of anterior & transition PCa lesions compared to non-ERC subcohort.

CLINICAL RELEVANCE/APPLICATION

Although performance of 3T mpMRI with & without ERC is similar, ERC enables improved detection of posterior & peripheral lesions.

Purposes

To determine the association between PIRADS v2 lexicon terms and histopathological outcomes in a blinded randomized setting to assess the discriminatory power of these terms.

METHOD AND MATERIALS

120 prostate MRI in patients with subsequent TRUS/MRI biopsy were evaluated in a blinded and randomized setting by two radiologists (>6 years of prostate MRI experience) using a dedicated review software. Lesions were marked and each lesion was characterized with respect to PIRADS lexicon terms for shape and border. Lexicon terms describing diffusion weighted imaging were included for comparison. Positive and negative predictive values (PPV, NPV) were calculated for each of the terms and reported. A combination of high PPV/NPV was considered favorable for malignant features, a combination of low PPV/NPV for benign features.

RESULTS

A total of 871 consecutive WMHP localized lesions (54.2% clinically significant) in 429 patients with a mean age of 65.4±7 were included in the study cohort. The ERC & non-ERC subcohorts comprised 260 patients with 529 lesions & 169 patients with 342 lesions, respectively. Tumor detection rates for overall, ERC & non-ERC subcohorts were 49.5% (431/871), 50.3% (266/529) & 48.2% (165/342), & 78.6% (333/429), 78.5% (204/260) & 76.3% (129/169) for overall & index lesions, respectively (p >0.05). The ERC & non-ERC subcohorts detected 35.9% (66/184) & 48.4% (76/157) of anterior lesions (p =0.019), 58% (200/345) & 48.1% (89/185) of posterior lesions (p=0.025), 37.3% (41/110) & 54.4% (62/114) of transition lesions (p =0.010) & 53.7% (225/419) & 45.2% (103/228) of peripheral lesions (p=0.033). The individual lesion ADC, PIRADS v2 score, pathological staging, tumor volume & prostate volume were similar between two groups (p >0.05).

CONCLUSION

3T mpMRI with & without ERC made similar performance for overall & index PCa detection, PI-RADS v2 scoring & staging. However, the ERC subcohort had significantly higher detection rates of clinically significant posterior & transition PCa lesions & lower detection rates of anterior & transition PCa lesions compared to non-ERC subcohort.

CLINICAL RELEVANCE/APPLICATION

Although performance of 3T mpMRI with & without ERC is similar, ERC enables improved detection of posterior & peripheral lesions.
Purpose
To evaluate the incremental value of contrast-enhanced images for clinically significant prostate cancer detection on multiparametric MRI (mpMRI) prior to biopsy.

Method and Materials
IRB approved, prospective study. In an 8 months period, all men who underwent prostatic mpMRI in our institution without a prior diagnosis of clinically significant prostate cancer were enrolled. Patients performed mpMRI on a 3-Tesla scanner with a phased array coil using a routine protocol: T2-weighted, diffusion-weighted and dynamic post-contrast enhancement sequences. Two radiologists read images independently, first without, and subsequently including the post-contrast series. The analysis was performed on a sextant basis, and graded on a 5-points scale for cancer suspicion. Sensitivity, specificity, PPV, NPV and accuracy for both readers were calculated using biopsy with imaging fusion ultrasound/mpMRI as the gold standard. The level for statistical significance was set at p < 0.05.

Results
Of 449 patients enrolled in our study, 102 were submitted to prostate biopsy with US/MRI imaging fusion. Median time between MRI and biopsy was 15 days. Positivity for different levels of suspicion on mpMRI, comparing images without and with contrast, showed no statistically significant difference for both readers (p-values > 0.05). Sensitivity ranged from 64.5 to 77.7%, specificity from 58.9 to 67.0%, PPV from 23.9 to 25.6%, NPV from 91.8 to 92.8% and accuracy from 60.6 to 65.5%, also with no statistically significant difference between both protocols.

Conclusion
Our study shows that detection of clinically significant prostate cancer on mpMRI protocols with and without contrast-enhanced sequences were similar.

Clinical Relevance/Application
A prostate MRI performed without contrast is desirable due to its lower cost, faster scanning time and increased safety for a broader range of patients.

SSG05-06 Influence of the Location and Zone of Tumor in Prostate Cancer Detection and Localization on 3T Multiparametric MRI Based On PI-RADS V2 on 39 Sector Segmentation: Correlation with Whole Mount Histopathology (WMHP) in 415 Consecutive Cases

Tuesday, Nov. 28 11:10AM - 11:20AM Room: S102CD

Participants
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consensus. Both a rigid (RS) & adjusted sector (AS) matching models were utilized to account for fixation related issues.

RESULTS
We analyzed 863 PCa foci & 16,185 prostate sectors. 3T Mp-MRI detected more PCa lesions in the midgland (54.9 % all & 83.1 % index lesions) than in base (42.1% all [p=0.04] & 64.0 % index lesions [p=0.02]) or apex (41.9% all lesions [p=0.001] and 71.4% index lesion [p 0.006]). There was no difference in detection between overall peripheral and transitional zone PCa (50.4 % vs 43.2 % [p=0.2]) or index PCa 79.1 % vs 73.1 % (p=0.2). The highest of PCa localization sensitivity was for midgland PCa vs. base or apical PCa. AS was higher than RS localization for overall (70.8% vs 36.0%) & index mid gland PCa match (71.3% vs 43.7%). 3T mp-MRI had greater sensitivity (p<0.05) of PZ PCa vs. TZ PCa localization for overall PCa (30.28% vs 24.53% by RS, 58.9% vs 51.2 % by AS match) and for index lesions (37.0% vs 29.2% by RS, and 58.4% vs 50.5% by AS match). 3T mp-MRI had similarly high specificity (93.8-98.3 %) for overall and index tumor localization when using both rigid adjusted sector match approaches.

CONCLUSION
Using 3T mp-MRI and the PI-RADS v2, achieved 83.1% sensitivity for detection of index PCa in the mid gland with 98.3 % specificity. Sectoral localization of PCa within the prostate was moderate and was best with an AS vs RS match.

CLINICAL RELEVANCE/APPLICATION
In this largest study to evaluate influence of the location and zone of tumor in PCa detection and localization on 3T mp-MRI with WMHP correlation. We have demonstrated excellent sensitivity and specificity for prostate cancer detection but moderate performance for intraprostatic sectoral localization, which may have implications for focal therapy.

SSG05-07 Comparison of Subjective and Quantitative Shape Analysis for Differentiation of Transition Zone Prostate Cancer (TZ PCA) From Benign Prostatic Hyperplasia (BPH)

Tuesday, Nov. 28 11:40AM - 11:50AM Room: S102CD

Participants
Satheesh Krishna, MD, Ottawa, ON (Presenter) Nothing to Disclose
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PURPOSE
TZ PCa overlaps in appearance with BPH nodules on MRI. Shape features favoring TZ PCa in PI-RADS version 2 include: non-circumscribed/spiculated margin with absent hypointense rim and lenticular shape. Reproducibility of these findings may be limited and have not been compared to quantitative analysis. This study compares subjective and quantitative shape analysis for differentiation of TZ PCa from BPH.

METHOD AND MATERIALS
With IRB approval, 22 TZ PCa were compared to 30 consecutive BPH nodules (15 stromal/15 glandular) identified using MRI-radical prostatectomy (RP) mapping. Two blinded radiologists (provided with location of lesions) subjectively evaluated: shape (round/oval vs lenticular), margin (smooth/lobulated or spiculated/irregular) and presence of hypointense rim on T2W-MRI. Radiologists manually contoured lesions which were quantitatively assessed for: circularity (roundness), convexity (lens shape) and number of skeleton branches/junctions (spiculations). Comparisons were performed using logistic regression, accuracy assessed with ROC and inter-observer agreement calculated.

RESULTS
There was no difference in size comparing TZ PCa to BPH (17.8 ± 6.4 vs. 18.7 ± 7.7 mm), p=0.64. Lenticular shape, irregular/spiculated margin and lack of hypointense rim were associated with TZ PCa (p<0.001). Inter-observer agreement was weak to moderate (K=0.32-0.48). Area under ROC curve (AUC) and sensitivity/specificity of shape and margin to diagnose PCa were: 0.77; 32.2%/100.0% and 0.89; 81.8%/96.7%. Hypointense rim showed AUC=0.89 with sensitivity/specificity of 70.3%/93.3%

CONCLUSION
Lenticular shape is specific but insensitive for diagnosing TZ PCa with weak inter-observer agreement. Comparatively, quantitative shape features (circularity and convexity) showed higher accuracy and inter-observer agreement. Irregular/spiculated margin and lack of hypointense rim are accurate features of TZ PCa.

CLINICAL RELEVANCE/APPLICATION
Quantitative shape analysis improves accuracy and reproducibility for diagnosis of TZ PCa compared to subjective analysis.

SSG05-08 Validation of a Prospective Quantitative Evaluation of Gleason Score Prediction Using Prostate Diffusion Weighted Imaging: A Single Institution Experience in 293 Men with a Clinical Suspicion of Prostate Cancer

Tuesday, Nov. 28 11:40AM - 11:50AM Room: S102CD

Participants
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Pekka Taimen, Turku, Finland (Abstract Co-Author) Nothing to Disclose
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To evaluate the potential of prostate diffusion weighted imaging (DWI) for Gleason score (GS) prediction in men with a clinical suspicion of prostate cancer.

**METHOD AND MATERIALS**

A total of 315 men with a suspected prostate cancer (PCa) based on elevated PSA (2.5 - 20.0 ng/ml) were enrolled in single institutional registered clinical trials between March 2013 and March 2017. Three tesla biparametric MRI (bpMRI) was performed using surface array coils and consisted of T2-weighted imaging (T2w) and three separate epi read-out based diffusion weighted imaging (DWI) acquisitions (5 b values 0-500 s/mm², 2 b values 0-1500 s/mm², 2 b values 0-2000 s/mm²). The probability of a suspicious lesion containing Gleason grade 4 was prospectively assigned based on the apparent diffusion coefficient (ADCm) maps calculated using a monoexponential fit and 5 b-values in the range of 0 to 500 s/mm². This probability was expressed as a Gleason grade score (GGS): 1. unlikely- ADCm above or equal to 850 x 10⁻⁶ mm²/s, 2. probable: ADCm below 850 x 10⁻⁶ mm²/s 3. highly probable- ADC below 750 x 10⁻⁶ mm²/s. All bpMRI reports were reported and/or approved by one reader before biopsy.

**RESULTS**

Two hundred ninety three (293/315, 93%) men completed bpMRI and subsequent biopsy procedure. GGS could not be assigned in 7 men (2%, 7/293) due to susceptibility artefacts. GGS of 1, 2, and 3 were found in 53% (152/286), 17% (48/286), and 30% (86/286) of men, respectively. PCs with GS of 3+3, 3+4, >3+4 was present in 14% (41/286), 24% (69/286), and 30% (86/286) of men, respectively, while targeted and systematic biopsy cores were free of cancer in 97 men (34%, 97/293). In 58% (88/152) and 18% (28/152) of men with GGS 1 no PCs and GS 3+3 was found, respectively, in contrast to 2% (2/86) and 8% (7/86) of men with GGS 3 (p<0.001). The negative predictive values of GGS 1 for GS >3+4 was 88% while positive predictive value of GGS 3 was 60%. The corresponding values for GS equal to or higher than 3+4 were 76% and 90% for GGS 1 and GGS 3, respectively.

**CONCLUSION**

Our newly developed system for GS prediction demonstrated high negative and positive predictive values for clinically significant prostate cancer in men with a clinical suspicion of prostate cancer.

**CLINICAL RELEVANCE/APPLICATION**

Prostate diffusion weighted imaging (DWI) performed as a part of biparametric MRI, T2-weighted imaging and DWI acquired using “low” and “high” b values, has a potential to predict the Gleason score.

**SSG05-09 Characteristics of PI-RADS 4 Lesions within the Prostatic Peripheral Zone: A Retrospective Diagnostic Accuracy Study Evaluating 170 Lesions**

Tuesday, Nov. 28 11:50AM - 12:00PM Room: S102CD

Participants
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**PURPOSE**

To assess whether lesion shape, margination within the peripheral zone, or PI-RADS v2 diagnostic criteria impact accuracy in the detection of clinically significant cancer within the peripheral zone.

**METHOD AND MATERIALS**

This was an IRB-approved, HIPAA-compliant, retrospective diagnostic accuracy study to evaluate a subset of peripheral zone (PZ) lesions identified on multiparametric prostate MRI (mpMRI) at our large academic medical center. Our prospectively maintained mpMRI database was queried for all PI-RADS 4 (PR4) lesions reported over a 16-month period. Following pre-determined exclusion criteria, 170 PR4 PZ lesions (149 mpMRIs) were reviewed by two faculty abdominal radiologists, blinded to inter-reader assessment and pathologic outcome. Readers classified each lesion based on shape, margination within the PZ, and basis for PR4 score. Lesions were classified as: PR4 by a DWI score of 4, PR4 by a DWI score of 3 + early enhancement, or not meeting PR4 criteria. Lesions not meeting PR4 criteria (n=22) were excluded from the analysis of the remaining variables. All lesions within the study met the reference standard of MR-Ultrasound fusion biopsy. The primary outcome measure was detection of Gleason >= 7 prostate cancer. Logistic regression analysis and chi^2 testing were used for statistical analysis.

**RESULTS**

Oval shaped lesions were most strongly associated with clinically significant prostate cancer with a PPV of 59.4% (19/32 [p=0.03]). PR4 lesions with a DWI score of 4 were more likely to represent clinically significant prostate cancer than those with a DWI score of 3 + early enhancement (p=0.04). Lesions that did not meet PR4 criteria were statistically less likely to represent Gleason >= 7 prostate cancer (p=0.02).

**CONCLUSION**

PR4 PZ lesions with an oval shape or DWI score of 4 are more likely to represent clinically significant prostate cancer than the population of all PR4 lesions. Additionally, strict adherence to PI-RADS v2 criteria in classifying PZ lesions leads to exclusion of
lesions that are statistically less likely to represent clinically significant cancer.

**CLINICAL RELEVANCE/APPLICATION**

This study highlights a subset of PR4 lesions within the PZ that are associated with a higher probability of clinically significant prostate cancer. These findings may help radiologists in determining the suspicion of a given prostatic lesion and may help urologists in management of discordant targeted biopsies.
SSG16

Science Session with Keynote: Radiation Oncology (Genitourinary)

Tuesday, Nov. 28 10:30AM - 12:00PM Room: S104A

SSG16-01 Radiation Oncology Keynote Speaker:

Tuesday, Nov. 28 10:30AM - 10:50AM Room: S104A

SSG16-03 Patients Treated with Volumetric Modulated Arc Therapy for Prostate Cancer Return to Baseline Urinary Function Following Treatment to 81 Gy

Tuesday, Nov. 28 10:50AM - 11:00AM Room: S104A

Participants

Martin Colman, MD, Houston, TX (Moderator) Nothing to Disclose
Abhishek A. Solanki, MD, Maywood, IL (Moderator) Consultant, Blue Earth Diagnostics Ltd; Advisory Board, Blue Earth Diagnostics Ltd

Sub-Events

SSG16-04 Differences in Prostate Gland Geometry and Dosimetry After Pre-operative and Intra-operative Ultrasound Planning in Patients Undergoing Prostate Seed Brachytherapy: Implications for Current Practice

Participants

Abhishek A. Solanki, MD, Maywood, IL (Presenter) Consultant, Blue Earth Diagnostics Ltd; Advisory Board, Blue Earth Diagnostics Ltd

Purpose

The purpose of the abstract was to determine both the acute and long-term consequences of VMAT to 81 Gy for prostate cancer in a cohort of 501 men treated between 8/2010 and 12/2015 using a validated measure of urinary function.

Method and Materials

Five hundred and one men were treated with VMAT to 81 Gy from 8/2010 to 12/2015 for low (27.5%), intermediate (47.7%) and high risk (24.8%) prostate cancer. In addition to the use of VMAT, patients were treated using gold fiducial markers, a rectal stabilization device and MRI treatment planning. All men were given the International Prostate Symptom Score sheet prior to treatment, at one month following treatment and at one year. IPSS scores were prospectively collected and comparisons of means were made by T-test. The incidence of elevations in IPSS which have been previously described to be bothersome to men and require either medical or surgical intervention are also reported.

Results

The baseline IPSS score prior to therapy was 9.57 for the entire cohort, at one month following completion of radiation the average score was 10.51 (p=0.003) and at one year 9.23 (p=0.017). 119/501 (23.8%) of patients began treatment with an IPSS score greater than or equal to 15 with an average score of 19.65. At one month following treatment the IPSS score was 15.34 (p<0.01) and at a year 13.9 (p<0.01). For patients with baseline IPSS less than 15, the average score prior to therapy was 6.49, and at one month and one year 9.01 and 7.66 respectively (p<0.01). For 171 (34.1%) patients who were initially asymptomatic, IPSS less than or equal to 5, the average IPSS prior to treatment was 2.81, and at one month and one year 7.08 and 6.29 (p<0.01). When evaluated individually, 111/501 (22.2%) patients experienced a rise in IPSS of at least 5, 46/501 (9.1%) of 10, 15/501 (3.0%) of 15 and 6/501 (1.2%) of 20 points. No patient required catheterization at any point or use of pads.

Conclusion

Patients who were highly symptomatic prior to VMAT therapy experienced improved urinary function prior to baseline measurements at one month following treatment and continued improvement on to one year of treatment. Very few patients experienced a clinically significant rise in IPSS of greater than 15 and 20 from their pretreatment baseline measurements. No patient experienced catheterization or incontinence.

Clinical Relevance/Application

Prostate cancer treatment to very high doses is associated with minimal urinary toxicity.
The ADC mean, median and kurtosis measures increased in most patients at the third MRI scan indicating increased diffusion after SABR. Apparent diffusion coefficient (ADC) maps were computed from DWI data, heuristic parametric and pharmacokinetic maps extracted. Changes in DWI and DCE MRI characteristics were correlated with change in tumour volume shown by maps using the extended Tofts model were fitted to the DCE data. Tumour volumes were contoured and statistics including after SABR. Response assessment of renal cell carcinoma (RCC) after stereotactic ablative body radiotherapy (SABR) using size criteria from CT is challenging, as changes may evolve over months and even years post-therapy. The purpose of this study was to analyze early diffusion and perfusion changes in RCC tumors shown by multiparametric MRI after SABR, and to assess whether any changes are associated with overall treatment response.

RESULTS
The POP and OR ultrasound volume studies and PB plans of 30 patients were analyzed and compared. PB dose was 144Gy with I-125 seeds. Different prostate gland volumes (cc) receiving a %dose (V100% and V150%) and dose to % prostate volumes (D90%) were estimated and compared using Wilcoxon rank sum test.

CONCLUSION
There were significant differences in prostate geometry and dosimetry between OR and POP scans. Differences in patient positioning (hip flexion) and use of general anesthesia for OR plans were responsible for these observations. The use of POP scans for PB may result in higher relapse rates due to underdosage of at-risk regions in the prostate. Intra-operative ultrasound volume study-based PB treatment planning provides superior prostate dosimetry compared to preoperative planning.

CLINICAL RELEVANCE/APPLICATION
Intra-operative volume study-based PB planning delivers a higher target dose to the prostate gland compared to pre-operative planning.

METHOD AND MATERIALS
The POP and OR ultrasound volume studies and PB plans of 30 patients were analyzed and compared. PB dose was 144Gy with I-125 seeds. Different prostate gland volumes (cc) receiving a %dose (V100% and V150%) and dose to % prostate volumes (D90%) were estimated and compared using Wilcoxon rank sum test.

RESULTS
The POP and OR ultrasound volume studies and PB plans of 30 patients were analyzed and compared. PB dose was 144Gy with I-125 seeds. Different prostate gland volumes (cc) receiving a %dose (V100% and V150%) and dose to % prostate volumes (D90%) were estimated and compared using Wilcoxon rank sum test.

CONCLUSION
There were significant differences in prostate geometry and dosimetry between OR and POP scans. Differences in patient positioning (hip flexion) and use of general anesthesia for OR plans were responsible for these observations. The use of POP scans for PB may result in higher relapse rates due to underdosage of at-risk regions in the prostate. Intra-operative ultrasound volume study-based PB treatment planning provides superior prostate dosimetry compared to preoperative planning.

CLINICAL RELEVANCE/APPLICATION
Intra-operative volume study-based PB planning delivers a higher target dose to the prostate gland compared to pre-operative planning.
SABR, however there was no clear correlation with the change in tumour volume. DCE analysis showed strong correlations between the change in enhancement curve type and the change in tumour volume. Pharmacokinetic maps showed a positive correlation between tumour volume change and the difference in $K_{\text{trans}}$, and a negative correlation with the change in $V_e$, at the third MRI scan.

CONCLUSION

Voxel-based analysis of tumors using DCE MRI shows promise for early prediction of overall tumour response, and may provide a useful biomarker for guiding patient management which is more reliable than RECIST criteria. DWI analysis did not provide a strong early indicator of treatment response.

CLINICAL RELEVANCE/APPLICATION

DCE MRI after SABR treatment for RCC may provide novel early response biomarkers which are more reliable than conventional CT based geometric RECIST response criteria.

SSG16-06 High Quality Volumetric CT Reduces PTV Margin for Radiotherapy of Prostate Cancer

Tuesday, Nov. 28 11:20AM - 11:30AM Room: S104A

Participants

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ABSTRACT

Purpose/Objective(s): To determine whether superior soft tissue contrast provided by high-dose-high-quality volumetric CT (HDVCT) scans can reduce inter-observer variability in prostate gland segmentation which may results in the reduction of PTV margin.

Materials/Methods: Ten prostate patients receiving radiotherapy were imaged with conventional CT (CCT, 120kV, 300mAs), HDVCT (120kV, 2300mAs, 80 slices of volumetric scan) and 3T MRI (T2W) all with 2mm thickness. Five radiation oncologists delineated prostate gland on all three image sets, totaling 150 contoured target volumes. Inter-observer variability was measured along base/middle/apex, posterior/anterior, and left/right directions. Degree of target confidence was measured in terms of membership by counting the number of times that each image voxel (0.2mmx0.2mmx2.0mm) were enclosed by contours delineated by five observers. A modal target volume was defined by the voxels with the membership of 50% or more in each imaging modality used. PTV margin was calculated by expanding every 150 contours with a step size of 0.5mm to 10mm that guarantees 95% of the prescription dose to the modal target volume to more than 90% of patient population. When contours to be expanded and the modal target volume to be covered are from the same image modality, the PTV is called intra modal PTV margin, and with different imaging modality, it is called inter modal PTV margin. Intra and inter modal PTV were compared for each image modality. Results: Inter-observer variability was 2.0mm, 2.0mm, and 1.7mm on average and 2.5mm, 2.1mm and 2.0mm with the maximum in apex region for CCT, HDVCT, and MRI, respectively (pConclusion: Inter-observer variability in target delineation is a source of systematic uncertainty. HDVCT CT and MRI imaging demonstrated significant reduction in inter-observer variability and intra PTV margin compared to CCT. Inter modal PTV margin appears minimal with HDVCT (5mm) than CCT or MRI (6mm) although the average volume of HDVCT is smaller than that of CCT. Smaller target volume together with smaller inter/intra PTV margin for HDVCT is promising for radiotherapy planning of prostate cancer.

SSG16-07 Early Urinary and Sexual Toxicity Outcomes for Patients Receiving Proton Radiation for Prostate Cancer

Tuesday, Nov. 28 11:30AM - 11:40AM Room: S104A

Awards

Student Travel Stipend Award

Participants

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PURPOSE

While proton therapy becomes increasingly available to patients with prostate cancer, only a few centers have published their clinical results to date. We present our 2-year results using proton beam therapy (PBT) to treat patients with prostate cancer.

METHOD AND MATERIALS

82 patients on an IRB approved institutional registry were treated with PBT from 2013-2015. CTCAE v4.0 was used to score toxicity. Univariate and multivariate Cox regression were performed to identify clinical and dosimetric predictors of toxicity.

RESULTS

For the 82 patients treated, 23 had low risk prostate cancer, 42 intermediate risk, and 17 high risk. 95% of patients received >=78 CGE. 25 patients received androgen deprivation therapy (ADT). Median follow up was 2 years. Time to PSA nadir was 1 year, with an average nadir of 0.5 ng/ml for patients treated with radiation alone without androgen deprivation. Two-year grade 2 and 3 GU toxicity were 22.0% and 1.2% respectively. Median time-to-event for G2+ urinary toxicity was 8 months. Univariate analysis showed a significant correlation between grade 2+ urinary toxicity and pretreatment prostate reductive procedures such as TURP.
(p=0.009), ADT use (p=0.006), baseline IPSS score (p=0.02) and baseline IPSS bother score (p=0.01). Relative volume of bladder receiving 81 Gy was also significantly related to G2+ urinary toxicity (p=0.04). On multivariate analysis, ADT use and baseline IPSS bother score correlated significantly with grade 2+ toxicity (p=0.006 and p=0.01). Two year rates of grade 2 and 3 decline in erectile function were 19.5% and 1.2%, respectively. On univariate analysis, only age was significant for grade 2+ sexual toxicity (p=0.001). There were only two events of grade 2 hip pain.

CONCLUSION
Rates of grade 2+ urinary, sexual, and hip toxicities were acceptable after proton therapy for prostate cancer. The highest risk subgroup for developing urinary toxicity was men on ADT with high baseline IPSS bother scores. Future analysis will include larger patient numbers and longer follow up to better assess late treatment toxicities and PSA trends.

CLINICAL RELEVANCE/APPLICATION
Our preliminary results show acceptable rates of urinary, sexual, and hip toxicity in patients with prostate cancer treated with proton therapy, with adequate PSA response.

PURPOSE
Increasing numbers of patients with prostate cancer are being treated with proton therapy. Theoretically, proton beam therapy (PBT) may have dosimetric advantages over photon radiation in treating a smaller region of the rectum. An ongoing randomized trial of proton versus photon therapy for prostate cancer has bowel toxicity as the primary endpoint (PARTIQoL). We present the 2-year bowel toxicity data for patients treated for prostate cancer at our proton center.

METHOD AND MATERIALS
82 patients on an IRB approved registry were treated with PBT from 2013-2015. CTCAE v4.0 was used to score bowel toxicity. Univariate Cox regression was performed to test correlations of baseline patient and dosimetric features with grade 2 or higher bowel toxicity.

RESULTS
For the 82 patients treated, 23 had low risk prostate cancer, 42 intermediate risk, and 17 high risk. Ninety-five percent of patients received >=78 CGE, and 4 patients received pelvic node radiation. 25 patients received androgen deprivation therapy. 33 patients were treated with uniform scanning, and 49 patients were treated with pencil beam scanning. Median follow-up was 2 years. Radiation proctitis with transient rectal bleeding was the predominant bowel toxicity after PT, accounting for 95% of events. Grade 1 toxicity occurred in 15 patients (18%), grade 2 in 20 patients (24%), and grade 3 in 1 patient (1.2%). There were no grade 4 or 5 events. Median time to developing rectal bleeding was 14 months (range 5-33). Univariate analyses showed borderline correlation between grade 2+ toxicity and hyperlipidemia (p=0.05). No other associations to clinical variables, including use of anticoagulation, were observed. Dose-volume histogram parameters did not show a statistically significant correlation with grade 2+ toxicity, but the best correlation was with rectal V70 (p=0.11). No difference in toxicity risk was found between uniform scanning versus pencil beam scanning techniques.

CONCLUSION
We report 2-year bowel toxicity results from our proton center experience treating prostate cancer. A larger patient series with longer follow up is underway to better delineate the risk factors for development of bowel toxicity with proton radiation.

CLINICAL RELEVANCE/APPLICATION
Our preliminary results show acceptable rates of bowel toxicity in patients with prostate cancer treated with proton therapy, our studies are ongoing with larger patient numbers and longer follow up.

Awards
Student Travel Stipend Award

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Mark Korpics, MD, Maywood, IL (Abstract Co-Author) Nothing to Disclose
Purpose/Objective(s): Multiparametric magnetic resonance imaging (MRI) is increasingly being used to manage patients with prostate cancer. For brachytherapy (BT) patients, it can identify frank radiographic extracapsular extension (ECE) or seminal vesicle invasion (SVI) that may not be adequately covered by BT monotherapy. The objectives of our study were to identify predictors of ECE and SVI on MRI and determine how often MRI findings alter management in patients electing BT.

Materials/Methods: We performed a retrospective cohort study of prostate cancer patients at our institution electing low dose rate (LDR) or high dose rate (HDR) BT and who underwent MRI prior to treatment. Patients with frank ECE or SVI on MRI were not recommended to undergo BT monotherapy and were offered either combined external beam radiotherapy + BT boost (CMT) or another approach. Clinical records were used to determine changes in physician recommendations due to MRI findings. Chi-Square tests were performed for univariate analysis (UVA) to determine covariates associated with ECE or SVI, including risk group, T-stage, Gleason score and group, prostate-specific antigen (PSA), percent positive cores (ppc; \(\geq 50\%\)) vs. Results: The study cohort included 54 patients evaluated from August 2013 to January 2017 who elected BT (8 low risk, 40 intermediate risk and 6 high risk). 40 patients had cT1c disease, and 14 patients had cT2 disease. Median PSA was 6.51. 12 (22%), 30 (55%), 11 (20%), and 2 (4%) had Gleason group 1, 2, 3, and 5, respectively. 19 patients (35%) had \(\geq 50\%\) ppc. 13 patients had radiographic ECE (24%) and 2 (4%) had SVI. Only ppc \(\geq 50\%\) was associated with ECE (\(p=0.02\)); 15\% of patients with ppc On MVA, ppc \(\geq 50\%\) continued to be associated with ECE (Odds Ratio 4.36; 95\% Confidence Interval 1.17-16.3; \(p=0.29\)), but Gleason group did not (\(p=0.99\)). No variables predicted for SVI on UVA or MVA. No low risk or high risk patients had a change in recommendation due to MRI findings, but 20\% (\(n=8\)) of the intermediate risk patients had a change in recommendation. 6 of these patients were switched from monotherapy to CMT due to ECE (and also SVI in 1 patient). One patient had hormonal therapy added to planned CMT. One patient had HDR recommended instead of LDR due to large gland size. Conclusion: MRI should be considered to help determine candidacy for BT monotherapy in intermediate risk prostate cancer patients and those with \(\geq 50\%\) ppc due to a higher risk of radiographic ECE that may not be adequately covered with monotherapy. Longer follow-up is needed to determine the impact on disease control.
Genitourinary Tuesday Poster Discussions

Tuesday, Nov. 28 12:15PM - 12:45PM Room: GU/UR Community, Learning Center

GU

AMA PRA Category 1 Credit ™: .50

FDA Discussions may include off-label uses.

Participants
Antonio C. Westphalen, MD, Mill Valley, CA (Moderator) Scientific Advisory Board, 3DBiopsy LLC ; Research Grant, Verily Life Sciences LLC

Sub-Events

GU246-SD- TUA1 Reproducibility of CT Perfusion in Ovarian Cancer: A Substudy of ACRIN 6695/GOG-0262

Participants
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PURPOSE

The primary objective of ACRIN 6695 was to determine whether CT perfusion (CTP) parameters are prognostic of progression-free survival at 6 months in a cohort of patients from the GOG-262 trial. The latter is a phase III trial on advanced stage ovarian cancer comparing standard to dose-dense paclitaxel/carboplatin with 91% of cohort also receiving bevacizumab. The purpose of this substudy was to determine the reproducibility of CTP parameters.

METHOD AND MATERIALS

Seventy-six subjects underwent 3 CTP studies before (T0) and within the third (last) week of first cycle (T1) and first week of second cycle (T2) of treatment in 19 US cancer centers. Each study comprised of dynamic contrast enhanced imaging with a two-phase scanning protocol without breath-hold: 24 images at 2.8 s intervals followed by 8 images at 15 s intervals acquired using 120 kV and 50 mAs each image. Nine out of 76 patients had a repeat CTP study at T1 at 6 different centers. There was a 10-15 min of contrast wash-out time between the first and second study. The free-breathing CTP images were manually registered using ANALYZE (Mayo Clinic, Rochester) to minimize breathing motion before blood flow (F), blood volume (BV) and vessel permeability surface product (PS) maps were generated using CT Perfusion (GE Healthcare).

RESULTS

The coefficients of variation of BF, BV and PS calculated as the whole tumor differences between the two studies as percentages of the means were: 14.5%, 18.3% and 59.3% respectively.

CONCLUSION

BF measured with CTP had higher reproducibility than either BV or PS. Results from this substudy support the primary finding of ACRIN 6695/GOG 262 that increase in tumor BF from T0 to T2 was associated with reduced patient time to progression and explain why BV and PS were less useful as prognostic markers because of their higher variability.

CLINICAL RELEVANCE/APPLICATION

CT Perfusion derived BF shows promise as an imaging biomarker of response in ovarian cancer as early as 4-week post treatment and can be reproducibly assessed in a multicenter trial setting.

Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Susanna I. Lee, MD, PhD - 2013 Honored Educator
To analyze the difference of the apparent diffusion coefficient (ADC) value of early cervical cancer in different pathological types, and to explore the clinical application of ADC value in pathological classification of early cervical cancer.

**METHOD AND MATERIALS**

131 patients were selected who were diagnosed as early cervical cancer by pathology and clinic. There were 100 cases of squamous cell carcinoma (SCC), 17 cases of adenocarcinoma (AC) and 14 cases of adenosquamous carcinoma (ASC). Among 100 cases of SCC, there were 4 cases of poor differentiation, 87 cases of middle differentiation and 7 cases of well differentiation. All patients underwent 3.0T MRI routine scan and DWI examination. The ADC values were measured and analyzed for the characteristics of early cervical cancer with different pathological types and different differentiation.

**RESULTS**

ADC minimum (ADCmin), ADC mean (ADCmean) and ADC maximum (ADCmax) values of SCC were (619±0.011)×10-3mm2/s, (0.953±0.017)×10-3mm2/s and (1.642±0.032)×10-3mm2/s; The ADCmin, ADCmean and ADCmax values of AC were (0.798±0.058)×10-3mm2/s, (1.129±0.055)×10-3mm2/s and (1.643±0.050)×10-3mm2/s; The ADCmin, ADCmean and ADCmax values of ASC were (0.565±0.036)×10-3mm2/s; (0.944±0.063)×10-3mm2/s and (1.636±0.076)×10-3mm2/s. In early cervical cancer, the ADCmin and ADCmean of AC were higher than those of SCC and ASC (p<0.01). It was no significant difference in ADCmean and ADCmin value between SCC and ASC. In three pathological types of early cervical cancer, it was no statistical difference of the ADCmax value. It was no statistically significant difference in ADCmean among different pathological differentiation levels of early cervical cancer.

**CONCLUSION**

ADC values have a certain diagnostic value in the differentiation of pathological types of early cervical cancer, but the value in diagnosing the degrees of differentiation is limited.

**CLINICAL RELEVANCE/APPLICATION**

The study of ADC values in the early different types of cervical cancer have a certain degree of differentiation, it will help to diagnose different types of early cervical cancer, and provide the basis for clinical treatment.
Hyoscine butylbromide significantly improves image quality and reduces motion-related artefacts in mp-MRI of the prostate and therefore facilitates and optimizes prostate cancer detection and diagnostics. Moreover, side effects of hyoscine butylbromide are rare and were not documented in our study population.

CLINICAL RELEVANCE/APPLICATION

Hyoscine butylbromide significantly improves image quality and reduces motion-related artefacts in mp-MRI of the prostate and therefore facilitates and optimizes prostate cancer detection and diagnostics. Moreover, side effects of hyoscine butylbromide are rare and were not documented in our study population.

Impact of Magnetic Resonance Imaging (MRI) of the Fetal Brain in the Assessment of Fetal Central Nervous System (CNS) Anomalies

Participants
Mariam R. Louis, MD, Cairo, Egypt (Presenter) Nothing to Disclose

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PURPOSE

To analyze the impact MRI of the fetal brain and if it adds to the routine antenatal ultrasound study in the second trimester.

METHOD AND MATERIALS

40 fetuses with suspected or diagnosed central nervous system (CNS) anomaly in their routine antenatal ultrasound study at the second trimester done between 18 and 27 weeks. Balanced FFE T2 weighted images of fetal brain done in axial, coronal and sagittal planes, with assessment of brain anatomy and different congenital anomalies. The diagnosis was confirmed by postnatal MRI or CT and autopsy in still born or abortus fetuses.

RESULTS

We found different CNS anomalies including: 12 cases with supra and infratentorial arachnoid cysts, 6 cases with Dandy-Walker malformation and its variants, 4 cases of holoprosencephaly and its interhemispheric variant (syntelencephaly), 3 with cases with hydrocephalus, 6 cases with corpus callosum agenesis, 8 cases with Meckel's Gruber Syndrome and one case of extradural lesion which was only diagnosed in MRI as a hematoma. MRI was done in the same week of the ultrasound. Obtained MRI confirmed US diagnosis in 30 cases (75%), added an extra finding in 6 cases (15%) and changed diagnosis in 4 cases (10%). The 40 pregnancies resulted in 25 terminations (62.5%), two intrauterine fetal deaths (IUFD) (5%) two spontaneous abortion (5%) and eleven births (27.5%).

CONCLUSION

Ultrasound is the gold standard imaging modality for anomaly scan in the second trimester, however fetal MRI of CNS anomalies in the second trimester might be a clinically valuable complement, especially when the ultrasound examination is inconclusive due to maternal obesity, severe oligohydraominos or in complicated cases with unclear diagnosis.

CLINICAL RELEVANCE/APPLICATION

MRI of the fetal brain is a feasible modality that confirms the diagnosis of ultrasound, sometimes adds more information and in other times it completely changes the diagnosis. More over it is not operator dependent and its images are more accepted and understood by neurologists and neuro-surgeons. In addition it provides images with much better tissue contrast thus confirm the US diagnosis and can add or change diagnosis in few cases.

Uterine Malformations Associated with Higher Incidence of Ectopic Ovary

Participants
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PURPOSE

Ovarian position plays a significant role in the strategy of oocyte retrieval for in vitro fertilization. The aim of the study was to investigate the association between uterine malformations and ectopic ovary.

METHOD AND MATERIALS

Ovarian position was evaluated in 294 individuals with uterine malformations and 53 normal females. Forty-five patients were excluded for prior pelvic surgery and/or large pelvic mass (>5cm). The rest 249 patients were finally included and divided into three subgroups. Group A. Development anomalies (MRKH syndrome and unicornuate uterus), 100 patients. Group B. Fusion anomalies (Bicornuate uterus and Didelphys Uteri), 45 patients. Group C. Degeneration anomalies (Complete and partial septate uterus), 104 patients. Ovary is located in the posterior compartment of the pelvis generally. The evaluation strategy of ectopic ovary was variable in past publications. In this study, ectopic ovary was established if the ovary was lied out of the pelvic, or located anterolaterally just behind the anterior abdomen wall. Two experience gynecological radiologists rendered consensus diagnosis. Any discrepancies were resolved through discussions.
RESULTS

Results: Altogether 498 ovaries in 249 patients with uterine anomalies and 106 ovaries in 53 normal females were evaluated. The incidence of ectopic ovary was highly increased in patients with uterine malformations [20% (49/249), P<0.05], especially in the group of development anomalies [34% (34/100), P<0.001], as compared with normal females (7.5%. 4/53).

CONCLUSION

The study proved that patients with uterine malformation have a higher incidence of ectopic ovary, especially patients with development anomalies.

CLINICAL RELEVANCE/APPLICATION

Patients with uterine malformations have a higher incidence of ectopic ovary. An accurate evaluation of the ovarian location is significant in the strategy of oocyte retrieval approach for in vitro fertilization. Transabdominal approach is preferred than transvaginal routine in cases with ectopic ovary.

GU251-SD- TUA6 Does a Negative Prostate mpMRI Rule-Out Clinically Significant Cancer

PURPOSE

To evaluated the histopathologic results from systematic 12-core biopsy performed in patients with negative prostate multiparametric MRI (mpMRI) to estimate the negative predictive value (NPV) for any and clinically significant cancer detection.

METHOD AND MATERIALS

We queried our IRB approved, retrospective prostate mpMRI registry for men who underwent systematic 12-core biopsy within a year of negative prostate mpMRI between January 2013-February 2017. Clinicopathologic features were analyzed for the entire cohort and stratified by biopsy history. Negative predictive value (NPV) was calculated for detection of any cancer (>=Gleason 6) and clinically significant cancer (>=Gleason 7). Regression analysis was performed to identify outcome predictors.

RESULTS

Overall, 114 men met the inclusion criteria. Median age in this cohort was 61 (IQR 57-67) years, median PSA was 5.5 (IQR 3.6-8.7) ng/ml, 4.4% of the patients had a positive digital rectal exam. NPV of mpMRI for any cancer and clinically significant cancer was 0.77 and 0.96, respectively. NPV for significant cancer in biopsy naïve (n=20), prior negative biopsy (n=53), and prior positive biopsies (n=41) cohorts was 1.0, 1.0, and 0.90, respectively. Demographic and clinical parameters including age, ethnicity, PSA, prostate volume, PSA density, prior negative biopsy, positive DRE displayed no relationships to the detection of PCa.

CONCLUSION

Negative mpMRI has excellent NPV and useful for ruling out intermediate and high-risk prostate cancer. There was a lower incidence of prostate cancer biopsy naïve patients and patient with previous negative biopsy. Forgoing repeat biopsy on active surveillance patients with negative mpMRI could prevent unnecessary biopsy on these patients. Although imaging currently cannot replace diagnostic biopsy, it may be a useful tool to include in active surveillance and help stratify risk and need for biopsy in patients with elevated PSA.

CLINICAL RELEVANCE/APPLICATION

mpMRI demonstrated high NPV and is useful for ruling out clinically significant prostate cancer. Patients with negative prostate mpMRI may not need to undergo prostate biopsy, especially if they have had a previously negative biopsy or are on active surveillance.

URL70-ED- TUA8 Therapeutic Ultrasound Ablation of the Prostate: A Review of Available Devices and Evidence

Participants
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TEACHING POINTS

Treatments such as prostatectomy and brachytherapy for localized prostate cancer can leave many men with complications affecting urinary, bowel, and sexual function. Therapeutic ultrasound ablation (TUA) of the prostate has the potential to avoid these complications. Two devices, which use high-intensity focused ultrasound under US guidance for TUA of prostate tissue, are FDA approved. Clinical trials for devices that use MRI guidance for TUA of the prostate are ongoing. Our goal is to educate
radiologists about available devices for prostate TUA and to discuss the current evidence & controversies of prostate TUA treatment. In contrast to the limited role in US-guided whole-gland TUA, a radiologist's responsibility in MR whole gland and MR-US fusion-guided focal ablations may include pre-treatment planning, monitoring & deciding if re-treatment is needed, and interpreting the post TUA appearance of the prostate.

**TABLE OF CONTENTS/OUTLINE**

Discussion of the principles of TUA Description of the technical & patient specifications for available commercial devices Comparison and contrast of different approaches: Transurethral vs. transrectal, MR- vs. US-guided, whole gland vs. focal ablation Evaluation of the current evidence for TUA including efficacy, complications, and controversies surrounding FDA approval. Analysis of imaging after TUA

**UR212-ED-TUA9**  
The Many Faces of Urinary Bladder Disorders

**Participants**

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**TEACHING POINTS**

? To explain the usefulness of different imaging modalities in the diagnosis of urinary bladder diseases, including contrast-enhanced US, MDCT and MRI.  
? To propose a diagnostic approach of urinary bladder tumor-like lesions.  
? To review a varied group of disorders that can appear as focal bladder masses or bladder wall thickening, with pathologic correlation.

**TABLE OF CONTENTS/OUTLINE**

**Gu252-Sd-Tub1**

3D Texture-based Kernel Regression for Characterization of Clear Cell Renal Cell Carcinoma vs Oncocytoma on Four Phase MDCT

**Method and Materials**

With IRB approval for this HIPAA-compliant retrospective study, we queried our clinical databases to obtain a cohort of pathologically proven ccRCC and ONC with preoperative multiphasic multidetector CT imaged with a four-phase renal mass protocol (unenhanced, corticomedullary (C), nephrographic (N), and excretory (E)). A whole lesion 3D ROI was obtained in each phase with in house software. A feature classification system was proposed for separating two types of renal masses, using histogram and texture features extracted from the 3D lesion ROI in the C phase. Each dicom image was convolved with a Schmid filter with sigma = 4 and tau = 3.5. The intensity values within the lesion in these filtered images were then divided into histogram bins of size 0.5 between the values of -20 and 20, giving a total 80 bins per histogram. To account for variation in lesion size, the bin counts in the histograms were normalized by the total number of pixels in the lesion. This set of 51 patients with 80 parameters per patient was used to train a support vector machine binary classification algorithm. To assess the prediction accuracy of the classifier, a leave-one-out cross-validation method was used.

**Results**

We analyzed 51 patients with 51 untreated unique renal lesions (30 (59%) ccRCC and 21 (41%) ONC). The algorithm was able to correctly classify ccRCC from Oncocytoma in 73% of cases with a misclassification rate of 27%.

**Conclusion**

In this pilot project, using 80 parameters per patient to train a support vector machine binary classification algorithm and using a one-out cross-validation method with each DICOM image convolved with a Schmid filter, we were able to correctly classify ccRCC from Oncocytoma in 73% of cases.

**Clinical Relevance/ Application**

It may be possible to incorporate 3D whole lesion CT texture features as an adjunct to established qualitative and quantitative features to discriminate ccRCC from Oncocytoma.

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**Gu253-Sd-Tub2**

Radiogenomics of High-Grade Serous Ovarian Cancer: Association Between Qualitative and Radiomics CT Features, Clinical Features and Mutations of BRCA1 and BRCA2

**Participants**

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To assess the association between CT radiomics features, clinical features and BRCA1/BRCA2 status in patients with ovarian serous adenocarcinoma.

**METHOD AND MATERIALS**

Patients tested for BRCA status, whose pre-operative CT scan was available, were included in this study. Qualitative evaluation of CT scans included sites of abdominal lesions. If the CT scan included the chest, presence of pleural nodules, pleural effusion, internal mammary and subclavicular lymph nodes were also assessed. On the CT images a volume of interest was drawn including the ovarian mass, and 1419 radiomics features were extracted. After exclusion of unstable and redundant features, 490 features were grouped into 26 clusters and a single representative feature from each cluster was included in the statistical analysis. The association of radiological and clinical features with gene mutations was assessed with Chi-Square test and Mann-Whitney test. Overall survival (OS) and progression-free survival (PFS) were evaluated with the Log-Rank test accordingly with clinical, genetic, radiological and radiomics features. P-values <0.05 was considered statistically significant.

**RESULTS**

101 patients were included: 31/101 were BRCA1+ and 15/110 were BRCA2+. In 76/101 patients CT scan included the chest. We found a significant association between BRCA2+ status and the presence of residual tumor, internal mammary lymph nodes, carcinosarcoma in the superior abdomen and in the pelvis, mesenterial retraction, whereas BRCA1+ status was associated with younger age, smaller tumor and familiarity for breast and ovarian cancer. Worse OS was observed for higher stage and was associated with the following radiomics features: difference entropy, dissimilarity and energy; worse PSF was observed for higher stage, residual tumor, and supradiaphragmatic disease.

**CONCLUSION**

This study disclosed associations between BRCA2+ status and qualitative CT features, as well as between radiomics features and OS.

**CLINICAL RELEVANCE/APPLICATION**

Qualitative and radiomics CT features, along with clinical and genetic features may be applied to the pre-operative evaluation of ovarian cancer patients in order to stratify the relative OS.

**GU254-SD-TUB3 The Differential Diagnosis Value of Texture Analysis and Histogram Parameters in Apparent Diffusion Coefficient of Diffusion Weighted Images for Uterine Sarcoma and Degenerated Hysteromyoma**

**Participants**

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**PURPOSE**

To explore the value of texture analysis(TA) and histogram parameters in apparent diffusion coefficient(ADC) of diffusion weighted images(DWI) for differential diagnosing uterine sarcoma(US) and degenerated hysteromyoma(DH).

**METHOD AND MATERIALS**

Sixteen cases of US and Thirty-one cases of DH including hyaline and mucinous degeneration were retrospectively analyzed from January 2010 to February 2017 in our hospital that were proven by histopathology.Patients age ranged from 27 to 85 years old, the average age was 52 years old. All patients underwent GE1.5T MRI T1WI, T2WI, LEVE and DWI scans(b=0,600s/mm²).Applying Functool in ADW 4.6 workstation to reprocessed the DWI images into ADC images,next exported the ADC images and inputed it into Omni-Kinetics software.Placed one region of interest(ROI) in the substantial parts of lesion in ADC images of US and DH respectively in which the area of ROI was greater than 1/3 of the lesion.Then used the double blind method to measure the images by two radiologists.The measured parameters were tested by intraclass correlation coefficient (ICC).If the values agreed well each other, the average datas from them were calculated for further statistical analysis.The ROC curves of all parameters were used to analyze and compare the diagnostic value of TA and histogram parameters in differentiating US and DH.

**RESULTS**

The consistency of TA and histogram parameters is well(mean ICC>0.75).The TA energy value of US 0.087(0.031,0.126) is higher than DH 0.010(0.008,0.017),P<0.000.Both of 90th (×10-5) 193.304(109.061,195.503) and 95th (×10-5) 193.770(190.439,195.990) in histogram of US are lower than DH 90th (×10-5) 193.770(190.439,195.990) and 95th (×10-5) 213.464(200.257,226.72),P<0.000.Both of 90th (×10-5) 193.304(109.061,195.503) and 95th (×10-5) 193.770(190.439,195.990) in histogram of US are lower than DH 90th (×10-5) 193.770(190.439,195.990) and 95th (×10-5) 213.464(200.257,226.72),P<0.000.The AUC of energy is 0.974, threshold value is 0.034, sensitivity and specificity is 75% and 96.8% The AUC of entropy is 0.974, threshold value is 0.034, sensitivity and specificity is 81.2% and 96.8%.The AUC of 90th and 95th are 0.839 and 0.883, threshold value is 195.564
and 199.834, sensitivity is 81.2% and 93.7%, specificity is 80.7% and 77.5%.

CONCLUSION
TA and histogram parameters in ADC of DWI can effectively identify US and DH, in which the energy value has a high diagnostic efficacy for the two diseases.

CLINICAL RELEVANCE/APPLICATION
To guide clinical treatment and assess prognosis.

GU255-SD- TUB4 Evaluating the Ultrasound Diagnostic Criteria for Non-Viable First Trimester Pregnancies

Station #4
Participants
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PURPOSE
To evaluate the current ultrasound diagnostic criteria for non-viable pregnancy early in the first trimester.

METHOD AND MATERIALS
A retrospective chart review was conducted at a tertiary care center. Consecutive first-trimester ultrasound reports performed between January 2013 and June 2016 were reviewed by two of the authors. All examinations in which the pregnancy was documented to have reached at least the third trimester were included. Data collected included gestational sac diameter (GSD), yolk sac (YS) presence and diameter, embryo (EMB) presence and length, presence of fetal heart (FH) and its rate.

RESULTS
Two hundred and forty-five (245) examinations with a viable pregnancy outcome (mean age 32.5) and 301 examinations with a non-viable pregnancy outcome (mean age 34.7) were included. Predictors of a non-viable pregnancy outcome included a GSD of >19mm in the absence of a YS (n=60), EMB (n=45) or FH (n=118) (Specificity 100%, PPV 100%). Other predictors of non-viability included absence of FH with an EMB >= 3mm (n=161), measurable EMB without a YS (n=49) and YS diameter >7mm (n=16) (Specificity 100%, PPV 100%).

CONCLUSION
Our results suggest that the current criteria to determine a non-viable pregnancy on first-trimester ultrasound are too conservative and maybe resulting in unnecessary ultrasound follow ups. As well, the absence of a measurable YS or a large YS (> 7mm) appears to be suggestive of non-viability.

CLINICAL RELEVANCE/APPLICATION
While we don't propose specific cut-off values for GSD and EMB length to determine viability, we do suggest reconsideration of the current values set at 25mm and 7mm, respectively. It may also be useful to consider the presence/absence of a measurable YS and the size of the YS when assessing viability.

GU256-SD- TUB5 3T MR Imaging, PIRADSv2 based detection of Index Prostate Cancer Lesions in the Transition Zone and the Peripheral Zone using Whole Mount Histopathology as Reference Standard

3T MR Imaging, PIRADSv2 Based Detection of Index Prostate Cancer Lesions

Station #5
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PURPOSE
To evaluate 3T mpMR characteristics of transition zone (TZ) and peripheral zone (PZ) index prostate cancer (PCA) lesions stratified by Gleason Score (GS) and PI-RADSv2 with whole mount histopathology (WMHP) correlation.

METHOD AND MATERIALS
An IRB approved HIPAA compliant single arm observational study of 425 consecutive men with 3T mpMRI prior to radical
prostatectomy from December 2009 to October 2016 was performed. A genitourinary (GU) radiologist and a GU pathologist matched all lesions detected on WMHP with lesions concordant for size and location on 3T mpMRI. Differences in clinical (PSA, PSA density, biochemical recurrence), MRI parameters (prostate volume, ADC zone, PI-RADSv2 category), Histopathology (tumor diameter, GS, staging, clear surgical margin) between TZ and PZ were determined and analyzed with Chi-square and Mann-Whitney U test for categorical and continuous variables, respectively. Area under the curve was measured.

RESULTS

3T mpMRI detected 323 (76.0%) index lesions. 244/323 (75.5%) of lesions were located in the PZ and 79/323 (24.4%) in the TZ. TZ PCa had higher median PSA (p=0.001), larger tumor on 3T mpMRI (p=0.001), lower proportions of PI-RADS category 4 and 5 (p=0.01), less aggressive PCa Gleason Grade (p=0.3) and lower pathological stage (p=0.05) compared to PZ PCa. No significant differences were detected between PZ and TZ lesions in PSA density, preoperative biopsy GS, pathology stage, and biochemical recurrence. After adjusting for significant variables from univariate analysis including prostate volume, tumor volume, PSA, PI-RADSv2 category, the area under the curve for predicting clinically significant tumor in TZ and PZ were 0.80 and 0.72, respectively.

CONCLUSION

On 3T mpMRI, PI-RADSv2 had high diagnostic performance for clinically significant tumors irrespective of zone, but had higher performance for the TZ over the PZ.

CLINICAL RELEVANCE/APPLICATION

3T mpMRI may help elucidate the histopathological differences between TZ and PZ PCa and further improve risk stratification of patients with PCa.

GU257-SD-TUB6  MRI Features of Endometrial Polyps: Frequency of Occurrence and Interobserver Reliability

Station #6

Participants
Kirsten Cooper, MD, New Haven, CT (Presenter) Nothing to Disclose
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PURPOSE

To assess the interobserver agreement and frequency of occurrence of the MRI features used to diagnose endometrial polyps in the radiological literature.

METHOD AND MATERIALS

The retrospective study was approved by the Institutional Review Board. We searched for female patients over 18 years who underwent routine MRI of the pelvis without and with intravenous contrast administration between 2012 and 2016, as well as either hysterectomy, dilation and curettage or endometrial biopsy within 8 months of the MRI. Patients with endometrial malignancy, intrauterine device or suboptimal imaging were excluded. 146 patients constituted the cohort of the study. The MR images were evaluated by two fellowship trained abdominal radiologists. For each case, the reader determined whether or not a polyp was present. If present, the following were also evaluated: polyp number, size of the largest polyp, T2 signal characteristics, presence of intratumoral cysts, T2 hypointense fibrous core and polyp enhancement characteristics. The endometrial thickness and polyp location were also recorded.

RESULTS

The average age of the women in the study was 49.8 years (SD 12.5). 100 were premenopausal and 46 postmenopausal. The sensitivity and specificity were 67.7 and 86.2% for reader 1, and 45.4 and 90.8% for reader 2 for identifying endometrial polyps. There was moderate agreement on the presence of a polyp (K=0.556, P=<0.0001). Of the MRI features, only the presence of intratumoral cysts was significant (k=0.638, p<0.005). The mean polyp size measured by readers 1 and 2 were 16.0 mm (2-60 mm, SD 13.8) and 25.3 mm (6-100 mm, SD 11.9), respectively. The mean polyp size on pathology was 15.3 mm (range 3-63 mm SD 11.9). Both readers had moderate Band-Altman correlation between polyp size and pathology, which were 0.465 (p=0.025) for reader 1 and 0.562 (p=0.029) for reader 2. The mean endometrial thickness for the polyp group was 8.5 mm (SD 6.29) for reader 1 and 10.1 mm (SD 7.5) for reader 2, whereas for the non-polyp group the mean thickness was 6.5 mm (SD5.1) for reader 1 and 8.1 mm (SD 7.7) for reader 2 (p=>0.05).

CONCLUSION

MRI has some value in assessing for the presence of endometrial polyps and showed good size correlation with pathology. The features described in the literature are only seen in a small number of patients and have moderate inter-observer agreement at best, although some are very specific when present.

CLINICAL RELEVANCE/APPLICATION

MRI is a first-line imaging modality in the evaluation of the endometrium and non-endometrial pelvic pathology, however the value of MRI in evaluating endometrial polyps has not been well established.

UR130-ED-TUB7  Percutaneous Nephrolithotomy: Role of Computed Tomography in Pre and Post-procedural Assessment

Station #7

Awards
Certificate of Merit

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TEACHING POINTS

1. Describe current management of nephrolithiasis and indication of percutaneuous nephrolithotomy (PCNL).
2. Discuss value of computed tomography (CT) in pre-PCNL nephroureteral (NU) access planning to maximize stone clearance.
3. Illustrate various normal and abnormal CT findings following PCNL.

TABLE OF CONTENTS/OUTLINE

1. Overview of current management of nephrolithiasis and indications for PCNL.
2. Pre-PCNL NU access planning with CT: renal anatomy including anomaly such as horseshoe kidney or duplicated renal pelvis, stone characteristics (size, location, number and density), and hydronephrosis.
3. Techniques used for Pre-PCNL nephroureteral access and PCNL.
4. Post-PCNL CT evaluation: Post-PCNL normal findings (which can be observed) on computed tomography (air within the renal collecting system, perirenal fat stranding, etc) - Assessment of stone clearance/residual stones - Post-PCNL abnormal findings including complications (bleeding/hematoma, pelvic perforation/urinoma, obstruction/hydronephrosis, pleural effusion/urinothorax) and improper placement of nephroureteral/double J stent.
5. Recent advances in renal stone characterization with dual energy CT

Bilateral Renal Lesions: A Pictorial Review

A Multimedia Application for Comprehensive Depiction of Imaging Findings in Urological Disorders for iPad and iPhone

The purpose of this exhibit is as follows: Teaching of core curriculum in radiology has traditionally relied on textbooks format, but in recent years has largely progressed to electronic format. We present a comprehensive Urology teaching resource that can be repackaged in App format for use on iPhones and iPads aimed at helping both medical students and doctors in their knowledge and interpretation of urological imaging. Users can interact with the comprehensive database at multiple levels with increasing complexity. This interactive teaching tool allows access to a large volume of educational material, and offers PACS-like functionality that allows the user to scroll through the images which have suppressible annotations. This offers a more realistic and comprehensive learning experience than offered by static texts. We have a number of screenshots from our application which demonstrate its utility in teaching users about a number of urological diseases using clinical scenarios and descriptions of relevant imaging with interactive annotation.
Participants
Matthew S. Davenport, MD, Cincinnati, OH (Presenter) Royalties, Wolters Kluwer nv;
Arvin K. George, MD, Ann Arbor, MI (Presenter) Nothing to Disclose
Daniel A. Hamstra, MD, PhD, Dearborn, MI (Presenter) Advisory Board, Myriad Genetics, Inc; Consultant, Augmenix, Inc

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LEARNING OBJECTIVES
1) Understand typical imaging findings of prostate cancer on mpMRI. 2) Learn the positive predictive value of various PI-RADS v.2 scores. 3) Recognize the imaging findings of post-treatment prostate cancer recurrence.
RC413

**Pediatric Series: Gastrointestinal/Genitourinary**

**Tuesday, Nov. 28 3:00PM - 6:00PM Room: S102CD**

**AMA PRA Category 1 Credits ™**: 2.75
**ARRT Category A+ Credits**: 3.25

**FDA** Discussions may include off-label uses.

**Participants**
Teresa Victoria, MD, PhD, Philadelphia, PA *(Moderator)* Nothing to Disclose
C. Matthew Hawkins, MD, Atlanta, GA *(Moderator)* Nothing to Disclose
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Susan E. Sharp, MD, Cincinnati, OH *(Moderator)* Nothing to Disclose

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**Sub-Events**

**RC413-01 Abdominal Wall Defects: Prenatal Imaging with Postnatal Implications**

**Tuesday, Nov. 28 3:00PM - 3:15PM Room: S102CD**

**Participants**
Teresa Victoria, MD, PhD, Philadelphia, PA *(Presenter)* Nothing to Disclose

**LEARNING OBJECTIVES**
1) To review basic concepts in fetal abdominal wall defects (AWD). 2) To identify basic imaging tricks to correctly identify each AWD. 3) To review prenatal/postnatal treatments of these AWD.

**RC413-02 Diagnostic Accuracy of Magnetic Resonance Imaging Hepatic Proton Density Fat Fraction in Pediatric Nonalcoholic Fatty Liver Disease**

**Tuesday, Nov. 28 3:15PM - 3:25PM Room: S102CD**

**Participants**
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**PURPOSE**
The purpose of this study was to assess cross-sectional and longitudinal diagnostic performance of hepatic proton density fat fraction (PDFF) to grade histologic steatosis in children with nonalcoholic fatty liver disease (NAFLD) using centrally-scored histology as the reference standard.

**METHOD AND MATERIALS**

We assessed the performance of magnetic resonance imaging (MRI) proton density fat fraction (PDFF) in children to stratify hepatic steatosis grade before and after treatment in the Cysteamine Bitartrate Delayed-Release for the Treatment of Nonalcoholic Fatty Liver Disease in Children (CyNCh) trial, using centrally-scored histology as reference. This study was conducted at nine clinical centers in the United States, with centrally-evaluated MRI. Participants had multi-echo 1.5T or 3T MRI on scanners from three manufacturers.

**RESULTS**

Of 169 enrolled children, 110 (65%) and 83 (49%) had MRI and liver biopsy at baseline and at end-of-treatment (EOT; 52-weeks), respectively. At baseline, 17% (19/110), 28% (31/110), and 55% (60/110) of liver biopsies showed grades 1, 2, and 3 histologic steatosis; corresponding PDFF (mean ± standard deviation) values were 10.9 ± 4.1%, 18.4 ± 6.2%, and 25.7 ± 9.7%, respectively. PDFF classified grade 1 vs. 2-3 and 1-2 vs. 3 steatosis with areas under receiver operating characteristic curves (AUROCs) of 0.87 (95% confidence interval [CI]: 0.80, 0.94) and 0.79 (0.70, 0.87), respectively. PDFF cut-offs at 90% specificity were 17.5% for grades 2-3 steatosis, and 23.3% for grade 3 steatosis. At EOT, 47% (39/83), 41% (34/83), and 12% (10/83) of biopsies showed improved, unchanged, and worsened steatosis grade, respectively, with corresponding PDFF (mean ± standard deviation) changes of -7.8 ± 6.3%, -1.2 ± 7.8% and 4.9 ± 5.0%, respectively. PDFF change classified steatosis grade improvement and worsening with AUROCs of (95% CI) of 0.76 (0.66, 0.87) and 0.83 (0.73, 0.92), respectively. PDFF change cut-off values at 90% specificity were -11.0% and +5.5% for improvement and worsening.

**CONCLUSION**

MRI-estimated PDFF has high diagnostic accuracy to both classify and predict histologic steatosis grade, and change in histologic steatosis grade in children with NAFLD.

**CLINICAL RELEVANCE/APPLICATION**

Our study results support the feasibility of using MRI-estimated PDFF in multi-center pediatric clinical trials as a biomarker of hepatic steatosis, and of change in hepatic steatosis.

**PURPOSE**

To investigate the value of Supersonic shear-wave elastography (SSWE) in the assessment of hepatic fibrosis in patients with biliary atresia (BA) and to analyze factors that might influence the SSWE value.

**METHOD AND MATERIALS**

The ethics committee approved this study, and informed parental consent was obtained. From January 2012 to January 2016, sixty-seven infants with BA who preoperatively had SSWE measurements and consequently underwent Kasai portoenterostomy were ruled in. All patients were also underwent preoperative serologic testing. Interoperative liver specimens were reviewed in a blinded manner by two pathologists using METAVIR criteria. SSWE measurements were correlated with pathological results, age and serologic testing results. Performance of SSWE in differentiating liver fibrosis was determined by using areas under the receiver operating characteristic curve (AUC).

**RESULTS**

The SSWE value of F0 (n=1), F1 (n=16), F2 (n=28), F3 (n=18), F4 (n=4) was 8.2Kpa, 11.0(8.4-12.2)Kpa, 12.6(10.1-13.9)Kpa, 16.6(14.7-24.0)Kpa, 20.3(13.4-37.2)Kpa, respectively. SSWE value were significantly correlated with γ-glutamyltranspeptidase(P=0.010), age(P<0.001) and liver fibrosis P<0.001). Logistic regression analysis demonstrated that liver fibrosis(P<0.001) and age(P=0.033)were significantly associated with SSWE. The AUC for differentiating severe fibrosis or greater (>=F3) was 0.896, with an optimal cutoff value of 13.2 Kpa.

**CONCLUSION**

Preoperative SSWE measurements for infants with BA could be used as a noninvasive tool for predicting severe fibrosis or greater (>=F3). However, SSWE value might be influenced by infant’s age.

**CLINICAL RELEVANCE/APPLICATION**

The severity of liver fibrosis at the time of surgery is predictive of the long-term success of portenterostomy. For BA infants with severe liver fibrosis, direct liver transplantation may be a better choice over portenterostomy. Thus, Preoperative SSWE measurements for infants with BA may help decide whether a Kasai surgery or a direct liver transplantation is better for infants with BA. Furthermore, the severity of liver fibrosis reflected by SSWE value may also be important in predicting the outcome of Kasai surgery.
Participants
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PURPOSE
MR enterography (MRE) with contrast injection is the imaging modality of choice for diagnosing and monitoring Crohn's disease (CD). Since recent studies described intracranial gadolinium depositions in patients undergoing repeated contrast-enhanced MRI's, efforts have been made to reduce the use of gadolinium. Diffusion-weighted Imaging (DWI) sequence enables to detect inflammatory changes without the use of gadolinium. Our purpose is to estimate the accuracy and efficacy of DWI sequences in MRE (DWI-MRE) for assessment of CD in children.

METHOD AND MATERIALS
This study utilized 50 MRE's of children with CD performed as part of the large prospective ImageKids study in which children underwent MRE and ileocolonoscopy. MRE's were re-read, first, without the contrast injection sequences (DWI-MRE) and then including post contrast sequences (CE-MRE). Parameters evaluated in both readings included: involved segment, segment length, degree of inflammation, degree of fibrosis and severity of disease (inflammation and fibrosis). Comparisons were made between the different parameters in both readings and with Simple Endoscopic Score for Crohn's Disease (SES-CD) of the terminal Ileum (TI).

RESULTS
Comparison of DWI-MRE to CE-MRE: Affected bowel segments were identified with accuracy > 85% in the upper gastrointestinal tract, TI and colon. Accuracy was 82% in the ileum and 80% in the jejunum. Pearson correlation coefficient (PCC) for severity of disease was 0.86 in the colon and rectum, 0.81 in the jejunum, 0.77 in the ileum and 0.68 in the TI. PCC between the two readings for inflammation was 0.74 (jejenum), 0.68 (ileum), 0.7 (colon). PCC for fibrosis was highest for colon (0.68) but lower for the small intestine. PCC for segment length between the readings was 0.76 (colon), 0.61 (jejenum), 0.65 (TI). Comparison of MRE to SES-CD: PCC of 0.64 for degree of inflammation between the DWI-MRE and SES-CD and PCC of 0.52 for severity of disease between CE-MRE and SES-CD.

CONCLUSION
DWI-MRE is accurate enough for assessment of involved segments, length of segments and estimation of severity disease but less accurate for differentiating fibrotic from inflammatory lesions.

CLINICAL RELEVANCE/APPLICATION
There is an increasing concern regarding sedimentation of gadolinium in the brain after multiple examinations. DE-MRE can substitute CE-MRE in CD patients subject to multiple MRE exams.

RC413-05 Role Of Supersonic Shear Wave Elastography (SSWE) In Diagnosis Of Extrahepatic Biliary Atresia (EHBA)

Tuesday, Nov. 28 3:45PM - 3:55PM Room: S102CD

Awards
Student Travel Stipend Award

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PURPOSE
To evaluate the role of SSWE in evaluation of infants with cholestatic jaundice.

METHOD AND MATERIALS
This was a prospective observational study which was approved by the ethics committee of our institute. Infants with biochemically proven cholestatic jaundice were evaluated using SSWE of the liver. The mean Shear Wave Speed (SWS) and mean Young's Modulus (YM) in the nine Couinaud's segments of liver and at the echogenicity anterior to the right portal vein were recorded. On the basis of histopathological findings, clinical follow up and other laboratory investigations, patients were placed in two groups: EHBA and non-EHBA. Shear wave sonographic findings were compared for these two groups. Sub group analysis was
RESULTS
90 infants (58 boys, 32 girls; median age 85 days) were enrolled of which 51 were <90 days of age. There were 19 patients of EHBA of which 16 were <90 days of age. The mean SWS in the liver segments in the EHBA and Non-EHBA group were 3.43 ± 0.85 m/s and 2.81 ± 0.88 m/s respectively. The mean YM in the liver segments in the EHBA and Non-EHBA group were 39.04 ± 17.40 kPa and 26.78 ± 16.70 kPa respectively. These differences were statistically significant. Although the mean SWS and YM anterior to the right portal vein were higher in the EHBA group, the differences were not statistically significant. At a cut off mean SWS value of 2.14 m/s for the liver segments, the sensitivity to diagnose EHBA was 94.7 % and the specificity was 31.0 % while with a cut off mean SWS value of 4.43 m/s, the sensitivity to diagnose EHBA was 15.6 % and the specificity was 94.4 %. Similarly, at a cut off mean YM value of 16.31 kPa for the liver segments, the sensitivity to diagnose EHBA was 94.7 % and the specificity was 40.8 % while with a cut off of mean YM value of 60.88 kPa, the sensitivity to diagnose EHBA was 15.8 % and the specificity was 97.2 %. For the children <90 days of age, mean SWS and YM in liver segments and anterior to right portal vein were higher in EHBA group and the differences were statistically significant.

CONCLUSION
SSWE of liver can be used to differentiate between EHBA and other etiologies of infantile cholestatic jaundice.

CLINICAL RELEVANCE/APPLICATION
SSWE can be another tool in radiological armamentarium for segregating patients of EHBA from other causes of infantile cholestatic jaundice.

RC413-06 Segmental Correlation between Hepatic Proton Density Fat Fraction (PDFF) and R2* Using Magnitude (-M) and Complex (-C) Based MRI Techniques

Tuesday, Nov. 28 3:55PM - 4:05PM Room: S102CD

Participants
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PURPOSE
To determine segment-level correlation between hepatic PDFF and R2* using magnitude based (-M) and complex based (-C) MRI techniques.

METHOD AND MATERIALS
In this cross-sectional study, we conducted a secondary analysis of 3T MR exams performed as part of prospective research studies in children in whom conditions associated with iron overload were excluded clinically. Each exam included low-flip-angle, multi-echo magnitude and complex based chemical-shift-encoded MRI techniques with spectral modeling of fat to generate hepatic PDFF and R2* parametric maps. For each technique and each patient, regions of interest were placed on the maps in each of the nine Couinaud segments and the corresponding segmental PDFF and R2* values were recorded. For each segment and each MR technique, correlation between PDFF and R2* values was assessed using Pearson's correlation coefficient (r). Correlations were compared using Steiger's test; Bonferroni's correction was applied.

RESULTS
184 children (123 boys, 61 girls) were included in this analysis. Mean ± STDEV values for segment-level PDFF estimated by MRI-M and MRI-C were 9.28 ± 9.75 % and 8.95 ± 8.90 %, respectively. Mean ± STDEV values for segment-level R2* estimated by MRI-M and MRI-C were 9.28 ± 12.39 s-1 and 9.86 ± 11.45 s-1, respectively. Segment-level correlations between PDFF and R2* ranged from 0.626 to 0.843 for MRI-M and 0.516 to 0.785 for MRI-C. All segment-level correlations were significant for both techniques (p < 0.0001). For both techniques, the highest correlations were observed in segments 4b, 5, and 6 and the lowest in segments 2, 3 and 4a. The difference in correlations between MRI-M and MRI-C techniques was significant for segments 1 and 4a, and trend-wise significant for segment 6 after Bonferroni correction.

CONCLUSION
Hepatic PDFF and R2* are correlated in each Couinaud segment using two different techniques. For both techniques, the correlations were highest for segments 5, 6, 4b, 1 and 7, and lowest for segments 2, 3 and 4a. Correlation coefficients were higher for MRI-M than for MRI-C for all segments.

CLINICAL RELEVANCE/APPLICATION
Segments 4b, 5, and 6 exhibit the highest correlations between PDFF and R2*; whereas 2, 3, and 4a exhibit lower correlations than
other hepatic segments. Although further validation is needed, this may be because the proximity of left lobe segments to the lungs increases the contribution of large-scale susceptibility effects on R2* estimation.

**RC413-07 Free-Breathing Pediatric Liver MRI Using a Multiecho 3D Stack-of-Radial Technique Enables Accurate and Repeatable Liver Fat Quantification**

**Awards**

**Trainee Research Prize - Medical Student**

**Participants**

Tess Armstrong, MS, Los Angeles, CA (Presenter) Research support, Siemens AG
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**PURPOSE**

MRI provides non-invasive liver fat quantification, but Cartesian MRI is susceptible to motion artifacts and limited to a breath-hold (BH). In children, BH may not be possible and anesthesia is undesired. In this work, we develop a new free-breathing 3D stack-of-radial pediatric liver fat quantification technique and assess accuracy and repeatability.

**CONCLUSION**

FB radial showed significant correlation and low mean difference compared to BH Cartesian and BH SVS. Accurate and repeatable free-breathing PDDF quantification in children is possible using a FB radial technique.

**CLINICAL RELEVANCE/APPLICATION**

The new FB radial technique achieves accurate and repeatable free-breathing liver fat quantification in children with NAFLD.

**RC413-08 Pediatric Enteric Access**

**Participants**

C. Matthew Hawkins, MD, Atlanta, GA (Presenter) Nothing to Disclose

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**LEARNING OBJECTIVES**

1) Understand the different devices that are available for percutaneous gastric and gastrojejunal access. 2) Apply appropriate patient selection when considering enteric access. 3) Understand the risks associated with different types of pediatric enteric access.

**RC413-09 Urinary Tract Dilatation: Classification Opportunities and Challenges**

**Participants**

Lynn A. Fordham, MD, Chapel Hill, NC (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Review and compare systems to grade antenatal and postnatal hydronephrosis. 2) Describe etiologies of antenatal and postnatal hydronephrosis. 3) Discuss benefits and limitations of classification systems.

**ABSTRACT**

Prenatal ultrasound is performed throughout the world to evaluate the fetus. Detection of anomalies can dramatically alter treatment plans and help predict postnatal outcomes. Renal and bladder anomalies are relatively common. Dilatation of the urinary tract is seen in 1-2% of fetuses and can be due to a variety of etiologies. Various ultrasonographic features have been used to grade the severity of the dilatation. In March of 2014, experts representing 8 professional societies convened and created a new scoring system to standardize classification of prenatal and postnatal urinary tract dilatation (UTD). Recommendations for further evaluation of these patients were then made based on the UTD grade. This talk will review the UTD grading system and publications evaluating the new method.
PURPOSE
To evaluate the feasibility of shear wave elastography ultrasound as a potential non-invasive tool to facilitate early diagnosis of hepatic veno-occlusive disease (HVOD) in a pediatric population undergoing hematopoietic stem cell transplantation (HSCT).

METHOD AND MATERIALS
Under IRB approval, HSCT patients with a clinical suspicion of HVOD were recruited for the study (N=11, age: 10.3 ± 6.4 y). Diagnosis of HVOD was made by fulfillment of the Revised Seattle Criteria as determined by a physician using the following clinical criteria: right upper quadrant pain, total bilirubin, percent weight gain, and ascites, as well as the detection of portal venous flow reversal. All patients underwent serial ultrasound examinations, which included evaluation by grayscale, Doppler, and elastographic techniques. Ten ultrasound exams were performed every other day using a GE Logic-E9 ultrasound unit with linear and curvilinear transducers. Four elastography measurements each were made in Couinaud's liver segments numbers 5 through 8 (16 total for each patient).

RESULTS
Of the eleven recruited patients, four completed fewer than 10 exams due to discharge or withdrawal of consent. The figure displays each patient's average SWE velocity (m/s) over all 10 exams obtained in liver segments 5 through 8. The mean SWE velocity from all patients in this population was 1.81 ± 0.18 m/s (range: 1.66 to 2.18 m/s), which was higher than the vendor specified cut-off for normal stiffness of 1.35 m/s. The patient with the highest measured SWE velocity (2.18 ± 0.28 m/s) was the only patient to die due to multi-organ failure as a complication of HVOD. This patient's SWE measurements were significantly higher than the rest of the cohort (p=0.00085), with a mean SWE velocity greater than 2.10 m/s delineating this severe patient from other patients with mild or moderate disease.

CONCLUSION
This study demonstrated elevated liver stiffness values with shear wave elastography in pediatric patients undergoing HSCT with clinically suspected HVOD, and the ability to delineate between mild and severe disease in this population.

CLINICAL RELEVANCE/APPLICATION
This study demonstrates the potential diagnostic application of an emerging sonographic technique in a unique population of pediatric patients. Early detection of this disease has the potential to profoundly impact patient care.
predominance of 69% and mean age of 62 days. Of these, 19 (31.1%) patients were proven to have biliary atresia and 42 (68.9%) patients to have hepatic dysfunction per the gold standard. The conventional method yielded an accuracy of 65.6% without significant correlation with the gold standard (p=0.998), whereas using the alternate method resulted in an accuracy of 83.6% with significant correlation to the gold standard (p=0.003).

CONCLUSION
Background activity grading supplemented with visualization of the SB and GB increases accuracy of diagnosis of biliary atresia versus hepatic dysfunction on HIDA scan and provides a significant correlation with findings on surgery and histopathologic evaluation.

CLINICAL RELEVANCE/APPLICATION
Utilizing background activity can improve accuracy of diagnosis on HIDA scan and potentially result in avoidance of unnecessary invasive testing.

**RC413-12 Early Detection of Ureteropelvic Obstruction from Diuresis Renography**

Tuesday, Nov. 28 5:15PM - 5:25PM Room: S102CD

Participants
Antonio R. Porras, PhD, Washington, DC (Abstract Co-Author) Nothing to Disclose
Emily S. Bum, MD, Washinton, DC (Abstract Co-Author) Nothing to Disclose
Elilaj Biggs, BS, Washington, DC (Abstract Co-Author) Nothing to Disclose
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Marius G. Linguraru, DPhil,MS, Washington, DC (Presenter) Nothing to Disclose

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**PURPOSE**
To provide early and accurate detection of severe ureteropelvic junction obstruction requiring surgical intervention from the evaluation of the drainage curves obtained from the first diuresis renography (DR) exam. We introduce the calculation of new metrics for surgical decision-making based on advanced signal analysis and machine learning techniques.

**METHOD AND MATERIALS**
Sixty DR studies (5 bilateral) from 55 patients (age 80±70 days) were acquired, in which 34 kidneys needed surgery and 26 did not. Surgical decision was based on the clinical evaluation of the dynamic information embedded in longitudinal DR. Posterior dynamic images of the kidneys were obtained for 30 minutes, using a Siemens e-Cam Signature with 1.0 mCi 99mTechnetium MAG3. After administration of furosemide 1 mg/Kg, additional images were obtained for 30 minutes. In this study, we used the drainage curves from the first DR of each patient. We extracted 45 features using signal analysis including curve spatio-temporal descriptors. Feature selection was done within a leave-one-out analysis, selecting a group of features for each training dataset based on their weights on a linear support vector machine classifier. A histogram of selected features was created and those that were selected at least 95% of the times were chosen as final features. Then, a linear support vector machine classifier identified surgical or non-operative cases. Our method was evaluated in terms of accuracy, sensitivity and specificity, and compared with the results obtained from the widely used t-half time, which is the time to drain half of the radiotracer from the kidney.

**RESULTS**
We predicted ureteropelvic obstruction for which surgery was performed with an accuracy of 93% (91% sensitivity, 96% specificity), compared to the accuracies of 77% (71% sensitivity, 85% specificity) and 80% (67% sensitivity, 96% specificity) obtained using thresholds of 20 and 30 min on the t-half time (p<0.05).

**CONCLUSION**
Our signal analysis method for drainage curves from DR studies at the time of the first exam significantly improves the detection of ureteropelvic obstruction with accuracy to 93%. Earlier detection of surgical candidates could potentially improve patient outcome.

**CLINICAL RELEVANCE/APPLICATION**
Early detection of ureteropelvic junction obstruction has the potential to reduce the time and number of longitudinal DR exams required to determine course of treatment.

**RC413-13 Testicular Adrenal Rest Tumor in Congenital Adrenal Hyperplasia Patients: Long-Term Follow-Up Study and Correlation with Sonographic Volume and Hormone Level**

Tuesday, Nov. 28 5:25PM - 5:35PM Room: S102CD

Participants
Seunghyun Lee, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
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**PURPOSE**
To identify changes in testicular adrenal rest tumor (TART) during long-term follow-up and to evaluate the correlation between TART volumes and hormone levels in children with congenital adrenal hyperplasia.

**METHOD AND MATERIALS**
We retrospectively reviewed serial testicular ultrasonography and hormone levels from 39 children with congenital adrenal hyperplasia (mean age 15.7 years; range 5-19 years). The median follow-up period was 8 years (range 1-13 years). The volumes of each testis and TART were calculated using the prolate ellipsoid formula and the relative TART volume was defined as the ratio of TART volume divided by the testicular volume. Serum concentrations of renin and 17-hydroxyprogesterone (17-PG) around the time of testicular ultrasonography were collected. Serial changes in volumetric parameters of ultrasonography and hormone levels were analyzed with a linear mixed model, adjusting individual repeated measurement.

RESULTS
During follow-up, the mean testicular volume of all patients grew from 8.76±4.39 cm³ to 9.68±5.01 cm³. Among 39 children, thirty-six children (94.6%) had TARTs, bilaterally. At initial, the mean TART volume and mean relative TART volume were 1.16 cm³ (range, 0.0-12.3 cm³) and 0.12 (range, 0.0-0.5), respectively. The volume of TART was unchanged in 30 children and increased in 9 children (mean volume change of TART, 4.07±3.41 cm³). Among 9 children with growing volume of TART, one patient was diagnosed as having an adrenocortical carcinoma. However, there was no malignant change in testicular mass. Relative TART volume was associated with a higher risk for increasing 17-PG serum concentration (Estimate = 114.87, 95% CI = 14.8 to 214.9, P = .025). The other volumetric parameters showed no significant correlation with hormone levels.

CONCLUSION
TART grew during follow-up in 9 (23%) out of 39 children under treatment for congenital adrenal hyperplasia and relative TART showed a significant correlation with 17-PG level.

CLINICAL RELEVANCE/APPLICATION
Testicular ultrasonography can be a useful imaging tool for monitoring growth of TARTs and development of malignant tumors in children with congenital adrenal hyperplasia, although these are not common.

Awards
Student Travel Stipend Award
Participants
Jacob Parzen, Rochester, NY (Presenter) Nothing to Disclose
Annalynn Williams, Rochester, NY (Abstract Co-Author) Nothing to Disclose
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PURPOSE
Wilms tumor survivors have increased risk of developing late nephrotoxicity. We evaluated the prevalence of impaired renal function in survivors of Wilms tumor who were treated with radiation therapy (RT).

METHOD AND MATERIALS
Patients who were under the age of 21 at the time of RT for Wilms tumor and who had at least 2 years of follow-up were eligible for the study. All patients treated with RT between 1995-2016 at this institution were included. Renal function was assessed with estimated glomerular filtration rate (eGFR) using the modified Schwartz equation. Impaired renal function was defined as eGFR <90 mL/minute/1.73m². Secondary outcomes of interest were proteinuria and elevated systolic blood pressure (SBP).

RESULTS
28 patients met all inclusion parameters, with a median age at RT of 3.3 years (range, 0.4-17.5 years). There were 17 female and 11 male patients. There were 1 Stage I, 0 Stage II, 18 Stage III, 5 Stage IV, and 3 Stage V patients. RT was delivered to the hemiabdomen in 18 patients and to the whole abdomen in 10 patients. RT dose was <=1080 Gy in 19 patients and >1080 Gy in 9 patients. All patients received chemotherapy and surgery. 25 of the patients received doxorubicin, actinomycin, and vincristine. Ipsilateral nephrectomy was the most common surgical procedure, in 23 patients. At median length of follow-up of 10.0 years (range, 2.5-28.1 years), 13 (46.4%) patients had impaired renal function. No patients had developed end-stage renal disease. 6 (21.4%) patients had elevated blood pressure (SBP > 120) and 4 (14.3%) patients had proteinuria. Age <=3 at time of RT was not associated with the development of reduced eGFR (p = 0.151).

CONCLUSION
Patients requiring trimodality therapy for Wilms tumor are at substantial risk for developing late renal toxicity. Further studies are needed to clarify the effect of age at RT on the propensity to develop late nephrotoxicity.

CLINICAL RELEVANCE/APPLICATION
There is a high rate of late nephrotoxicity in children receiving radiation therapy for Wilms tumor and further efforts are needed to decrease treatment-related morbidity in this patient population.

UPDATE ON NUCLEAR IMAGING OF THE PEDIATRIC URINARY SYSTEM

Patients requiring trimodality therapy for Wilms tumor are at substantial risk for developing late renal toxicity. Further studies are needed to clarify the effect of age at RT on the propensity to develop late nephrotoxicity.

CLINICAL RELEVANCE/APPLICATION
There is a high rate of late nephrotoxicity in children receiving radiation therapy for Wilms tumor and further efforts are needed to decrease treatment-related morbidity in this patient population.
medicine for imaging the pediatric urinary system.
SSJ10-01  
**Symptomatic Fibroids in Pregnancy: MR Imaging Features and Differentiation from Non-Symptomatic Fibroids**

Tuesday, Nov. 28 3:00PM - 3:10PM Room: E351

**Participants**
Dean A. Nakamoto, MD, Beachwood, OH (Moderator) Research agreement, Toshiba Medical Systems Corporation  
Elaine M. Cailli, MD, MS, Ann Arbor, MI (Moderator) Nothing to Disclose

**Method and Materials**
MRI studies of pregnant patients with uterine fibroids performed for acute lower abdominal and/or pelvic pain between 1/2010-9/2016 were retrospectively evaluated. Patient age, gestational age, fibroid size, fibroid number, fibroid location, signal intensity of the fibroid relative to myometrium on T1- weighted imaging, T2-weighted imaging, and diffusion weighted imaging (DWI), and ADC values were recorded along with final discharge diagnoses. Kruskal-Wallis and chi-squared tests compared continuous and categorical variables, respectively, between symptomatic and non-symptomatic fibroids.

**Results**
Twenty-seven pregnant patients (mean age of 33 [range: 24-47] and mean gestational age of 18 [range: 4-33]) with a total of 57 fibroids comprised the study cohort, with 13 fibroids in 13 patients ultimately identified as the cause of pain based on clinical examination and final discharge diagnoses. Larger size (5.8 versus 3.4 cm in diameter, p = 0.00012), T2 hyperintensity relative to myometrium (p = 0.000049), and hyperintensity on DWI (p = 0.00054) were significantly associated with symptomatic fibroids. ADC values were slightly lower in symptomatic fibroids but not statistically significant (1401 versus 1493 x 10-6 mm2/s, p = 0.32). No difference in T1 signal intensity was seen between symptomatic and non-symptomatic fibroids (p = 0.73).

**Conclusion**
MRI characteristics of fibroids causing acute pain in the setting of pregnancy have not previously been described, with the exception of T1 hyperintensity seen with red degeneration. In our cohort, larger size and hyperintensity on DWI and T2-weighted imaging relative to myometrium are significantly associated with symptomatic fibroids. These imaging features may also be useful indicators of fibroid degeneration.

**Clinical Relevance/Application**
MR signal characteristics associated with symptomatic fibroids are described in our cohort of pregnant patients presenting with acute pain, and may be useful indicators of fibroid degeneration.
To define the diagnostic role of fetal MRI in the assessment of cortical dysplasias and other malformations of the developing cerebral cortex, in fetuses with different forms of Agenesis of the Corpus Callosum (ACC).

**METHOD AND MATERIALS**

104 MR images of fetal CNS with a US suspicion of ACC were retrospectively reviewed. Fetal MRI was performed at 1.5 T Magnetom Avanto (Siemens, Erlangen, Germany) without mother-fetal sedation. Polymicrogyria, lissencephaly, schizencephaly, subependymal heterotopias and migration disorders were evaluated. Cortical findings were compared to three types of ACC (complete agenesis, partial agenesis and hypoplasia). Genetic tests were collected. Post-natal MRI or fetopsy for diagnostic confirmation were collected.

**RESULTS**

On 104 fetuses, fetal MRI was able to detect cortical malformations in 32 cases even in early gestational ages (<24GW). The mean Gestational Weeks (GW) at MR diagnosis was 26 (range: 22-36GW). MR imaging found 13/32 polymicrogyria, 7/32 lissencephaly, 5/32 schizencephaly, 4/32 subependymal heterotopias and 3/32 neuronal migration disorders. 22/32 had complete ACC, 4/32 had partial ACC and 6/32 had CC hypoplasia. Statistically significant correlations (p<0.005) between complete ACC, focal polymicrogyria and cortical dysmorphism affecting frontal lobes were found.

**CONCLUSION**

Fetal CNS MRI can detect cortical development malformations in complex ACC, providing further information for the clinician to assess the severity of perinatal outcome.

**CLINICAL RELEVANCE/APPLICATION**

MRI is a useful tool in improving obstetrical genetic prenatal counselling to predict pregnancy and fetal prognosis.
CLINICAL RELEVANCE/APPLICATION

The data from this study suggests that fetal exposure to MR imaging at 3.0 T is safe.

SSJ10-04  Use of a Telerobotic Ultrasound System for Prenatal Imaging

Tuesday, Nov. 28 3:30PM - 3:40PM Room: E351

Awards
Trainee Research Prize - Resident

Participants
Scott J. Adams, MD, Saskatoon, SK (Presenter) Nothing to Disclose
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Luis Bustamante, Saskatoon, SK (Abstract Co-Author) Nothing to Disclose
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Ivar Mendez, MD, PhD, Saskatoon, SK (Abstract Co-Author) Nothing to Disclose
Paul S. Babyn, MD, Saskatoon, SK (Abstract Co-Author) Nothing to Disclose

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PURPOSE

To determine the feasibility of using a telerobotic ultrasound system to remotely perform prenatal ultrasound examinations and generate images of diagnostic quality, and determine the acceptability of the system to patients and sonographers.

METHOD AND MATERIALS

Thirty participants (mean gestational age 22.8 weeks, range 15-36 weeks) were prospectively recruited. Participants underwent a limited examination (consisting of biometry, placental location, and amniotic fluid; n=21) or detailed examination (biometry, placental location, amniotic fluid, and fetal anatomic survey; n=9) performed using a conventional ultrasound system (EPIQ 5, Philips). This was immediately followed by an equivalent examination performed by a different sonographer using a telerobotic system consisting of a robotic arm (MELODY System, AdEchoTech), ultrasound unit (SonixTablet, BK Ultrasound), and videoconferencing system. Using this system, radiologists or sonographers remotely control all ultrasound settings and fine movements of a transducer from a distance. Telerobotic images were read independently from conventional images. Patients and sonographers were surveyed to assess acceptability of the system.

RESULTS

A paired sample t-test showed no statistically significant difference between conventional and telerobotic measurements of fetal head circumference or single deepest vertical pocket of amniotic fluid; however, a small but statistically significant difference was observed in measurements of biparietal diameter, abdominal circumference, and femur length (p-values <0.05). Intraclass correlations displayed excellent agreement (>0.90) between telerobotic and conventional measurements of all four biometric parameters. Of 21 fetal structures included in the anatomic survey, 82% (range 68-100%) of the structures attempted were sufficiently visualized using the telerobotic system. Ninety-seven percent of patients strongly or somewhat agreed they would be willing to have another telerobotic examination in the future.

CONCLUSION

The telerobotic ultrasound system assessed is feasible for performing prenatal ultrasound examinations. Telerobotic ultrasound systems may allow for the development of satellite ultrasound clinics in rural, remote, or low-volume communities, thereby increasing access to prenatal imaging.

CLINICAL RELEVANCE/APPLICATION

Telerobotic sonography may increase access to prenatal imaging for patients in rural, remote, or low-volume communities.

SSJ10-05  Magnetic Resonance Imaging Evaluation of Invasive Placentation: Accuracy and Impact on Delivery Management

Tuesday, Nov. 28 3:40PM - 3:50PM Room: E351

Awards
Student Travel Stipend Award

Participants
Filippo Monelli, MD, Modena, Italy (Presenter) Nothing to Disclose
Federica Fiocchi, Modena, Italy (Abstract Co-Author) Nothing to Disclose
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Elisabetta Petrella, Modena, Italy (Abstract Co-Author) Nothing to Disclose
Mario De Santis, Modena, Italy (Abstract Co-Author) Nothing to Disclose
Fabio Facchinetti, Mdena, Italy (Abstract Co-Author) Nothing to Disclose
Pietro Torricelli, MD, Modena, Italy (Abstract Co-Author) Nothing to Disclose

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PURPOSE

To assess accuracy and reproducibility of Magnetic Resonance Imaging (MRI) findings in the diagnosis of Invasive Placentation (IP) in high risk patients. To evaluate the impact of interventional radiological assistance (IRA) on delivery outcomes.
METHOD AND MATERIALS
Twenty-one patients (mean age 36.05 years) with risk factors for IP underwent 1.5T MR examination. Images were reviewed by two readers. Gold standard was histology in 11 and obstetrical diagnosis in 10 patients. Sensitivity and specificity of MRI findings were calculated and reproducibility was estimated with Cohen's K-test. Impact of eventual IRA was evaluated regarding multiple maternal-child factors during and after delivery.

RESULTS
IP was found in 13 patients (61.90%), placenta accreta/increta in 10 (47.62%) and percreta in 3 (14.29%). MRI had sensitivity of 100% and specificity of 87.5%. MRI findings with higher sensitivity were placental heterogeneity, uterine bulging, black intraplacental bands, myometrial interruption and thinning of the uterine-placental interface. Findings with higher specificity were uterine scarring, placental heterogeneity, myometrial interruption and tenting of the bladder. MRI inter-rater agreement was high (K=1). IRA was performed in 10 women among 13 with diagnosis of IP, with global positive impact on delivery's outcome. Factors with statistical significant difference (p<0.05) were: blood loss (1405 ml vs 3080 ml), days in surgical intensive care unit (1 vs 3), APGAR at first minute (6.11 vs 4) and overall days of hospitalization (12.00 vs 41.77).

CONCLUSION
MRI is an accurate and reproducible tool in prenatal diagnosis of IP and can be used to plan safe delivery in an appropriate setting with eventual IRA, that positively affects delivery's outcomes.

CLINICAL RELEVANCE/APPLICATION
MRI is extremely accurate in the diagnosis of invasive placentation and it has a strong indication in high risk patients allowing to plan delivery with eventual interventional radiological assistance.

SS10-06 The Ringed Placenta on Fetal MRI: 11 Cases Linked with Fetal Ventral Body Wall Defects
Tuesday, Nov. 28 3:50PM - 4:00PM Room: E351

Awards
Student Travel Stipend Award

Participants
Jesus A. Ocana, PhD, Indianapolis, IN (Presenter) Nothing to Disclose
Brandon P. Brown, MD, MA, Indianapolis, IN (Abstract Co-Author) Nothing to Disclose

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PURPOSE
Fetal MRI is increasingly used in high-risk pregnancies not just for diagnosis and treatment planning, but also for prognostication of neonatal outcomes. Ventral Body Wall Defects (VBWD) of variable manifestation are well-recognized on fetal MR imaging and have been described in the literature. In more severe cases, outcomes can be highly variable, and counseling in these cases can be extremely challenging. We present here a pattern of abnormal placental MRI signal not previously described, which we found to correlate with extremely high mortality in patients born with VBWD. Specifically, we identified abnormal T1 hyperintense signal in the placenta in a multi-ringed pattern in several cases of fetal VBWD which correlated with extremely high mortality. We have termed this finding, the "ringed placenta."

METHOD AND MATERIALS
A local database of prenatal imaging studies was used to retrospectively review prenatal cases with MR imaging which demonstrated the characteristic appearance of ringed placenta in patients with VBWD. Electronic medical records were also used to follow up on the outcome of the patients identified as having these same areas of signal abnormality.

RESULTS
The "ringed placenta" appearance was identified in 11 fetal MRI studies, with the neonates later confirmed at birth to have VBWD. On pathology, these placentae were variably described as containing massive perivillous hemorrhage, intervillous thrombosis, villous edema, and diffuse chorionic villitis. Out of the 11 identified cases, only one neonate survived beyond 3 months of life.

CONCLUSION
This work presents cases of VBWD in the fetus, demonstrating the presence of T1 hyperintense ringed patterns in the placenta, which correlate with subsequent high perinatal mortality. Given the pathologic findings, this MRI appearance may be secondary to global placental ischemia with reperfusion hemorrhage. In evaluating VBWD patients, accurate prognostic information can be critical for appropriate parental counseling, and it may also affect the approach to perinatal management. Further studies will be necessary to better evaluate the prognostic accuracy of this MR imaging sign.

CLINICAL RELEVANCE/APPLICATION
This novel sign may enable improved planning and more accurate counseling for parents, many of whom face very high levels of uncertainty during the pre-natal management of complex fetal anomalies.
**SSJ11**

**Genitourinary (Imaging of Benign Gynecological Disease)**

*Tuesday, Nov. 28 3:00PM - 4:00PM Room: E353B*

**AMA PRA Category 1 Credit ™: 1.00**

**ARRT Category A+ Credit: 1.00**

### Participants

Hilton M. Leao Filho, MD, Sao Paulo, Brazil (*Moderator*) Nothing to Disclose  
Douglas S. Katz, MD, Mineola, NY (*Moderator*) Nothing to Disclose

### Sub-Events

**SSJ11-01  Structured vs Narrative Reporting of Pelvic MRI for Fibroids: Impact on Treatment Planning**

*Tuesday, Nov. 28 3:00PM - 3:10PM Room: E353B*

**Awards**

**Student Travel Stipend Award**

**Participants**

Andrea Francconeri, MD, Boston, MA (*Presenter*) Nothing to Disclose  
Laura Miller, MD, Bridgeport, CT (*Abstract Co-Author*) Nothing to Disclose  
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Jieming Fang, Boston, MA (*Abstract Co-Author*) Nothing to Disclose  
Hye-Chun Hur, Boston, MA (*Abstract Co-Author*) Nothing to Disclose  
Louise King, Boston, MA (*Abstract Co-Author*) Nothing to Disclose  
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Koenraad J. Mortele, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose  
Olga R. Brook, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

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**PURPOSE**

To evaluate the usefulness of MRI reporting of uterine fibroids using a structured disease-specific template vs narrative reporting for planning fibroid treatment by gynecologists and interventional radiologists.

**METHOD AND MATERIALS**

This is a HIPAA-compliant, IRB-approved study with informed consent waived given its retrospective nature. In April 2016, a structured reporting template for fibroid MRI examinations was developed in collaboration between gynecologists, interventional radiologists and diagnostic MRI radiologists. Study population included 29 consecutive women who underwent myomectomy for uterine fibroids and a pelvic MRI prior to implementation of structured reporting; and 42 consecutive women with MRI for uterine fibroids after implementation of structured reporting. Subjective evaluation by gynecologists and radiologists and objective evaluation for the presence of 19 key features were performed to assess the clarity and usefulness of the reports for treatment planning. Statistical analysis was performed using the Student t test, Fisher exact test and Wilcoxon signed-rank test.

**RESULTS**

More key features were absent from the narrative reports 7.3±2.5 (range 3-12) than from structured reports 1.2±1.5 (range 1-7), (p<0.0001). Compared to narrative reports, gynecologists and radiologists deemed structured reports both more helpful for surgical planning (gynecologists: 8.5±1.2 vs. 5.7±2.2, (p<0.0001); radiologists: 9.6±0.6 vs. 6.0±2.9, (p<0.0001)) and easier to understand (gynecologists: 8.9±1.1 vs. 5.8±1.9, (p<0.0001); radiologists: 9.4±1.3 vs. 6.3±1.8, (p<0.0001)).

**CONCLUSION**

Structured fibroid MRI reports miss less key features essential for treatment planning than narrative reports. Gynecologists and radiologists described structured reports to be more helpful for treatment planning and easier to understand.

**CLINICAL RELEVANCE/APPLICATION**

Structured reports for uterine fibroid MRI are more helpful, easier to understand and miss less key features essential for procedural planning than narrative reports.

**SSJ11-02  Efficacy of Vaginal and Rectal Distension Using Gel in MRI for Deep Pelvic Endometriosis**

*Tuesday, Nov. 28 3:10PM - 3:20PM Room: E353B*

**Participants**
The average age was 68 years ± 10 (SD). Of 110 lesions, 72 (65%) were simple cysts, 22 (20%) were complex cysts, 9 (8%) were

classified lesions as simple cystic, complex cystic, solid-cystic or solid. Lesion classifications and characteristics were compared
classified each lesion by presence/absence of complex features (e.g., solid component, mural nodules and septae) and then

readers, blinded to the images from the other modality and patients' clinical information. Readers
an associated CECT (reference standard) within 180 days (median: 7 days, 72% within 30 days). NCCT and CECT images were

We performed an IRB approved HIPAA compliant retrospective review of 101 patients with 110 ovarian lesions found on NCCT with

POSTER PRESENTATIONS:

SSJ11-03 Accuracy of Non-Contrast CT in Characterizing Simple Cysts in Late Post-Menopausal Patients: Do We Really Need to Perform an Ultrasound in All Cases?

Tuesday, Nov. 28 3:20PM - 3:30PM Room: E353B

Participants
Muhammad U. Aziz, MBBS, Seattle, WA (Presenter) Nothing to Disclose
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Cory Lewis, DO, North Oaks, MN (Abstract Co-Author) Nothing to Disclose
Daniel S. Hippe, MS, Seattle, WA (Abstract Co-Author) Research Grant, Koninklijke Philips NV; Research Grant, General Electric Company; Research Grant, Toshiba America Medical Systems
Ryan O'Malley, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose
Carolyn L. Wang, MD, Seattle, WA (Abstract Co-Author) Nothing to Disclose

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PURPOSE
Contrast enhanced CT (CECT) is accurate at characterizing simple appearing cysts with benign features relative to US. We sought to
determine the accuracy of non-contrast CT (NCCT) in characterizing adnexal lesions found in late postmenopausal (>55 years)
women and whether a probably benign adnexal cyst >1 cm on NCCT needs further US evaluation in all cases as is the case with
current ACR guidelines.

METHOD AND MATERIALS
We performed an IRB approved HIPAA compliant retrospective review of 101 patients with 110 ovarian lesions found on NCCT with

an associated CECT (reference standard) within 180 days (median: 7 days, 72% within 30 days). NCCT and CECT images were

reviewed by different readers, blinded to the images from the other modality and patients' clinical information. Readers
characterized each lesion by presence/absence of complex features (e.g., solid component, mural nodules and septae) and then
classified lesions as simple cystic, complex cystic, solid-cystic or solid. Lesion classifications and characteristics were compared
between modalities using Bhapkar's or the sign test. Cohen's kappa was used to assess agreement between modalities.

RESULTS
The average age was 68 years ± 10 (SD). Of 110 lesions, 72 (65%) were simple cysts, 22 (20%) were complex cysts, 9 (8%) were

...
solid-cystic and 7 (6%) were solid on CECT compared with 49 (45%), 39 (35%), 13 (12%), and 9 (8%) for the same categories, respectively, on NCCT. There was overall moderate agreement in lesion classification (kappa = 0.56), though more cysts were simple-appearing on CECT than NCCT (65% vs. 45%, p<0.001). This was primarily due to the increased number of perceived mural nodules (1% vs. 13%, p=0.01) and septae (12% vs. 37%, p<0.001) seen on NCCT compared with CECT. Of 49 simple cysts by NCCT, 48 were found to be simple cysts on CECT (PPV = 98.0%, 95% CI: 87.8-99.9%). Of 61 non simple cystic lesions by NCCT, 37 were also found to be non-simple cystic lesions on CECT (NPV = 60.7%, 95% CI: 48.3-73.0%).

CONCLUSION
Our study confirms the high accuracy of non-contrast CT in characterization of simple cysts seen in late postmenopausal women. On the other hand, non-simple cystic lesions were not as accurately characterized.

CLINICAL RELEVANCE/APPLICATION
Non-contrast CT accurately characterizes simple cysts; so if incidentally detected, these may not need further imaging characterization. Non-simple cysts may still need further imaging workup.

SSJ11-04 DTI and Tractography Correlated With Symptoms and Site of Pelvic Endometriosis

Participants
Valeria Vinci, MD, Rome, Italy (Presenter) Nothing to Disclose
Federica Capozza, Rome, Italy (Abstract Co-Author) Nothing to Disclose
Silvia Bernardo, MD, Rome, Italy (Abstract Co-Author) Nothing to Disclose
Maria Grazia Porpora, Rome, Italy (Abstract Co-Author) Nothing to Disclose
Corrado de vito, Rome, Italy (Abstract Co-Author) Nothing to Disclose
Lucia Manganaro, MD, Rome, Italy (Abstract Co-Author) Nothing to Disclose

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PURPOSE
The aim of the present study was to evaluate the sacral nerve roots aspects by the means of DTI tractography in women with endometriosis and to analyze the correlation between DTI abnormalities, the presence and intensity of different pain symptoms, and the endometriotic lesions found at surgery.

METHOD AND MATERIALS
In 2 years time, we enrolled 66 women affected by endometriosis and scheduled for surgery; they were asked for the presence of dysmenorrhea, deep dyspareunia and/or chronic pelvic pain (CPP), intensity of pain was recorded on a Visual Analog Scale (VAS) score. MRI was performed on 3T Magnet, DTI sequences was acquired and a 3D reconstruction of S1, S2 and S3 was achieved. FA was calculated for every root as described. Univariate analysis was performed collecting also data from the following laparoscopy.

RESULTS
DTI of sacral roots revealed a regular and homogeneous appearance in 17 (25.8%) patients, while 44 (66.7%) women showed abnormalities in microstructure reconstructions, consisting mainly of fiber irregularities and disorganization combined with the loss of the simple unidirectional course. In 5 (7.6%) women the reconstruction of the sacral roots was not possible. Pathological DTI was significantly associated with the severity of dysmenorrhea and CPP, but no association with dyspareunia (PV=0.398) or dyschezia (PV=0.738) was found. Furthermore, a higher duration of pain was significantly associated with a pathological DTI. Adhesions in Douglas Pouch resulted significantly associated with pathological DTI (PV=0.001), as well as DIE (PV=0.001) and tubo-ovarian adhesions.

CONCLUSION
Pathological DTI of the sacral nerves is associated to the presence of CPP, but also it is related to the type and the site of endometriosis being obliteration of the cul-de-sac, tubo-ovarian adhesions and DIE responsible of DTI abnormalities. This new noninvasive method may help both clinicians and surgeons to select a better and more personalized therapeutic approach or select those patients who might benefit from alternative treatments, such as presacral neuroectomy, anaesthetic nerve infiltration, neurostimulation or different types of pain killers that target neuropathic pain.

CLINICAL RELEVANCE/APPLICATION
DTI alterations may help to select an alternative therapeutic approach such as presacral neuroectomy, anaesthetic nerve infiltration, neurostimulation or different types of pain killers that target neuropathic pain.

SSJ11-05 Virtual Histerosapingography in Daily Practice in 14200 Cases

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

For information about this presentation, contact: patriciacarrascosa@diagnosticomaipu.com.ar

PURPOSE
To illustrate the typical findings of virtual histerosapingography (VHSG) by MDCT in daily practice and the differential diagnosis with...
To illustrate the typical findings of virtual hysterosalpingography (VHSG) by MDCT in daily practice and the differential diagnosis with other pathologies in patients studied between 2006 and 2014

METHOD AND MATERIALS

We evaluated the V-HSG studies of 14200 patients derived from our institution. Studies were performed using 64, 128 and 256 multislice CT scanners. Scanning parameters were: On 64-row CT: slice thickness of 0.9 mm 120 kV and 100-250 mAs, with an average duration of each scan of 3.5 seconds. On 128 and 256-slice CT: slice thickness of 0.6 mm and a reconstruction interval of 3 mm, 80 kV and 100-150 mAs, with an average duration of each scan of 1.3 seconds. A dilution of low-osmolality iodinated contrast (10-20 ml) was instilled into the uterine cavity. Images were analyzed using multiplanar reconstructions, 3D and virtual endoscopy. The duration of the CT scan, the radiation exposure and the degree of discomfort of the patients were documented.

RESULTS

The scan time was 3.5 and 1.3 seconds using 64-slice or 128-256-slice CT scanners respectively. The mean radiation dose was 0.9 and 0.3 mSv using 64-slice or 128-256-slice CT scanners respectively for each scan. In the cervical region were identified parietal irregularities (22%), thickening of folds (8%), polyps (7%), diverticula (5%), stenosis (5%) and sinchieas (1%). In the uterine cavity were visualized polyps (35%), submucosal myomas (7%) and adhesions (3%). In addition changes were observed in the wall of the uterus: myomas (15%), malformations (3.2%), adenomyosis (5%) and cesarean section (12%). Fallopian tubes showed hidrosalpinx in 8% cases; unilateral (3.4%) and bilateral (1.6%). Patients reported no or mild discomfort in 85% of the cases.

CONCLUSION

The VHSG allowed a proper assessment of the internal genital organs, providing useful diagnostic information on infertility and other gynecological disorders. The technique is painless, well tolerated by patients with low doses of radiation. These advantages place this modality as a valid alternative algorithm study in patients with infertility

CLINICAL RELEVANCE/APPLICATION

Virtual hysterosalpingography is an useful diagnostic tool to obtain information on infertility and other gynecological disorders.

SSJ11-06 Prospective Comparison of 3D FIESTA versus 2D SSFSE MRI in Evaluating Pelvic Floor Dysfunction Disease

Tuesday, Nov. 28 3:50PM - 4:00PM Room: E353B

Participants
Yanbang Lian, Zhengzhou, China (Presenter) Nothing to Disclose
Zhiyang Zhou, PhD, Guangzhou, China (Abstract Co-Author) Nothing to Disclose
Wuteng Cao, Guangzhou, China (Abstract Co-Author) Nothing to Disclose
Dechao Liu, Guangzhou, China (Abstract Co-Author) Nothing to Disclose
Zhicheng He, Guangzhou, China (Abstract Co-Author) Nothing to Disclose

PURPOSE

To compare fast imaging employing steady state acquisition (FIESTA) sequence with single shot fast spin echo (SSFSE) sequence in terms of acquisition time, image quality, artifacts, and lesion detection.

METHOD AND MATERIALS

Fifty-three patients (mean age, 49 years; range, 21-81 years) suspected pelvic floor dysfunction disease (PFDD) were enrolled in this study and underwent high resolution dynamic magnetic resonance defecography (MRD). The MR imaging protocol included static T2-weighted fast spin-echo sequence in three planes and a single sagittal dynamic sequence of FIESTA and SSFSE for rest, left and defecation phase. The acquisition time of dynamic sequence was calculated. The sagittal data sets of FIESTA were compared with SSFSE data sets with respect to image quality, artifacts, and lesion detection. Quantitative values of acquisition time and lesion detection and qualitative analyses of image quality and artifacts were analyzed by using a paired Student’s t test and the Kappa test, respectively.

RESULTS

Mean acquisition time of FIESTA sequence (80-slice/53 seconds) was significantly shorter than that of SSFSE sequence (40-slice/57 seconds) (p<0.05). More pelvic organ prolapse (39/53 VS. 22/53) and rectocele (21/53 VS. 11/53) were detected with FIESTA than SSFSE (p<0.05). There was no significant difference between FEISTA and SSFSE in image quality and artifacts (kappa=0.905, p>0.05). Readers preferred the FIESTA sequence for showing more details.

CONCLUSION

For time savings and the versatility of showing greater degree of lesions without compromise of image quality, the near real-time continuous imaging with FIESTA sequence should be included in MRD protocols to better evaluate pelvic floor dysfunction disease.

CLINICAL RELEVANCE/APPLICATION

We recommend that FIESTA sequence should be included in MRD protocols to better assess pelvic floor dysfunction disease.
SSJ26

Vascular Interventional (Gastrointestinal/Genitourinary)

Tuesday, Nov. 28 3:00PM - 4:00PM Room: S402AB

AMAPRA Category 1 Credit™: 1.00
ARRT Category A+ Credit: 1.00

FDA Discussions may include off-label uses.

Participants
James T. Bui, MD, Chicago, IL (Moderator) Nothing to Disclose
Nikunj R. Chauhan, MD, Cleveland, OH (Moderator) Nothing to Disclose

Sub-Events

SSJ26-01  Image Guided Cholecystostomy Tube Placement: Short and Long Term Outcomes of Transhepatic versus Transperitoneal Placement

Tuesday, Nov. 28 3:00PM - 3:10PM Room: S402AB

Participants
Michael D. Beland, MD, Providence, RI (Presenter) Research Grant, Toshiba Medical Systems Corporation
Lakir Patel, BSC, Providence, RI (Abstract Co-Author) Nothing to Disclose
Grayson L. Baird, PhD, Providence, RI (Abstract Co-Author) Nothing to Disclose
Sun Ho Ahn, MD, Providence, RI (Abstract Co-Author) Nothing to Disclose
David J. Grand, MD, Providence, RI (Abstract Co-Author) Nothing to Disclose

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PURPOSE
Image guided percutaneous cholecystostomy (PC) may be performed transhepatically (TH) or transperitoneally (TP). The TH approach is traditionally preferred and recommended when possible. We compared the short and long term outcomes of PC related to route of catheter placement.

METHOD AND MATERIALS
IRB approved, HIPAA compliant retrospective review of imaged guided PC was performed from 2004-2016. Search of the hospital RIS was performed using keywords including "percutaneous cholecystostomy" "gallbladder drain" and "cholecystostomy tube" and relevant procedural terminology (CPT) codes. All search results were manually reviewed to identify the cohort of 373 patients who underwent initial episode of PC placement. Radiology reports and images were reviewed to determine method and route of PC. Chart review was performed to determine clinical outcomes. Imaging studies following PC placement were reviewed when necessary to determine catheter course or complications. Differences were examined using a generalized linear model assuming a binary distribution and logit function with SAS/GLIMMIX.

RESULTS
Of the 373 patients, PC placement was performed using US in 229, US access with fluoroscopy in 129, CT in 14, fluoroscopy in 1. Trocar technique was used in 183 and seldinger in 190. 218 PC were placed TH and 153 were TP. The most common PC catheter sizes were 8 French (83), 8.5 French (151), 10 French (124), and 12 Fr (13). There was no significant difference observed between the TH and TP approach for bleeding (1.54% vs 0.91%, p=0.25), pain (2.16% vs 1.68%, p=0.85) or premature catheter dislodgement (3.15% vs. 2.61%, p=0.90). Odds of drain exchange were not different between TH (32%) and TP (24%), p=0.23. Odds of subsequent drain replacement were not different between TH (8%) and TP (10%), p=0.73. Median length of stay was 7 days for both TH and TP (p=0.96). Survival was not different (TH 1.8 years, TP 2.8 years; p=0.12).

CONCLUSION
Transperitoneal PC was not associated with increased incidence of bleeding, pain or premature catheter dislodgement. There was no significant difference between TP and TH placement for needing subsequent drain exchange, median hospital stay or survival.

CLINICAL RELEVANCE/APPLICATION
Placement of percutaneous cholecystostomy can be safely performed transhepatically or transperitoneally with similar short and long term outcomes. Choice of route should be based on the patient's anatomy.

SSJ26-02  Predictors of Clinical Outcomes of Self-Expandable Metal Stent Use to Palliate Malignant Esophageal Fistulas in 105 Patients

Tuesday, Nov. 28 3:10PM - 3:20PM Room: S402AB

Participants
Kun Yung Kim, MD, Jeonju-Si, Korea, Republic Of (Presenter) Nothing to Disclose
**PURPOSE**

to identify the predictors associated with clinical outcomes (initial and late clinical failure) and patient survival after self-expandable metal stent placement for malignant esophagorespiratory fistulas in 105 consecutive patients.

**METHOD AND MATERIALS**

All included patients were reviewed using logistic and Cox regression analysis.

**RESULTS**

Technical success was achieved in all patients. The initial clinical success rate was 78.1% (82/105; 95% confidence interval [CI], 69.3%-84.9%), and clinical success was maintained until the end of the follow-up in 47.6% (50/105; 95% CI, 38.3%-57.1%) of patients. The major complication rate was 26.7% (28/105; 95% CI, 19.1%-35.8%). A stricture length of 5-10 cm (odds ratio [OR] 0.335; 95% CI, 0.122-0.889) and stenting only in the airway (OR, 12.445; 95% CI, 1.086-284.863) were independent predictors of initial clinical failure, and stricture at the upper esophagus (OR, 3.722; 95% CI, 1.276-11.544) was an independent predictor of late clinical failure. The independent predictors of survival were fistulas opening to the pleura (hazard ratio [HR], 3.313; 95% CI, 1.142-9.605) and initial clinical failure (HR, 2.510; 95% CI, 1.490-4.228).

**CONCLUSION**

Self-expandable metal stent placement is safe and effective for treating malignant esophagorespiratory fistulas.

**CLINICAL RELEVANCE/APPLICATION**

A stricture length of 5-10 cm, stenting only in the airway, and the stricture at the upper esophagus are independent predictors of treatment failure, whereas a fistula opening to the pleura and initial clinical failures are independent predictors of shorter survival.

**Participants**

Min Tae Kim, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Zhe Wang, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jung-Hoon Park, PhD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Min Yung Kim, MD, Jeonju-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jiaywei Tsauo, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Ho-Young Song, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Young Je Lim, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

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**PURPOSE**

To assess the long-term outcomes of covered retrievable self-expandable metallic stent (REMS) placement for recurrent benign urethral stricture and to compare the outcomes of three types of covered REMS.

**METHOD AND MATERIALS**

November 1998 to December 2016, 114 REMSs were placed in 54 men. These included 26 polyurethane (PU)-covered REMSs in 13 patients (Group A), 47 internally polytetrafluoroethylene (PTFE)-covered REMSs in 21 patients (Group B), and 41 externally PTFE-covered REMSs in 20 patients (Group C). The outcomes were analyzed and compared between the groups.

**RESULTS**

Overall clinical success was achieved in 14 (24%) of the 54 patients at the 5-year follow-up (Group A, 12%; Group B, 19%; Group C, 40%). The overall complication rate was 60.5%, and complication rates were significantly different between the groups (p = 0.004). The median maintained patency period was 108 months. In multivariate analysis, stent indwelling time was the only significant factor associated with maintained patency.

**CONCLUSION**

The long-term outcome of covered REMSs has not achieved the desired success rate for the standard treatment of recurrent bulbar urethral stricture. However, externally PTFE-covered REMS showed a better long-term outcome than the other studied types.

**CLINICAL RELEVANCE/APPLICATION**

Externally PTFE-covered REMS has low complication rate and long stent patency. Externally PTFE-covered REMS showed no tissue ingrowth and low stent migration rate. Longer stent indwelling time contributes to a high clinical success rate. Long-term outcome of covered REMSs has not achieved the desired success rate.

**Participants**

Min Tae Kim, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose
Zhe Wang, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jung-Hoon Park, PhD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Min Yung Kim, MD, Jeonju-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Jiaywei Tsauo, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
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Young Je Lim, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose

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The long-term outcome of covered REMSs has not achieved the desired success rate for the standard treatment of recurrent bulbar urethral stricture. However, externally PTFE-covered REMS showed a better long-term outcome than the other studied types.

**CLINICAL RELEVANCE/APPLICATION**

Externally PTFE-covered REMS has low complication rate and long stent patency. Externally PTFE-covered REMS showed no tissue ingrowth and low stent migration rate. Longer stent indwelling time contributes to a high clinical success rate. Long-term outcome of covered REMSs has not achieved the desired success rate.
Formation in a Canine Urethral Model

Tuesday, Nov. 28 3:40PM - 3:50PM Room: S402AB

Participants
Jung-Hoon Park, PhD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Ho-Young Song, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Kun Yung Kim, MD, Jeonju-Si, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Min Tae Kim, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Zhe Wang, MD, Seoul, Korea, Republic Of (Abstract Co-Author) Nothing to Disclose
Young Je Lim, Seoul, Korea, Republic Of (Presenter) Nothing to Disclose

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PURPOSE
To evaluate an EW-7197-eluting nanofiber-covered stent (NFCS) for suppressing granulation tissue formation after stent placement in a canine urethral model.

METHOD AND MATERIALS
All experiments were approved by the committee of animal research. A total of 12 NFCSs were placed in the proximal and distal urethras of six dogs. Dogs were divided into two groups with 3 dogs each. The control stent (CS) group received NFCSs and the drug stent (DS) group received EW-7197 (1000 μg)-eluting NFCSs. All dogs were sacrificed 8 weeks after stent placement. Histologic findings of the stented urethra were compared using the Mann-Whitney U test.

RESULTS
Stent placement was technically successful in all dogs without procedure-related complications. On urethrographic analysis, the mean luminal diameter was significantly larger in the DS group than in the CS group at 4 and 8 weeks after stent placement (all p < 0.001). On histological examination, mean thicknesses of the papillary projection, thickness of submucosal fibrosis, number of epithelial layers, and degree of collagen deposition were significantly lower in the DS group than in the CS group (all p < 0.001), whereas the mean degree of inflammatory cell infiltration was not significantly different (p > 0.05). The in vitro release study demonstrated that approximately 80% of the drug was eluted from the stents within 1 day after which the elution rate slowed and reached a plateau after 10 days.

CONCLUSION
The EW-7197-eluting NFCS is effective and safe for suppressing granulation tissue formation after stent placement in a canine urethral model.

CLINICAL RELEVANCE/APPLICATION
The direct and local therapy with EW-7197 via a covered stent is effective and safe for suppressing granulation tissue formation after stent placement in a canine urethral model.

Outcomes of Percutaneous Cholecystostomy Tube Placement in 419 Patients: A Single Institute Experience

Tuesday, Nov. 28 3:50PM - 4:00PM Room: S402AB

Participants
Daniel J. Young, MD, Saint Louis, MO (Presenter) Nothing to Disclose
John P. Karageorgiou, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Naganathan B. Mani, MD, Chesterfield, MO (Abstract Co-Author) Nothing to Disclose
Seung Kwon Kim, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose

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PURPOSE
To determine proportion of patients who undergo definitive treatment of acute cholecystitis (AC), either surgical cholecystectomy or percutaneous cholecystolithotomy, following percutaneous cholecystostomy (PC).

METHOD AND MATERIALS
Retrospective study was performed with institutional review board approval, and the requirement to obtain informed consent was waived. 419 patients that underwent PC at our institution between July 2010 and September 2016 were included. Patients who underwent PC for indication other than AC were excluded from analysis. Primary outcome was definitive treatment of AC following PC, including cholecystectomy or percutaneous cholecystolithotomy. Secondary outcomes include removal of drainage catheter without further management or death with catheter in place.

RESULTS
During the study period, 377 of 419 patients underwent PC for treatment of AC (mean age, 64.5 years; range 18-100 years). Diagnosis of AC was made via sonography (51%), computed tomography (29%), or hepatobiliary scan (20%). Technical success rate of PC at our institution was 100% with few complications (major 2.4%, minor 1.6%). Following PC, 118 patients (31%) underwent definitive treatment with percutaneous cholecystolithotomy. Of these, 60 patients (51%) underwent definitive treatment with percutaneous cholecystolithotomy with removal of catheters. Seventy-four patients (20%) had their catheters removed upon resolution of cholecystitis without undergoing surgery or stone removal. Definitive treatment differed between calculous and acalculous cholecystitis groups with the former undergoing further intervention more frequently, while the acalculous group were more likely to have their drain removed without further treatment (p<0.001). Fifty patients (13%) died with catheters in place due to other comorbidities. Five patients (1%) still had their catheters in place at the end of the study period.
CONCLUSION

About half of patients with AC that had PC underwent subsequent treatment with surgery or percutaneous cholecystolithotomy. Percutaneous cholecystostomy remains a viable option for treatment of AC with low complication rate, and can be used as bridge to definitive therapy or as sole treatment for alleviation of symptoms associated with AC.

CLINICAL RELEVANCE/APPLICATION

PC can be used for early management of AC when plan for definitive treatment is unclear. The procedure is safe, has low complication rate, and prevents progression to sepsis in patients with AC.
Controversies in Intravenous Contrast Media 2017: Getting Your Questions Answered

Tuesday, Nov. 28 4:30PM - 6:00PM Room: S406B

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

 FDA Discussions may include off-label uses.

Participants
Richard H. Cohan, MD, Ann Arbor, MI (Coordinator) Nothing to Disclose
Richard H. Cohan, MD, Ann Arbor, MI (Moderator) Nothing to Disclose
Matthew S. Davenport, MD, Cincinnati, OH (Presenter) Royalties, Wolters Kluwer nv ;
Robert J. McDonald, MD, PhD, Rochester, MN (Presenter) Consultant, General Electric Company; Investigator, General Electric Company
Alexander Radbruch, MD, Heidelberg, Germany (Presenter) Consultant, Guerbet SA; Consultant, Bayer AG; Support, Guerbet SA; Support, Bayer AG; Advisory Board, Guerbet SA; Advisory Board, Bayer AG; Advisory Board, Bracco Group; Advisory Board, AbbVie Inc; Speaker, Guerbet SA; Speaker, Bayer AG; Speaker, Siemens AG; Speaker, prIME Oncology; Advisory Board, General Electric Company;
Jay K. Pahade, MD, New Haven, CT (Presenter) Consultant, Precision Imaging Metrics, LLC

For information about this presentation, contact:
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LEARNING OBJECTIVES

1) To review current management recommendations regarding contrast material administration, including a) what to do in patients who have had allergic-like reactions and who require reinjection, b) current thoughts concerning the risks of contrast induced nephrotoxicity, c) the most recent observations of long-term gadolinium retention in the body, and d) how to minimize the likelihood of errors in management of contrast reactions, particularly with respect to administration of epinephrine.

ABSTRACT

Premedication: Is it worthwhile? (Matthew Davenport - University of Michigan) Objectives: During this talk, the attendee will learn the common indications for premedication and premedication regimens; the degree to which premedication reduces the incidence of subsequent reactions, the likelihood of breakthrough reactions, and the costs of premedication. CIN: Does it exist? If not, why are we trying so hard to prevent it (Robert McDonald - Mayo Clinic) Objectives: During this talk, the literature calling into question the existence of CIN will be reviewed and the necessity of prophylaxis in patients who are more likely to develop acute kidney injury will be discussed. Gadolinium Deposition in the Brain: What does this mean and what should we do about it? (Alexander Radbruch - German Cancer Research Center, Heidelberg, Germany). Objectives: During this talk, the recent literature demonstrating gadolinium retention in the body, including the brain will be reviewed. The potential clinical implications of such retention will be discussed, along with a description of future research that needs to be performed in this area. Treating Contrast Reactions: How can we minimize errors? (Jay Pahade - Yale University) Objectives: During this talk, the indications for epinephrine administration, appropriate dose and route of epinephrine administration; common treatment errors that are made and common problems with current treatment training will be discussed. Possible solutions for reducing treatment errors will be discussed.
**RC410A  Ultrasound Evaluation of Renal Masses and Parenchymal Disease**

Participants
Michael D. Beland, MD, Providence, RI (Presenter) Research Grant, Toshiba Medical Systems Corporation

**LEARNING OBJECTIVES**

1) Recognize 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**

In this presentation, we will discuss the many applications of Doppler imaging for the evaluation of renal vessels. Evaluation for renal artery patency and stenosis will be discussed. We will also review the evaluation of renal artery stents. There will also be a brief discussion of renal masses, renal injuries including fistula and pseudoaneurysm and renal infarct.

**Participants**
Dirk-Andre Clevert, MD, Muenchen, Germany (Presenter) Speaker, Siemens AG; Speaker, Koninklijke Philips NV; Speaker, Bracco Group; Speaker, Samsung Electronics Co, Ltd;

**LEARNING OBJECTIVES**

1) Ultrasound visualization of renal lesions using B-mode sonography, contrast enhanced ultrasound and image fusion is explained. This includes the characterization of renal cysts. 2) The Bosniak classification is explained with the five different categories of characterization of renal cysts; a common finding are non-complicated solitary lesions Bosniak type I. 3) The main differential diagnoses are explained with an emphasis on the renal cell carcinoma.

**ABSTRACT**

Ultrasound is the most used interdisciplinary non-ionizing imaging technique in clinical routine. Therefore, ultrasound has a special value in the diagnosis and monitoring of cystic renal lesions, which can be classified as non-complicated or complicated and by means of occurrence as solitary or multifocal lesions. The Bosniak classification (I-IV) classifies renal cysts in 5 different categories with the help of ultrasound and computed tomography image criteria and is used for decisions of further clinical treatment. Additionally to normal native B-mode sonography, several new methods are in clinical use to improve diagnostic accuracy of unclear cases. Contrast enhanced ultrasound and MRU/CT are able to find and characterize difficult pathologies. In contrast to multislice-CT (MS-CT), ultrasound image fusion is a real-time imaging technique that can be used in combination with other cross-sectional imaging techniques. This course explains the most important pathologies of cystic lesions of the kidney and stresses the different imaging methods of native B-mode sonography and the new techniques of contrast enhanced ultrasound.
Participants
Tristan Barrett, MBBS, Cambridge, United Kingdom (Presenter) Nothing to Disclose
Stanley L. Liauw, MD, Chicago, IL (Presenter) Nothing to Disclose
Brian J. Davis, MD, PhD, Rochester, MN (Presenter) Stockholder, Pfizer Inc; Speaker, Augenix Inc

For information about this presentation, contact:
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LEARNING OBJECTIVES
1) To review contouring guidelines for the treatment of intact or post-operative prostate cancer with radiation therapy. 2) To address the radiological challenges of radiotherapy volume delineation and planning at MRI. 3) To highlight the important aspects of radiological anatomy applied to treatment planning and delivery.

ABSTRACT
This course intends to cover the radiological anatomy relevant to the prostate and address the challenges encountered for its application for treatment planning and delivery.

Active Handout: Tristan Barrett
Controversy Session: Imaging of the Pelvis: When is Ultrasound Enough?

Wednesday, Nov. 29 7:15AM - 8:15AM Room: E350

Gu US

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

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

LEARNING OBJECTIVES
1) Utilize ultrasound as the primary imaging modality for diagnosing of a variety of gynecologic abnormalities. 2) Understand which gynecologic findings on ultrasound are adequate to make a specific diagnosis and do not require further imaging. 3) Recognize which sonographic findings in the pelvis require further investigation with other imaging modalities and which do not.

Sub-Events

SPSC40A Imaging of the Pelvis: Ultrasound is Enough
Participants
Beryl R. Benacerraf, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

View learning objectives under main course title.

SPSC40B Imaging of the Pelvis: Ultrasound is Not Always Enough
Participants
Deborah Levine, MD, Boston, MA (Presenter) Editor with royalties, UpToDate, Inc; Editor with royalties, Reed Elsevier;

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dlevine@bidmc.harvard.edu

LEARNING OBJECTIVES
1) Illustrate adnexal masses where MR adds additional information that can alter decision to perform surgery. 2) Discuss how MR can be utilized in pre-procedure planning for women with fibroids. 3) Discuss use of MR in pregnancy when additional information is needed regarding complex uterine pathology.

ABSTRACT
Ultrasound is first line imaging for the female pelvis. However, there are instances where additional imaging is needed for further assessment. MRI can frequently add additional information that can alter patient care. Examples include: the indeterminate adnexal mass, where findings could alter the decision to perform surgery; precise delineation of size and location of fibroids when this information is needed prior to surgery or other intervention; and assessment of complex uterine pathology during pregnancy.
**Prostate MRI (Hands-on) Course**

**Will be repeated Monday, Tuesday, Wednesday and Thursday from 8am-10am**

**Wednesday, Nov. 29 8:00AM - 10:00AM Room: S401CD**

**AMA PRA Category 1 Credits ™**: 2.00

**ARRT Category A+ Credits**: 2.25

**Participants**

Jelle O. Barentsz, MD, PhD, Nijmegen, Netherlands *(Presenter)* Advisor, SPL Medical BV

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

Roel D. Mus, MD, Nijmegen, Netherlands *(Presenter)* Nothing to Disclose

Geert M. Villeirs, MD, PhD, Ghent, Belgium *(Presenter)* Nothing to Disclose

Marloes van der Leest, MD, Nijmegen, Netherlands *(Presenter)* Nothing to Disclose

Roel D. Mus, MD, Nijmegen, Netherlands *(Presenter)* Nothing to Disclose

Rianne Engels, Cuijk, Netherlands *(Presenter)* Nothing to Disclose

Leonardo K. Bittencourt, MD, PhD, Rio De Janeiro, Brazil *(Presenter)* Investor, Healfies LLC

Joseph J. Busch, MD, Chattanooga, TN *(Presenter)* Nothing to Disclose

Baris Turkbey, MD, Bethesda, MD *(Presenter)* Nothing to Disclose

Daniel J. Margolis, MD, Los Angeles, CA *(Presenter)* Nothing to Disclose

Antonio C. Westphalen, MD, Mill Valley, CA *(Presenter)* Scientific Advisory Board, 3DBiopsy LLC ; Research Grant, Verily Life Sciences LLC

Philippe A. Puech, MD, Lyon, France *(Presenter)* Nothing to Disclose

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**LEARNING OBJECTIVES**

1) Understand the Pi-RADS v2 Category assessment to detect and localize significant cancer for both peripheral zone and transitional zone lesions.

2) Recognize benign pathology like inflammation and BPH and to differentiate these from significant prostate cancers.

**ABSTRACT**

In this Hands-on Workshop, the participants will able to review up to 30 multi-parametric MRI cases with various prostatic pathology using a dedicated workstation. Focus will be on the overall assessment of PI-RADS v2 category, which enables them to score the probability of the presence of a significant cancer in patients with elevated PSA and/or clinical suspicion. All cases are from daily non-academic practice, and have various levels of difficulty. The cases include: easy and difficult significant peripheral-transition- and central zone cancers, inflammation, BPH, and the most common pitfalls. Internationally renowned teachers will guide the participants during their PI-RADS v2 scoring. **PLEASE NOTICE:** Based on last year’s experience we expect this course to be very popular. We only have 50 computers, and two spots per computer. Only the first 100 people will be accepted in the room. The front rows are reserved for beginners. In case you have experience with prostate MR: Please take a seat at the computers in the back of the room. We will not have space for any additional listeners this year. The coursebook can be found as handout to this course. Please take it with you to the course on your tablet or other device.

**Active Handout:** Renske Lian van Delft

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

Wednesday, Nov. 29 8:30AM - 10:00AM Room: N226

**Participants**
William W. Mayo-Smith, MD, Boston, MA (Coordinator) Author with royalties, Reed Elsevier;  
William W. Mayo-Smith, MD, Boston, MA (Moderator) Author with royalties, Reed Elsevier;  
Andrea G. Rockall, MRCP, FRCR, London, United Kingdom (Presenter) Nothing to Disclose  
Christine O. Menias, MD, Chicago, IL (Presenter) Nothing to Disclose

For information about this presentation, contact:  
menias.christine@mayo.edu

**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.

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

**Honored Educators**

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/  
Andrea G. Rockall, MRCP, FRCR - 2017 Honored Educator  
Christine O. Menias, MD - 2013 Honored Educator  
Christine O. Menias, MD - 2014 Honored Educator  
Christine O. Menias, MD - 2015 Honored Educator  
Christine O. Menias, MD - 2016 Honored Educator  
Christine O. Menias, MD - 2017 Honored Educator
LEARNING OBJECTIVES

1) Review findings of the 'First International Consensus Report on Adnexal Masses: Management Recommendations which is to be published in 2017. 2) Assess the potential of risk prediction models to improve practice patterns. 3) Improve knowledge of the malignant potential of various sonographic biomarkers. 4) Integrate these findings into daily practice with goal of reducing excess surgery for benign masses while improving triage to gynecology-oncology in women with suspicious adnexal masses. 5) Recognize the varied appearance of the uterus and endometrium throughout a woman's life. 6) Improve sonographic visualization of the endometrium utilizing some technical tips and tricks. 7) Recite a basic differential diagnosis for uterine/cervical masses and endometrial thickening. 8) Apply appropriate terminology when describing abnormal bleeding, location of myomas and mullerian duct anomalies. 9) Understand the controversies, cutoffs and considerations in the context of the role of US in postmenopausal bleeding. 10) Define clinical and epidemiological aspects of endometriosis. 11) Define the importance of imaging mapping for deeply infiltrative endometriosis before clinical counseling. 12) Apply the most appropriate technique to investigate endometriosis. 13) Define the bowel preparation required for the transvaginal ultrasound to investigate endometriosis. 14) Apply the imaging algorithm to map deeply infiltrative endometriosis. 15) Assess the ultrasonographic findings of deeply infiltrative endometriosis in the most common sites such as bladder, vesicouterine pouch, retrocervical space, vagina, ureters, appendix and rectosigmoid colon. 16) To discuss the multiplanar reconstruction technique in scanning the pelvis, including the usefulness of looking at the coronal view of the uterus to evaluate the endometrium and uterine shape. 17) To discuss the use of 3D ultrasound to look for causes of pelvic pain. 18) To discuss the use of 3D ultrasound when evaluating a potential hydrosalpinx.

SAM

New in 2017: PLEASE NOTE - All courses designated for SAM credit at RSNA 2017 will require attendees bring a personal device e.g. phone, iPad, laptop to complete the required test questions during the live session.

Sub-Events

RC510A Ovarian Cysts & Masses - Evidence Based Guidelines 2017

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

LEARNING OBJECTIVES

1) Review findings of the 'First International Consensus Report on Adnexal Masses: Management Recommendations which is to be published in 2017. 2) Assess the potential of risk prediction models to improve practice patterns. 3) Improve knowledge of the malignant potential of various sonographic biomarkers. 4) Integrate these findings into daily practice with goal of reducing excess surgery for benign masses while improving triage to gynecology-oncology in women with suspicious adnexal masses.

ABSTRACT

The goal of this session is to review strategies which may aid in the reduction of excess surgery for benign masses while improving triage to gynecology-oncology in women with suspicious adnexal masses. The recently published ‘First International Consensus Report on Adnexal Masses: Management Recommendations’ has focused on these two goals and we will review the analysis and recommendations from this report.

RC510B Uterus and Endometrium: A Primer with Pearls to Perfect Your US Performance

Participants
Loretta M. Strachowski, MD, San Francisco, CA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the varied appearance of the uterus and endometrium throughout a woman's life. 2) Improve sonographic visualization of the endometrium utilizing some technical tips and tricks. 3) Recite a basic differential diagnosis for uterine/cervical masses and endometrial thickening. 4) Apply appropriate terminology when describing abnormal bleeding, location of myomas and mullerian duct anomalies. 5) Understand the controversies, cutoffs and considerations in the context of the role of US in postmenopausal bleeding.

Active Handout:Loretta M. Strachowski

RC510C Ultrasound for Deeply Infiltrative Endometriosis

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

For information about this presentation, contact:
luciana@chamie.com.br
LEARNING OBJECTIVES

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

ABSTRACT

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

URL

http://chamie.com.br/download

RC510D 3D Ultrasound in Gynecology

Participants
Beryl R. Benacerraf, MD, Boston, MA (Presenter) Nothing to Disclose

LEARNING OBJECTIVES

1) To discuss the multiplanar reconstruction technique in scanning the pelvis, including the usefulness of looking at the coronal view of the uterus to evaluate the endometrium and uterine shape. 2) To discuss the use of 3D ultrasound to look for causes of pelvic pain. 3) To discuss the use of 3D ultrasound when evaluating a potential hydrosalpinx.

ABSTRACT

NA
Carotid and Abdominal Doppler (Hands-on)

Wednesday, Nov. 29 8:30AM - 10:00AM Room: E264

Participants
Gowthaman Gunabushanam, MD, New Haven, CT (Presenter) Nothing to Disclose
Shweta Bhatt, MD, MBBS, Rochester, NY (Presenter) Nothing to Disclose
Wui K. Chong, MD, Houston, TX (Presenter) Advisory Board, Bracco Group;
Corinne Deurdulian, MD, Los Angeles, CA (Presenter) Nothing to Disclose
Vikram S. Dogra, MD, Rochester, NY (Presenter) Editor, Wolters Kluwer nv;
Ulrike M. Hamper, MD, MBA, Baltimore, MD (Presenter) Nothing to Disclose
Dave Jones-Manns, Hampstead, MD (Presenter) Nothing to Disclose
Mark E. Lockhart, MD, Birmingham, AL (Presenter) Author, Oxford University Press; Author, JayPee Brothers Publishers; Deputy Editor, John Wiley & Sons, Inc
Margarita V. Revzin, MD, New Haven, CT (Presenter) Nothing to Disclose
Michelle L. Robbin, MD, Birmingham, AL (Presenter) Consultant, Koninklijke Philips NV;
Leslie M. Scoutt, MD, New Haven, CT (Presenter) Speaker, Koninklijke Philips NV
Ravinder Sidhu, MD, Rochester, NY (Presenter) Nothing to Disclose
Sadhna Verma, MD, Cincinnati, OH (Presenter) Nothing to Disclose
William D. Middleton, MD, St. Louis, MO (Presenter) Nothing to Disclose

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

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

Honored Educators
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LEARNING OBJECTIVES

1) Identify which imaging features (both ultrasound and MRI) are more specific for endometriosis and help to distinguish it from other adnexal masses. 2) Recognize and diagnose more unusual manifestations and complications of this disorder.

ABSTRACT

Endometriosis is an important gynecologic disorder primarily affecting women during their reproductive years. Pathologically, it is the result of functional endometrium located outside the uterus. It may vary from microscopic endometriotic implants to large cysts (endometriomas). The physical manifestations are protean, with some patients being asymptomatic and others having disabling pelvic pain, infertility, or adnexal masses. Ultrasonographic features are variable and can mimic those of other benign and malignant ovarian lesions. Low-level internal echoes and echogenic wall foci are more specific US features for endometriomas. MRI improves diagnostic accuracy, with endometriotic cysts typically appearing with high signal intensity on T1-weighted images and demonstrating "shading" on T2-weighted images. The ovaries are the most common sites affected, but endometriosis can also involve the gastrointestinal tract, urinary tract, chest, and soft tissues.

LEARNING OBJECTIVES

1) To become familiar with surgical and nonsurgical cystic renal lesions. 2) To know the typical imaging findings of the most frequent benign renal masses. 3) To know the typical imaging findings of renal cell carcinomas including subtype classification.

ABSTRACT

Focal renal masses are frequently detected incidentally on cross-sectional imaging. These lesions are cystic or solid. Cystic renal lesions are stratified according to the Bosniak classification. Bosniak I and II cysts are non-surgical lesions, Bosniak III and IV cysts are surgical lesions and Bosniak IIF need to be followed up. Solid lesions are often smaller than 4 cm in diameter (small renal masses=SMR) when incidentally detected and mainly correspond to renal cell carcinomas (RCCs). RCCs are divided in clear cell, chromophob and papillary with typical imaging features on CT and MRI. Clear cell RCC is the most frequent and most aggressive subtype and typically shows strong enhancement on CT or MRI, necrotic areas and a high ADC on DWI. Papillary RCCs are typically homogeneous, show little enhancement, have a low ADC on DWI and are hypointense on T2w MRI. The imaging features of chromophob RCCs are in between. The most frequent benign solid renal masses are angiomyolipomas (AML) and oncocytomas. AML contains fat, whereas lipid poor AMLs are hypointense on T2w and show strong enhancement. Oncocytomas are typically homogeneous solid lesions and show strong enhancement with a high ADC value, however its differentiation from clear cell RCC often remains a challenge.

LEARNING OBJECTIVES

1) To understand the evolving role of multiparametric MRI in the work-up of prostate cancer. 2) To appreciate the evolution in MRI protocols and their interpretation. 3) To recognise the advantages and limitations of each technique. 4) To understand the clinical relevance of MRI for treatment decision-making and management triage.

ABSTRACT

Multiparametric MRI of the prostate is changing the paradigm of prostate diagnostic pathways, leading to an exponential increase in...
demand form clinicians. Increasingly MRI is being performed in patients without a cancer diagnosis in order to subsequently guide prostatic biopsy. This has shifted the emphasis of radiological interpretation from one of basic staging to lesion detection and characterisation. In order to accurately assess the differential diagnosis there needs to be an appreciation of the sequences performed, their limitations in terms of sensitivity and specificity, and the expected normal anatomical appearances. Further knowledge of how MRI results affect clinical outcomes can enable the radiologist to optimise patient management as part of a multidisciplinary team.

Active Handout: Tristan Barrett


MSES42D  A Simple Guide to Adrenal Gland Imaging

Participants

Antonio C. Westphalen, MD, Mill Valley, CA (Presenter) Scientific Advisory Board, 3DBiopsy LLC; Research Grant, Verily Life Sciences LLC

For information about this presentation, contact:
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LEARNING OBJECTIVES

1) Understand the role of imaging for the characterization of an incidentaloma of the adrenal gland and for the assessment of symptomatic patients. 2) Be able to list the most prevalent causes of adrenal nodules and apply imaging to make a few specific diagnoses. 3) Be able to correctly recommend further evaluation with imaging or tissue sampling, as appropriate.

ABSTRACT

The increase in use of cross-sectional imaging in the last decade or two has led to a parallel growth in the detection of incidental adrenal lesions, or 'incidentalomas'. This has become a common diagnostic dilemma for radiologists, as these must at least be characterized as benign, malignant or indeterminate. While most incidental nodules are benign, usually an adenoma, the possibility of malignant involvement requires accurate imaging assessment to inform management decisions. In this presentation, I review a systematic approach to the evaluation of adrenal nodules with imaging, with emphasis on computed tomography and magnetic resonance imaging.

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MSSR42

RSNA/ESR Hybrid Imaging Symposium: Hybrid Imaging in the Female (An Interactive Session)

Wednesday, Nov. 29 10:30AM - 12:00PM Room: S402AB

Participants
Alexander Drzezga, MD, Cologne, Germany (Moderator) Consultant, Siemens AG; Consultant, Bayer AG; Consultant, General Electric Company; Consultant, Eli Lilly and Company; Consultant, The Piramal Group; Speakers Bureau, Siemens AG; Speakers Bureau, Bayer AG; Speakers Bureau, General Electric Company; Speakers Bureau, Eli Lilly and Company; Speakers Bureau, The Piramal Group
Katrine Riklund, MD, PhD, Umea, Sweden (Moderator) Nothing to Disclose

For information about this presentation, contact:
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Sub-Events

MSSR42A Pelvic Tumors

Participants
Farrokh Dehdashti, MD, Saint Louis, MO (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Learn about different tracers. 2) Understand how to interpret hybrid imaging examinations of the pelvis. 3) Learn about the role of hybrid imaging in staging, treatment evaluation and follow-up.

ABSTRACT
This presentation summarizes the literature in PET/CT and PET/MRI in the evaluation of the three most common gynecologic malignancies: cervical, endometrial and ovarian cancers. The advantages and challenges of each hybrid modality will be briefly discussed. In addition to clinically used 2-[18F]fluoro-2-deoxy-D-glucose (FDG), novel tracers that are currently used for research purposes in these malignancies will be briefly discussed.

MSSR42B Breast Cancer

Participants
Osman Ratib, MD, PhD, Geneva, Switzerland (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Learn about pathophysiology and relation to different tracers. 2) Understand how to interpret hybrid imaging examinations of the breast. 3) Learn about the role of hybrid imaging in staging, treatment evaluation and follow-up.

MSSR42C Interactive Case Discussion

Participants
Farrokh Dehdashti, MD, Saint Louis, MO (Presenter) Nothing to Disclose
Osman Ratib, MD, PhD, Geneva, Switzerland (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Understand how to interpret hybrid imaging in female pelvic tumours. 2) Understand how to interpret hybrid imaging in breast cancer. 3) Learn how to avoid common pitfalls.

ABSTRACT
Imaging is critical for staging, determining prognosis and treatment strategy, and in predicting prognosis in gynecological malignancies. In this case presentation session, common clinical applications of PET/CT and PET/MRI in the evaluation of the most common gynecologic malignancies will be presented. In addition, the advantages and disadvantages of each hybrid modality will be illustrated and discussed.
PURPOSE
The development and validation of multi-parametric MRI (mp-MRI) for prostate cancer (CaP) diagnosis relies on comparisons with histopathology (HP) and accurate spatial alignment is critical. In this study, we develop and evaluate a new system that combines patient-specific molds and ex vivo MRI of the resected prostate to align in vivo (InV) MRI, ex vivo (ExV) MRI, and whole-mount (WM) HP in CaP patients.

METHOD AND MATERIALS
Patients who underwent radical prostatectomy were studied. InV-MRI was obtained prior to surgery (mean = 77 days) at 3 T (Trio/Verio/Skyra/Prisma, Siemens) using an external array and an endorectal coil. The protocol included 3D T2w MRI, on which the prostate was contoured in 3D to print a patient-specific mold before surgery. Within 30 min after surgery, the fresh whole prostate specimen was placed in a patient-specific mold and underwent ExV-MRI at 3 T (Prisma, Siemens) using a knee coil. The protocol included high-resolution T2w MRI to evaluate spatial alignment with in vivo 3D T2w MRI and WM slides. Immediately afterwards, the prostate was sectioned in the mold along slits (4.5-mm steps) to create WM slides. InV-MRI was registered to ExV-MRI using a mutual information based rigid 3D algorithm. A non-rigid algorithm was used to register WM slides to ExV and InV MRI. A radiologist matched 2D slice locations and annotated corresponding non-cancerous landmarks on all three image sets. The WM to ExV-MRI slice offset error was recorded. In the matched slices, 2D target registration error (TRE) between the landmarks was calculated.

RESULTS
In all patients (N=10, mean 64.7 years, mean PSA 6.17 ng/ml), ExV-MRI was successfully completed (mean time 116 min). The mold and ExV-MRI had no adverse impact on WM HP. The mean slice offset error was 1.36 mm (<1.5-mm MRI slice thickness). Mean 2D TRE was (mean±SD): 1.9±1.1 mm for InV vs. ExV MRI, 1.6±0.9 mm for WM vs. ExV MRI, and 2.1±1.4 mm for WM vs. InV MRI.

CONCLUSION
We have successfully integrated the new system with our clinical workflow to achieve excellent spatial alignment among InV-MRI, ExV-MRI, and WM slides with 2D TRE of 1-2 mm. This can enable MRI-WM comparisons and integrated research in CaP.

CLINICAL RELEVANCE/APPLICATION
The new system achieves excellent spatial alignment among in vivo MRI, ex vivo MRI, and whole-mount histopathology for integrated research in prostate cancer.
Participants
Chen Lihua, Dalian, China (Presenter) Nothing to Disclose
Ailian Liu, MD, Dalian, China (Abstract Co-Author) Nothing to Disclose
Xin Guo, Shenyang, China (Abstract Co-Author) Nothing to Disclose
Dan Guo, Dalian, China (Abstract Co-Author) Nothing to Disclose

PURPOSE
To evaluate the usefulness of radiomics features indistingushing prostate cancer (PCa) from benign prostatic hyperplasia (BPH) based on diffusion-weighted imaging (DWI) sequence without subjective factors.

METHOD AND MATERIALS
This retrospective study was approved by local IRB, and written informed consent was waived. 200 patients were enrolled followed by surgery or biopsy within one month in this study (100 were PCa and 100 were BPH). High-throughput extraction and analysis of the radiomics features based on DWI included five procedures: 1) 2D region of interest (ROI) was sketched along the edge of the whole prostate at the slice with the maximum diameter of the lesion by a 3-year experienced radiologist. 2) 396 radiomics features, including size and shape-based features, histogram, GLCM as well as GLRLM texture features were automatically generated from A.K. (Analysis-Kinetics, GE Healthcare). 3) Feature reduction was conducted based on Kruskal-Wallis test and auto-correlation analysis with |r| > 0.9 using R. 4) 90 PCa and 90 BPH were randomly selected in 200 patients were used for supervise Model-learning using Logistic Regression. 5) 10 PCa and 10 BPH were used and compared with pathologic diagnosis and receiver operating characteristics (ROC) were used to assess the efficiency of model.

RESULTS
K-W test showed that 233 radiomic parameters had significant difference between PCa and BPH groups, auto-correlation analysis reduced them into 47 potential predictors which used for diagnostic model building. The area under the curve (AUC) of Logistic regression model in discriminating the two groups was 0.894, sensitivity and specificity were respectively 92.2% and 86.7%, with 85% diagnosis accuracy rate.

CONCLUSION
Radiomics features of DWI performed well indistingushing PCa from BPH, which could help objectively and quantitatively evaluate tumor heterogeneity, and have prospect of being an independent & non-invasive efficient diagnostic tool.

CLINICAL RELEVANCE/APPLICATION
Compared with traditional manual method, Radiomics features not only could lighten the visual fatigue for radiologist but also raise the precision of diagnosis.

SSK09-03 Diagnosing Prostate Cancer through Non-Invasive Estimation of Prostate Tissue Composition Using Hybrid Multidimensional MRI

Awards
Student Travel Stipend Award

Participants
Antrick Chatterjee, PhD, Chicago, IL (Presenter) Nothing to Disclose
Roger Bourne, PhD, Sydney, Australia (Abstract Co-Author) Nothing to Disclose
Shiyang Wang, PhD, Chicago, IL (Abstract Co-Author) Nothing to Disclose
Alexander Gallan, MD, Chicago, IL (Abstract Co-Author) Nothing to Disclose
Gregory S. Karczmar, PhD, Chicago, IL (Abstract Co-Author) Research Grant, Koninklijke Philips NV; Research Grant, Guerbet SA; Research Grant, Profound Medical Inc; Medical Advisory Board, Profound Medical Inc; Speaker, Bracco Group; Tatjana Antic, Chicago, IL (Abstract Co-Author) Nothing to Disclose

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antrick@uchicago.edu

PURPOSE
This study proposes to use Hybrid Multidimensional MRI (HM-MRI) to measures the change in ADC and T2 as a function of TE and b-value, respectively. This interdependence is used as a source of information about the underlying tissue microstructure. Specifically, we analyzed HM-MRI data to identify signal contribution from epithelial, stromal and luminal compartments in each image voxel. We evaluated whether this compartmental analysis can distinguish prostate cancer (PCa) from normal tissue.

METHOD AND MATERIALS
Patients (n=21) with confirmed PCa underwent preoperative 3T MRI. Axial images using HM-MRI were acquired with TE = 47, 75, 100 ms and b-values of 0, 750, 1500 s/mm², resulting in a 3×3 array of data associated with each voxel. Volumes of tissue components- stroma, epithelium and lumen were calculated by fitting the hybrid data to a three compartment signal model, with distinct ADC and T2 associated with each compartment. Volume fractions, and conventional ADC and T2 were measured for ROIs on sites of prostatectomy verified malignancy (n=28) and normal tissue (n=71). ROC analysis was used to evaluate the performance of various parameters in differentiating PCa from benign tissue.

RESULTS
HM-MRI data from PCa showed significantly increased fractional volumes of epithelium (48.8±49.2 vs 23.2±47.1%) and reduced lumen (14.0±5.2 vs 26.4±14.1%), stroma (37.2±9.1 vs 50.5±15.7%), ADC (0.86±0.18 vs 1.30±0.23μm²/ms) and T2 (76.3±22.9 vs...
Temporal Changes in MRI Appearance of the Prostate after Focal Ablation

Wednesday, Nov. 29 11:00AM - 11:10AM Room: E450B

Participants
Andreas M. Hoetker, MD, Mainz, Germany (Presenter) Nothing to Disclose
Andreas A. Meier, MD, New York, NY (Abstract Co-Author) Nothing to Disclose
Yousef Mazaheri, PhD, New York, NY (Abstract Co-Author) Nothing to Disclose
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Jonathan A. Coleman, MD, New York, NY (Abstract Co-Author) Speakers Bureau, Amgen Inc Speakers Bureau, Steba-Biotech NV
Hedvig Hricak, MD, PhD, New York, NY (Abstract Co-Author) Board of Directors, Ion Beam Applications, SA
Oguz Akin, MD, New York, NY (Abstract Co-Author) Nothing to Disclose

Purpose
The purpose of our study was to retrospectively evaluate and categorize temporal changes in MRI appearances of the prostate in patients who underwent focal therapy with MRI follow up.

Method and Materials
The Institutional Review Board approved this retrospective study and waived the requirement for informed consent. Forty-two patients (median age 61; 48-76 years) with low-to-intermediate-risk, clinically organ-confined prostate cancer underwent focal ablation therapy from 2009 through 2014. Two radiologists reviewed post-treatment MRIs (n=88) and categorized imaging features blinded to the time interval between the focal therapy and the follow-up MRI. Inter-reader agreement was assessed (kappa) and generalized linear regression was used to examine associations between imaging feature being present/absent and days between ablation and MRI.

Results
Inter-reader agreement on MRI features ranged from fair to substantial. The presence of edema on MRI was found at the shortest median time interval after ablation (15-22d; p<0.001), followed by rim enhancement of the ablation zone (18-23d), a hypointense rim around the ablation zone on T2-weighted images (49-54d) and the presence of an appreciable ablation cavity (49-55d; all p<0.05). The formation of a T2-hypointense scar (446-461d) and enhancement of the ablation zone/scar (216-610d) were found to be present on later MRI scans for one reader.

Conclusion
The MRI appearance of the prostate after focal ablation changes substantially over time. Identification of temporal patterns in the appearance of imaging features should help radiologists distinguish normal MRI findings from possible recurrence and reduce image interpretation variability and errors when assessing post-therapeutic scans.
Multiplexed Sensitivity-Encoding (MUSE) is a new reconstruction algorithm for multi-shot diffusion weighted image (msDWI) without using navigator echo to correct motion-induced phase error. The purpose of this study was to prospectively evaluate the image quality and apparent diffusion coefficient (ADC) of high-spatial resolution msDWI reconstructed with MUSE in patients suspected with prostate cancer.

Fifteen consecutive patients clinically suspected with prostate cancer (median 72 years old, range 55 - 80) underwent 3-T MR imaging using T2 weighted image, single-shot DWI (ssDWI; matrix, 96 x 96) and MUSE-reconstructed msDWI (matrix, 192 x 192) acquired with 4-shot interleaved echo-planar imaging. Both DWI were acquired with FOV of 22 cm, thickness of 4 mm, and b-value of 50 and 800 mm2/s. ADC maps were constructed for both DWI. Two radiologists blindly and independently assessed the image quality of DWI (b = 50, 800) and ADC map by comparing ssDWI and msDWI on image noise, anatomic delineation, distortion, artifact, and overall image quality with a 5-point scale. ADC values were measured in transitional and peripheral zone (TZ and PZ). Wilcoxon rank-sum test, kappa coefficient and paired t test was used to compare the score, inter-observer concordances and ADC value.

The scores of anatomic delineation of msDWI (b = 50, 800) and msADC map were significantly better than a single-shot image, and the scores of image noise were significantly worse for multi-shot image by 2 radiologists (p < .05, respectively). The score of overall image quality of msDWI (b = 50) was significantly better than ssDWI by 2 radiologists (p = .001, for both), but there were no significant differences for DWI (b = 800) and ADC map. Distortion and artifact were not significantly different between msDWI and ssDWI. The inter-observer concordances were poor to good (k = .074 - .770). ADC values of msDWI and ssDWI were not significantly different for TZ and PZ (p = 0.47 and 0.70).

The msDWI reconstructed with MUSE and its ADC map significantly improved anatomical delineation of the prostate, although the technique increased image noise. ADC values were not significantly different between ssDWI and msDWI.

Evaluation of the prostate can be improved with high-spatial resolution msDWI reconstructed with MUSE, which is a promising technique for the detection and diagnosis of prostate cancer.

To apply radiomics and machine learning (ML) to PI-RADS version 2 lesions and assess whether radiomics alone or the addition of radiomics improves predictive performance.

In 194 consecutive patients examined on a 3T MRI system 253 PI-RADSv2 lesions were identified and manually segmented on ADC/b-value of 1500 s/mm2 and T2-weighted images (segP). Patient were subsequently undergoing MRI-TRUS fusion biopsy with median 23 systematic cores and 4 targeted cores per lesion. In addition, on the basis of the biopsy results, retrospective PI-RADS assessment (PIRADSv2R) and manual lesions segmentation of the MR index lesion was performed manually by an experienced radiologist (segR). A total of 1073 quantitative radiomics features [including first-order, volume shape features, and texture features] were automatically extracted. The prediction of clinically significant Cancer (csPC) (GS 3+4 and 4+3 or higher) by radiomics improves predictive performance.

A cut-off >=3 for PI-RADSv2 was used. Radiomics Models were evaluated at the PI-RADSv2 sensitivity, which was 96-97% in all cases. On a per-lesion basis PI-RADSv2 achieved a specificity of 20% compared to 39% for the best ML model (RF trained using segR at PI-RADSv2 cut-off of 4 including normalization, for GS4+3 prediction), which would have saved 42.3 biopsies. On a per-patient basis the model increased specificity from 23% to 37% which would have saved 23 patients a biopsy. Excluding the transitional zone, specificity increased from 41% to 52% for lesions, saving 11.2 biopsies and from 48% to 59% for patients saving
CONCLUSION
Radiomics and ML improve predictive performance compared to PI-RADS version 2 when applied to clinically selected lesions. The potential of radiomics to support clinical decision making is shown. Our results motivate the evaluation of this approach in larger and prospective cohorts.

CLINICAL RELEVANCE/APPLICATION
The potential application of the addition of radiomics to the clinical evaluation of PI-RADS lesions should be evaluated in a prospective setting.

SSK09-07 Towards Improved Gleason Score Prediction Using 18F-FACBC (Fluciclovine) PET and MRI: Evaluation of Advanced Post-Processing Methods Using Machine Learning

Wednesday, Nov. 29 11:30AM - 11:40AM Room: E450B

Awards
Trainee Research Prize - Resident

Participants
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PURPOSE
To evaluate the potential of advanced post-processing methods for 18F-FACBC (Fluciclovine) PET and MRI in the characterization of prostate cancer.

METHOD AND MATERIALS
Twenty one patients with histologically confirmed prostate cancer (PCa) scheduled for robotic-assisted prostatectomy underwent PET/CT immediately after injection of 369 ±10 MBq 18F-FACBC followed by PET/MRI (ClinicalTrials.gov Identifier: NCT02002455). MRI of PET/MRI consisted of T2-weighted imaging (T2w), two separate diffusion weighted imaging (DWI) acquisitions, second order rotating frame (RAFF) imaging, and T2 mapping. A separate 3T mpMRI consisting of T2w, three DWI acquisitions, proton magnetic resonance spectroscopy (1H-MRS) and dynamic contrast enhanced (DCE) imaging was acquired within a week of the PET scans. DWI was post-processed using kurtosis (ADCk, K), mono- (ADCm), and biexponential functions (f, Dp, Df) while Logan plots were used to calculate volume of distribution (VT). Logistic Regression with I2 normalization and leave-pair out cross validation (LPOCV) based area under the curve (AUC) values were used to estimate the potential of the quantitative parameters and their combination to predict Gleason score group (3+3 vs >3+3). Recursive feature elimination technique in the cross-validation loop was applied to exclude the bias of the model performance. In total, 16 unique PET (VT, SUV) and MRI derived quantitative parameters were evaluated. Whole mount prostatectomy sections were used as "ground true".

RESULTS
The RAFF, monoexponential and kurtosis derived parameters had LPOCV AUC in the range of 0.72 to 0.82 while the corresponding value for VT was 0.85. T2 mapping, 1H-MRS ((choline+creatine)/citrate)) and DCE-MRI (Ktrans, Ve) derived parameters had the lowest LPOCV AUC in the range of 0.33 to 0.60. Most frequently selected parameters in each round of the cross-validation were VT, ADCk (0-2000 s/mm², 12 b values), ADCm (0-500 s/mm², 5 values), and K (0-2000 s/mm², 12 b values) which demonstrated LPOCV AUC of 0.91.

CONCLUSION
Quantitative models using DWI and RAFF derived parameters led to improved PCa characterization. The added value of 18F-FACBC PET appears to be limited.

CLINICAL RELEVANCE/APPLICATION
18F-FACBC (Fluciclovine) PET has a power to predict Gleason score but adds little value to DWI and RAFF derived parameters.

SSK09-08 Computer-Aided Diagnosis for Prostate Cancer Detection in Multiparametric MRI: Influence on Reader Performance

Wednesday, Nov. 29 11:40AM - 11:50AM Room: E450B

Participants
Ge Gao, MD, Beijing, China (Presenter) Nothing to Disclose
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PURPOSE
To determine the interaction between computer-aided diagnosis (CAD) and readers with varying levels of experience in the interpretation of multiparametric prostate MR imaging with PIRADS v2.
SUS09-09 Detection of MRI "Index Lesion" with mpMRI-TRUS Fusion-Targeted Prostate Biopsy: Does it Correspond to Histopathology?

Wednesday, Nov. 29 11:50AM - 12:00PM Room: E450B

METHOD AND MATERIALS

The institutional review board waived the need for informed consent. 64 patients (PCa=35; nonPCa=29) who were suspected of PCa and underwent mpMRI with subsequent biopsy or prostatectomy within 3 months were involved in this retrospective study. 6 readers were divided into 3 groups according to their experience in prostate imaging. Unknown the pathologic diagnosis, readers were asked to detect up to 3 lesions and graded 1-5 score according to PI-RADS v2 separately first without CAD and subsequently with CAD. Interreader agreement was assessed. According to histologic-radiologic correlation, the effect of CAD was evaluated by using ROC curve and Z test on patients and lesions basis. Wilcoxon signed ranks test were used to compare the diagnostic time and confidence with and without CAD. Furthermore, the requirement for CAD was also evaluated.

RESULTS

The AUC of stand-alone CAD was 0.918±0.036, and the spearman correlation coefficient between predictive values and PI-RADS scores was 0.706(P<0.01). Based on lesions, the AUCs of 6 readers were improved from 0.697-0.868 to 0.778-0.921 and the improvements were better than patient basis analysis. While the difference wasn't significant(P>0.05). Among 3 groups, the difference of AUCs between less experienced and more experienced readers was significant without CAD, while with CAD, the difference was not significant. Besides, the interreader agreement and diagnostic confidence was improved significantly with CAD assisted. The rates of requirement for CAD were rising with reader's experience reduce. The average interpretation time of each case required an additional 0.8 minutes.

CONCLUSION

Integrating CAD into PCa mpMRI diagnostic process as a second reader, the performance of less experienced readers could be improved and similar with experienced readers. Additionally, with the reducing of experience, the requirement for CAD was rising.

CLINICAL RELEVANCE/APPLICATION

The CAD assisted can significantly improve the performance of less experienced readers in prostate mpMRI interpretation, and much better in lesion detection and evaluation than it in patient, which indicate that CAD could be a promising method for detecting a target lesions for prostate biopsy.
SSK10
Science Session with Keynote: Genitourinary (DECT)

Wednesday, Nov. 29 10:30AM - 12:00PM Room: N228

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

FDA Discussions may include off-label uses.

Participants
Benjamin M. Yeh, MD, San Francisco, CA (Moderator) Research Grant, General Electric Company; Author with royalties, Oxford University Press; Shareholder, Nextrast, Inc; Research Grant, Koninklijk Philips NV;
Daniele Marin, MD, Durham, NC (Moderator) Research support, Siemens AG

SUB-EVENTS

SSK10-01 Genitourinary Keynote Speaker: Vivid Material Separation at Multi-energy CT

Participants
Benjamin M. Yeh, MD, San Francisco, CA (Presenter) Research Grant, General Electric Company; Author with royalties, Oxford University Press; Shareholder, Nextrast, Inc; Research Grant, Koninklijk Philips NV;

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SSK10-02 A Probabilistic Approach to the Assessment of Renal Stone Mineral Composition Using Dual-Energy CT

Participants
Andrea Ferrero, PhD, Rochester, MN (Presenter) Nothing to Disclose
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PURPOSE

In dual-energy CT (DECT) a threshold in the ratio between the average CT number within the stone from a low kV and a high kV image is generally used to differentiate stone types. This approach has demonstrated near 100% accuracy in separating uric acid (UA) from non-uric acid (NUA) stones, however it has failed to yield acceptable performance in separating NUA subtypes, such as calcium oxalate and apatite stones. In this study, we investigated a probabilistic approach that replaced discrete classification of stone mineral composition with a likelihood estimation.

METHOD AND MATERIALS

Patients with a DECT scan of the abdomen followed by an ex vivo analysis of the removed stone were retrospectively evaluated with IRB approval. Of these, only the cases with pure stones (i.e. >90% purity) were included in the study. Each stone was segmented using automated in-house software, and histograms of the distribution of CT number ratios for each stone were generated. Each histogram was compared to simulated histograms for 5 mineral compositions: uric acid (UA), cystine (CYS), struvite (STR), calcium oxalate / brushite (COM/COD/BRU) and apatite (APA). The likelihood of each mineral composition was computed as the overlap of the area between each histogram. The most likely mineral composition was compared to the conventional, threshold based approach currently used in clinical practice. Accuracy for the two methods was computed as the percentage of patient cases whose stone was correctly classified, using the ex vivo composition analysis as reference.

RESULTS

228 patients were retrospectively identified. 112 patients that had a pure stone (as determined ex vivo through infrared spectroscopy) of at least 10 mm3 were included in the study. The threshold-based method correctly classified 70% of the stones, whereas the probabilistic method correctly classified 73% - 88% if the two most likely compositions were considered. Of note is that the average confidence for the correct cases was 65%, whereas it was below 50% for the incorrect cases.

CONCLUSION

A probabilistic approach that provides an estimation of composition likelihood has been shown to more accurately characterize renal stones compared to threshold-based methods.

CLINICAL RELEVANCE/APPLICATION

The proposed method would increase clinician confidence in the in vivo determination of urinary stone composition using DECT,
**SSK10-03** Characterization of Small (<4 cm) Focal Renal Lesions: Diagnostic Accuracy of Spectral Analysis using Single-Phase Contrast-enhanced Dual-energy CT  
**Wednesday, Nov. 29 10:50AM - 11:00AM Room: N228**  
Participants  
Bhavik N. Patel, MD, MBA, Stanford, CA (Presenter) Consultant, General Electric Company; Research support, General Electric Company  
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Daniele Marin, MD, Durham, NC (Abstract Co-Author) Research support, Siemens AG  

**PURPOSE**  
To determine whether single-phase contrast-enhanced dual-energy quantitative spectral analysis improves the accuracy of diagnosis for small (< 4.0 cm) renal lesions, compared to conventional single-energy attenuation measurements.  

**CONCLUSION**  
Single-phase contrast-enhanced dual-energy quantitative spectral analysis significantly improves the specificity for characterization of small (< 4.0 cm) renal lesions, compared to conventional single-energy attenuation measurements.  

**CLINICAL RELEVANCE/APPLICATION**  
Single-phase contrast enhanced dual energy quantitative spectral analysis can reliably characterize small renal lesions thereby reducing the need for additional subsequent dedicated renal lesion evaluation protocol imaging.

**SSK10-04** Analysis of Dual Energy Spectral CT and Pathological Grading of Clear Cell Renal Cell Carcinoma  
**Wednesday, Nov. 29 11:00AM - 11:10AM Room: N228**  
Participants  
Jinyan Wei, Lanzhou, China (Presenter) Nothing to Disclose  
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**PURPOSE**  
To discuss the dual energy spectral CT imaging features of the pathological grading of clear cell renal cell carcinoma (ccRCC) and the correlation between spectral CT imaging features and pathology.  

**METHOD AND MATERIALS**  
We performed retrospective analyses of 62 patients with confirmed diagnosis of ccRCC. All patients underwent non-enhanced CT and dual-phase(cortex phase, CP and parenchyma phase, PP) contrast-enhanced CT with dual energy spectral mode. The subjects were pathologically divided into two groups: low-grade group (Fuhrman 1/2) and high-grade group (Fuhrman 3/4). The CT value of each lesion was measured on the monochromatic image of 70keV; the normalized iodine concentrations (NIC) and the slope of spectrum curve were calculated. The qualitative morphological parameters, including tumor shape, calcification, pseudocapsule, necrosis, and enhancement mode were compared between the two groups.  

**RESULTS**  
The CT value, NIC, and the mean slope of the low-grade group were higher than that of the high-grade group during CP (P=0.001, P=0.043, P=0.001, respectively); however, the NIC and mean slope varied considerably in the low grade than the high-grade group (P=0.048, P=0.017, respectively). The CT threshold value, NIC, and slope had high sensitivity and specificity in differentiating well-differentiated ccRCC from the poorly differentiated. The tumor shape, pseudocapsule, and necrosis differed significantly between the two groups (P<0.01).  

**CONCLUSION**  
Dual energy spectral CT with the quantitative analysis of iodine concentration and qualitative analysis of morphological characteristics increase the accuracy of diagnosing pathological grading of ccRCC.  

**CLINICAL RELEVANCE/APPLICATION**  
Clinically relevant/application Dual energy spectral CT with the analysis of iodine concentration and the correlation between spectral CT imaging features and pathology may help increase the accuracy in differentiating the pathological grading of ccRCC.

**SSK10-05** Impact of Noise-Optimized Virtual Monoenergetic Dual-Energy Computed Tomography on Image Quality in Patients With Renal Cell Carcinoma  
**Wednesday, Nov. 29 11:10AM - 11:20AM Room: N228**  

**Awards**  
Student Travel Stipend Award  

Participants  
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PURPOSE
To perform a quantitative and qualitative image analysis of noise-optimized virtual monoenergetic images (VMI+) in patients with renal cell carcinoma (RCC) undergoing dual-energy computed tomography (DECT).

METHOD AND MATERIALS
Fifty-two patients (33 men; 61.5±13.6 years) with RCC underwent contrast-enhanced DECT during the corticomedullary and nephrogenic phase of renal enhancement. DECT datasets were reconstructed with standard linearly-blended (M_0.6) as well as traditional virtual monoenergetic (VMI) and VMI+ algorithms in 10-keV increments from 40 to 100 keV. Contrast-to-noise (CNR) and tumor-to-cortex ratios for corticomedullary- and nephrogenic-phase images were objectively measured. Subjective image quality and RCC delineation were evaluated by three radiologists.

RESULTS
Greatest CNR values were found for 40-keV VMI+ series in both corticomedullary- (8.9±4.9) and nephrogenic-phase (7.1±4.6) images and were significantly higher compared to all other reconstructions (P<0.001). Furthermore, tumor-to-cortex ratios were highest for 40-keV nephrogenic-phase VMI+ (2.1±3.5; P<=0.016), followed by 50-keV and 60-keV VMI+ (2.0±3.2 and 1.8±2.8, respectively). Qualitative image quality scored highest for 50-keV VMI+ series in corticomedullary-phase reconstructions and 60-keV in nephrogenic-phase reconstructions (P<=0.031). Highest scores for lesion delineation were assigned for 40-keV VMI+ reconstructions (P<=0.074).

CONCLUSION
Low-keV VMI+ reconstructions lead to improved image quality and lesion delineation of corticomedullary- and nephrogenic-phase DECT datasets in patients with RCC.

CLINICAL RELEVANCE/APPLICATION
In summary, our results demonstrate that the noise-optimized VMI+ algorithm substantially improves subjective and objective image quality of abdominal DECT examinations in patients with RCC compared to traditional VMI and standard linearly-blended images. Furthermore, low-keV VMI+ reconstructions have the potential to improve delineation of RCC lesions.
and confidence for the presence of lesion, regardless of the radiologists’ experience.

SSK10-07  The Application Value of Spectral CT Imaging in Distinguishing Renal Cell Carcinoma and Renal Angiomyolipomas

Wednesday, Nov. 29 11:30AM - 11:40AM Room: N228

Participants
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PURPOSE
To assess the value of dual-energy spectral CT imaging in differentiating renal cell carcinoma (RCC) from Renal Angiomyolipomas (RAML).

METHOD AND MATERIALS
53 patients with suspected renal tumors who underwent plain and contrast-enhanced CT in cortical phase and medulla phase with dual-energy Spectral imaging mode were retrospectively analyzed. There were 31 cases of RCC and 22 cases of RAML. Images were analyzed on an AW4.6 workstation with GSI Viewer software to measure the effective-Z and fat concentration for lesions with the plain scan, CT values in 70keV images and iodine concentration (IC) in the cortical and medulla phases for lesions. The iodine concentration was normalized to that of the aorta to obtain normalized iodine concentration (NIC), and the difference of NIC between medulla and cortical phases was calculated. The above quantitative parameters from lesions were compared using independent sample t test, and ROC analysis was used to evaluate their diagnosis efficiency in differentiating RCC from RAML.

RESULTS
The Effective-Z, fat concentration, NIC in cortical phase, medulla phase, NIC difference, CT value in cortical phase and medulla phase for RCC were 7.60±0.13, -143.03±32.75g/L, 0.64±0.13, 0.49±0.15, 0.14±0.18, 116.53±14.29HU, 94.8±12.34HU, respectively; while the corresponding values for RAML were 7.74±0.11, -103.24±9.84 g/L, 0.50±0.88, 0.58±0.12, -0.08±0.13, 96.47±18.46HU, 105.58±14.14HU, respectively. The differences for these parameters between the two lesion types were statistically significant (all p<0.05). Using the threshold value of -112.8g/L for the fat concentration in ROC analysis, one would obtain a sensitivity of 90.9% and specificity of 77.4% for differentiating RCC from RAML and the area under the curve was 0.89.

CONCLUSION
The parameters obtained in dual-energy spectral CT scans demonstrated appreciable clinical values for differentiating RCC from RAML, with the fat concentration providing the highest diagnostic performance.

CLINICAL RELEVANCE/APPLICATION
Dual-energy spectral CT is a promising method in differentiate RCC from RAML.

Awards
Student Travel Stipend Award

SSK10-08  Does Dual Energy CT Have the Ability to Differentiate Benign vs Malignant Ovarian Tumors?

Wednesday, Nov. 29 11:40AM - 11:50AM Room: N228

Awards
Student Travel Stipend Award

Participants
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PURPOSE
To assess the ability of dual energy CT (DECT) to distinguish benign from malignant ovarian tumors (OT).

METHOD AND MATERIALS
Following approval of the institutional-review-board, institutional database was mined for treatment naïve patients who underwent primary cytoreduction for OT. 35 patients were included in the study. 17 patients had high grade, 8 had low grade, and 10 had benign tumors. Age, gender pathological diagnosis following surgical resection and tumor grade was documented. Advanced processing using the Advantedge Work (AW) station was performed on the preoperative dual energy CT scan. ROIs were drawn on the ovarian mass on the AW. Pixel level data of the tumor was recorded for different energy levels 50 keV, 70 keV and 120 keV. The effective-Z (atomic number) amount of water and iodine present in the ovarian mass was recorded. Kruskal-Wallis test was used to compare the differences between three types of OT. All tests were two-sided and p < 0.05 were considered statistically significant.

RESULTS
Patients with high grade OTs were older than those with the low grade and the benign OTs (p = 0.02). High grade OT had higher
Hounsfield values than low grade and benign OT at 50 keV ($p = 0.001$), 70 keV ($p = 0.0006$), 120 keV ($p = 0.0009$), and higher amount of water g/cm$^3$ ($p < 0.005$). Benign OT had significantly lower atomic number ($p = 0.002$) and amount of iodine g/cm$^3$ ($p = 0.002$) compared to malignant OT.

**CONCLUSION**

Dual energy CT has the potential to distinguish between high grade, low grade and benign ovarian tumors. Given the small sample size, future trials may be helpful in confirming our findings.

**CLINICAL RELEVANCE/APPLICATION**

DECT has the potential to differentiate between benign and malignant tumors and may be helpful in avoiding unnecessary surgery.

**Honored Educators**

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Priya R. Bhosale, MD - 2012 Honored Educator

**SSK10-09 Dual Layer Spectral CT: Non-Inferiority Assessment Compared To Dual Source Dual Energy CT in Discriminating Uric Acid from Non-Uric Acid Stones in a Phantom Model**

**Wednesday, Nov. 29 11:50AM - 12:00PM Room: N228**

**Participants**

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**PURPOSE**

To assess non-inferiority of novel dual layer spectral detector CT (SDCT) technology in comparison to dual source dual energy CT (dsDECT) in discriminating between uric acid (UA) and non-UA stones.

**METHOD AND MATERIALS**

In this phantom study, 57 surgically extracted urinary calculi were placed in individual tubes within a cylindrical phantom in a water bath. CT images were obtained at 1 mm slice thickness and 0.5 mm intervals on a prototype SDCT scanner (IQon, Philips Healthcare), and second and third generation dsDECT scanners (Somatom Flash and Force, Siemens Healthcare) under matched scan parameters. For SDCT data, effective Z images and virtual monoenergetic images (40, 62, 92, 100, and 200 keV) were created. For SDCT data, 3D growing region segmentation tool using custom pyOsirix software was used to segment each stone on the various reconstructions for pixel by pixel analysis. Median virtual monoenergetic ratios (VMR) of 40/200, 62/92, and 62/100 were recorded. For dsDECT data, dual energy ratio (DER) for each stone was recorded from vendor specific post-processing software (Syngo Via) using the Kidney Stones Application. The clinical reference standard of x-ray diffraction analysis was used to assess non-inferiority. Pearson's correlation coefficient was calculated to assess correlation between the 3 VMRs and 2 DERs.

**RESULTS**

6 pure UA, 47 pure calcium based, 1 pure cystine, and 3 mixed struvite stones were scanned. All pure UA stones were correctly separated from non-UA stones using SDCT and dsDECT. For UA stones, median VMR was 0.95-0.99, Zeff 7.2, DER 1.00-1.02. For non-UA stones, median VMR was 1.65-4.1, Zeff 10.76, and DER 1.54-1.69. VMR ratio 40/200 provided the greatest difference between UA and non-UA stones. There was excellent correlation between the 3 VMRs and DEPs (Pearson's correlation coefficient 0.89-0.94, p<.0001). More variability was noted using Zeff.

**CONCLUSION**

SDCT spectral reconstructions demonstrate similar performance to dsDECT in discriminating UA from non-UA stones in a phantom model.

**CLINICAL RELEVANCE/APPLICATION**

Uric acid stones may be differentiated from non uric acid stones using novel dual layer spectral detector CT technology in a phantom model.

**Honored Educators**

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational activities.
educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Suhny Abbara, MD - 2014 Honored EducatorSuhny Abbara, MD - 2017 Honored Educator
Application of Diffusion Kurtosis MR Imaging in Characterization of Renal Cell Carcinomas with Different Pathological Types and Grades

**PURPOSE**

To probe the feasibility and characteristics of Diffusion kurtosis imaging (DKI) in renal cell carcinoma (RCC) and to apply DKI in distinguishing the subtypes of RCC and the grades of clear cell RCC (CCRCC).

**METHOD AND MATERIALS**

This prospective study was approved by the Institutional Review Board, and the informed consent was waived. 38 patients with pathologically confirmed RCCs [CCRCC for 30 tumors, papillary RCC (PRCC) for 5 tumors and chromophobic RCC (CRCC) for 3 tumors] were involved. Diffusion kurtosis MR imaging were performed with GE 750 3.0T MR system (3 b-values: 0, 500, 1000s/mm2, 30 diffusion directions). Kurtosis metrics including mean kurtosis (MK), axial kurtosis (Ka) and radial kurtosis (Kr) were measured for the renal lesions and contralateral uninvolved renal parenchyma. Both intra- and inter-observer agreements of all metrics were evaluated by using the intraclass correlation coefficient (ICC) and Bland-Altman plot. Statistical comparisons with metrics of three RCC subtypes were performed with ANOVA test and multiple comparison Scheffé test. Furthermore, DKI metrics of low grade (Furman grade I~II, 22 cases) and high grade (Furman grade III~IV, 8 cases) CCRCCs were compared and receiver operating characteristic curves were drawn to establish cut-off DKI metrics.

**RESULTS**

Inter- and intra-observer measurements for each metrics showed great reproducibility with good ICCs ranging from 0.815 to 0.942. The range of mean differences of MK (Ka, Kr) ± LOA were from (-0.007±0.127) to (0.035±0.152). There were significant differences between the DKI metrics of RCCs and contralateral uninvolved renal parenchyma, also among the subtypes of RCC. MK and Ka values of CRCCs were significantly higher than those of CCRCCs and PRCCs(Figure). Statistical difference of MK, Ka and Kr values were obtained between CCRCCs with high- and low-grades. MK values were more effective for distinguishing between low- and high- grade CCRCCs (area under the ROC curve:0.955). A threshold value of 0.875 permitted distinction with high sensitivity (87.5%) and specificity (95.5%).

**CONCLUSION**

Our preliminary results suggested a possible role of DKI in differentiating CRCC from CCRCC and PRCC. For CCRCC, there was a decreasing trend of DKI values with increasing nuclear grade.

**CLINICAL RELEVANCE/APPLICATION**

Diffusion Kurtosis MR Imaging is feasible to detect the microstructure difference of renal cell carcinoma with different pathological types and grades.


**PURPOSE**

Shear wave elastography (SWE) is the last development in ultrasonic assessment of the tissue elasticity. Our aim was to evaluate the values of the stiffness in normal parenchyma and in common pathologies in order to determine a threshold value for diagnosis.

**METHOD AND MATERIALS**

This prospective study recorded 235 patients (mean age 43.2±17.2 years, range 17-90) using a Toshiba ApioTM 500 (Toshiba Medical Systems, Japan). Young modulus (YM) values were recorded by mean of a circular ROI over the color map. The cohort was divided into two groups according the grey scale aspect: a normal group of 110 patients with 902 values (67 bilateral, 43 unilateral+12 contralateral -3 localizations (superior, mid, inferior) - including microthlasis and hydrocele) and a pathological group of 125 patients with 375 values (87 lesions up to 5mm, 38 diffuse abnormalities). Final diagnosis was done by clinical findings, follow up or histological analysis. For statistical analysis a Mann-Whitney test was used and the optimal cut off value was calculated from the ROC curves analysis. A P value below 0.05 was considered as significant.

**RESULTS**

The YM values of free lesion testicle was 4.56±1.53kPa, median = 3.85kPa. There was no significant difference concerning the side, the localization, the presence of hydrocele or stage I or II microthlasis. There was a significant higher mean value stiffness with age (>60 years: 4.97kPa; p<0.001), stage III microthlasis (6.27kPa; p<0.001) and in case of contralateral tumor (5.60kPa; p<0.001). The stiffness values and cut off thresholds were for tumors (n=48, mean = 21.31±7.01kPa, median =19.60kPa , p<0.001) and 16.1kPa (Se= 0.82 - CI95[0.48-0.98] , Sp= 0.81 kPa CI95[0.74-0.86], AUC= 0.881), orchitis (n=43, mean = 9.48±3.19kPa, median =6.65kPa, p<0.001) and 5.7kPa (Se= 0.63 - CI95[0.49-0.76], Sp= 0.77 - CI95[0.70-0.83], AUC=0.764) and fibrosis (n=34, mean = 31.55±9.08kPa, median =25.20kPa, p<0.001) and 26.3kPa (Se= 0.82 - CI95[0.63-0.94], Sp= 0.85 - CI95[0.79-0.90], AUC= 0.872 ), respectively. By analyzing the distributions between the different pathologies, the difference was statistically significant between orchitis and fibrosis (p= 0.002) and tumors and fibrosis (p<0.001).

**CONCLUSION**

SWE is a complementary tool to differentiate fibrosis from a tumoral process.

**CLINICAL RELEVANCE/APPLICATION**

Quantitative SWE is an efficient mean to differentiate a fibrous tissue from a tumoral process on a localized gray scale lesion.

**GU262-SD-WEAS**

**Effects of Echo Time on IVIM Quantification and Reproducibility of the Normal Prostate**

**Station #5**

Participants
Zhaoxian Feng, MD, Wuhan, China (Presenter) Nothing to Disclose
Liang Wang, MD, PhD, Wuhan, China (Abstract Co-Author) Nothing to Disclose
Xu Yan, Shanghai, China (Abstract Co-Author) Employee, Siemens AG
Xiangde Min, MD, Wuhan, China (Abstract Co-Author) Nothing to Disclose
Zan Ke, Wu Han, China (Abstract Co-Author) Nothing to Disclose
Peipei Zhang, Wuhan, China (Abstract Co-Author) Nothing to Disclose
Huijuan You, Wuhan, China (Abstract Co-Author) Nothing to Disclose

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**PURPOSE**

To investigate the effects of echo time (TE) on intravoxel incoherent motion (IVIM) diffusion-weighted imaging (DWI)-derived parameters and short-term test-retest reproducibility of the prostate at 3.0 T.

**METHOD AND MATERIALS**

In this prospective study, 17 healthy volunteers underwent two repeat examinations at 3.0 T. Each scan included IVIM-DWI using 9 b values (0, 10, 20, 50, 100, 200, 500, 800, and 1000 s/mm²); the IVIM-DWI data were scanned 6 times with variable TE values of 60, 70, 80, 90, 100, and 120 ms. The apparent diffusion coefficient (ADC) of a mono-exponential model and the D, D*, and f parameters of the IVIM model with variable TEs were calculated. The repeat measures were assessed by calculating the coefficient of variation (CV) and Bland-Altman limits of agreement (BA-LA) for each parameter. Pearson correlation coefficients were used to analyse the relationships between diffusion indices and TE.

**RESULTS**

Both the ADC and D values exhibited good reproducibility in the peripheral zone (PZ) and central zone (CZ) for different TE values (CV: 1.641% and 6.661%; BA-LA: -4.965% to 4.263% and -24.413% to 21.284%). Poor measurement reproducibility was observed for f, with CVs of 12.337% and 25.108% and BA-LA values of -43.961% to 30.994% and -52.185% to 62.516%; D* was found to be the most unreliable parameter, with CVs of 11.640% and 33.644% and BA-LA values of -29.917% to 35.054% and -96.248% to 52.016%.

**CONCLUSION**

Good reproducibility of ADC/D and poor reproducibility of D*/f were observed in the normal prostate. TE had an effect on diffusion quantification, which should be kept constant in each examination protocol. This may be helpful for guiding clinical research, especially for longitudinal studies.

**CLINICAL RELEVANCE/APPLICATION**

TE had an effect on diffusion quantification. It is necessary to improve the existing algorithm to reduce or eliminate the effect of the TE value on the quantitative parameters of IVIM, which may improve the clinical application value of IVIM.
Putting MRI to Test Testes: A Review on Malignant Testicular Neoplasms

Gabriella M. Borges, MD, Rio de Janeiro, Brazil (Presenter) Nothing to Disclose
Flavia P. Lopes, MD, RIO DE JANEIRO, Brazil (Abstract Co-Author) Nothing to Disclose
Gustavo O. Da Cunha, MD, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Rachel F. Muffareg Do Amaral, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Natalia Sabaneeff, MD, Rio de Janeiro, Brazil (Abstract Co-Author) Nothing to Disclose
Leonardo K. Bittencourt, MD, PhD, Rio De Janeiro, Brazil (Abstract Co-Author) Investor, Healffies LLC

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TEACHING POINTS
- Highlight the high prevalence of malignant testicular cancer in young adults.
- Review the histopathological classification.
- Describe imaging findings with a pictorial essay.
- Remember the curative potential of most subtypes upon early diagnose.
- Call attention to potential relation with cumulating radiation regarding consecutive CT scans.

TABLE OF CONTENTS/OUTLINE
- Testicular cancer: high prevalence in the young adult population.
- Brief discussion on radiation association, specially consecutive CT scans.
- Revising the TNM classification.
- Histopathological classification with a table, along with illustrative cases, emphasizing US and MRI image findings.
- Suggested MRI protocol.
- Prognosis.
- Key points and tips at staging, with schematic drawing of T descriptors.
- Post-orchiectomy imaging findings and potential pitfalls.
- Summary and practical tips.

UR214-ED-WEA8 Feeling the Burn? Imaging Features of Urinary Tract Infections

Peyman Kangavari, MD, Los Angeles, CA (Presenter) Nothing to Disclose
Catherine Evans, MD, Los Angeles, CA (Abstract Co-Author) Nothing to Disclose

TEACHING POINTS
Understand the anatomy and embryologic development of the urinary tract. Describe the imaging features of common and uncommon urinary tract infections. Describe the clinical manifestations of common and uncommon urinary tract infections.

TABLE OF CONTENTS/OUTLINE
Overview of anatomy and embryologic development of the urinary tract. Discussion of epidemiology, pathophysiology, pathologic findings, complication and imaging features of various urinary tract infections, including but not limited to: Pyelonephritis
Pyelonephritis with renal abscess
Emphysematous Pyelonephritis
Xanthogranulomatous Pyelonephritis
Renal and perirenal abscess
Cystitis and Emphysematous Cystitis
Parasitic Infections of the urinary tract: Renal Tuberculosis
HIV nephritis
PURPOSE
To evaluate biparametric MRI (bpMRI) in men with elevated PSA before their first biopsy in a multi-institutional clinical trial.

METHOD AND MATERIALS
Between February 2015 and March 2017, 293 men with elevated PSA (2.5 - 20.0 ng/ml) and no previous biopsy underwent bpMRI examination prior to a systematic 12 core biopsy (SB) at four centers (NCT02241122). T2-weighted imaging (T2w) and three separate diffusion weighted imaging (DWI) acquisitions were acquired using surface array coils at 3 Tesla (3 centers) or 1.5 Tesla (1 center). Each lesion was assigned a Likert score (1-5) and a three grade Gleason grade score (GGS). GGS was prospectively assigned based on the apparent diffusion confident (ADCm) maps calculated using a monoexponential fit and 5 b-values in the range of 0 to 500 s/mm² as follows: 1. ADCm above or equal to 850 x 10⁻⁶ mm²/s, 2. ADCm below 850 x 10⁻⁶ mm²/s 3. ADC below 750 x 10⁻⁶ mm²/s. All bpMRI were reported centrally and approved by one reader before biopsy. If a suspicious lesion was present (Likert score 3-5), two cores of targeted biopsy (TB) cores were taken prior to the SB. A maximum of two lesions per patient were targeted. Clinically significant (SPCa) was defined as Gleason score (GS) 3+4 or higher.

RESULTS
Prostate cancer and SPCa were diagnosed in 177 (60%) and 124 (42%) men, respectively. Twenty five (9%), 34 (12%), 62 (21%), 52 (18%), and 120 (41%) men presented with Likert score 1, 2, 3, 4, and 5, respectively. One hundred sixty six (57%), 45 (15%), and 76 (26%) had GGS of 1, 2, and 3, respectively, while GGS could not be assigned in 7 men (2%) due to susceptibility artifacts. In men with Likert score 3 and GGS 0, 89% (40/45), 31% (14/45), 4% (2/45), and 7% (3/45) of men had no PCa, GS 3+3, GS 3+4, and GS >3+4, respectively, at SB/TB. Only 12 men (10%, 12/120) had Likert score 5 and GGS 0 in contrast to 75 men (63%, 75/120) with Likert score 5 and GGS 3. In men with Likert score 5 and GGS 3, 4% (3/75), 10% (13/120), 17% (23/120), and 60% (45/120) had no PCa, GS 3+3, GS 3+4, and GS >3+4, respectively, at SB/TB.

CONCLUSION
Our newly developed bpMRI acquisition and reporting system demonstrated a high accuracy for estimating PCa risk in men with elevated PSA before their first biopsy.

CLINICAL RELEVANCE/APPLICATION
Qualitative and quantitative evaluation of biparametric MRI can reliably estimate prostate cancer risk in men with elevated PSA before their first biopsy.
Patients with high Gleason grade (GG) prostate cancer have been shown to have radiological indicators of increased tumour aggressiveness on MRI. The aim of this study was to evaluate tumour volume on MRI as a potential predictor of aggressive disease by correlating with Gleason grade.

**METHOD AND MATERIALS**

We performed a retrospective review of prostate MRI in patients with high grade prostate cancer (GG 8-10) over a three year period. An age-matched and PSA-matched number of patients with GG 7 prostate cancer (GG 3+4 and 4+3) was also reviewed. Volumetric tumour analysis was performed on T2-weighted (T2W) sequences and on diffusion-weighted MRI using Osirix® software.

**RESULTS**

Seventy-five (n=38 GG 7, n=17 GG 8, n=17 GG 9, n=3 GG 10) MR studies were included in total. Average tumour volume for GG 7 disease was 1.96 cc on T2W sequences (range: 0.14–21.0159 cc) and 1.81 cc on diffusion MRI (range: 0.0763–17.1745 cc). High grade prostate cancer (GG 8 and above) had an average tumour volume of 6.95 cc (3.29 cc GG 8, 9.31 cc GG 9, 14.39 cc GG 10) on T2W sequences (range: 0.0891–54.3883) and 7.83 cc (3.27 cc GG 8, 11.04 cc GG 9, 15.47 cc GG 10) on diffusion MRI (range: 0.0778–72.7619). There was a positive correlation between tumour volume and GG using both T2W sequences (p<0.001) and diffusion MRI (p<0.001).

**CONCLUSION**

This study has shown a positive correlation between tumour volume and Gleason grade. Volumetric analysis of prostate cancer on MRI may have a role in predicting more aggressive disease.

**CLINICAL RELEVANCE/APPLICATION**

The signal intensity (T2 and DWI) of lesions on MRI has been shown to correlate with tumour aggressiveness based on Gleason grade found on prostate biopsy. Other high-risk features on MRI include extracapsular extension and seminal vesicle invasion. There are few studies correlating tumour volumes and seminal vesicle invasion. There is a need for further studies correlating tumour volumes with tumour aggressiveness based on Gleason score.

**GU266-5D**

Radiological Assessment of Peritoneal Cancer Index (PCI) on Preoperative CT in Ovarian Cancer: Relationship with Surgical Outcome and Survival

**PURPOSE**

To evaluate if the radiological assessment of Peritoneal Cancer Index on preoperative CT (rPCI) of patients with ovarian cancer can be predictive of complete surgical debulking and whether the radiological rPCI is related with Overall Survival (OS) and Progression Free Survival (PFS)

**METHOD AND MATERIALS**

We considered all patients with a diagnosis of ovarian cancer, a preoperative CT, up-front cytoreductive surgery at a single institution between 2004 and 2009 and a complete clinical follow-up after surgery, to December 2015 (297 patients). An expert radiologist retrospectively evaluated the CT examinations and assigned rPCI following Sugarbaker’s diagram. We correlated rPCI score with the results of surgery using ROC curve analysis and with OS and PFS using multivariate Cox-regression analysis (considering also age, stage and histology)

**RESULTS**

The median value of rPCI was 9 (0-33). 77.2% of patients had complete cytoreduction; the median value of OS was 24.6 months and of PFS was 14.6 months. Serous carcinoma has a higher rPCI in comparison with other histological subtype (p<0.001) and in particular a higher prevalence of upper abdomen and intestinal involvement (p<0.001). rPCI was significantly higher in histologically confirmed stage III-IV than in stage I-II (p<0.001). rPCI is positively correlated with the risk of residual disease (Odd ratio (OR)=1.04, p=0.003); however ROC curve analysis demonstrated low AUC (0.64) in predicting complete debulking with a positive predicting value of 0.36 and a negative predicting value of 0.90 (threshold of >0). In multivariate analysis, patients with no peritoneal disease seen at CT had a significantly longer PFS (OR=1.8, p=0.05). In OS analysis, patients with serosal involvement of
CONCLUSION

rPCI is correlated with histological subtype and stage. There is a positive correlation between rPCI and the risk of residual disease; however, rPCI has low ability in predicting complete debulking and even if no peritoneal disease is seen at CT, complete debulking is not always achieved. On the other hand, rPCI may be useful to identify high-risk patients pre-operatively, especially those with bowel involvement.

CLINICAL RELEVANCE/APPLICATION

In ovarian cancer, rPCI on preoperative CT is correlated with the risk of residual disease and can help identifying high-risk patients pre-operatively, especially those with high stage disease.

PURPOSE

To evaluate the incremental value of gray-scale ultrasound (US) in the differentiation of fat poor angiomyolipoma (AML) from renal cell carcinoma (RCC) in case of inconclusive diagnosis after use of both CT and MR.

METHOD AND MATERIALS

Forty-one consecutive patients who had renal mass with low signal intensity on T2-weighted image without macroscopic fat were retrospectively evaluated who had undergone US. They were pathologically confirmed as AML (n=18) and RCC (n=23; 7 clear cell, 9 chromophobe and 7 papillary RCC). Age, gender, size, presence of signal drop on chemical shift image, and echogenicity were recorded by reader blinded to the pathology. Echogenicity was evaluated as five degrees, which were 1=hypo-, 2=iso-, 3=hyperechoic compared to renal cortex, 4=marked hyperechoic similar to renal sinus fat, and 5=hypoechoic with bright dots. The statistical analysis was done using T-test, chi-square, and Fisher exact tests.

RESULTS

The median age of patients was 52 (range, 26-77) and the average tumor size was 1.99 cm (range, 0.8-3.7 cm). There were no significant differences in age, size, and presence of signal drop between two groups (p>0.05). There was significant female predominance in AML (p<0.001). There was overlap in the echogenicity between fat poor AML and RCC, especially in terms of hypo- (16.7% vs. 34.8% in AML vs. RCC, respectively), iso- (16.7% vs. 21.7%), and hyperechogenicity (5.6% vs. 39.1%). However, 4.3% and 0% of RCC showed marked hyperechoic and hypoechoic with bright dots as opposed to 44.4% and 16.7% of AML, respectively. The percentage of those two characteristic US features was significantly higher in fat poor AML compared with RCC (p<0.001) with 61.1% sensitivity, 95.7% specificity, 91.7% positive predictive value, and 75.9% negative predictive value.

CONCLUSION

Echo patterns of marked hyperechoic mass similar to renal sinus fat or hypoechoic mass with bright dots on US had high specificity and positive predictive value in predicting fat poor AML over RCC in inconclusive cases despite using CT and MR. These two features can be useful imaging characteristics when differentiating fat poor AML and RCC.

CLINICAL RELEVANCE/APPLICATION

Additional US on CT and MR can be helpful to differentiate fat poor angiomyolipoma and renal cell carcinoma in case of indeterminate small renal mass.

PURPOSE

To evaluate the immediate post renal radiofrequency ablation (RFA) ablation zone determined by iodine maps acquired with twin-beam dual energy computed tomography (DECT) compared to conventional non-contrast and contrast enhanced CT.

METHOD AND MATERIALS

Patients undergoing percutaneous renal RFA with immediate contrast enhanced post-ablation imaging performed with twin-beam DECT (Edge, Siemens, Erlangen, Germany) were included. Seven patients (2 females, 5 males) with average age of 64 years (range...
RESULTS
Acquisition of DECT and creation of iodine maps was possible in all patients. The ablation zone determined by DECT based iodine maps were found to be highly correlated with the ablation zones determined by comparing conventional noncontrast CT with nephrographic phase CT. The interpretation was consistent between both radiologists.

CONCLUSION
Post renal RFA, the ablation zones determined by twin-beam DECT technology based iodine maps are highly correlated with the ablation zones determined by comparison of conventional noncontrast CT and nephrographic phase CT. Additional study is needed to validate these results, but this small study suggests this approach has promise and could potentially eliminate the need for a noncontrast CT in the post-ablation assessment of the ablation zone.

CLINICAL RELEVANCE/APPLICATION
With the use of iodine maps instead of conventional noncontrast CT and nephrographic phase CT to assess ablation zones after renal RFA, the need for a non-contrast CT could be eliminated thus reducing the patient's radiation dose.

GU269-SD-WEB6
Intra-Tumoral Texture and Features of Organ Distension Predict Prostate Cancer Biochemical Recurrence on Pre-Treatment MRI

Awards
Trainee Research Prize - Fellow

Participants
Rakesh Shiradkar, PhD, Cleveland, OH (Presenter) Nothing to Disclose
Soumya Ghose, PhD, Cleveland, OH (Abstract Co-Author) Nothing to Disclose
Andrej S. Purysko, MD, Cleveland, OH (Abstract Co-Author) Nothing to Disclose
Anant Madabhushi, PhD, Piscataway, NJ (Abstract Co-Author) Nothing to Disclose

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PURPOSE
Cancerous lesions tend to introduce stresses in the surrounding tissue which may induce distensions in shape of the prostate. Additionally, radiomic texture features could help identify differences in heterogeneity patterns between more and less aggressive prostate cancers (PCa) on multi parametric MRI (mpMRI). The goal of this study was to evaluate whether a combination of pre-treatment mpMRI derived radiomic texture features of the tumor coupled with distension features of the capsule could together predict biochemical (BCR) in PCa patients.

METHOD AND MATERIALS
In this single center retrospective study, 80 PCa patients who underwent a 3T mpMRI scan prior to therapy and were then followed for at least 3 years were identified in an IRB approved database. These men were grouped into a training set D1 (N = 50, 25 each of BCR+ and BCR-) and a hold-out validation set D2 (N = 30, 10 BCR+ and 20 BCR-). PIRADS score, regions of interest (ROIs) for dominant PCa lesions and prostate capsule were delineated by an expert radiologist. Radiomic features (FR) including 1st and 2nd order statistics, Gabor and Haralick were extracted from within the cancer ROIs on T2w MRI and ADC maps. Features (FS) quantifying prostate capsule distension (curvature and orientation) are computed using an atlas based approach. FR and FS extracted from D1 were used to train individual machine learning classifiers CR and CS and were combined to obtain a joint classifier (CR+S) via Bayesian fusion, as shown in Figure. PIRADS and CR+S were assessed individually for their correlation with BCR.

RESULTS
On D2, combined classifier predictions CR+S resulted in an AUC = 0.84, while CR and CS resulted in AUC’s of 0.81 and 0.72 respectively. FR and FS were found to complement each other in cases where intensity artifacts or smaller organ distensions were observed. Correlation coefficient of CR+S with BCR was 0.6 while that of PIRADS with BCR was 0.4.

CONCLUSION
Tumor radiomics and organ distension features on pre-treatment mpMRI complement each other and improve BCR prediction in PCa patients. Assessment of PCa using PIRADS in these patients did not show significant correlation with BCR.

CLINICAL RELEVANCE/APPLICATION
Radiomic and organ distension features may help in improved PCa risk stratification and predict which patients are at risk for BCR following definitive therapy. This will allow for early identification of patients who might benefit from neo or adjuvant therapy.

UR135-ED-WEB7
Imaging Complications of Intravesical BCG Therapy for Bladder Cancer

Awards
Cum Laude
Identified for RadioGraphics

Participants
Daniel B. Green, MD, New York, NY (Presenter) Nothing to Disclose
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TEACHING POINTS

intravesical Bacillus Calmette-Guerin (BCG) immunotherapy is the standard of care for high-risk non-muscle invasive bladder cancer.
Although the therapy is highly effective, complications can affect any organ in the body and may be severe in some cases. For the radiologist, awareness of the spectrum of complications and the patient’s history of BCG therapy are crucial in making a prospective diagnosis. The purpose of this educational exhibit is to: 1. Review the history of BCG and its use in bladder cancer treatment. 2. Provide a case-based, pictorial review of the imaging features of BCG complications. 3. Discuss the key clinical characteristics of these entities.

TABLE OF CONTENTS/OUTLINE


Honored Educators

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Christine O. Menias, MD - 2013 Honored Educator Christine O. Menias, MD - 2014 Honored Educator Christine O. Menias, MD - 2015 Honored Educator Christine O. Menias, MD - 2016 Honored Educator Christine O. Menias, MD - 2017 Honored Educator Christine O. Menias, MD - 2018 Honored Educator

UR176-ED WEBB Challenging Adrenal Cases: A Quiz-Based Approach to Adrenal Gland Pathologies

Station #8

Awards

Certificate of Merit

Participants

Eduardo K. Fonseca, MD, Sao Paulo, Brazil (Presenter) Nothing to Disclose
Marco Filipe T. Ponte, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Amanda D. Tames, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Caroline D. Amoedo, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Fernando I. Yamouchi, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose
Ronaldo H. Baron, MD, Sao Paulo, Brazil (Abstract Co-Author) Nothing to Disclose

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TEACHING POINTS

The purpose of this exhibit is: - to confront classic findings with difficult/atypical cases of adrenal pathologies through a quiz-based approach. - to briefly review both typical and atypical features of adrenal lesions. - to discuss limitations and pitfalls of imaging modalities.

TABLE OF CONTENTS/OUTLINE

We will present the most important adrenal pathologies in a quiz format. Key differential diagnostic points will be highlighted in the discussion of each case. A brief review of both classic and atypical appearance will also be included. The list of cases includes: 1. Adrenal cyst vs Adenoma 2. Myelolipoma vs retroperitoneal liposarcoma vs lipid-poor myelolipoma 3. Adrenal adenocarcinoma vs metastasis 4. Classic pheochromocytoma vs atypical pheochromocytoma 5. Adrenal hemorrhage vs neoplastic lesion 6. Adrenal paracoccidioidomycosis vs neoplastic lesion 7. Shock adrenal vs hyperplasia 8. Adrenal lesion vs extra-adrenal mimickers and pitfalls

UR218-ED WEBB Adrenal Lesions from ACC to Zuckerkandl: Interactive Case-Based Review of the Diagnosis of Adrenal Lesions

Station #9

Participants

Karen Tran-Harding, MD, Lexington, KY (Presenter) Nothing to Disclose
James T. Lee, MD, Lexington, KY (Abstract Co-Author) Nothing to Disclose
Cortney Y. Lee, MD, Lexington, KY (Abstract Co-Author) Nothing to Disclose
Joseph W. Owen, MD, Saint Louis, MO (Abstract Co-Author) Nothing to Disclose
Halemane S. Ganesh, MD, Lexington, KY (Abstract Co-Author) Nothing to Disclose
Rashmi T. Nair, MD, Lexington, KY (Abstract Co-Author) Nothing to Disclose
Scott D. Stevens, MD, Lexington, KY (Abstract Co-Author) Nothing to Disclose
Adrian A. Dawkins, MD, Lexington, KY (Abstract Co-Author) Nothing to Disclose
Andres R. Ayoob, MD, Lexington, KY (Abstract Co-Author) Nothing to Disclose

For information about this presentation, contact:
TEACHING POINTS

Review pertinent anatomy and histology pertaining to the adrenal glands. Illustrate imaging findings of common and uncommon adrenal masses in a case based interactive manner. Review current clinical management algorithms pertaining to adrenal incidentalomas and symptomatic masses.

TABLE OF CONTENTS/OUTLINE

The cases will be presented in a quiz format. Key differential diagnostic points will be highlighted in the discussion of each case. The list of cases includes:
- Adrenal adenoma - diagnosis, management of functional, nonfunctional and 'subclinical' nodules
- Adrenal cortical carcinoma - diagnosis, management, prognosis
- Extramedullary Hematopoiesis - diagnosis and clinical context
- Ganglioneuroma - imaging features and management
- Hemangioma - imaging features and management
- Lymphangioma - imaging features and management
- Metastatic disease - common and atypical metastasis
- Myelolipoma - imaging diagnosis and management
- Pheochromocytoma - diagnosis, varying imaging appearance, association with MEN syndrome, management of 'benign' and malignant disease. Atypical locations i.e. organ of Zuckerkandl
- Primary Adrenal Hyperplasia - imaging appearance, diagnosis and clinical manifestations
- Teratoma - imaging appearance and management
RSNA/ESR Hybrid Imaging Symposium: Hybrid Imaging in the Male (An Interactive Session)

Wednesday, Nov. 29 1:30PM - 3:00PM Room: S402AB

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

Participants
Alexander Drzezga, MD, Cologne, Germany (Moderator) Consultant, Siemens AG; Consultant, Bayer AG; Consultant, General Electric Company; Consultant, Eli Lilly and Company; Consultant, The Piramal Group; Speakers Bureau, Siemens AG; Speakers Bureau, Bayer AG; Speakers Bureau, General Electric Company; Speakers Bureau, Eli Lilly and Company; Speakers Bureau, The Piramal Group
Katrine Riklund, MD, PhD, Umea, Sweden (Moderator) Nothing to Disclose

LEARNING OBJECTIVES
1) Learn about pathophysiology in prostate cancer. 2) Understand how to interpret hybrid imaging of prostate cancer. 3) Learn about the role of hybrid imaging in staging, treatment evaluation and follow-up.

MSSR43A  Prostate Cancer: PET, MR or Both?

Participants
Frederik L. Giesel, MD, MBA, Heidelberg, Germany (Presenter) Patent application for F18-PSMA-1007

LEARNING OBJECTIVES
1) Learn about novel tracer and their biochemical properties. 2) Understand the differences of information given by the use of different tracers. 3) Understand how to interpret examinations with different tracers.

MSSR43B  Prostate Cancer: Novel Tracers

Participants
Steven P. Rowe, MD, PhD, Parkville, MD (Presenter) Nothing to Disclose

LEARNING OBJECTIVES
1) Learn how to interpret hybrid imaging of prostate cancer. 2) Understand the pathophysiology in relation to imaging.

MSSR43C  Interactive Case Discussion

Participants
Frederik L. Giesel, MD, MBA, Heidelberg, Germany (Presenter) Patent application for F18-PSMA-1007
Steven P. Rowe, MD, PhD, Parkville, MD (Presenter) Nothing to Disclose
**Genitourinary (Gynecology and Genitourinary Ultrasound)**

**Wednesday, Nov. 29 3:00PM - 4:00PM Room: E351**

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

**FDA** Discussions may include off-label uses.

**Participants**

Harris L. Cohen, MD, Memphis, TN (*Moderator*) Nothing to Disclose
Mary C. Frates, MD, Sharon, MA (*Moderator*) Nothing to Disclose

**Sub-Events**

**SSM10-01 Impact of Contrast-Enhanced Ultrasound in the Secondary Prevention of Testicular Tumors**

**Wednesday, Nov. 29 3:00PM - 3:10PM Room: E351**

**Participants**

DARIO DE ROSA, MD, NAPOLI, Italy (*Abstract Co-Author*) Nothing to Disclose
Pietro Gisonni, Napoli, Italy (*Abstract Co-Author*) Nothing to Disclose
Giuseppina Dell'Aversano Orabona, MD, NAPOLI, Italy (*Presenter*) Nothing to Disclose
Maria Chiara Imperato, Napoli, Italy (*Abstract Co-Author*) Nothing to Disclose
Dolores Ferrara, Napoli, Italy (*Abstract Co-Author*) Nothing to Disclose
Arturo Brunetti, MD, Naples, Italy (*Abstract Co-Author*) Nothing to Disclose

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**PURPOSE**

This study evaluated the role of contrast-enhanced ultrasound CEUS in the secondary prevention of testicular tumours.

**METHOD AND MATERIALS**

Forty patients (median age 25 years, range 18-36 yrs) with a focal testicular lesion underwent B-mode ultrasound (US), Doppler and CEUS. Then all patients underwent orchiectomy and the histological exam of the mass was performed. Histological features and ultrasound images were recorded and compared for each patient.

**RESULTS**

The medium diameter of the lesions was 12 mm (range 3-29 mm). 30 of 50 patients had malignant tumours (75%), 5 had benign tumours (12.5%) and 5 non-neoplastic lesions (12.5%). B-mode US detected neoplastic characteristics only in 9 of the 35 tumoural lesions; with color-Doppler techniques in 10 of 35 tumours was found intralesional hypervascularization (B-mode and color-Doppler US findings suggestive of neoplastic disease were irregular margins and internal hypervascularization). On qualitative CEUS evaluation 34 of the 35 neoplastic lesions showed intense enhancement; on quantitative CEUS all tumours showed different kinetics from the surrounding parenchyma, according to a rapid wash in and wash out for malignant tumours and rapid wash-in but delayed wash-out for benign tumours (CEUS findings suggestive of neoplastic disease were intense enhancement of contrast, rapidity of wash-in and wash-out and peak characteristics).

**CONCLUSION**

In this study, we confirmed the CEUS high accuracy in the differentiation between malignant and benign small lesions and its utility in the early diagnosis of testicular cancer. Conventional US revealed in all patients the presence of a solid testicular mass and color-Doppler revealed presence of increased blood flow signal, but in small testicular tumours it did not show vascularization and only CEUS was able to do a differential diagnosis. Using CEUS, the temporal perfusion dynamics of the contrast enhancement help in the differentiation between malignant and benign tumours; the intensity of contrast enhancement helps in the differentiation between neoplastic and non-neoplastic lesions. Therefore, CEUS is useful in the secondary prevention of small testicular masses with an ambiguous color-Doppler pattern and permits, rapidly and without damage, to predict the lesion nature.

**CLINICAL RELEVANCE/APPLICATION**

CEUS can add relevant information for surgical decision making in small testicular lesions.

**SSM10-02 Utility of Ultrasound Elastography (Acoustic Radiation Force Impulse Imaging) in Differentiating Ovarian Endometriomas from Hemorrhagic Ovarian Cysts; In Correlation with Histopathology**

**Wednesday, Nov. 29 3:10PM - 3:20PM Room: E351**

**Participants**

Jayasudha Sambedu, MBBS,DMRD, Chennai, India (*Presenter*) Nothing to Disclose
RESULTS
Ultrasound elastography (ARFI) was performed on all the 40 lesions and the median shear wave velocities (SWV) were calculated. The definitive diagnosis was made by post-operative histopathological examination results and the SWV values were correlated. Out of the 40 cystic lesions, 23 lesions were endometriomas and 17 lesions were hemorrhagic cysts. All the lesions histopathologically proven as endometriomas had higher SWV values compared to those proven as hemorrhagic ovarian cysts. A cut-off value of 2.85 m/s was established, concluding the lesions with SWV values above 2.85 m/s were more likely to be endometriomas and those below 2.85 m/s were more likely to be hemorrhagic cysts with a sensitivity and specificity of 94% and 100% respectively.

CONCLUSION
ARFI imaging is a feasible technique for pre-operative discrimination of ovarian endometriomas and hemorrhagic ovarian cysts.

CLINICAL RELEVANCE/APPLICATION
With the use of this modality clear preoperative diagnosis of the two lesions can be established and the existing diagnostic dilemma leading to unnecessary surgeries can be avoided.

METHOD AND MATERIALS
This prospective study recorded 235 patients (mean age 43.2±17.2 years, range 17-90) using a Toshiba AplioTM 500 (Toshiba Medical Systems, Japan). Young modulus (YM) values were recorded by mean of a circular ROI over the color map. The cohort was divided into two groups according the grey scale aspect: a normal group of 110 patients with 902 values (67 bilateral, 43 unilateral+125 controlateral -3 localizations (superior, mid, inferior) - including microlithiasis and hydrocele) and a pathological group of 125 patients with 375 values ( 87 lesions up to 5mm, 38 diffuse abnormalities). Final diagnosis was done by clinical findings, ultrasound elastography (ARFI), and those below 2.85 m/s were more likely to be hemorrhagic cysts with a sensitivity and specificity of 94% and 100% respectively.

RESULTS
The YM values of free lesion testicle was 4.56±1.53 kPa, median = 3.85 kPa. There was no significant difference concerning the side, the localization, the presence of hydrocele or stage I or II microlithiasis. There was a significant higher mean value stiffness with age (>60 years: 4.97 kPa; p<0.001), stage III microlithiasis (6.27 kPa; p<0.001) and in case of contralateral tumor (5.60 kPa; p<0.001). The stiffness values and cut off thresholds were for tumors (n=48, mean =21.31±7.01 kPa, median =19.60 kPa), age (>60 years: 4.97 kPa; p<0.001), stage III microlithiasis (6.27 kPa; p<0.001) and in case of contralateral tumor (5.60 kPa; p<0.001). The stiffness values and cut off thresholds were for tumors (n=48, mean =21.31±7.01 kPa, median =19.60 kPa), age (>60 years: 4.97 kPa; p<0.001), stage III microlithiasis (6.27 kPa; p<0.001) and in case of contralateral tumor (5.60 kPa; p<0.001).

CONCLUSION
ARFI imaging is a feasible technique for pre-operative discrimination of ovarian endometriomas and hemorrhagic ovarian cysts.

CLINICAL RELEVANCE/APPLICATION
With the use of this modality clear preoperative diagnosis of the two lesions can be established and the existing diagnostic dilemma leading to unnecessary surgeries can be avoided.

METHOD AND MATERIALS
This retrospective study recorded 235 patients (mean age 43.2±17.2 years, range 17-90) using a Toshiba AplioTM 500 (Toshiba Medical Systems, Japan). Young modulus (YM) values were recorded by mean of a circular ROI over the color map. The cohort was divided into two groups according the grey scale aspect: a normal group of 110 patients with 902 values (67 bilateral, 43 unilateral+125 controlateral -3 localizations (superior, mid, inferior) - including microlithiasis and hydrocele) and a pathological group of 125 patients with 375 values ( 87 lesions up to 5mm, 38 diffuse abnormalities). Final diagnosis was done by clinical findings, ultrasound elastography (ARFI), and those below 2.85 m/s were more likely to be hemorrhagic cysts with a sensitivity and specificity of 94% and 100% respectively.

RESULTS
The YM values of free lesion testicle was 4.56±1.53 kPa, median = 3.85 kPa. There was no significant difference concerning the side, the localization, the presence of hydrocele or stage I or II microlithiasis. There was a significant higher mean value stiffness with age (>60 years: 4.97 kPa; p<0.001), stage III microlithiasis (6.27 kPa; p<0.001) and in case of contralateral tumor (5.60 kPa; p<0.001). The stiffness values and cut off thresholds were for tumors (n=48, mean =21.31±7.01 kPa, median =19.60 kPa), age (>60 years: 4.97 kPa; p<0.001), stage III microlithiasis (6.27 kPa; p<0.001) and in case of contralateral tumor (5.60 kPa; p<0.001). The stiffness values and cut off thresholds were for tumors (n=48, mean =21.31±7.01 kPa, median =19.60 kPa), age (>60 years: 4.97 kPa; p<0.001), stage III microlithiasis (6.27 kPa; p<0.001) and in case of contralateral tumor (5.60 kPa; p<0.001).
CI95(0.79-0.90), AUC = 0.872, respectively. By analyzing the distributions between the different pathologies, the difference was statistically significant between orchitis and fibrosis (p= 0.002) and tumors and fibrosis (p<0.001).

CONCLUSION
SWE is a complementary tool to differentiate fibrosis from a tumoral process.

CLINICAL RELEVANCE/APPLICATION
Quantitative SWE is an efficient mean to differentiate a fibrous tissue from a tumoral process on a localized gray scale lesion.

SSM10-04 Clinical Significance of the Slope of the Increasing Pressure Curve When Injecting Ultrasound Contrast Agent during the Evaluation of the Fallopian Tubal Patency

Wednesday, Nov. 29 3:30PM - 3:40PM Room: E351

Participants
Ye Qiang, Nanjing, China (Presenter) Nothing to Disclose
Yiyun Wu, Nanjing, China (Abstract Co-Author) Nothing to Disclose
Meimei Zhang, Nanjing, China (Abstract Co-Author) Nothing to Disclose

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PURPOSE
To explore the association between Fallopian tubal patency and the slope of the increasing pressure curve for ultrasound contrast agent.

METHOD AND MATERIALS
A total of 145 patients underwent hysterosalpingo contrast sonography (HyCoSy) between August 2015 and January 2016. HyCoSy was performed with the Voluson E8 ultrasound system (GE Healthcare, Zipf, Austria) equipped with an RIC5-9-D probe. The ultrasound contrast agent was injected and the pressure curve was recorded with a liquid-injecting machine (YLD YZ-800, Yi Lida Corp., Zhu Hai, China) that records the injection pressure in real time and automatically traces it as a pressure curve. We used SonoVue (Bracco International BV, Amsterdam, The Netherlands) as the ultrasound contrast medium. The statistical analysis was performed with SPSS Statistics, version 19 (IBM, Chicago, USA), and P < 0.05 was deemed statistically significant.

RESULTS
We divided the patients into three groups according to their different Fallopian tubal patency status: 71 patients (48.97%) in bilateral tubal patency group, 45 (31.03%) in unilateral tubal patency group (one side patent, and the other either passable or occluded), and 20 in bilateral tubal lesion group (both sides passable or occluded). The slopes of the increasing pressure curves for the three groups were 1.242 ± 0.572, 1.472 ± 0.638 and 2.068 ± 1.236 kpa/s, respectively. There was some correlation between the slope of the increasing pressure curve and tubal patency (R = 0.287, P < 0.05). The slopes differed significantly between the bilateral tubal patency group and the bilateral tubal lesion group (P < 0.05) and between the unilateral tubal patency group and the bilateral tubal lesion group (P < 0.05). However, the difference between the bilateral tubal patency group and the unilateral tubal patency group was not significant (P > 0.05).

CONCLUSION
The slope of the curve tracing the increase in the pressure of the injected contrast agent during HyCoSy is associated with the tubal patency.

CLINICAL RELEVANCE/APPLICATION
Therefore, it can be used as an objective index of tubal patency, and should have utility in both diagnosis and treatment.

SSM10-05 Vasectomy Related Changes in the Scrotum on Ultrasound

Wednesday, Nov. 29 3:40PM - 3:50PM Room: E351

Participants
Pramod K. Gupta, MD, Plano, TX (Presenter) Nothing to Disclose
Ann M. Mottershaw, MD, Dallas, TX (Abstract Co-Author) Nothing to Disclose
Vidisha V. Ghole, MD, Irving, TX (Abstract Co-Author) Nothing to Disclose

For information about this presentation, contact:
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PURPOSE
Vasectomy is a popular method of male contraception, so that a signification proportion of men referred for scrotal sonography will have had a vasectomy. The purpose of our study is to evaluate the sonographic changes in the scrotum after vasectomy and compare them with the sonographic appearance of non vasectomy patients.

METHOD AND MATERIALS
We performed a comparative study of 75 patients with a history of vasectomy and 75 patients without this history who were referred for scrotal sonography for various indications. Ultrasound findings in these two groups were tabulated and compared.

RESULTS
Certain ultrasonographic findings were more commonly observed in the patients with vasectomy than in non-vasectomy patients. These findings were: Thickened epididymides (41% versus 2%), Tubular ectasia of epididymis (57% versus 4%), both thickened epididymides and epididymal tubular ectasia together (36% versus 2%), sperm granulomas (21% versus 2%), tubular ectasia of rete...
testis (29% versus 7%), mediastinal cysts (15% versus 4%), medial rotation of the testis in the scrotal sac which is determined by location of testis-epididymis complex (33% versus 3%). No significant difference was found in the incidence of epididymal cysts, varicoceles and hydroceles in the vasectomy and non vasectomy groups.

**CONCLUSION**

There was significantly higher incidence of thickened epididymides, epididymal tubular ectasia, sperm granulomas, tubular ectasia of rete testis and mediastinal cysts in the post vasectomy patients as compared to non vasectomy patients. These changes most likely occur due to postvasectomy obstruction, sperm stasis and increased intraluminal pressure in the efferent ducts, epididymis and vas deferens. Medial rotation of the testis in the scrotal sac was also more common in the vasectomy group, which is likely due to iatrogenic changes in the structural support mechanism of the testis with resultant increased mobility of the testis within the scrotum.

**CLINICAL RELEVANCE/APPLICATION**

Familiarity with common ultrasound findings in vasectomy patients may help suggest post vasectomy status when history is not provided and in some cases may help avoid unnecessary intervention.

**PURPOSE**

To evaluate myometrial stiffness using TVUS SWE in women with benign myometrial pathologies including adenomyosis and leiomyoma vs. normal myometrium, using pelvic MR as the reference standard.

**METHOD AND MATERIALS**

Between January 2015 to June 2016, premenopausal women without a history of gynecologic malignancy presenting with pelvic pain and/or bleeding were enrolled in this IRB-approved prospective study. TVUS was performed in SWE mode with multiple regions of interest (ROIs) (>=1 cm²) in the uterus. Multiple shear wave velocities (SWVs) were recorded in each location and averaged. Reference pelvic MR exams were performed with multiplanar T2WI, and T1WI pre and post IV gadolinium administration. MR exams were reviewed in consensus by two radiologists blinded to the US findings, and the presence or absence of adenomyosis and/or leiomyomata was assessed using published criteria. US images were reviewed in consensus by two different radiologists and SWV for each ROI tabulated by anatomic area. Continuous variables were analyzed using means, t-tests and ANOVA, assuming p <0.05 for statistical significance.

**RESULTS**

34 premenopausal women (mean age 36.8 years, range 22–52) were enrolled with mean time between US and MR 11 days (±27, range 0-118). MR diagnosed adenomyosis in 6 women involving 12 uterine locations, and leiomyomata in 12 women involving 28 uterine locations. Mean SWV in 16 women with normal myometrium was 4.3 m/s (±1.7, range 1.8-9.4), compared with 5.7 m/s (±2.3, range 1.7-9.9) in 18 women with adenomyosis or leiomyomata (p <0.0002, 95% CI of difference -2.2, -0.6).

**CONCLUSION**

Our pilot study demonstrated that myometrial SWVs were higher in women with adenomyosis or leiomyomata than in women with normal myometrium (p <0.0002), indicating increased tissue stiffness associated with common benign myometrial diseases.

**CLINICAL RELEVANCE/APPLICATION**

Because women with benign myometrial conditions have increased myometrial stiffness, quantitative ultrasound SWE may be helpful in diagnosis and treatment response assessment for these disorders.

**Honored Educators**

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Ruth C. Carlos, MD, MS - 2015 Honored EducatorKatherine E. Maturen, MD - 2014 Honored Educator
Participants
Abhishek A. Solanki, MD, Maywood, IL (Moderator) Consultant, Blue Earth Diagnostics Ltd; Advisory Board, Blue Earth Diagnostics Ltd

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LEARNING OBJECTIVES
1) Review the management options for localized prostate cancer. 2) Describe the advantages of immediate treatment of localized prostate cancer. 3) Describe the disadvantages and harms of immediate treatment of localized prostate cancer.

ABSTRACT
Prostate cancer is the most commonly diagnosed malignancy in men in the United States. However, the relatively indolent natural history of localized prostate cancer has raised concern regarding potential overdiagnosis and overtreatment. Many men elect immediate curative treatment with radical prostatectomy, external beam radiotherapy, or brachytherapy, but active surveillance remains a reasonable option for many men. The results of multiple recent studies have shed light into the advantages and disadvantages of immediate treatment over active surveillance, helping clinicians and patients with shared decision making to identify the optimal approach.

Participants
Stanley L. Liauw, MD, Chicago, IL (Presenter) Nothing to Disclose

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LEARNING OBJECTIVES
View learning objectives under main course title.

ABSTRACT
The management of localized prostate cancer could be considered controversial. While local therapy is often successful in limiting the progression of disease, treatment also carries morbidity that can adversely affect quality of life. This overview highlights some of the difficulties in managing localized prostate cancer, and reviews considerations for the clinician to individualize decision making.

Participants
Jason Efstathiou, Boston, MA (Presenter) Consultant, Blue Earth Diagnostics Ltd; Consultant, TARIS BioMedical, Inc; Consultant, Bayer AG; Advisory Board, Merck KGaA

LEARNING OBJECTIVES
View learning objectives under main course title.

ABSTRACT
Not all patients with localized prostate cancer require immediate treatment. Many patients with an early diagnosis of slow-growing prostate cancer will die with, rather than from the prostate cancer. The over-treatment of many of these patients is a well-recognized issue, which leads to treatment-related side effects that harm the patient rather than benefit them. On the other hand,
patients with more aggressive prostate cancer do benefit from aggressive treatment. This session will describe active surveillance and watchful waiting as two options for select patients with early prostate cancers, and appropriate selection of patients to offer these options.
Controversy Session: MR Imaging Enhancers (Muscle Relaxants, Rectal Gel, Vaginal Gel): Are They Really Necessary?

Wednesday, Nov. 29 4:30PM - 6:00PM Room: E353B

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

FDA

Discussions may include off-label uses.

Participants
Hero K. Hussain, MD, Ann Arbor, MI (Moderator) Nothing to Disclose

LEARNING OBJECTIVES

1) To determine the advantages and disadvantages of imaging enhancers on image quality and diagnostic capability. 2) To assess the effect of imaging enhancers on MRI workflow. 3) To examine the financial effects of imaging enhancers on the patient and the imaging department. 4) To evaluate the impact of potential side effects of imaging enhancers on the patient and the imaging department.

Sub-Events

SPSC43A The Case FOR the Use of Imaging Enhancers for MRI of Prostate and Rectal Cancer

Participants
Caroline Reinhold, MD, MSc, Montreal, QC (Presenter) Consultant, GlaxoSmithKline plc

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

The Case FOR the Use of Imaging Enhancers for MRI of Prostate and Rectal Cancer will be made. 1) To determine the advantages of antispasmodic agents and rectal contrast on the image quality and diagnosis for MR examinations of the prostate and rectum. 2) To propose an efficient workflow for administering imaging enhancers. 3) To propose screening guidelines to minimize potential side effects of imaging enhancers on the patient and the imaging department.

Honored Educators

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SPSC43B The Case AGAINST the Use of Imaging Enhancers for MRI of Prostate and Rectal Cancer

Participants
Donald G. Mitchell, MD, Philadelphia, PA (Presenter) Consultant, CMC Contrast AB

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LEARNING OBJECTIVES

View learning objectives under main course title.

SPSC43C The Case FOR the Use of Imaging Enhancers for MRI of the Female Pelvis

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

LEARNING OBJECTIVES

View learning objectives under main course title.

ABSTRACT

The case to support the use of image enhancers in female pelvic MRI will be made.

Honored Educators

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educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Andrea G. Rockall, MRCP, FRCR - 2017 Honored Educator

**SPSC43D**  
**The Case AGAINST the Use of Imaging Enhancers for MRI of the Female Pelvis**

**Participants**  
Evan S. Siegelman, MD, Philadelphia, PA (Presenter) Consultant, BioClinica, Inc; Consultant, ICON plc;

For information about this presentation, contact:  
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**LEARNING OBJECTIVES**

View learning objectives under main course title.

**ABSTRACT**

Upon completion of this presentation, participants should be able to: 1. Apply principles of MR imaging to optimize female pelvic imaging protocols without the use of imaging enhancers and perform MR studies that are not inferior to MR studies performed with MR enhancers. 2. Assess the cost savings and improvement in workflow when muscle relaxants, vaginal gel and rectal gel are not administered.

**Honored Educators**

Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Evan S. Siegelman, MD - 2013 Honored Educator
**Prostate MRI (Hands-on) Course**

Prostate MRI (Hands-on) Course will be repeated Monday, Tuesday, Wednesday and Thursday from 8am-10am

**Thursday, Nov. 30 8:00AM - 10:00AM Room: S401CD**

**AMA PRA Category 1 Credits ™**: 2.00

**ARRT Category A+ Credits**: 2.25

**Participants**

Jelle O. Barentsz, MD, PhD, Nijmegen, Netherlands (Presenter) Advisor, SPL Medical BV

Jurgen J. Futterer, MD, PhD, Nijmegen, Netherlands (Presenter) Research Grant, Siemens AG

Roel D. Mus, MD, Nijmegen, Netherlands (Presenter) Nothing to Disclose

Geert M. Villeirs, MD, PhD, Ghent, Belgium (Presenter) Nothing to Disclose

Marloes van der Leest, MD, Nijmegen, Netherlands (Presenter) Nothing to Disclose

Renske L. van Delft, Nijmegen, Netherlands (Presenter) Nothing to Disclose

Rianne R. Engels, Cuijk, Netherlands (Presenter) Nothing to Disclose

Baris Turkbey, MD, Bethesda, MD (Presenter) Nothing to Disclose

Daniel J. Margolis, MD, Los Angeles, CA (Presenter) Nothing to Disclose

Antonio C. Westphalen, MD, Mill Valley, CA (Presenter) Scientific Advisory Board, 3DBiopsy LLC; Research Grant, Verily Life Sciences LLC

Philippe A. Puech, MD, Lyon, France (Presenter) Nothing to Disclose

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Lkayat@gmail.com

**LEARNING OBJECTIVES**

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

**ABSTRACT**

In this Hands-On Workshop, the participants will be able to review up to 30 multi-parametric MRI cases with various prostatic pathology using a dedicated workstation. Focus will be on the overall assessment of PI-RADS v2 category, which enables them to score the probability of the presence of a significant cancer in patients with elevated PSA and/or clinical suspicion. All cases are from daily non-academic practice, and have various levels of difficulty. The cases include: easy and difficult significant peripheral-transition- and central zone cancers, inflammation, BPH, and the most common pitfalls. Internationally renowned teachers will guide the participants during their PI-RADS v2 scoring. There will be 50 workstations available. **PLEASE NOTICE:** Based on last year's experience, we expect this course to be very popular. We only have 50 computers, and two spots per computer. Only the first 100 people will be aceted in the room. The front ows are reserved for beginners. In case you already are experienced in prostate MR: Please take a seat in the back of the room. We will not have space for any additional listeners this year. The coursebook can be found as handout to this course. Please dowload and take it with you on your tablet or other device.

**Active Handout:** Renske Lian van Delft

**RC607**

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

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

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

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

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**LEARNING OBJECTIVES**

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

**Sub-Events**

**RC607-01 mpMRI in Clinical Practice: Changes in Urology Practice Patterns in US**

Thursday, Nov. 30 8:30AM - 8:50AM Room: E450B

**Participants**
Scott Eggener, Chicago, IL (Presenter) Research Grant, Visualase, Inc Speakers Bureau, Johnson & Johnson

**LEARNING OBJECTIVES**

View learning objectives under main course title

**RC607-02 Cost-Effectiveness of Multiparametric Magnetic Resonance Imaging and Targeted Biopsy in the Diagnosis of Prostate Cancer**

Thursday, Nov. 30 8:50AM - 9:00AM Room: E450B

**Participants**
Ruth M. Dunne, MB BCH, Aclare, Ireland (Presenter) Nothing to Disclose
Wendy Ye Wang, Boston, MA (Abstract Co-Author) Nothing to Disclose
Steven Chang, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose

**PURPOSE**

The purpose of our study is to evaluate the cost-effectiveness of multiparametric magnetic resonance imaging (mp-MRI) and
targeted biopsy (MRTB) in diagnosing prostate cancer (PCa) by comparing standard transrectal ultrasound guided biopsy (TRUSGB) pathway and MRTB pathway in diagnosis of PCa and assessing whether the assessed initial costs related to MRI are balanced with the benefits of MRTB in a cost-utility model from a US perspective.

METHOD AND MATERIALS
A decision-analytic Markov model with a lifetime horizon of 10 years was developed to evaluate diagnostic accuracy, long-term health outcomes, costs, and quality-of-life of the two strategies (i.e., mp-MRI and MRTB versus TRUSGB) in men with elevated prostate-specific antigen (>4 ng/ml). Probabilities of clinical events were obtained from published literature. Direct medical costs included diagnostic and treatment-related healthcare costs were derived from the Premier Hospital Database. Costs were inflated to 2015 US dollars and discounted at an annual rate of 3%. Health outcomes were measured in quality-adjusted life years (QALYs), which were determined based on published literature and expert opinion. We calculated the incremental cost-effectiveness ratio and performed sensitivity analyses to assess uncertainty.

RESULTS
The MRTB biopsy strategy yielded a lower average discounted cost ($5,358 versus $6,372) and higher total QALYs-gained (7.21 versus 7.19) than TRUS. The reduced expenditures associated with MRTB was primarily due to avoiding intervention for clinically insignificant prostate cancer. The results were robust with the sensitivity analyses.

CONCLUSION
The mp-MRI and MRTB strategy generated lower total costs but higher QALYs than the TRUSGB strategy. Therefore, mp-MRI and MRTB was the optimal choice that provided the greatest health benefits for the diagnosis of men with suspected PCAs in the US population.

CLINICAL RELEVANCE/APPLICATION
For men in the United States with an elevated PSA, the use of MRTB in the evaluation for PCa represents a greater value than TRUSGB, the standard of care option. Widespread adoption of MRTB may serve to reduce the economic burden of PCa.

RG07-03 Addition of Standard Systematic Biopsies to Target Prostate Biopsies May Influence Treatment Choices for Patients and Clinicians

Thursday, Nov. 30 9:00AM - 9:10AM Room: E450B

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

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PURPOSE
To determine detection rate of prostate cancer (PCa) Gleason score (GS) >= 7 in the other sectors of the prostate separated from the sector containing cancer suspicious region (CSR) and to determine the necessity of performing a standard systematic prostate biopsy in addition to a target biopsy for the CSR.

METHOD AND MATERIALS
Twelve sectors of prostate were generated by dividing the prostate base, midgland, and apex into four quadrants each. A total of 102 consecutive men with elevated PSA, at least one CSR detected on mp-MRI on a sector of the prostate and no TRUS-guided biopsy within the preceding 3 years underwent MRI/US fusion-guided biopsy of CSRs and standard systematic prostate biopsy (12 cores). Histopathology results, including GS, location of cancer and percentage of tumor involving positive cores were recorded. Two experienced GU radiologists retrospectively reviewed all mp-MRI studies blindly in consensus. The assessment included but was not limited to location and PI-RADS scores of CSRs. The findings from the imaging review were correlated with the histopathology results.

RESULTS
On confirmatory MRI/US fusion-guided target biopsy, 78 of 102 patients had biopsy-proven PCa (77%). By the standard systematic biopsy, 14 of 102 patients (14%) had PCa GS >= 7 (GS 7, n=8, GS 8, n=4 and GS 9 n=2) in the sectors of the prostate other than the sector containing target lesions. Among the 14 patients, the mean percentage of the positive core of PCa for GS 7 was 45, GS 8 was 25% and GS 9 was 20%. Three of 14 patients had higher GS PCa than that of the target lesions. Retrospective review of these 14 patients’ mp-MRI studies detected 4 lesions with PI-RADS score 3 (positive for PCa GS >= 7 on TRUS biopsy) and the remaining 10 patients had corresponding normal findings.

CONCLUSION
Addition of standard systematic prostate biopsy to target biopsy detected PCa GS >= 7 in 14% of patients in the sectors of the prostate other than the sector containing target lesions. This result may influence treatment choices, particularly for those patients considering focal therapy for PCa.

CLINICAL RELEVANCE/APPLICATION
Addition of standard systematic prostate biopsy to target biopsy may be necessary in patients with no TRUS-guided biopsy within the preceding 3 years. That is because some significant prostate cancers (14%) may be sparsely distributed in the gland, resulting in negative mp-MRI.

RG07-04 Prostate cancer: Detection and Localization of Prostate Cancer on 3T Multiparametric MRI Based on
Overview and Current Impact of PI-RADS v2 in Clinical Practice

Thursday, Nov. 30 9:20AM - 9:40AM Room: E450B

Participants
Cleopatra A. Tan, MD, Los Angeles, CA (Poster Co-Author) Nothing to Disclose
Moshksar Moshk, MD, Reseda, CA (Poster Co-Author) Nothing to Disclose
David J. Jiaotiop, MD, Los Angeles, CA (Poster Co-Author) Nothing to Disclose
Ahlf, PhD, Los Angeles, CA (Poster Co-Author) Nothing to Disclose
David S. Lu, MD, Los Angeles, CA (Poster Co-Author) Nothing to Disclose
Jiaotiop Jiaotiop, PhD, Los Angeles, CA (Poster Co-Author) Nothing to Disclose
Cleo K. Maehara, MD, Brookline, MA (Poster Co-Author) Nothing to Disclose
Preeti Preeti, MD, Los Angeles, CA (Poster Co-Author) Nothing to Disclose
Nazanin H. Asvadi, MD, Los Angeles, CA (Poster Co-Author) Nothing to Disclose
William E. Reiter, MD, Los Angeles, CA (Poster Co-Author) Nothing to Disclose
Abhishek Tan, MD, Los Angeles, CA (Poster Co-Author) Nothing to Disclose
Nelly Nelly, Los Angeles, CA (Poster Co-Author) Nothing to Disclose
Amin Moshk Moshk, MD, Reseda, CA (Poster Co-Author) Nothing to Disclose
Pooria Khoshnoodi, MD, Los Angeles, CA (Poster Co-Author) Nothing to Disclose

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PURPOSE
To determine the fit and feasibility of PI-RADS v2 scoring and segmentation within whole mount histopathology (WMHP).

METHOD AND MATERIALS
With IRB approval and HIPAA compliance, the authors review and assigned PI-RADS v2 scores for 415 consecutive men with thin section WMHP. Two GU radiologists and a GU pathologist reviewed and assigned a true focus and manually mapped into the same prostate model. The rigid sector and adjust sector model were utilized to account for surgical deformation, shrinkage, and non-uniform slicing factors in pathologic specimens.

RESULTS
Overall 863 prostate cancer lesions and 16,185 prostate sectors were analyzed. There was significantly greater detection of PCa for lesions >= 1 cm (61.6% all lesions and 81.6% index lesions), higher Gleason grade lesions (GS >= 7) (71.4% all lesions, 80.9% index lesions), and lesions with GS >= 7, >=1 cm (83.3%). Adjusted tumor localization sensitivity was significantly higher than rigid tumor localization for all lesions (56.0% vs 28.5%), index lesions 55.4% vs 34.3%), GS >= 7, (55.7% vs 36) and index tumors >=1 cm (56.1% vs 35%). 3T mp-MRI had similarly high specificity (96-97.5%) for overall and index tumor localization when using both sector match approaches.

CONCLUSION
Using 3T mp-MRI and the PIRADS v2, we were able to achieve the highest sensitivity (83.3%) for detection of index tumor with GS >= 7 lesions >=1 cm with 97.5% specificity. Sectoral localization of PCa within the prostate was moderate and best with the adjusted model compared to the rigid model.

CLINICAL RELEVANCE/APPLICATION
To date this is the largest study to evaluate the performance of 3T mpMRI with WMHP correlation. We have demonstrated excellent sensitivity and specificity for significant prostate cancer detection but moderate performance for intraprostatic sectoral localization of individual PCa foci, which may have implications for focal therapy.

RC607-05 Update on Prostate Cancer Care and Role of Imaging

Thursday, Nov. 30 9:20AM - 9:40AM Room: E450B

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

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LEARNING OBJECTIVES
View learning objectives under main course title

RC607-06 Overview and Current Impact of PI-RADS v2 in Clinical Practice

Thursday, Nov. 30 9:20AM - 9:40AM Room: E450B

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

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LEARNING OBJECTIVES
View learning objectives under main course title

PI-RADS Version 2 and 39 Sector Segmentation: Correlation with Whole Mount Histopathology (WMHP)

Thursday, Nov. 30 9:10AM - 9:20AM Room: E450B

Participants
Punlee77@gmail.com

PURPOSE
To determine the performance of 3T mp-MRI for prostate cancer detection and localization by using PI-RADS v2 scoring and segmentation correlated to whole mount histopathology (WMHP).

METHOD AND MATERIALS
With IRB approval and HIPAA compliance, the authors review and assigned PI-RADS v2 scores for 415 consecutive men with thin section WMHP. Two GU radiologists and a GU pathologist reviewed and assigned a true focus and manually mapped into the same prostate model. The rigid sector and adjust sector model were utilized to account for surgical deformation, shrinkage, and non-uniform slicing factors in pathologic specimens.

RESULTS
Overall 863 prostate cancer lesions and 16,185 prostate sectors were analyzed. There was significantly greater detection of PCa for lesions >= 1 cm (61.6% all lesions and 81.6% index lesions), higher Gleason grade lesions (GS >= 7) (71.4% all lesions, 80.9% index lesions), and lesions with GS >= 7, >=1 cm (83.3%). Adjusted tumor localization sensitivity was significantly higher than rigid tumor localization for all lesions (56.0% vs 28.5%), index lesions 55.4% vs 34.3%), GS >= 7, (55.7% vs 36) and index tumors >=1 cm (56.1% vs 35%). 3T mp-MRI had similarly high specificity (96-97.5%) for overall and index tumor localization when using both sector match approaches.

CONCLUSION
Using 3T mp-MRI and the PIRADS v2, we were able to achieve the highest sensitivity (83.3%) for detection of index tumor with GS >= 7 lesions >=1 cm with 97.5% specificity. Sectoral localization of PCa within the prostate was moderate and best with the adjusted model compared to the rigid model.

CLINICAL RELEVANCE/APPLICATION
To date this is the largest study to evaluate the performance of 3T mpMRI with WMHP correlation. We have demonstrated excellent sensitivity and specificity for significant prostate cancer detection but moderate performance for intraprostatic sectoral localization of individual PCa foci, which may have implications for focal therapy.

RC607-05 Update on Prostate Cancer Care and Role of Imaging

Thursday, Nov. 30 9:20AM - 9:40AM Room: E450B

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

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LEARNING OBJECTIVES
View learning objectives under main course title
Participants
Katarzyna J. Macura, MD, PhD, Baltimore, MD (Presenter) Author with royalties, Reed Elsevier; Research Grant, Profound Medical Inc

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LEARNING OBJECTIVES
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HONORED EDUCATORS
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at:
https://www.rsna.org/Honored-Educator-Award/
Katarzyna J. Macura, MD, PhD - 2012 Honored Educator
Katarzyna J. Macura, MD, PhD - 2014 Honored Educator

RC607-07 Standard and New Quantitative MR Techniques - Added Value to PI-RADS

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

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LEARNING OBJECTIVES
View learning objectives under main course title

PURPOSE
PIRADS v2 provides a comprehensive set of minimal technical standards for the performance of prostate MRI. We assess variability in imaging facilities' adherence to the PIRADS v2 technical standards.

METHOD AND MATERIALS
90 prostate MRI examinations performed at 90 separate imaging facilities that were referred to a tertiary care center for secondary interpretation were included. All exams were performed after the release of PI-RADS v2. The image sets, DICOM headers, and outside reports were reviewed to assess adherence to PI-RADS v2 minimum technical requirements. Comparisons were performed using Fisher's exact test.

RESULTS
The distribution of vendors was: 44% Siemens, 38% General Electric, 16% Phillips and 2% Toshiba. 25% were performed at 1.5T with a pelvic coil, 9.1% at 1.5T with an endorectal coil, 63% at 3T with a pelvic coil, and 3% at 3T with an endorectal coil. Adherence to PI-RADS v2 technical standards for T2WI: slice thickness (ST) <=3mm, 78%; no inter-slice gap, 53%; FOV 120-200mm, 82%; frequency resolution <=4mm, 0%; phase resolution <=0.7mm, 39%. Adherence for DWI (performed by 94% of facilities): TR>=3000ms, 91%; TE<=90ms, 73%, ST<=4mm, 91%; no inter-slice gap, 62%; FOV 120-220mm, 27%; frequency resolution <=2.5mm, 91%; phase resolution <=2.5mm, 77%. Among those performing DWI, 25% acquired two b-values, 58% three b-values, 12% four b-values, and 6% five or more b-values. 98% acquired a low b-value, 58% an intermediate b-value, 91% a high b-value, and 58% a very high b-value (e.g., >=1400; calculated in 15%); 99% calculated an ADC map. Adherence for DCE (performed by 91%): TR<=100ms, 100%; TE<=5ms, 100%, ST<=3mm, spatial resolution <=2mm, 98%, phase resolution <=2mm, 89%. Median DCE duration was 4.6 min (range, 1.3-11.2 min; >2min (minimum standard) in 93%. Temporal resolution was <10sec (minimum standard) in 21% and <7sec (preferred standard) in 11%. Studies performed at 3T were significantly more likely (p<0.05) to adhere to a number of minimal technical standards (e.g., T2WI phase resolution and DWI inter-slice gap).

CONCLUSION
Facilities' adherence to PI-RADS v2 technical standards was variable, being particularly poor for various T2WI parameters and for DCE temporal resolution.

CLINICAL RELEVANCE/APPLICATION
Greater community education regarding the PI-RADS v2 minimum technical standards is warranted. In certain circumstances, the standards may be too stringent, and revisions should be considered.
PURPOSE
To evaluate the safety and effectiveness of Magnetic Resonance guided Focused Ultrasound (MRgFUS) ablation in patients with organ-confined intermediate risk prostate cancer in order to postpone or eliminate the need of definitive treatment (i.e. Radical Prostatectomy or Radiation therapy).

METHOD AND MATERIALS
This prospective single-arm study enrolled 16 patients, aged 50-74 years, with histologically proven organ-confined intermediate risk prostate cancer. Inclusion criteria for participation: Gleason score \( \leq 7 \) (=3+4 or 4+3, no grade 5 pattern), T1-T2b, N0, M0 stage, PSA \( \leq 20 \) ng/ml, lesion visible to dynamic contrast enhanced (DCE) MR imaging and no previous prostatic surgery, radiation therapy or androgen deprivation therapy. All patient underwent pre-treatment DCE (Gd-BOPTA, Bracco) MR examination (Discovery 750, GE) and MRgFUS treatment with ExAblate (InSightec). Safety of treatment was determined by evaluation of the incidence and severity of device related complications while clinical efficacy was evaluated monitoring MR imaging changes and PSA levels at 3, 6 and 12-months.

RESULTS
1 patient reported urinary incontinence while 2 patients referred erectile dysfunction after MRgFUS treatment. DCE MR imaging at 3, 6 and 12 months showed no recurrence/residual disease in treated patients. According to imaging, laboratory exams showed a progressive decrease of PSA level from an average value of 17.1 ng/ml before treatment to 2.2 ng/ml at 12 months follow-up. No one patient needed definitive treatment so far and can be considered free of clinically significant prostate cancer.

CONCLUSION
MR guided Focused Ultrasound appears as a safe and effective treatment for patients with organ-confined intermediate risk prostate cancer and can reduce the need of definitive treatment (i.e. Radical Prostatectomy or Radiation therapy).
RESULTS

Of all participants 314 (52%) had PCa, and 178 (57%) of these were clinically significant PCa. mpMRI was positive (PIRADS 3-5) in 303 men (51%). With TRUS-GB 146 (24%) insignificant PCa’s were detected, with the MRI strategy 80 (13%). TRUS-GB detected 134 (22%) clinically significant PCa’s which about equal to MRI: 149 (25%).

CONCLUSION

This prospective multicenter powered trial shows that using mpMRI reduces the number of men who need biopsy with 49%, and only detects in 13% a clinically insignificant PCa, versus TRUS-GB in 24%. The detection of significant PCa is slightly better with mpMRI: 25% vs 22% with TRUS.

CLINICAL RELEVANCE/APPLICATION

The superior performance of MRI in this large study can alter the diagnostic workup of biopsy naive men with elevated PSA. Less will need biopsy and in only 13% insignificant cancers are detected.

RFC607-12  MRI-Guided Transurethral Ultrasound Ablation in Patients with Localized Prostate Cancer: State of the Art

Thursday, Nov. 30 11:30AM - 11:40AM Room: E450B

Participants

David Bonekamp, MD, PhD, Heidelberg, Germany (Presenter) Speaker, Profound Medical Inc
Sandeep S. Arora, MBBS, Nashville, TN (Abstract Co-Author) Speaker, Profound Medical Inc; Researcher, Profound Medical Inc
Masoom A. Haider, MD, Toronto, ON (Abstract Co-Author) Consultant, Bayer AG; Advisory Board, Siemens AG
Zahra Kassam, MD, London, ON (Abstract Co-Author) Nothing to Disclose
Gary L. Brahms, BMedSc, MD, London, ON (Abstract Co-Author) Nothing to Disclose
Jurgen J. Futterer, MD, PhD, Nijmegen, Netherlands (Abstract Co-Author) Research Grant, Siemens AG
Maya B. Mueller-Wolf, MD, Heidelberg, Germany (Abstract Co-Author) Nothing to Disclose
Kirin R. Nandalur, MD, Bloomfield Hills, MI (Abstract Co-Author) Nothing to Disclose
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Gencay Hatiboglu, Heidelberg, Germany (Abstract Co-Author) Nothing to Disclose
Markus Hohenfellner, MD, PhD, Heidelberg, Germany (Abstract Co-Author) Nothing to Disclose
Heinz-Peter W. Schlemmer, MD, Heidelberg, Germany (Abstract Co-Author) Nothing to Disclose

PURPOSE

MRI-guided transurethral ultrasound ablation (TULSA) is a novel minimally-invasive technology for ablation of malignant and benign prostate tissue, aiming to provide control of localized prostate cancer (PCa) with low morbidity. A prospective Phase I clinical study investigated safety and feasibility of TULSA; 12-month data have been published, and 30-month follow-up is presented here. Additionally, initial results are described from a larger Pivotal study (TACT) which is currently underway to evaluate the safety and efficacy of TULSA whole-gland ablation.

METHOD AND MATERIALS

Thirty PCa patients were enrolled in the Phase I trial: age>=65y, T1c/T2a, PSA<=10ng/ml, Gleason=<3+3 (3+4 in Canada only). Under general anaesthesia and 3T MRI guidance, the ultrasound device (TULSA-PRO, Profound Medical Inc.) was positioned in the prostatic urethra. Treatment planning was performed with 3mm margins at the gland periphery, and 10% residual viable prostate expected around the capsule. Treatment was delivered under continuous MRI thermometry feedback control. In the Pivotal trial, treatment planning has been adjusted to reduce residual viable prostate to <1%. To-date, 20 PCa patients have been enrolled in the TACT study: age 45-80y, <=T2b, PSA<=15ng/ml, Gleason<=3+4.

RESULTS

In Phase I, median (IQR) age was 69 (67-71) years and PSA 5.8 (3.8-8.0) ng/ml. Median PSA decreased 87% at 1 month, stable to 0.8 (0.6-1.1) ng/ml at 12 months (n=30), and to 0.7 (0.5-1.1) ng/ml at 30 months (n=15). MRI at 12 months shows diminutive prostates with median volume reduction of 88% (83-95%). In the first 16 TACT study patients, age was 64 (60-66) years and PSA 6.2 (5.4-7.1 ng/ml), with 53% low-risk and 47% intermediate-risk cancers (D’Amico). Spatial control of ablation was ±1.5mm on MRI thermometry, and correlated well with the non-perfused volume confirmed on CE-MRI immediately after treatment.

CONCLUSION

MRI-guidance enables accurate treatment planning, real-time dosimetry and control of the thermal ablation volume. Phase I data demonstrate safety and tissue ablation performance of TULSA. A larger TULSA trial with reduced safety margins is currently enrolling patients.

CLINICAL RELEVANCE/APPLICATION

Whole-gland ablation can be safely and accurately achieved using MRI-guided TULSA, which represents a minimally-invasive treatment option for organ-confined prostate cancer.

RFC607-13  MR Guided Focal Therapy for Prostate Cancer: The Approaches and New Guidelines

Thursday, Nov. 30 11:40AM - 12:00PM Room: E450B

Participants

Jurgen J. Futterer, MD, PhD, Nijmegen, Netherlands (Presenter) Research Grant, Siemens AG

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LEARNING OBJECTIVES

View learning objectives under main course title
Participants
Leslie M. Scoutt, MD, New Haven, CT (Moderator) Speaker, Koninklijke Philips NV

SAM
New in 2017: PLEASE NOTE - All courses designated for SAM credit at RSNA 2017 will require attendees bring a personal device e.g. phone, iPad, laptop to complete the required test questions during the live session.

Sub-Events
RC608A  Hepatobiliary Ultrasound Pitfalls
Participants
Leslie M. Scoutt, MD, New Haven, CT (Presenter) Speaker, Koninklijke Philips NV
For information about this presentation, contact:
leslie.scoutt@yale.edu
LEARNING OBJECTIVES
1) Discuss common pitfalls encountered during US examination of the patient presenting with acute abdominal pain. 2) Discuss pitfalls in interpretation of common findings such as gallbladder wall thickening. 3) Review US diagnosis of some uncommon and easily overlooked causes of acute abdominal pain.

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Leslie M. Scoutt, MD - 2014 Honored Educator

RC608B  Pediatric Abdominal Sonography Pitfalls
Participants
Susan D. John, MD, Houston, TX (Presenter) Nothing to Disclose
For information about this presentation, contact:
susan.d.john@uth.tmc.edu
LEARNING OBJECTIVES
1) Plan safe and effective imaging protocols for pediatric gastrointestinal conditions using ultrasound. 2) Avoid pitfalls of US of the gastrointestinal tract in children by using best practices. 3) Recognize potentially confusing ultrasound findings of various pediatric abdominal conditions.

RC608C  Non-obstetrical Gynecologic Ultrasound Pitfalls
Participants
Ana P. Lourenco, MD, Providence, RI (Presenter) Nothing to Disclose
LEARNING OBJECTIVES
1) Recognize gynecologic US pitfalls. 2) Describe strategies to avoid pitfalls.

RC608D  First Trimester Sonographic Pitfalls
Participants
Mariam Moshiri, MD, Seattle, WA (Presenter) Grant, Koninklijke Philips NV; Author, Reed Elsevier
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moshiri@uw.edu
LEARNING OBJECTIVES
1) Learn how to evaluate a fetus during first trimester imaging. 2) Learn which fetal abnormalities can be detected in the first trimester. 3) Learn pitfalls to avoid while imaging a first trimester pregnancy.
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Mariam Moshiri, MD - 2013 Honored EducatorMariam Moshiri, MD - 2015 Honored Educator
**Superficial Ultrasound**

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

**AMA PRA Category 1 Credits ™:** 1.50

**ARRT Category A+ Credit:** 1.75

**LEARNING OBJECTIVES**

1) Describe the normal anatomy of the scrotum.
2) Describe common mass-like pathologic conditions of the scrotum.
3) Describe the significance and management of testicular microlithiasis.

**ABSTRACT**

This didactic lecture will review proper sonographic technique for scrotal examination, review normal anatomy of the scrotum as demonstrated by ultrasound, and will then progress to a description of the common pathologic and normal conditions that may present as a scrotal mass.

N.B. Dr Benson is running this course, and there are 2 other presenters. Thus, please follow Dr. Benson's wishes and remove my objectives and abstract if she so desires and replace with whatever else she prefers. Thanks.

**Active Handout:** Thomas Charles Winter


**RC610B**  
**Just Below the Surface**

Participants
Howard T. Heller, MD, Boston, MA (Presenter) Stockholder, Baxter International Inc; Stockholder, The Cooper Companies, Inc

**LEARNING OBJECTIVES**

1) To understand and use the most current ultrasound examination techniques for imaging superficial soft tissue structures.
2) To recognize normal anatomy of soft tissue structures.
3) To appreciate the utility of high frequency ultrasound in detecting pathologic processes of the superficial soft tissues and formulate appropriate differential diagnoses.

**RC610C**  
**Art of Diagnosing Subtle Groin Hernias: Simple Protocol, Pearls and Pitfalls**

Participants
Girish Gandikota, MBBS, Ann Arbor, MI (Presenter) Nothing to Disclose

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ggirish@med.umich.edu

**LEARNING OBJECTIVES**

1) Describe the sonographic technique/protocol of evaluating hernias.
2) Identify sonographic features which help differentiate direct, indirect and femoral hernias.
3) Understand some of the common pitfalls encountered when using sonography to evaluate groin hernias.

**ABSTRACT**

Groin hernias are common, often presenting with inguinal discomfort, pain and sometimes with a lump. Ultrasound is a useful means for making a definite diagnosis. Ultrasound is most helpful in diagnosing Subtle hernias which are often difficult to diagnose clinically. Understanding the sonographic anatomy of the inguinal canal and femoral triangle and dynamic evaluation using Valsalva, is the key to diagnosing different types of groin hernias. However, there are a number of concepts which help the practitioner maximize the utility of the technique, including understanding the relationship between the deep ring and the inferior epigastric artery, and being aware of the pitfalls like the ‘thin man’ pitfall and the normal movement of the spermatic cord, to name a few.
Emerging Technology: Contrast Enhanced Ultrasound—Opportunities and Challenges

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

GI  GU  US

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

Discussions may include off-label uses.

Participants
David T. Fetzer, MD, Dallas, TX (Moderator) Nothing to Disclose

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LEARNING OBJECTIVES
1) Briefly introduce contrast-enhanced ultrasound (CEUS) imaging techniques, and the pharmacology of these unique agents. 2) Discuss how CEUS has been adopted by the ACR LI-RADS as a technique for the definitive diagnosis of HCC. 3) Examine the use of CEUS in trouble-shooting renal masses and in imaging of the genitourinary tract. 4) Explore how CEUS can enhance ultrasound-guided procedures, and may be used to monitor tumors following ablation. 5) Consider the major emerging clinical applications and where current research efforts may be directing these techniques into the future.

ABSTRACT
Contrast-enhanced ultrasound (CEUS) has been recognized world-wide as a robust tool that can be applied in a variety of clinical situations, particularly given its high safety profile. With the recent FDA approval of one agent for use in liver imaging in adults, and hepatic and urological imaging in pediatrics, there has been increased acceptance and use of these techniques throughout the country. However, CEUS is not limited to the liver-the use of ultrasound contrast in a range of pathologies and situations is also possible and with a variety of agents, off-label. This session will cover the opportunities and challenges in CEUS, including a brief introduction into these unique contrast agents and the imaging techniques utilized; how CEUS has been adopted by LI-RADS in the definitive diagnosis on HCC; the growing experience in renal mass characterization and collecting system imaging; how contrast may be used as a problem-solving tool and in ultrasound-guided procedures; and finally where CEUS techniques and agents may be headed in the future.

Sub-Events

RC617A  CEUS: A Brief Introduction
Participants
David T. Fetzer, MD, Dallas, TX (Presenter) Nothing to Disclose

For information about this presentation, contact:
David.Fetzer@UTSouthwestern.edu

LEARNING OBJECTIVES
1) Briefly introduce ultrasound microbubble agent formulation and pharmacology. 2) Discuss the unique imaging techniques required for contrast-enhanced ultrasound (CEUS). 3) Highlight ultrasound contrast agent safety profile and contraindications.

RC617B  CEUS: Liver Imaging & LI-RADS (Liver Imaging Reporting and Data System)
Participants
Yuko Kono, MD, PhD, San Diego, CA (Presenter) Equipment support, Toshiba Medical Systems Corporation; Equipment support, General Electric Company; Equipment support, Lantheus Medical Imaging, Inc

For information about this presentation, contact:
ykono@ucsd.edu

LEARNING OBJECTIVES
1) To learn CEUS LI-RADS will standardize technique, data collection interpretation and reporting of CEUS exams on patients at risk for HCC. 2) To learn how to apply CEUS LIRADS v2017 algorithm.

RC617C  CEUS: Renal Mass and Collecting System Imaging
Participants
Stefanie Weinstein, MD, San Francisco, CA (Presenter) Nothing to Disclose

For information about this presentation, contact:
Stefanie,Weinstein@ucsf.edu
LEARNING OBJECTIVES

1) Review common indications and guidelines for performing renal CEUS. 2) Illustrate how CEUS can help troubleshoot and improve diagnosis of renal pathology. 3) Discuss the evolving role of CEUS beyond the kidney in the non-pediatric GU tract.

Active Handout: Stefanie Weinstein


RC617D CEUS: Procedure Guidance and Post-Ablation Assessment

Participants
Hisham A. Tchelepi, MD, Los Angeles, CA (Presenter) Research Grant, General Electric Company Research Grant, Roper Industries, Inc

LEARNING OBJECTIVES

1) To review clinical applications of contrast-enhanced ultrasound in interventional procedure guidance and post-ablation tumor monitoring.

RC617E CEUS: What Have We Learned and Where are We Heading

Participants
Robert F. Mattrey, MD, Dallas, TX (Presenter) Nothing to Disclose

For information about this presentation, contact:
Robert.Mattrey@UTSouthwestern.edu

LEARNING OBJECTIVES

1) Recite the major accomplishments since the ultrasound contrast effort began. 2) Understand the dominant interaction of sound and ultrasound contrast media. 3) Understand the source of ultrasound contrast signal. 4) Current salient clinical applications. 5) Future direction and major research efforts.
PARTICIPANTS

Elizabeth A. Sadowski, MD, Madison, WI (Moderator) Nothing to Disclose
Evis Sala, MD, PhD, New York, NY (Moderator) Nothing to Disclose

SUB-EVENTS

SSQ10-01 Genitourinary Keynote Speaker: The Added Value of MRI in Evaluation of Gynecological Malignancies

Thursday, Nov. 30 10:30AM - 10:40AM Room: E353B

Participants
Evis Sala, MD, PhD, New York, NY (Presenter) Nothing to Disclose

SSQ10-02 Clinical Application of PET/MR in Staging of Cervical Cancer and Diagnosis of Pelvic Lymph Node Metastasis

Thursday, Nov. 30 10:40AM - 10:50AM Room: E353B

Participants
Hongzan Sun, Shenyang, China (Presenter) Nothing to Disclose
Jin Shang, Shenyang, China (Abstract Co-Author) Nothing to Disclose
Jun Xin, Shenyang, China (Abstract Co-Author) Nothing to Disclose
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Qiyong Guo, MD, Shenyang, China (Abstract Co-Author) Nothing to Disclose

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sunhz@sj-hospital.org

PURPOSE

The present study aimed to evaluate the clinical value of PET/MR in the staging of cervical cancer and diagnosis of pelvic lymph node metastasis.

METHOD AND MATERIALS

Seventy patients with cervical cancer were prospectively enrolled. Pelvic PET/MR scan and whole-body PET scan were performed before treatment. All images were evaluated by two experienced radiologists using a randomized, double-blind method. The diagnostic consistency of PET/MR staging, clinical staging, and gold standard staging of cervical cancer was evaluated with the Kappa consistency test, and the diagnostic consistency between each two methods was calculated. The difference between PET/MR staging and clinical staging was evaluated with the paired chi-square test (P<0.05). The value of PET/MR in the diagnosis of pelvic lymph node metastasis of cervical cancer was analyzed using diagnostic consistent rate, sensitivity, specificity, positive predictive value, and negative predictive value. The statistical software SPSS 19.0 was used in the analyses.

RESULTS

The consistency between PET/MR staging and the gold standard method for the diagnosis of cervical cancer was 91.43%. Kappa analysis indicated that the consistency between PET/MR staging and gold standard staging was satisfactory (kappa = 0.908). The consistency between clinical staging and gold standard staging of cervical cancer was fair (Kappa = 0.542). There was a significant difference between pre-treatment PET/MR staging and clinical staging (X² = 9.278, P<0.05). In the patient-based analysis, the accuracy of PET/MR diagnosis of pelvic lymph node metastasis was 95.71%, sensitivity was 95.65%, and specificity was 95.74%. In the lymph node-based analysis, the accuracy, sensitivity, and specificity of PET/MR diagnosis were 97.61%, 92.16%, and 98.13%, respectively.

CONCLUSION

The diagnostic value of PET/MR for the staging of cervical cancer is significantly superior to clinical staging, and the former can be used as a one-stop diagnostic method for cervical cancer by accurately diagnosing and identifying pelvic lymph node metastasis.

CLINICAL RELEVANCE/APPLICATION

PET/MR without gadolinium administration will stage cervical cancer and identify pelvic lymph node metastasis accurately, and is strongly recommended as a one-stop diagnostic method in cervical cancer.

SSQ10-03 How to Differentiate Benign Atypical Myomas from Malignant Uterine Sarcomas Using MR Imaging

Thursday, Nov. 30 10:50AM - 11:00AM Room: E353B
Accuracy of Time Intensity Curves Generated From 4-Point DCE MRI in Differentiating Benign and Malignant Adnexal Lesions

Thursday, Nov. 30 11:10AM - 11:20AM Room: E353B

PURPOSE
To retrospectively evaluate MRI charateristics to differentiate malignant uterine sarcomas from benign myomas with atypical presentation on MRI.

METHOD AND MATERIALS
IRB-approved monocentric case-control study including 113 women (51 sarcomas and 62 atypical myomas) with an atypical uterine mass on MRI were underwent before surgery. Clinical and MRI data (heterogeneity on T2-weighted and diffusion sequences, ADC and perfusion curves relative to outer myometrium) were collected and compared with pathological findings.

RESULTS
Only 50% of sarcomas presented as a single uterine mass. Predictive criterias for malignancy were age (64 vs 48 years, p <0.0001), menopausal status (84% vs 20%, p <0.0001, OR = 20.82), irregular contours (73% vs 5%, p <0.0001; OR = 46.69), intra-tumoral hemorrhage (38% vs 13%, p = 0.003), high signal greater than the endometrium on DWI (100% vs 16%, p <0.0001 OR = 12.01), ADC (0.7 vs 1, 2.10-3 mm² / s, p <0.0001). Conversely, the presence of a portion, even partial, with low T2 signal or a type I perfusion curve had a VPN of 100% (p <0.0001).

CONCLUSION
Beyond the previously known clinical and morphologic criteria, adding functional sequences on MRI better differentiates malignant sarcomas from atypical myomas.

CLINICAL RELEVANCE/APPLICATION
Diffusion and perfusion MRI sequences may allow better predicting malignancy when facing an atypical uterine mass, to guide optimal therapeutic management.

SSQ10-05 Accuracy of Time Intensity Curves Generated From 4-Point DCE MRI in Differentiating Benign and Malignant Adnexal Lesions

Thursday, Nov. 30 11:10AM - 11:20AM Room: E353B

Participants
Vi Thuy Tran, MD, Montreal, QC (Presenter) Nothing to Disclose
Sandra M. Nino, MD, Bogota, Colombia (Abstract Co-Author) Nothing to Disclose
Maria Tsatoumas, MD, Outremont, QC (Abstract Co-Author) Nothing to Disclose
Sameh Saif, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
Benoit P. Gallix, MD, PhD, Montpellier, France (Abstract Co-Author) Nothing to Disclose
Anthony Dohan, MD, PhD, Montreal, QC (Abstract Co-Author) Consultant, GlaxoSmithKline plc

PURPOSE
To assess the accuracy of time intensity curves (TIC) generated from 4-point dynamic contrast-enhanced magnetic resonance imaging (DCE MRI) in differentiating benign and malignant ovarian lesions with solid tissue.

METHOD AND MATERIALS
Patient consent was waived by the Ethics Review Board for this retrospective study. From April 2006 to January 2017, 98 patients with ovarian DCE MRI studies with evidence of solid tissue at MRI were included (45 benign, 10 borderline and 43 malignant lesions). Semiquantitative analysis of signal intensity (SI) over time curves was performed using region-of-interest on the most enhancing solid tissue. TICs were classified according to three patterns of enhancement: a minimal increase with no well-defined shoulder ‘type 1, benign.’ A moderate initial rise in the SI of solid tissue relative to myometrium ‘type 2, borderline.’ An initial rise in the SI of solid tissue that was equal or steeper than myometrium ‘type 3, malignant’. In patients with hysterectomy (n=11), the lesion SI was normalized to psoas and compared to a standard normalized myometrium curve. Standard of reference was histopathology in all patients.

RESULTS
Accuracy, sensitivity, specificity, PPV, and NPV of TIC for differentiating benign from malignant/borderline tumors was 85.9%, 96.2%, 74.5%, 80.6% and 94.6% respectively. TIC yielded comparable results to prospective clinical radiological diagnosis using standard morphological assessments (acc 85.7%, sens 93.9%, spec 80.0%, PPV 76.7%, NPV 94.9%). However, out of the 12 misdiagnosed patients during the clinical reads, (2 false negatives, 10 false positives), TIC was able to accurately reclassify 6 of them, resulting in an overall acc 93.9%, sens 100%, spec 87.5%, PPV 89.3%, NPV 100%.

CONCLUSION
The enhancement patterns of ovarian lesions on 4-point DCE MRI can help distinguish between benign and borderline/malignant tumors. Although pharmacokinetic parameters have been proposed by research-based groups, they have not been widely adopted or validated in the clinic. TIC based on 4-point DCE MRI can be a useful adjunct to standard qualitative morphological reads, with
Amide Proton Transfer Imaging of Early Radiotherapy Response in High-Risk HPV+ Gynecologic Cancer

Thursday, Nov. 30 11:20AM - 11:30AM Room: E353B

Participants
Kyle M. Jones, PhD, Houston, TX (Abstract Co-Author) Nothing to Disclose
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Aradhana M. Venkatesan, Houston, TX (Presentation) Grant, Toshiba Medical Systems Corporation; ;

PURPOSE
HPV-associated gynecologic cancers are treated primarily with radiation, with cervical cancer being the most common cancer among women in the developing world. Anatomical MRI can be challenging to interpret following radiation when the morphological appearance of residual or early recurrent tumor tissue mimics post-radiotherapy inflammation and/or fibrosis. Amide proton transfer (APT) MRI, a subset of chemical exchange saturation transfer (CEST) MRI, has the potential to provide molecular information regarding tissue pH and mobile protein content, which may be beneficial in distinguishing radiation necrosis from recurrent disease. Necrotic lesions should demonstrate less cytosolic protein and peptide content as a result of the loss of cytoplasm compared to viable tumor tissue. We investigated the prognostic value of APT MRI following radiotherapy in a murine model of high risk HPV+ cervical cancer.

METHOD AND MATERIALS
A clinically relevant HPV+ orthotopic cervical cancer model was developed that expresses the E6 and E7 oncogenes of HPV-16 and the Ras oncogene. 4 animals received 9 Gy radiation and were imaged on days -1 and +1. A CEST-RARE pulse sequence was used with a 3 second saturation period consisting of a 2.0 uT continuous wave saturation pulse. 40 saturation frequencies between +5 and -5 ppm were acquired to generate a CEST spectrum in 8 minutes on a 7T Bruker MRI (Bruker Corporation, Billerica MA). Pixelwise analyses of magnetization transfer asymmetry (MTRasym) was performed to measure mobile protein content.

RESULTS
Preliminary results show that MTRasym measurements decreased the day after radiation treatment indicating a decrease in mobile protein content. This result supports the hypothesis that necrotic lesions have less cytosolic protein content than viable tumor, which can be detected with APT MRI.

CONCLUSION
Initial results indicate that as early as one day after radiation treatment, APT MRI can be used to distinguish necrotic tissue vs. viable tumor through a decrease in MTRasym. Additional mice will be imaged to confirm this trend and determine statistical significance.

CLINICAL RELEVANCE/APPLICATION
These findings may be beneficial to clinicians in identifying a new functional MRI technique to monitor early radiotherapy response of HPV+ gynecologic cancers.

Preoperative Tumor Texture Analysis from MRI Predicts High-Risk Status and Reduced Survival in Endometrial Carcinomas

Thursday, Nov. 30 11:30AM - 11:40AM Room: E353B

Participants
Sigmund Ytre-Hauge, MD, Bergen, Norway (Presenter) Nothing to Disclose
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Ingfrid S. Haldorsen, MD, Bergen, Norway (Abstract Co-Author) Nothing to Disclose

PURPOSE
Tumor heterogeneity is a key feature of malignant disease. Heterogeneity at MRI can be quantified by texture analysis. We aimed to explore whether high-risk clinical and histological features in endometrial cancer are reflected in tumor texture parameters from preoperative MRI, and to assess the prognostic value of tumor texture parameters.

METHOD AND MATERIALS
Preoperative pelvic MRI (1.5T) including contrast-enhanced (CE) T1-weighted, T2-weighted and diffusion-weighted imaging was
performed in 180 patients with histologically confirmed endometrial carcinomas. Using the software TexRAD, tumor regions of interest (ROIs) were manually drawn on the slice displaying the largest cross-section tumor area. Histogram based texture parameters (standard deviation, entropy, mean of positive pixels (Mpp), skewness and kurtosis) were calculated from these tumor ROIs on non-filtered and filtered images. The derived texture parameters were included in multivariate logistic regression models assessing their predictive value for identifying high tumor grade, deep myometrial invasion (DMI), cervical stroma invasion (CSI) and lymph node metastases. Preoperative histological risk from biopsy, conventional MRI findings and MRI-measured tumor volume were included as covariates, and the best cutoff values of texture parameters were determined by ROC curve analysis. Multivariate Cox regression was used for survival analysis.

RESULTS
High entropy in ADC-maps independently predicted DMI (OR 5.1, p=0.001), low Mpp in T2 images independently predicted CSI (OR 3.5, p=0.01) and high Mpp in CE T1 images independently predicted high grade (OR 3.5, p=0.005). High kurtosis in CE T1 images independently predicted reduced recurrence- and progression-free survival (HR 1.5, p=0.001). Different levels of filtration, including no filtration, were represented among the high ranked texture parameters.

CONCLUSION
MIR derived tumor texture parameters, reflecting tumor heterogeneity, independently predict high tumor grade, deep myometrial invasion, cervical stroma invasion and reduced survival in endometrial carcinomas. Thus, tumor texture parameters based on MRI represent promising biomarkers to aid preoperative tumor characterization for risk stratified surgical treatment.

CLINICAL RELEVANCE/APPLICATION
Tumor texture features at MRI are associated with high-risk phenotype and may aid preoperative risk classification for stratified surgery in endometrial cancer.

SSQ10-09 Machine Learning to Differentiate Uterine Sarcoma from Leiomyoma with High Signal Intensity on T2-Weighted Imaging Based on Multi-Parametric Magnetic Resonance Quantitative Imaging Features

Participants
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Yasuyuki Yamashita, MD, Kumamoto, Japan (Abstract Co-Author) Consultant, DAIICHI SANKYO Group

PURPOSE
To determine whether a prediction model using machine learning based on quantitative multi-parametric magnetic resonance imaging (MRI) features has adequate diagnostic performance for differentiating uterine sarcomas from benign leiomyomas with high signal intensity on T2-weighted imaging (T2WI).

METHOD AND MATERIALS
This retrospective study was approved by the institutional review board. The need for informed consent was waived. We included 62 patients who underwent pelvic 3T MRI examination for evaluation of uterine myometrial smooth muscle masses with high signal intensity on T2WI. Of the 62 patients, 38 had benign leiomyoma and 24 had uterine sarcoma. Age, tumor size, and 12 histogram and texture parameters (minimum, mean, standard deviation of, and maximum normalized signal; skewness; kurtosis; homogeneity; energy; contrast; correlation; entropy; and dissimilarity) were assessed on T1WI, T2WI, ADC maps, and contrast-enhanced T1WI. We developed a prediction model with machine learning (extreme gradient boosting) and calculated the area under the receiver operating characteristic curve (AUC) of this model by 10-fold cross validation, and compared the performance of this model with two board-certified radiologists.

RESULTS
Age had the highest importance (leiomyoma, 43.8±9.9; sarcoma, 59.2±15.5; p=0.0001), followed by the minimum normalized T2 signal (leiomyoma, 0.35±0.45; sarcoma, 0.82±0.54; p=0.0009), ADC skewness (leiomyoma, 0.33±0.85; sarcoma, 0.86±0.89; p=0.0237), mean ADC (leiomyoma, 1.56±0.40; sarcoma, 1.29±0.33; p=0.0057), and T2WI correlation (leiomyoma, 0.86±0.08; sarcoma, 0.91±0.04; p=0.0041). In the validation analysis, the AUC of the machine learning is significantly higher than two radiologists (0.92 vs. 0.75 and 0.64, respectively; p<0.001).

CONCLUSION
Age was the most important factor for differentiation of uterine sarcoma from leiomyoma with high signal intensity on T2WI. The performance of machine learning was superior to that of experienced radiologists.

CLINICAL RELEVANCE/APPLICATION
Machine learning based on patient age and the texture of multi-parametric MRI has adequate diagnostic performance for differentiating uterine sarcoma from myoma with high signal intensity on T2WI.
Development and Validation of Biparametric MRI Followed by Targeted Biopsy in Men with a Clinical Suspicion of Prostate Cancer: IMPROD and Multi-IMPROD Clinical Trials

Station #1

Participants
Elizabeth A. Sadowski, MD, Madison, WI (Moderator) Nothing to Disclose

Sub-Events
GU270-SD-THA1  Development and Validation of Biparametric MRI Followed by Targeted Biopsy in Men with a Clinical Suspicion of Prostate Cancer: IMPROD and Multi-IMPROD Clinical Trials

Participants
Ivan Jambor, MD, Turku, Finland (Presenter) Speakers Bureau, Koninklijke Phillips NV
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Peter Bostrom, Turku, Finland (Abstract Co-Author) Nothing to Disclose

PURPOSE
To develop and validate biparametric MRI (bpMRI) and bpMRI targeted TRUS-guided biopsy in men with a clinical suspicion of prostate cancer.

METHOD AND MATERIALS
Between March 2013 and March 2017, 494 men with elevated PSA (2.5 - 20.0 ng/ml) were offered bpMRI examination prior to a systematic 12 core biopsy (SB) at four centers (NCT01864135, NCT02241122). bpMRI was performed using surface array coils at 3 Tesla (3 centers) or 1.5 Tesla (1 center), which consisted of T2-weighted imaging (T2w) and three separate diffusion weighted imaging (DWI) acquisitions (5 b values 0-500 s/mm2, 2 b values 0-1500 s/mm2, 2 b values 0-2000 s/mm2). All bpMRI were reported centrally and approved by one reader before biopsy. If a suspicious lesion was present (Likert score 3-5), a maximum of two lesions per men were targeted and each lesion was targeted with two TB cores. Clinically significant prostate cancer (SPCa) was defined as a Gleason score of 3+4 or higher.

RESULTS
Ninety two percent of enrolled men (455/494) completed bpMRI and the subsequent biopsy procedure. Prostate cancer and SPCa were diagnosed in 283 (62%) and 206 (43%) men, respectively. Fifty-five (12%), 42 (9%), 86 (19%), 73 (16%), and 199 (44%) men presented with Likert scores of 1, 2, 3, 4, and 5, respectively. Performing biopsy only in men with Likert scores of 3-5 or 4-5 would have resulted in a 21% (358/455) or 40% (272/455) reduction in the number of men undergoing biopsy while missing only 6 (1%) or 14 (3%) of the men with SPCa, respectively. The corresponding values for a Gleason score >3+4 are 0 and 7 (2%) men, respectively. Negative predictive values for SPCa using a Likert score 3-5 or Likert 4-5 cut-off are 94% and 93%. In men with a Likert score 3-5 (n=358), the addition of SB to TB resulted in the detection of SPCa in 19 (4%, 19/455) men while SPCa was diagnosed in the TB cores of only 30 (7%, 30/455) men (p<0.05).

CONCLUSION
Our newly developed biparametric MRI, consisting of T2w and three separate DWI acquisitions, has a high negative predictive value for SPCa and could be used to identify men who would benefit from biopsy while limiting unnecessary biopsy procedures.

CLINICAL RELEVANCE/APPLICATION
Biparametric MRI, consisting of T2-weighted imaging and three separate diffusion weighted imaging acquisitions, can significantly limit the number of unnecessary biopsy procedures.
Sensitivity, specificity, and NPV associated with a nomogram cutoff < 15% were 92.6%, 66.8%, and 95.0%, respectively. cutoff < 15%, 80 of 167 patients (47.9%) may be spared LN dissection, and LNM were missed in only 4 (5.0%) for two radiologists.

RESULTS of nomogram.

Area under the curve (AUC), bootstrap-corrected AUC, cutoff, sensitivity, specificity, and negative predictive value (NPV) were analyzed from the predicted probabilities of two radiologists using multivariate logistic regression with generalized estimating equation. AUC and bootstrap-corrected AUC of the nomogram were 0.871 and 0.849, respectively. Using a nomogram cutoff, sensitivity, specificity, and NPV associated with a nomogram cutoff < 15% were 92.6%, 66.8%, and 95.0%, respectively.

PURPOSE

We recently developed a 3D dual-echo steady state (DESS) MRI technique for rapid quantitative T2 mapping of the entire prostate at 3T. DESS T2 map can complement standard T2w, diffusion and DCE MRI for prostate cancer (PCA) diagnosis. Also, DESS has potential to replace clinical standard T2w MRI by using the T2 map to synthesize T2w images, which would increase protocol efficiency. In this study, we evaluate the images quality of 3D DESS versus standard 3D TSE T2w prostate MRI.

METHOD AND MATERIALS

DESS acquires 2 signals (FID & Echo) and Echo/FID was fitted to a signal model to calculate a quantitative T2 map and synthetic T2w images at an apparent TEsa: TEs=IFID*exp(-TEx/T2). N=11 patients were scanned at 3T (Prisma/Skyra, Siemens) with a body array coil using: 3D TSE (7min; FOV=17cm, 0.66*0.66*1.5mm3), and 3D DESS (7min 26s;TEa=85ms, same FOV/resolution as TSE). Linear correlation of DESS and TSE T2w signals was characterized from images. Contrast (CAB) was calculated among prostate transition zone (T2), peripheral zone (PZ) and muscle (MS) for DESS/TSE images. Dice coefficients were calculated to measure overlap of prostate contours drawn on DESS/TSE images. 2 radiologists scored images in blinded randomized order for delineating zonal anatomy (ZA), depicting prostate capsule (PC), image sharpness (IS), motion artifact (MA) and other artifacts (OA) on a 5 point scale (1:worst, 5:best).

RESULTS

Signal correlation was high: DESS-T2w=0.76-TSE-T2w+0.02,r2=0.84±0.06. Contrast was comparable between DESS-T2w (CTZ,MS :0.38±0.22, CPZ,MS:0.47±0.26, CTZ, PZ:0.40±0.31) and TSE-T2w (CTZ,MS:0.45±0.22,CPZ,MS:0.54±0.29,CTZ,PZ:0.43±0.27). Dice coefficient of 0.86±0.04 demonstrated good agreement between prostate contours. Image quality scores : ZADESS:4.4±0.5, ZATSE:4.7±0.4; PCDESS:3.6±0.6, PCTSE:4.3±0.6; ISDESS:3.8±0.3, ISTSE:4.7±0.4; MADESS:4.3±0.6, MATSE:4.7±0.4; OADESS:4.9±0.4, OATSE:4.9±0.2. DESS-T2w had slightly lower ZA, PC and IM scores, and similar MA and OA scores as TSE-T2w.

CONCLUSION

This preliminary study shows that 3D DESS-T2w images can have similar quality for prostate MRI compared with 3D TSE T2w images at 3T. 3D DESS MRI can potentially replace 3D TSE for T2w MRI while adding a quantitative T2 map for PCA diagnosis.

CLINICAL RELEVANCE/APPLICATION

3D DESS MRI obtains quantitative T2 maps and T2w images in single scan, and can potentially replace clinical standard T2w MRI while providing quantitative T2 information for prostate multi-parametric MRI.

PURPOSE

To evaluate preoperative nomogram to assess probability of lymph node metastasis (LNM) in malignant ovarian epithelial tumor.

METHOD AND MATERIALS

Institutional Review Board approved this retrospective study. A consecutive series of 167 patients with CT and surgery including abdominopelvic LN dissection were included. Long-axis diameter and solid-to-cystic ratio of an ovarian tumor (0-25%; 25-50%; 50-75%; 75-100%), presence of LN>= 1cm, and presence of seeding lesion>= 2cm were independently analyzed by two blinded radiologists. Carbohydrate antigen 125 (CA 125) was recorded. Preoperative nomogram was generated from pooled data of two radiologists using multivariate logistic regression with generalized estimating equation. Contrast (CAB) was calculated among prostate transition zone (T2), peripheral zone (PZ) and muscle (MS) for DESS/TSE images. Dice coefficients were calculated to measure overlap of prostate contours drawn on DESS/TSE images. 2 radiologists scored images in blinded randomized order for delineating zonal anatomy (ZA), depicting prostate capsule (PC), image sharpness (IS), motion artifact (MA) and other artifacts (OA) on a 5 point scale (1:worst, 5:best).

RESULTS

LNM rate was 32.3% (54/167). In multivariate analysis, tumor size (odds ratio= 0.892; p= 0.038), LN>= 1cm (odds ratio= 9.644; p< 0.001), and seeding>= 2 cm (odds ratio= 5.776; p< 0.001) were significant for LNM, while CA 125 and tumor solid-to-cystic ratio were not (p> 0.05). AUC and bootstrap-corrected AUC of the nomogram were 0.871 and 0.849, respectively. Using a nomogram cutoff < 15%, 80 of 167 patients (47.9%) may be spared LN dissection, and LNM were missed in only 4 (5.0%) for two radiologists. Sensitivity, specificity, and NPV associated with a nomogram cutoff < 15% were 92.6%, 66.8%, and 95.0%, respectively.
Current preoperative nomogram may accurately and noninvasively estimate a probability of LNM in in. malignant ovarian epithelial tumor. This would help significantly reduce unnecessary abdominopelvic LN dissection.

**CONCLUSION**

Current preoperative nomogram could guide surgical plan in patients with malignant ovarian epithelial tumor.

**GU273-SD-THA4**

**Multiparametric PET/MRI in Cervical Cancer: Radiomics Signature of Primary Tumor Predicts N- And M-Stage**

**PURPOSE**

Multiparametric PET/MR allows for morphologic, metabolic and functional tumor imaging, providing a powerful platform for the readout of comprehensive radiomics signatures to be used as non-invasive biomarkers. Hence, the aim of this pilot study was to explore the predictive potential of such PET/MR-derived signatures in patients with cervical cancer.

**METHOD AND MATERIALS**

30 patients with previously untreated cervical cancers underwent PET/MR imaging with FDG. Examinations comprised the acquisition of morphological (T1- and T2w-images), quantitative functional (DWI: apparent diffusion coefficients; DCE-MRI: Ktrans, Kep, Ve, and IAUC) and metabolic (PET standardized uptake values) parameters. The gross volume of the primary tumor was manually delineated. From these, 225 quantitative image features were calculated using the Radiomic Image Processing Toolbox. The 20 highest ranking features (Figure 1) based on univariate P values were selected to train a generalized stochastic gradient boosting model with 10-fold cross validation to predict N- and M-status. Stratified training and testing data partitions, with 60% of observations going to the training set, were created using random sampling within the levels of the response variable to balance the class distributions within the splits.

**RESULTS**

For the determination of N-stage the model achieved strong predictive power with an area under the curve (AUC) of 0.97 in ROC-analysis and 100% sensitivity, 80% specificity, resulting in an accuracy of 91% (95% CI [59%-100%]). For the classification of M-stage the model achieved perfect predictive power with an AUC of 1.0. At 100% sensitivity the model provided 100% specificity, resulting in an accuracy of 100% (95% CI [72%-100%]). A total of 6 identical image features were found to be top predictors of both M- and N-stage (Figure 2).

**CONCLUSION**

This pilot study demonstrates the potential of multiparametric PET/MRI for the comprehensive tumor characterization using radiomics signatures in even small patient cohorts. Still, further studies and external validation in larger cohorts are needed.

**CLINICAL RELEVANCE/APPLICATION**

Radiomics signatures based on multiparametric PET/MR data represent a promising new platform for the creation of non-invasive biomarkers in oncology.

**GU274-SD-THA5**

**Magnetic Resonance Imaging and Intraoperative Frozen Section in the Assessment of Myometrial Invasion in Endometrial Cancer: Radiology-Pathology Correlation**

**PURPOSE**

To establish diagnostic performance (DP) of initial Magnetic Resonance Imaging (MRI) and Intraoperative Frozen Section (IOFS) in the evaluation of myometrial invasion, superficial (M1) and deep (M2), in patients with endometrial cancer. To determine sensibility
METHOD AND MATERIALS

Retrospective cohort study. Between January 2010 and December 2015. 227 patients, 55 were excluded. Comparison between initial MRI and IOFS with P results. Analysis of possibles causes of discordance.

RESULTS

1. Initial MRI results. DP: M1: 69.7 %, SN 73%, SP 31%, PPV 75%, NPV 30%. M2: 26.7 %. SN 57%, SP 86%, PPV 69%, NPV 78%. Concordance between MRI and P: 77.3%. Analysis of discordance. MRI M1 and P M2: 71.7 %. MRI M2 and P M1: 28.2 %. IOFS results: DP: M1: 77%. M2: 22.9%. Concordance between IOFS and P: 81.9 %. Analysis of discordance: The majority were diagnosed as M1 when in fact was M2.

CONCLUSION

In our experience, the combination of the information given by initial MRI with the confirmation by IOFS helps gynecologist to choose the appropriate treatment for each patient.

CLINICAL RELEVANCE/APPLICATION

MRI is an useful technique in the process of treatment decision. It guides pathologists to perform the IOFS because it gives information about the deep and localization of myometrial invasion, as well as associated pathologies, like adenomyosis and myomas, that can lead to misleading. Therefore, the combination of the information given by MRI with the confirmation by IOFS helps gynecologists to select the appropriate patient to undergo lymphadenectomy and contributes to reducing the number of unnecessary lymphadenectomies, with the associated patient morbidity and health care costs.

GU275-SD-THA6 Bladder Cancer Staging in CT Urography Using Radiomic Biomarkers

Participants
Lubonir M. Hadjiski, PhD, Ann Arbor, MI (Presenter) Nothing to Disclose
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PURPOSE

To evaluate the accuracy of a decision support system for staging of bladder cancers based on automatically extracted radiomic biomarkers from CT urography (CTU) merged in a predictive model by machine learning techniques.

METHOD AND MATERIALS

Bladder cancers at stage T2 or above are recommended for neoadjuvant chemotherapy treatment clinically. Correct staging is crucial for the decision of neoadjuvant chemotherapy and minimizing the risk of under- or over-treatment. Pre-treatment CTUs of 84 patients with bladder cancer were retrospectively collected with IRB approval. 43 cancers were below stage T2 and 41 cancers were at stage T2 or above. Our Auto-Initialized Cascaded Level Set (AI-CALS) system was used to extract 3D lesion boundary from all lesions. 87 radiomic biomarkers including 55 tumor heterogeneity and 32 morphological features (volume (V), 23 gray level (GL) and 8 shape (S)) were extracted from the segmented lesions. Linear discriminant classifier (LDA), support vector machine (SVM), and backpropagation neural network (NN), with stepwise feature selection based on F-statistics, as well as a random forest (RAF) classifier were used to combine the biomarkers into 4 predictive models for comparison. The dataset was partitioned into independent Set 1 and Set 2 for two-fold cross validation. The predictive models including feature selection were trained on one partition set and tested on the other partition set and vice versa. The area under the receiver operating characteristic curve (AUC) was calculated for each model to estimate its performance in predicting cancer stage (>= T2 or < T2).

RESULTS

The test AUC on Set 1 was 0.89, 0.92, 0.91, and 0.86 for LDA, SVM, NN and RAF, respectively. The test AUC on Set 2 was 0.90, 0.89, 0.95, and 0.96 for LDA, SVM, NN and RAF, respectively. The differences between the models did not reach statistical significance. The useful biomarkers included 2 heterogeneity features, 2 gray level features, and a contrast feature.

CONCLUSION

The machine learning techniques are promising in selecting effective radiomic biomarkers and merging them into predictive models that may provide useful decision support for bladder cancer stage assessment.

CLINICAL RELEVANCE/APPLICATION

An objective decision support system that merges computer-extracted radiomic biomarkers in a predictive model may assist clinicians in making more accurate and consistent cancer staging assessment.
TEACHING POINTS

1. Ureteral injuries are mostly iatrogenic secondary to pelvic surgical procedures (mainly gynaecologic). 2. Its diagnosis is a major challenge because these injuries are not often identified intraoperatively, requiring early detection to repair them as early as possible, given the high morbidity and mortality associated. 3. These lesions are usually treated by open or laparoscopic surgery, which suppose a high morbidity and mortality. 4. However, it is feasible a minimally invasive radio-endoscopic approach, 'rendez-vous', to reestablish the integrity of the dissected ureter. This technique offers a good long term solution to the patients, avoiding prolonged nephrostomies that impair renal function. We describe the possibility of using a radiological-endourological combined approach, 'rendez-vous', minimally invasive, to restore ureteral continuity in cases of entire iatrogenic sections.

TABLE OF CONTENTS/OUTLINE


TEACHING POINTS

1. To review the available diagnostic modalities including USG, CT, MRI and PET to evaluate the adrenal gland. 2. To suggest an alternate imaging protocol weaving around the existing protocol and diagnostic algorithm. 3. Elaborate the imaging findings of usual and unusual adrenal neoplasms, both benign and malignant. 4. Role of image guided diagnostic and therapeutic interventions: how and when to perform and their efficacy.

TABLE OF CONTENTS/OUTLINE

1. Introduction - incidence of adrenal incidentalomas and their natural history. 2. Discuss the available diagnostic modalities including USG, CT, MRI and PET: their holistic implication in thinking beyond the adrenal protocol. 3. Discussing appropriate imaging protocols and diagnostic algorithm: what to do when an adrenal lesion is in question? 4. Illustrative pictorial review of common and uncommon incidentalomas: emphasizing on differential diagnosis and crucial differentiating points. 5. Approach to image guided diagnostic procedures (biopsy/FNAC): when and how to perform and when not to perform - Indications and contraindications. - Planning access route: transhepatic, paravertebral and lateral. - Potential complications. 6. Brief outline of management strategies including the current role of image guided radiofrequency ablation.
Detection and Characterization of Clinically Significant Prostate Cancer Index Lesions with Multiparametric MRI (Mpmri): Is There an Association between Reader Confidence and Diagnostic Accuracy?

PURPOSE
To evaluate if there is an association between reader confidence and diagnostic accuracy for prostate cancer (PCa) index lesions with mpMRI in attending abdominal imagers and abdominal imaging fellows.

METHOD AND MATERIALS
Four attending abdominal imagers with 2-16 years of experience and five abdominal imaging fellows with 0 years of experience evaluated 31 blinded prostate mpMRIs over two reading sessions in this IRB-approved, HIPAA-compliant, retrospective study for index lesion and anterior PCa detection. In addition to identifying the suspected index lesion in each case, the radiologists were also asked to rate their confidence in lesion detection on a 5-point scale (1: <25% confidence; 2: 25-50% confidence; 3: 50-75% confidence; 4: 75-90% confidence; 5: near 100% confidence of diagnosis of PCa). Reference standard was established combining whole mount histopathology with mpMRI findings by a board-certified radiologist with 5 years of specialized prostate mpMRI experience. The relationship between confidence and accuracy was assessed by fitting a generalized mixed effects linear model with reader and case and random effects, with confidence as the fixed effect, and error as the independent variable.

RESULTS
There is a statistically significant association between reader confidence and diagnostic accuracy for PCa index lesions across all nine readers (p=0.0088). The association between confidence and diagnostic accuracy was more statistically significant for abdominal imaging fellows (p = 0.00273) than for attending abdominal imagers (p = 0.0589).

CONCLUSION
The association between reader confidence and diagnostic accuracy for PCa index lesion detection on mpMRI is statistically significant for attending abdominal imagers and abdominal imaging fellows. Establishing this association is critical for an examination such as prostate mpMRI, which is relatively new to some readers and challenging to interpret. The association is particularly significant in abdominal imaging fellows which could have implications for improving/increasing dedicated prostate mpMRI education in training programs.

CLINICAL RELEVANCE/APPLICATION
Clinical Relevance/Application: Confident and strongly worded prostate mpMRI reports can inform clinical decision making and impart confidence to the referring provider/patient. This is critical to increase prostate mpMRI adoption and utilization worldwide.

The Diagnostic Potential of Diffusion Weighted and Dynamic Contrast Enhanced MR Imaging in the Characterization of Complex Ovarian Lesions

PURPOSE
To evaluate the diagnostic potential of diffusion weighted and dynamic contrast enhanced MR imaging in the characterization of complex ovarian lesions.
Are Hemorrhagic Renal Cysts T1 Bright Enough to be Distinguished from Papillary Type Renal Cell Carcinoma? A Retrospective Analysis of 155 MRI Studies

PURPOSE

Our aim was to evaluate the diagnostic potential of diffusion-weighted (DW) and dynamic contrast enhanced MR (DCE-MR) imaging in the diagnosis and characterization of complex ovarian lesions.

METHOD AND MATERIALS

We prospectively evaluated 59 patients with 65 complex ovarian lesions detected at US. MRI examinations were performed using a 1.5T MRI machine. Masses were classified as benign (n=30), borderline (n=7) and malignant (n=28). Regions of interest were drawn and parameters were calculated such as apparent diffusion coefficient (ADC) values for the diffusion as well as maximum absolute enhancement (Simax), maximum relative enhancement (MRE), time to peak (Tmax) and wash-in-rate (WIR) for the dynamic parameters.

RESULTS

There was a significant difference in ADC values (P<0.001), Simax (P< 0.05), MRE% (P<0.001), Tmax (P<0.001) and WIR (P<0.001) between benign and borderline/invasive malignant groups. A cut-off ADC value <=0.95 had a PPV of 81.8% for prediction of borderline/invasive malignant lesions; a cut-off Tmax<=141sec had a specificity of 86.7% and PPV of 86.7% for predicting malignancy.

CONCLUSION

The addition of DW and DCE-MRI to the conventional MRI has improved its diagnostic value. They provide additional information for the tumor behavior. Thus they are recommended to be added to the routine conventional MRI to help characterization of indeterminate masses.

CLINICAL RELEVANCE/APPLICATION

DW and DCE-MRI added to the conventional MRI provide additional information for the ovarian tumor behavior and are recommended to be part of MRI study prior to clinical decision.

Are Hemorrhagic Renal Cysts T1 Bright Enough to be Distinguished from Papillary Type Renal Cell Carcinoma? A Retrospective Analysis of 155 MRI Studies

PURPOSE

The purpose of this study was to evaluate the utility of T1- and T2-weighted imaging signal intensity ratios and signal intensity standard deviations of renal lesions to determine the feasibility of distinguishing between hemorrhagic renal cysts and papillary renal cell carcinomas.

METHOD AND MATERIALS

Institutional IRB approval was obtained. Pathology records of 52 cases of papillary RCCs between 1 and 5cm in size with preoperative MRIs were included. 49 and 54 abdominal MRI cases featuring simple and hemorrhagic renal cysts, respectively, between 1 and 5cm in size were identified using the Primordial search engine (Primordial, San Mateo, CA). Cases were randomized and interpreted by 1 subspecialty abdominal radiologist with 14 years of experience recording lesion laterality, location and size and T1 and T2 signal intensity and standard deviation values for each renal lesion and paraspinal or erector spinae muscle from which lesion-to-muscle ratios were calculated. ANOVA with Bonferroni corrections for multiple comparisons was used for statistical analysis (IBM SPSS Statistics ver. 24).

RESULTS

ANOVA revealed a statistically significant difference between the size of the cysts (simple cysts: 1.9 ± 0.9, mean ± standard deviation; hemorrhagic cysts: 1.7 ± 0.6) and the size of RCCs (2.6 ± 0.9) (p < 0.001). T1 ratio showed a statistically significant difference between the 3 groups (p < 0.001; simple cysts: 0.6 ± 0.3, hemorrhagic cysts: 1.9 ± 0.9 and RCCs: 1.1 ± 0.4). The T2 ratio showed a statistically significant difference between the simple (19.2 ± 11.7) and hemorrhagic (6.2 ± 5.8) cysts (p < 0.001), and between the simple cysts and RCCs (3.7 ± 2.9) (p < 0.001); however the difference between hemorrhagic cysts and RCCs was not significant (p = 0.3).Lesion standard deviation values computed from T2 images did not show significant differences between the groups (p = 0.5), and those computed from T1 images only showed significant differences between the cysts (simple cysts: 40.1 ± 34.2, hemorrhagic cysts: 68.6 ± 60.6, p = 0.01).

CONCLUSION

T1 lesion-muscle ratios are significantly higher for hemorrhagic renal cysts compared with papillary RCCs, but T2 ratios fail to distinguish between cysts and papillary RCCs.
Usefulness of Testicular Volumes and Apparent Diffusion Coefficient Values of Magnetic Resonance Imaging in Evaluation of Infertile Men with Azoospermia

Station #4

Participants
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PURPOSE
To assess retrospectively the usefulness of testicular volumes and apparent diffusion coefficient (ADC) values measured using magnetic resonance imaging (MRI) in the evaluation of infertile men with azoospermia.

METHOD AND MATERIALS
A computerized search generated a list of 30 infertile men with azoospermia (mean age, 34.7 years, age range 22-44 years) who underwent both scrotal MRI and testis biopsy. MRI determined testicular volumes and ADC values were compared between infertile men with obstructive azoospermia and those with non-obstructive azoospermia.

RESULTS
16 were diagnosed with obstructive azoospermia while the other 14 were diagnosed with non-obstructive azoospermia. Testicular volumes for obstructive azoospermia (8.7 mL to 27.6 mL, with a median volume of 16.9 mL) were significantly greater than non-obstructive azoospermia (1.8 mL to 15.4 mL, with a mean volume of 8.1 mL) ($p < 0.001$). The area under the receiver operating characteristic (ROC) curve for distinguishing non-obstructive azoospermia from obstructive azoospermia using testicular volume was 0.92. A cutoff value of less than or equal to 13.06 mL could distinguish non-obstructive azoospermia from obstructive azoospermia, with a sensitivity of 85.71% and a specificity of 87.5%.

Testicular ADC values for obstructive azoospermia (0.329x10-3 mm2/s to 1.578x10-3 mm2/s, with a median ADC value of 1.018x10-3 mm2/s) were significantly lower than non-obstructive azoospermia (0.801x10-3 mm2/s to 2.211x10-3 mm2/s, with a median ADC value of 1.190x10-3 mm2/s) ($p = 0.0094$). The area under the ROC curve for distinguishing non-obstructive azoospermia from obstructive azoospermia using testicular ADC value was 0.741. A cutoff value of more than 1.031x10-3 mm2/s could distinguish non-obstructive azoospermia from obstructive azoospermia with a sensitivity of 92.86% and a specificity of 56.25%.

CONCLUSION
The testicular volumes and ADC values measured on MRI may be useful to differentiate obstructive from non-obstructive azoospermia.

CLINICAL RELEVANCE/APPLICATION
MRI can evaluate azoospermia with good performance, the testicular volumes and ADC values measured on MRI are useful in predicting the histopathologic grading of azoospermia and differentiating obstructive from non-obstructive azoospermia. Therefore, DWI seems to be a promising imaging method with great potential for the differential diagnosis of azoospermia.

Texture Analysis of Bladder Cancer: Differentiating Transitional Cell Carcinoma from Micropapillary Carcinoma

Station #5

Awards
Student Travel Stipend Award

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PURPOSE
Micropapillary carcinomas (MPC) are a more aggressive variant of bladder carcinomas. Compared to transitional cell carcinomas (TCC), MPC are more resistant to chemotherapy and are associated with poorer prognosis. Here, we investigate the feasibility of using CT texture analysis (CTTA) features in differentiating MPC and TCC from standard of care imaging.

METHOD AND MATERIALS
In this HIPAA compliant and IRB approved retrospective study, standard-of-care CT images were collected from two groups of 33 patients each diagnosed with MPC and TCC. Regions of interest were marked by a fellowship trained radiologist in the primary tumor using Synapse 3D (Fujifilm, Stamford, CT). The segmented images were used as inputs to a CTTA panel, comprising texture metrics derived using four different methods: histogram analysis, gray-level co-occurrence matrix (GLCM), gray-level difference matrix (GLDM), and spectral (fast fourier analysis) analysis. Texture metrics were calculated for MPC and TCC, and they were analyzed using a univariate prediction model. The metrics were then compared using the independent t-test or Wilcoxon rank-sum test.
RESULTS
There is a significant (p<0.01) difference in texture features between MPC and TCC. Consistently, MPC have a significantly (p<0.01) lower amount of homogeneity, as measured by GLCM, compared to TCC (0.27 vs 0.31, p < 0.01). In addition, measures of textural heterogeneity, such as correlation, difference entropy, and information measures of correlation 2, as measured by GLCM and GLDM, are significantly (p < 0.01) higher in MPC compared to TCC. Textural differences in MPC and TCC based on histogram and spectral analyses were not significant.

CONCLUSION
CTTA analysis shows that MPC have a more heterogeneous texture compared to TCC. Considering visual discrimination of MPC from TCC is difficult, results from this study suggest that tumor heterogeneity extracted using CTTA, particularly using GLCM and GLDM, may be a good imaging aid in segregating MPC from TCC.

CLINICAL RELEVANCE/APPLICATION
CTTA is a useful tool for clinicians in segregating MPC and TCC. As a part of a radiomics platform, CTTA shows great potential at characterizing and stratifying bladder masses.

GU281-SD-THB6  Value of DTI Quantitative Parameters in Differential Diagnosis of Uterine Sarcoma and Degenerated Hysteromyoma

Participants
Miao Niu, Dalian, China (Presenter) Nothing to Disclose
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PURPOSE
To investigate the value of diffusion tensor imaging (DTI) quantitative parameters in differential diagnosis of uterine sarcoma and degenerated hysteromyoma.

METHOD AND MATERIALS
Fourteen cases of uterine sarcoma (US) and Thirty cases of degenerated hysteromyoma (DH) including hyaline degeneration and mucinous degeneration were retrospectively analyzed from September 2008 to February 2017 in our hospital that were proven by histopathology. The age of patients ranged from 28 to 85 years, the average age was 52 years old. All patients underwent 1.5T (GE 1.5T Signa HDXT, America) MRI conventional T1WI, T2WI, LAVA and DTI (b=0600 s/mm2, 6 direction). The DTI images were postprocessed using Functool software on ADW4.6 workstation, then generated ADC and FA maps. Two region of interest (ROI) were placed on the ADC map and FA map of US and DH respectively, and ROI was larger than the lesions of 1/3. The images were analyzed and measured by two radiologists using double blind method. The measured ADC value and FA value were tested by intraclass correlation coefficient (ICC). If the values agreed well each other, the average data from them were calculated for further statistical analysis. The differences of ADC values and FA values of DTI between US and DH were compared by independent t-test and nonparametric-test retrospectively. The ROC curves of all parameters were used to analyze and compare the diagnostic value of DTI in differentiating US and DH.

RESULTS
The parameters measured by the two observers were well(ICC>0.75). The ADC value( × e-9 mm2/s) of US was statistically lower than that of DH (1.108± 0.200) vs (1.624±0.225), p=0.000. The FA value of US was statistically lower than DH 0.168 (0.125,0.188) vs 0.254 (0.207,0.318), P=0.000. The area under the ROC curve(AUC) of ADC was 0.974. The ADC threshold for differentiating US from DH was 1.322× e-9 mm2/s and the sensitivity, specificity were 96.7% and 92.9% respectively. The AUC of FA was 0.831. The FA threshold for differentiating US from DH was 0.192 and the sensitivity, specificity were 86.7%, 85.7% respectively.

CONCLUSION
DTI quantitative parameters can effectively identify US and DH, in which the ADC value has a high diagnostic efficacy for the two diseases.

CLINICAL RELEVANCE/APPLICATION
The significance of DTI quantitative parameters in differential diagnosis of US and DH is to guide clinical treatment and assess prognosis.
**TEACHING POINTS**

Illustrate both common and uncommon entities that cause renal calcifications with brief pathophysiologic discussions. Highlight characteristic multimodality imaging features of these entities. Describe the clinical implications of these findings and their management.

**TABLE OF CONTENTS/OUTLINE**

Malignant Lesions Renal Cell Carcinoma Transitional Cell Carcinoma Liposarcoma Benign Lesions Vascular Causes Traumatic Cyst Rupture Renal Artery Aneurysm AV Fistula Renal Tubular Acidosis Papillary Necrosis Systemic Causes Amyloidosis Metastatic Calcifications Autosomal Dominant Polycystic Kidney Disease Infectious Causes Hydatid Cyst Tuberculosis Xanthogranulomatous Pyelonephritis Renal Replacement Lipomatosis

**Honored Educators**

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

**Awards**

Certificate of Merit

Participants

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**TEACHING POINTS**

- Briefly review embryological and phenotypic aspects of the main disorders of sex development (DSD) - Discuss MRI's role in diagnosis, clinical management and/or surgical planning - Propose an imaging evaluation approach based on the referring physician/endocrinologist's point of view

**TABLE OF CONTENTS/OUTLINE**

- MRI acquisition protocol considerations focused on DSD - Systematic compartmental approach based on embryological origin: o Gonads o Urogenital sinus and genital tubercle derivatives o External genitalia o Urethra o Prostate o Wolffian (mesonephric) derivatives o Epididymides o Vas deferens o Seminal vesicles o Ejaculatory duct o Müllerian (paramesonephric) derivatives o Proximal third of the vagina and Fallopian tubes o Uterus - Other essential practical information that may be useful for patient's management (e.g. vaginal canal length) - Adapting radiological terminology in order to avoid embarrassing situations due to phenotypic vs. self-identified gender discordance - Proposal of a structured report model (exemplifying its use through illustrated cases from our department) and the use of essential key-images to improve non-radiologists comprehension

**UR189-ED-THB**


Station #8

**Awards**

Certificate of Merit

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**TEACHING POINTS**

The purpose of the exhibit is: 1. To describe male reproductive tract and gonadal embryology detailing the stages of development. 2. To review normal radiological anatomy of the male reproductive system. 3. To illustrate gonadal anomalies with emphasis on common points of disruption. 4. To highlight the role of the Wolffian duct and potential disturbance of normal development. 5. To demonstrate the close relationship between urogenital and adrenal development and how this may influence pathology.

**TABLE OF CONTENTS/OUTLINE**

Background Aim Stages of embryological development of the male reproductive system Overview and diagrammatic illustration of normal radiological anatomy Graphic and multimodal depiction of gonadal developmental anomalies, including: - undescended testes
Hot Topic Session: New and Emerging Theranostic Agents for Prostate Cancer

Thursday, Nov. 30 3:00PM - 4:00PM Room: E451A

GU NM OI

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

Discussion may include off-label uses.

Participants
Frederik L. Giesel, MD, MBA, Heidelberg, Germany (Moderator) Patent application for F18-PSMA-1007
Andrei Iagaru, MD, Stanford, CA (Moderator) Research Grant, General Electric Company

LEARNING OBJECTIVES
1) To learn about recent developments in theranostics nuclear medicine. 2) To understand new treatment options for prostate cancer using a targeted radionuclide approach.

ABSTRACT
An important aspect of Nuclear Medicine and Molecular Imaging is that the same core compound of the administered radiopharmaceutical can be labeled with both gamma emitters (for diagnostic) and alpha or beta emitters (for therapy), allowing for the targeted treatment of lesions. This is known as theranostics, the combination of therapy and diagnostics that is based on the specific tumor biology of each patient’s disease. This session will highlight several examples of such paired diagnostic studies and treatments using Nuclear Medicine methods for prostate cancer.

Sub-Events

SPSH52A 18F-FACBC (Axumin) as a Newly FDA Approved Prostate Cancer Imaging Agent

Participants
David M. Schuster, MD, Decatur, GA (Presenter) Institutional Research Grant, Nihon Medi-Physics Co, Ltd; Institutional Research Grant, Blue Earth Diagnostics Ltd; Consultant, WellPoint, Inc; Speaker, Siemens AG;

LEARNING OBJECTIVES
1) Describe the mechanism of uptake of the PET radiotracer fluciclovine. 2) Identify normal biodistribution of fluciclovine. 3) Identify the FDA approved clinical indication of fluciclovine. 4) Discuss clinical interpretive criteria of fluciclovine PET.

SPSH52B 68Ga PSMA and GRPR Ligands as New and Emerging Prostate Cancer Imaging Agents and Theranostics

Participants
Andrei Iagaru, MD, Stanford, CA (Presenter) Research Grant, General Electric Company

LEARNING OBJECTIVES
1) To learn about the use of PSMA and GRPR as targets for imaging prostate cancer at initial diagnosis and biochemical recurrence. 2) To understand how the PSMA and GRPR targets can be used as treatment options for prostate cancer using a theranostic approach.

ABSTRACT
Tracers binding to the prostate-specific membrane antigen (PSMA) elicit high interest. This cell surface protein is significantly overexpressed in prostate cancer cells when compared to other PSMA-expressing tissues such as kidney, proximal small intestine or salivary glands. It therefore provides a promising target for prostate cancer-specific imaging. Gastrin-releasing peptide receptors (GRPR) proteins are highly overexpressed in several human tumors, including prostate cancer. The GRPR was detected in 63-100 % of human prostate cancer tissue. Moreover, because of their low expression in benign prostate hypertrophy and inflammatory prostatic tissues, imaging of GRPR has potential advantages over current choline- and acetate-based radiotracers.

SPSH52C 18F-PyL PSMA-targeting Diagnostic Agent

Participants
Martin G. Pomper, MD, PhD, Baltimore, MD (Presenter) Researcher, Progenics Pharmaceuticals, Inc; License agreement, Progenics Pharmaceuticals, Inc; Researcher, Advanced Accelerator Applications SA; License agreement, Advanced Accelerator Applications SA; Co-founder, Cancer Targeting Systems, Inc; Board Member, Cancer Targeting Systems, Inc; Researcher, Juno Therapeutics, Inc; Licensing agreement, Juno Therapeutics, Inc; Co-founder, Neurly; Board Member, Neurly; Co-founder, Theraly Pharmaceuticals, Inc; Board Member, Theraly Pharmaceuticals, Inc;

SPSH52D PSMA-ligands for Diagnostic Stratification and Alpha/Beta PSMA-targeted Therapy in Prostate Cancer

Participants
Frederik L. Giesel, MD, MBA, Heidelberg, Germany (Presenter) Patent application for F18-PSMA-1007
LEARNING OBJECTIVES

1) To understand challenges of different PSMA-ligands. 2) To understand the impact of PSMA-ligands in primary diagnostics. 3) To understand the impact of PSMA-ligands in recurrent disease. 4) To understand the patient treatment stratification of beta- and alpha targeted therapy.

ABSTRACT

The high specificity, especially in the undifferentiated stage, makes it an excellent target for diagnosis and therapy. Integrating PSMA-PET/CT into the planning phase of radiotherapy, the treatment concept is changed in 30%-50% of the patients. The combination of the Glu-urea-motif with DOTA, which can be labeled with several diagnostic and therapeutic radionuclides, opened new avenues for therapeutic usage of the small-molecule PSMA ligands. In the beginning of 2016, there are four confirmative reports (n = 19, n = 24, n = 30, and n = 56) from four different centers reporting a PSA response in approximately 70% of patients treated with (177)Lu-labeled PSMA ligands. In conclusion, the data available up to now and this review will cover the theranostic perspective of PSMA ligands in regard to imaging and further therapeutic options like beta- and alpha-emitters.
Predicting Outcomes for Genitourinary Malignancies: Role of Radiomics in Clinical Practice

Thursday, Nov. 30 4:30PM - 6:00PM Room: E353A

Participants
Ivan Pedrosa, MD, Dallas, TX (Coordinator) Nothing to Disclose
Ivan Pedrosa, MD, Dallas, TX (Moderator) Nothing to Disclose
Ivan Pedrosa, MD, Dallas, TX (Presenter) Nothing to Disclose
Atul B. Shinagare, MD, Boston, MA (Presenter) Advisory Board, Arog Pharmaceuticals, Inc.; Research grant, GTx, Inc.
Masoom A. Haider, MD, Toronto, ON (Presenter) Consultant, Bayer AG; Advisory Board, Siemens AG;

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LEARNING OBJECTIVES
1) Recognize the differences in the biologic behavior and prognosis between cystic and solid renal cancers and learn how the imaging phenotype can be helpful in guiding management decisions when incorporated into the radiology report. 2) Assess tumor aggressiveness of urothelial carcinomas of the upper tract and bladder with imaging and understand the added value of this information in disease management. 3) Use imaging characteristics of aggressive prostate cancer and the 'index lesion' to distinguish clinically significant prostate cancers from indolent ones.

ABSTRACT
The development of imaging phenotypes in genitourinary (GU) malignancies, supported by the application of Radiomics, has improved our understanding of the relationship between imaging phenotypes and clinical outcomes. Radiomics are based on the extraction of more information than what may be obvious to the eye with the use of quantitative and advanced feature analysis techniques. Radiomics provide a platform for whole-tumor analysis in vivo, and offer the opportunity for investigating pathophysiologic phenomena (e.g. blood flow, vascular permeability, tumor proliferation) that are difficult to examine in ex vivo tissue - these image-based features may serve as surrogate biomarkers of tumor aggressiveness. Furthermore, radiomics correlate with genetic profiles that predict tumor aggressiveness and provides a pathway toward the understanding of tumor heterogeneity, classification, and risk stratification. This refresher course will review the correlation between imaging phenotypes and the clinical behavior of renal, prostate, and urothelial malignancies. We will show how radiomics can be incorporated into radiology reports in patients with GU malignancies and emphasize how radiomics features can be used to affect patient care.

Active Handout: Atul Bhanudas Shinagare

Active Handout: Ivan Pedrosa

Honored Educators
Presenters or authors on this event have been recognized as RSNA Honored Educators for participating in multiple qualifying educational activities. Honored Educators are invested in furthering the profession of radiology by delivering high-quality educational content in their field of study. Learn how you can become an honored educator by visiting the website at: https://www.rsna.org/Honored-Educator-Award/ Atul B. Shinagare, MD - 2017 Honored Educator
LEARNING OBJECTIVES

1) To discuss the most frequently detected fetal anorectal malformations. 2) To identify presentation patterns and imaging clues that can be helpful in reaching a prenatal diagnosis. 3) List the different basic types of anorectal malformations that occur in males and females. 4) List the associated malformations that occur with anorectal malformations. 5) List the logical imaging tests that are required to evaluate for these associated malformations. 6) List imaging tests that are NOT necessarily required in the neonatal period. 7) Describe the importance of sonographic imaging of the abdomen and pelvis in females born with cloaca type anorectal malformation. 8) Know the radiologist's role in the evaluation of disorders of sexual development (DSD). 9) Understand the some of the developmental and genetic changes that result in DSDs. 10) Learn an ultrasound algorithm for the evaluation for infants with DSD. 11) See common examples of DSDs for easy recognition in the future.

SAM

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Sub-Events

RC713A  Prenatal Imaging of Anorectal Malformations

Participants
Maria A. Calvo-Garcia, MD, Cincinnati, OH (Presenter) Nothing to Disclose

For information about this presentation, contact:
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LEARNING OBJECTIVES

1) To discuss the most frequently detected fetal anorectal malformations. 2) To identify presentation patterns and imaging clues that can be helpful in reaching a prenatal diagnosis.

RC713B  Postnatal Imaging of Anorectal Malformations

Participants
Steven J. Kraus, MD, Cincinnati, OH (Presenter) Author, Reed Elsevier

For information about this presentation, contact:
steven.kraus@cchmc.org

LEARNING OBJECTIVES

1) List the different basic types of anorectal malformations that occur in males and females. 2) List the associated malformations that occur with anorectal malformations. 3) List the logical imaging tests that are required to evaluate for these associated malformations. 4) List imaging tests that are NOT necessarily required in the neonatal period. 5) Describe the importance of sonographic imaging of the abdomen and pelvis in females born with cloaca type anorectal malformation.

ABSTRACT

An anorectal Malformation (ARM) is diagnosed in about 1 in 5000 live births. The diagnosis is made clinically in newborn males and females by the absence of the opening of the rectum on the perineum, an abnormally located opening of the rectum on the perineum, or a single opening on the perineum of a newborn female. However, radiologic imaging in the newborn period is essential for management, surgical planning, and the eventual outcome in patients with ARM. There is a wide spectrum of possible malformations of the anorectal region, some of which also involve the urinary and genital tracts. Approximately 50% of newborns with ARM will have associated abnormalities, most commonly genitourinary, followed by cardiovascular, spinal cord, gastrointestinal, and abnormalities of the VATER or VACTERL associations. The early management (first 48 hours) of a newborn born with an ARM is two-fold; (1) to assess if there are any life-threatening associated abnormalities that are severe enough to preclude an operation for the ARM or associated abnormalities that need to be addressed immediately to avoid significant morbidity, and (2) to decide if the newborn is eligible for a primary operation to repair the malformation in the neonatal period with no protective colostomy or, is a protective decompressing colostomy required, with delayed definitive repair at 3-6 months of age. Clinical and imaging information are utilized to address these issues. Newborns, (male and female) born with the rectal opening in a location visible on the otherwise normal appearing perineum or just posterior to the vaginal opening (vestibular location) in girls will potentially be eligible for a primary repair by posterior sagittal anorectoplasty (PSARP) in the neonatal period. All other newborns with other types of ARM will require a diverting colostomy, with imaging to characterize the exact type of ARM performed just prior to definitive repair which is usually performed at 3-6 months of age. The decision which path to follow is made after the first 24-48 hours of life. During this
period gas develops in the newborn gastrointestinal tract causing enough distention to establish if the rectum connects to the skin (meconium on the perineum) or if the rectum connects to the urinary tract (meconium in urine in boys).

Active Handout: Steven Jay Kraus

RC713C  Imaging of Ambiguous Genitalia

Participants
Jeanne S. Chow, MD, Boston, MA (Presenter) CEO, Numberone LLC

LEARNING OBJECTIVES
1) Know the radiologist’s role in the evaluation of disorders of sexual development (DSD) . 2) Understand the some of the developmental and genetic changes that result in DSDs. 3) Learn an ultrasound algorithm for the evaluation for infants with DSD. 4) See common examples of DSDs for easy recognition in the future.

Active Handout: Jeanne S. Chow
Six Common Difficult Problems in GI and GU MRI: The Experts' Approach

Friday, Dec. 1 8:30AM - 10:00AM Room: E450B

**LEARNING OBJECTIVES**

1) Describe the differences between extracellular and hepatobiliary contrast. 2) Explain the types of liver lesion seen on CT that may benefit from imaging with hepatobiliary contrast. 3) Limitation of CT imaging in characterization of small renal masses (with focus on discriminating benign/indolent renal tumors from aggressive renal cancer). 4) Role of MRI as a problem solving tool in characterizing cystic and solid renal masses. 5) Evolving role of MRI in renal mass (histologic) subtyping and assessment of renal tumor aggressiveness. 6) Review normal anatomy of the anal sphincter complex and surrounding pelvic structures. 7) Discuss etiology, pathophysiology and classification of perianal fistulas. 8) Correlate implication of imaging findings on disease management. 9) Familiarize themselves with MR protocol for assessment of pelvic floor dysfunction. 10) Learn techniques for improving patient cooperation for dynamic images. 11) Identify normal anatomy of anterior, middle and posterior compartments. 12) Apply reference lines and angles used in assessment of pelvic floor dysfunction. 13) Identify and grade the severity of pelvic floor relaxation. 14) Identify and grade the severity of pelvic organ prolapse. 15) Review the common causes of non obstetric pelvic pain in pregnancy. 16) Recognize the unique diagnostic and therapeutic challenges in the pregnant patient with pelvic pain. 17) Discuss the safety considerations of imaging in pregnancy. 18) Review the evolving imaging and clinical literature on appropriate investigation of acute pelvic pain pregnancy. 19) Discuss the utility of MRI as a supplement to US in the pregnant patient.

**SAM**

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**Sub-Events**

**RC829A**  The CT Indeterminate Lesion in the Non-Cirrhotic Liver: Extracellular or Hepatobiliary Contrast-Enhanced MRI

Participants
Hero K. Hussain, MD, Ann Arbor, MI (Moderator) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Describe the differences between extracellular and hepatobiliary contrast. 2) Explain the types of liver lesion seen on CT that may benefit from imaging with hepatobiliary contrast.

**RC829B**  Is MRI Needed to Further Evaluate a CT Indeterminate Renal Mass?

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

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hersh.chandarana@nyumc.org

**LEARNING OBJECTIVES**

1) Limitation of CT imaging in characterization of small renal masses (with focus on discriminating benign/indolent renal tumors from aggressive renal cancer). 2) Role of MRI as a problem solving tool in characterizing cystic and solid renal masses. 3) Evolving role of MRI in renal mass (histologic) subtyping and assessment of renal tumor aggressiveness.

**RC829C**  Perianal Fistulae: What Does the Surgeon Want to Know?

Participants
Mahmoud M. Al-Hawary, MD, Ann Arbor, MI (Presenter) Nothing to Disclose

**LEARNING OBJECTIVES**

1) Review normal anatomy of the anal sphincter complex and surrounding pelvic structures. 2) Discuss etiology, pathophysiology and classification of perianal fistulas. 3) Correlate implication of imaging findings on disease management.
How Do I Perform and Interpret MRI of Pelvic Floor Weakness?

Participants
Victoria Chernyak, MD, MS, Bronx, NY (Presenter) Nothing to Disclose

For information about this presentation, contact:
vichka17@hotmail.com

LEARNING OBJECTIVES
1) Familiarize themselves with MR protocol for assessment of pelvic floor dysfunction. 2) Learn techniques for improving patient cooperation for dynamic images. 3) Identify normal anatomy of anterior, middle and posterior compartments. 4) Apply reference lines and angles used in assessment of pelvic floor dysfunction. 5) Identify and grade the severity of pelvic floor relaxation. 5) Identify and grade the severity of pelvic organ prolapse.

Is MRI the Next Step after US to Evaluate Non-Obstetric Pelvic Pain in Pregnancy?

Participants
Reena C. Jha, MD, Washington, DC (Presenter) Nothing to Disclose

For information about this presentation, contact:
jhar@gunet.georgetown.edu

LEARNING OBJECTIVES
1) Review the common causes of non obstetric pelvic pain in pregnancy. 2) Recognize the unique diagnostic and therapeutic challenges in the pregnant patient with pelvic pain. 3) Discuss the safety considerations of imaging in pregnancy. 4) Review the evolving imaging and clinical literature on appropriate investigation of acute pelvic pain pregnancy. 5) Discuss the utility of MRI as a supplement to US in the pregnant patient.

How Do I Perform a Diagnostic MRI in a Non-Cooperative Patient?

Participants
Mustafa R. Bashir, MD, Cary, NC (Presenter) Research support, Siemens AG; Research support, General Electric Company; Research support, NGM Biopharmaceuticals, Inc; Research support, TaiwanJ Pharmaceuticals Co, Ltd; Research support, Madrigal Pharmaceuticals, Inc; Consultant, RadMD

For information about this presentation, contact:
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LEARNING OBJECTIVES
1) Describe patient and technical factors that may contribute to suboptimal or nondiagnostic body MRI examinations. 2) Discuss methods for reducing the impact of the above factors using clinically-available MRI techniques.

ABSTRACT
Patient motion is a major issue in abdominal MRI. Not only are some patients unable to sustain a breath-hold, but breathing motion can be unpredictable. In this talk we will discuss a variety of techniques for combating motion, including fast imaging, special k-space filling trajectories, and respiratory gating using extrinsic and intrinsic signals.
**SST05**

**Genitourinary (CT and MRI of Urothelium)**

**Friday, Dec. 1 10:30AM - 12:00PM Room: E351**

CT  GU  MR

**AMa PRA category 1 Credits**: 1.50
**ARRT Category A+ Credit**: 1.75

FDA  Discussions may include off-label uses.

**Participants**

Paul Nikolaidis, MD, Chicago, IL (*Moderator*)  Nothing to Disclose

David D. Childs, MD, Clemons, NC (*Moderator*)  Nothing to Disclose

**Sub-Events**

**SST05-01  Upper Tract Urothelial Carcinoma: Characterization of Lesions Missing with Ureterorenoscopy despite Previous Detection and Localization with CT Urography**

**Friday, Dec. 1 10:30AM - 10:40AM Room: E351**

**Participants**

See Hyung Kim, Daegu, Korea, Republic of (*Presenter*)  Nothing to Disclose

Donghyeon Kim, Daegu, Korea, Republic of (*Abstract Co-Author*)  Nothing to Disclose

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**PURPOSE**

To retrospectively determine nondiminutive upper tract urothelial carcinomas (UTUCs) prospectively detected by using CT urography (CTU) but not confirmed with subsequent nonblinded ureterorenoscopy (URS).

**METHOD AND MATERIALS**

The institutional review board approved our study. Between 2003 and 2016, 8250 consecutive patients (mean age, 58 years±10.3) underwent 9133 CTU, which yielded 450 unique nondiminutive suspected UTUC lesions. Of 425 lesions that underwent subsequent nonblinded URS with knowledge of CTU findings—including size, location and morphology, 75 (17.7%) discordant lesions were not found at the initial unblended URS. After discordant lesions review, 30 lesions were classified as likely CTU false-positive findings without the necessity of further follow-up, and 45 lesions were classified as possible URS false-negative (FN) findings.

**RESULTS**

Nineteen of 75 (25.3%) of all discordant lesions after initial nonblinded URS were confirmed to be actual URS FN results, including 57.5% (19 of 33) of lesions with URS and/or CTU follow-up assessment. The average size of lesions with URS FN results was 7.5mm±3.2 and were more closely matched with higher confidence at the prospective CTU by using the three-point scale (2.7±0.4 vs. 2.0±0.3, P=0.002). URS FN lesions were significantly more likely than concordant lesions in the calyceopelvis (73.6%, 14 of 19 vs. 41.4%, 145 of 350; P=0.015). Eight lesions missed by using URS but confirmed by subsequent URS with surgical resection revealed adherent blood clot in one lesion and benign disease in seven lesions, and five lesions (62.5%) located in the calyceopelvis.

**CONCLUSION**

A priori knowledge of CTU for lesions missed at URS is more likely to have higher diagnostic confidence of the initial CTU.

**CLINICAL RELEVANCE/APPLICATION**

A priori knowledge of CTU for lesions missed at URS is more likely to have higher diagnostic confidence of the initial CTU.

**SST05-02  Does Split-Bolus Injection Truly Influence the Ability of Renal and Urinary Lesion Detection at CT Urography? Multi-Center Prospective Randomized Comparison between Split-Bolus and Single-Bolus Injection Techniques**

**Friday, Dec. 1 10:40AM - 10:50AM Room: E351**

**Participants**

Satoru Takahashi, MD, PhD, Kobe, Japan (*Presenter*)  Research Grant, Bayer AG

Kazuhiro Kitajima, MD, Nishinomiya, Japan (*Abstract Co-Author*)  Nothing to Disclose

Keitaro Sofue, MD, Kobe, Japan (*Abstract Co-Author*)  Nothing to Disclose

Utaro Tanaka, Kobe, Japan (*Abstract Co-Author*)  Nothing to Disclose

Kazuo Sugimura, MD, PhD, Kobe, Japan (*Abstract Co-Author*)  Research Grant, Toshiba Medical Systems Corporation; Research Grant, Koninklijke Philips NV; Research Grant, Bayer AG; Research Grant, Eisai Co, Ltd; Research Grant, DAICHI SANKYO Group; Research Grant, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd; Research Grant, DAIICHI SANKYO Group; Research Grant, DAIICHI SANKYO Group

Yoshiko Ueno, MD, PhD, Kobe, Japan (*Abstract Co-Author*)  Nothing to Disclose

Tonomori Mataura, Sendai, Japan (*Abstract Co-Author*)  Nothing to Disclose

**PURPOSE**

To retrospectively determine nondiminutive upper tract urothelial carcinomas (UTUCs) prospectively detected by using CT urography (CTU) but not confirmed with subsequent nonblinded ureterorenoscopy (URS).

**METHOD AND MATERIALS**

The institutional review board approved our study. Between 2003 and 2016, 8250 consecutive patients (mean age, 58 years±10.3) underwent 9133 CTU, which yielded 450 unique nondiminutive suspected UTUC lesions. Of 425 lesions that underwent subsequent nonblinded URS with knowledge of CTU findings—including size, location and morphology, 75 (17.7%) discordant lesions were not found at the initial unblended URS. After discordant lesions review, 30 lesions were classified as likely CTU false-positive findings without the necessity of further follow-up, and 45 lesions were classified as possible URS false-negative (FN) findings.

**RESULTS**

Nineteen of 75 (25.3%) of all discordant lesions after initial nonblinded URS were confirmed to be actual URS FN results, including 57.5% (19 of 33) of lesions with URS and/or CTU follow-up assessment. The average size of lesions with URS FN results was 7.5mm±3.2 and were more closely matched with higher confidence at the prospective CTU by using the three-point scale (2.7±0.4 vs. 2.0±0.3, P=0.002). URS FN lesions were significantly more likely than concordant lesions in the calyceopelvis (73.6%, 14 of 19 vs. 41.4%, 145 of 350; P=0.015). Eight lesions missed by using URS but confirmed by subsequent URS with surgical resection revealed adherent blood clot in one lesion and benign disease in seven lesions, and five lesions (62.5%) located in the calyceopelvis.

**CONCLUSION**

A priori knowledge of CTU for lesions missed at URS is more likely to have higher diagnostic confidence of the initial CTU.

**CLINICAL RELEVANCE/APPLICATION**

A priori knowledge of CTU for lesions missed at URS is more likely to have higher diagnostic confidence of the initial CTU.
Synergistic Combination of Radiomic Features and Clinically Estimated Feature

Analysis of Treatment Response of Bladder Cancer on CT Scans: Improved Assessment by Synergistic Combination of Radiomic Features and Clinically Estimated Feature

Friday, Dec. 1 10:50AM - 11:00AM Room: E351

Participants

Lubomir M. Hadjiiski, PhD, Ann Arbor, MI (Presenter) Nothing to Disclose
Kenny H. Cha, MSc, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Hean-Ping Chan, PhD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Richard H. Cohan, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Elaine M. Caoli, MD, MS, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Alon Z. Weizer, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Ravi K. Samala, PhD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Aljai S. Alva, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Jun Wei, PhD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose

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PURPOSE
To evaluate the accuracy of automatically extracted radiomic features from CT scans and clinically estimated feature in treatment response assessment of bladder cancer.

METHOD AND MATERIALS
Our Auto-Initialized Cascaded Level Set (AI-CALS) system is designed to extract 3D lesion boundary based on level sets. 47 radiomic features (RF) based on pre- and post- treatment changes in volume (V), 5 gray level (GL) and 9 shape (S) descriptors and 32 texture features (RLS) were extracted from the segmented lesions. A clinically estimated feature, the bimanual exam under anesthesia (EUA), was also collected from the clinical reports. Linear discriminant analysis was used to generate two combined response indices: one by the RFs alone (CRI-RF), and the other with both RFs and EUA (CRI-RF-EUA). With IRB approval, pre- and post-chemotherapy treatment CT scans of 98 patients with bladder cancers were collected. For all cases, cystectomy was performed after treatment and the disease outcome was available as reference standard of treatment response. 25% of patients had pT0 disease (complete response) at cystectomy. A radiologist marked 122 temporal pairs of primary site cancers. Stepwise feature selection and leave-one-case out cross-validation and receiver operating characteristic (ROC) analysis were performed. The area under the ROC curve (AUC) was calculated to estimate the accuracy for predicting pT0 stage (complete response) at cystectomy by V, CRI-RF and CRI-RF-EUA methods. Two radiologists also provided the likelihood of pT0 stage of the tumor by reading the pre- and post-treatment paired CT scans.

RESULTS
Although there were no differences in CTDIvol between single- and split-bolus injection, total DLP of split-bolus was significantly lower than those of single-bolus (1,425±460 vs. 2,013±59 mGy; p<.0001). There was no difference in the degree of the urinary tract opacification between single- and split-bolus (p=0.05). The renal parenchymal enhancement in NP of single-bolus achieved significantly better qualitative score than those in MP of split-bolus (p<.05), although no greater CT values than MP of split-bolus (162±31 vs. 128±22 HU; p<.0001). Nevertheless, there was no statistically significant difference in CR of renal lesion between in NP of single-bolus and MP of split-bolus (0.72±0.21 vs. 0.68±0.26; p=0.05). CT values of the renal pelvis were significantly higher in EP of single-dose than MP of split bolus (730±505 vs. 560±421HU; p=.0009). The AUC, Sens, Spec, and Accu of urinary tract lesions were; 0.99, 100%, 94.6%, 94.7% for split-bolus, 0.99, 100%, 95.8%, 95.8% for single-bolus without NP, 0.97, 92.3%, 94.7%, 94.7% for single-bolus including NP.

CONCLUSION
CTU with split-bolus injection technique can accurately depict the lesions in the renal parenchyma and the urinary tract as single-bolus injection with reduced radiation dose.

CLINICAL RELEVANCE/APPLICATION
Split-bolus technique should be applied for the CTU considering radiation dose.
RESULTS
For the 122 cancers, the AUC for prediction of pT0 disease at cystectomy was 0.70±0.05 for V. The AUC for CRI-RF based on 2 Contrast and 2 RLS features was 0.74±0.05 and increased to 0.78±0.05 when EUA was added (CRI-RF-EUA). Prediction of pT0 disease by radiologists resulted in AUCs of 0.77±0.05 and 0.75±0.05, respectively. The differences did not reach significance (p>0.05).

CONCLUSION
Both CRI-RF and CRI-RF-EUA performed similar to the radiologists and better than V for estimation of treatment response. The addition of EUA further improved the accuracy of treatment response assessment.

CLINICAL RELEVANCE/APPLICATION
The combined response index using both the radiomic features and clinically estimated EUA has the potential to provide accurate treatment response assessment and is superior to volume change alone.

SST05-04 Quantification of Microvascular Changes to Predict ypT1N0 in Chemotherapeutic Response in Bladder Cancer

Participants
Huyen T. Nguyen, PhD, Columbus, OH (Presenter) Nothing to Disclose
Amir Mortazavi, MD, Columbus, OH (Abstract Co-Author) Nothing to Disclose
Kamal S. Pohar, MD, Columbus, OH (Abstract Co-Author) Nothing to Disclose
Zarine K. Shah, MD, Columbus, OH (Abstract Co-Author) Nothing to Disclose
Lai Wei, PhD, Columbus, OH (Abstract Co-Author) Nothing to Disclose
Michael V. Knopp, MD, PhD, Columbus, OH (Abstract Co-Author) Nothing to Disclose
Debra Zynger, MD, Columbus, OH (Abstract Co-Author) Nothing to Disclose
Guang Jia, PhD, Baton Rouge, LA (Abstract Co-Author) Nothing to Disclose

PURPOSE
To apply a parametric MRI methodology to quantify the microvascular changes in bladder tumors at the mid-treatment point of neoadjuvant chemotherapy (NAC) to predict the response with ypT1N0 endpoint.

METHOD AND MATERIALS
Thirty-eight muscle-invasive bladder cancer patients were included. Each patient had a pre-chemotherapy, a mid-chemotherapy (after 2 cycles), and a post-chemotherapy MRI, followed by radical cystectomy. The pathological findings of cystectomy specimens were used as reference standard. A patient with <=ypT1N0 was defined as a responder. MRI was performed with T2W-MRI prior to DCE-MRI on a 3T multi-transmit system (Ingenia CX, Philips Healthcare). Two pharmacokinetic parameters (Amp - signal enhancement amplitude, and kep - the exchange rate between the interstitial space and the plasma space) were estimated. For each patient, the k-means clustering of a voxel-wise Amp and kep data matrix was performed to segment their bladder tumor in 3 clusters. The volume fraction (VF) changes of 3 clusters from pre- to mid-chemotherapy MRIs were calculated and correlated with NAC response. P<0.017 was considered statistically significant for tri-parametric analysis. ROC curve analysis was performed when significant difference was found.

RESULTS
Based on pathological findings, nineteen patients with <=ypT1N0 were classified as responders, and the other nineteen patients as non-responders. The k-means clustering segmented a tumor in 3 clusters: Cluster 1 contained voxels with both low Amp and kep; Cluster 2 had voxels with high Amp and low kep; Cluster 3 had voxels with low Amp and high kep. The correlation with chemotherapeutic response showed that responders had significantly higher VF change of cluster 2 (P<0.001) and lower VF change of cluster 1 (P<0.005). There was no correlation found in the VF change of cluster 3. The ROC curve analysis calculated that AUC values were 0.81 for cluster 1 VF change and 0.78 for cluster 2 VF change.

CONCLUSION
The quantitative MRI methodology can quantify the complex microvascular changes in bladder tumor at the mid-treatment point to characterize the tumor response. The quantitative assessment can provide valuable information to predict pT1N0 endpoint before the end of NAC.

CLINICAL RELEVANCE/APPLICATION
Accurate prediction of NAC response can make substantial impact on treatment stratification to improve the outcomes of bladder cancer patients.

SST05-05 Bladder Cancer Staging in CT Urography Using Radiomic Biomarkers

Participants
Lubomír M. Hadjiiski, PhD, Ann Arbor, MI (Presenter) Nothing to Disclose
Richard H. Cohan, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Sankeerth Garapati, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Kenny H. Cha, MSc, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Heang-Ping Chan, PhD, Ann Arbor, MI (Abstract Co-Author) Institutional research collaboration, General Electric Company
Elaine M. Caoli, MD, MS, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Ajai S. Alva, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Alon Z. Weizer, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Chintana P. Paramagul, MD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Jun Wei, PhD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose
Chuan Zhou, PhD, Ann Arbor, MI (Abstract Co-Author) Nothing to Disclose

PURPOSE
Accurate prediction of NAC response can make substantial impact on treatment stratification to improve the outcomes of bladder cancer patients.
To evaluate the accuracy of a decision support system for staging of bladder cancers based on automatically extracted radiomic biomarkers from CT urography (CTU) merged in a predictive model by machine learning techniques.

**METHOD AND MATERIALS**

Bladder cancers at stage T2 or above are recommended for neoadjuvant chemotherapy treatment clinically. Correct staging is crucial for the decision of neoadjuvant chemotherapy and minimizing the risk of under- or over-treatment. Pre-treatment CTUs of 84 patients with bladder cancers were retrospectively collected with IRB approval. 43 cancers were below stage T2 and 41 cancers were at stage T2 or above. Our Auto-Initialized Cascaded Level Set (AI-CALS) system was used to extract 3D lesion boundary from all lesions. 87 radiomic biomarkers including 55 tumor heterogeneity and 32 morphological features (volume (V), 23 gray level (GL) and 8 shape (S)) were extracted from the segmented lesions. Linear discriminant classifier (LDA), support vector machine (SVM), and backpropagation neural network (NN), with stepwise feature selection based on F-statistics, as well as a random forest (RAF) classifier were used to combine the biomarkers into 4 predictive models for comparison. The set was partitioned into independent Set 1 and Set 2 for two-fold cross validation. The predictive models including feature selection were trained on one partition set and tested on the other partition set and vice versa. The area under the receiver operating characteristic curve (AUC) was calculated for each model to estimate its performance in predicting cancer stage (>= T2 or < T2).

**RESULTS**

The test AUC on Set 1 was 0.89, 0.92, 0.91, and 0.86 for LDA, SVM, NN and RAF, respectively. The test AUC on Set 2 was 0.90, 0.89, 0.95, and 0.96 for LDA, SVM, NN and RAF, respectively. The differences between the models did not reach statistical significance. The useful biomarkers included 2 heterogeneity features, 2 gray level features, and a contrast feature.

**CONCLUSION**

The machine learning techniques are promising in selecting effective radiomic biomarkers and merging them into predictive models that may provide useful decision support for bladder cancer staging assessment.

**CLINICAL RELEVANCE/APPLICATION**

An objective decision support system that merges computer-extracted radiomic biomarkers in a predictive model may assist clinicians in making more accurate and consistent cancer staging assessment.

**SST05-06 Prospective Study of DWI and Intravoxel Incoherent Motion (IVIM) MRI as Biomarkers to Predict Clinical Aggressiveness in Bladder Cancer**

Friday, Dec. 1 11:20AM - 11:30AM Room: E351

Participants

Miaomiao Zhang, Beijing, China (Presenter) Nothing to Disclose
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**PURPOSE**

To evaluate the utility of the DWI and IVIM-MRI derived parameters in prediction of aggressiveness in bladder cancer.

**METHOD AND MATERIALS**

Fifty-eight patients (49 men, 9 women, mean age 61 years) were inspected through DWI and IVIM MR examination from April 2016 to March 2017. Bladder cancer (BC) was categorized in three different aggressiveness levels according to the classification criterion proposed by Kobayshi et al. The aggressiveness was classified as low- (including stage Ta and histological low-grade T1), intermediate- (high-grade T1) or high-aggressiveness (stage T2 or greater). Spearman Correlation Analysis was adopted to assess the correlation between aggressiveness and all parameters (apparent diffusion coefficient ADC, true diffusion coefficient D, pseudodiffusion coefficient D*, and perfusion fraction f). Comparisons of ADC value and IVIM parameters in different aggressiveness levels were performed using One-way analysis of variance (ANOVA). Diagnostic performance was calculated by means of receiver operating characteristics (ROC) analysis.

**RESULTS**

Aggressiveness of bladder cancer was negatively correlated with ADC value ($r$=-5.99, $P<0.001$), D value ($r$=-5.07, $P<0.001$) and f value ($r$=-3.64, $P<0.05$). ADC, D, and f values in high-aggressive BC were significantly lower than both those in low-aggressive BC ($P<0.05$) and those in intermediate-aggressive BC ($P<0.05$). There was not any significant difference between values of low- and intermediate-aggressive BC. The ROC analysis provided an AUC for ADC value to differentiate high-aggressive BC from low- and intermediate-aggressive BC (AUC=0.858, cut-off value =1.38mm²/s) with a sensitivity of 63.16%, a specificity of 100% and an accuracy of 75.87%, an AUC for D value (AUC=0.818, cut-off value =0.877mm²/s) with a sensitivity of 65.79%, a specificity of 95% and an accuracy of 75.86%, and an AUC for f value (AUC=0.782, cut-off value =0.33) with a sensitivity of 84.21%, a specificity of 70% and an accuracy of 79.3%.

**CONCLUSION**

ADC value and IVIM-derived parameters are promising biomarkers to predict aggressiveness in BC.

**CLINICAL RELEVANCE/APPLICATION**

(dealing with ADC value and aggressiveness)"The ADC value in DW-MRI can serve as a biomarker to predict the clinical aggressiveness of bladder cancer."
SST05-07

Comparison between Conventional Cystourethrography and MRI with Voiding MRCystourethrography in the Evaluation of Male Urethral Strictures
Friday, Dec. 1 11:30AM - 11:40AM Room: E351

Participants
Marco Di Girolamo, MD, Rome, Italy (Presenter) Nothing to Disclose
Francesco Carbonetti, MD, Rome-Roma, Italy (Abstract Co-Author) Nothing to Disclose
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PURPOSE

To evaluate the accuracy of conventional retrograde and voiding cystourethrography and MRI together with voiding MRcystourethrography in the evaluation of male urethral strictures.
METHOD AND MATERIALS

We evaluated 39 male patients with urethral strictures diagnosed with urine flow velocity recording and conventional retrograde and
voiding cystourethrography. All these patients underwent MRI and voiding MR-cystourethrography using a 1.5T superconductive
magnet. The patients had urine-filled bladders and high-resolution sagittal TSE T2-weighted scans were performed (TR:6250ms;
TE:90ms;sl.thick.:3mm; acq.time:3'38"). Voiding MR-cystourethrography was performed with T1-weighted spoiled 3D gradient-echo
acquisitions on sagittal plane (TR:12ms; TE:2,7ms; flip-angle:40°; sl.thickness: 2mm; acq.time:12s) after the filling of bladder
lumen with contrast-material-enhanced urine obtainded by the i.v administration 20 mg of furosemide followed by ¾ of the normal
dose of a paramagnetic contrast agent (Magnevist, Bayer Pharma, Germany). After micturition high-resolution coronal TSE T2weighted scans were performed at the level of the stenosis. Two radiologists in consensus evaluated the morphology and length of
the urethral stenosis with the two modalities and with MRI the entity and the site of spongio-fibrosis was assessed.
RESULTS

6 patients were not able to perform voiding MR-cystourethrography. In 33 patients evaluated with two imaging modalities 42
urethral strictures were detected. The measurement of the stenosis length was equal or superior with voiding MR
cystourethrography and the analysis of 3D sagittal scans allowed a better evaluation of the morphology of the urethral strictures in
comparison with conventional cystourethrography. 32 strictures with Spongio-fibrosis were found (76%). The site of spongiofibrosis was always assessed with MRI (dorsal, ventral, dorsal and ventral and circular fibrosis).
CONCLUSION

MRI with voiding MR-cystourethrography shows the morphology and the length of the urethral strictures better than conventional
cystourethrography and allows the detection and site of spongio-fibrosis, avoiding radiation exposure to the gonads and urinary
catheterization.
CLINICAL RELEVANCE/APPLICATION

MRI could be proposed as all-in-one technique for the evaluation of urethral stenosis, allowing their detection and length
assessment and determining the presence and site of spongiofibrosis.
SST05-08

Diagnostic Accuracy of MRI for T-Staging of Urothelial Bladder Cancer: Systematic Review and MetaAnalysis
Friday, Dec. 1 11:40AM - 11:50AM Room: E351

Awards
Student Travel Stipend Award

Participants
Niket Gandhi, MD, Ottawa, ON (Presenter) Nothing to Disclose
Matthew D. McInnes, MD, FRCPC, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
Scott Morgan, Ottawa, ON (Abstract Co-Author) Nothing to Disclose
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PURPOSE

To determine the diagnostic accuracy of MRI for T-staging (>T2) of urothelial bladder cancer (UBCa). Multi-disciplinary panel
determined a priori that a sensitivity of >95% was necessary to obviate the need for re-resection of tumor after initial TURBT
identifying
METHOD AND MATERIALS

Search of multiple databases was performed on Jan 26, 2017. Inclusion criteria: humans with UBCa who underwent pelvic MRI
(>1.5T) for local staging; reference standard (surgical pathology); no chemo- or radiotherapy prior to imaging. Inclusion and data
extraction was performed independently. Risk of bias was assessed using QUADAS-2. Summary estimates for diagnostic accuracy


were generated using bivariate random effects model and subgroup analyses evaluated for sources of heterogeneity.

RESULTS

13 studies (979 patients) were included. Pooled sensitivity and specificity for: A) 7 studies using only T2-W MRI = 89% (95%CI 78-95) and 55% (95%CI 45-65) and B) 8 studies using DWI = 78% (95%CI 69-85) and 78% (95%CI 70-84). Area under ROC curve (AUC) for T2WI was 0.71 and for DWI was 0.84. Summary ROC curve (SROC) is depicted in Figure 1; 95% prediction regions for T2WI and DWI do not overlap. Moderate risk of bias was identified in patient selection (3/13 studies), index test (4/13) and, reference standard (12/13); all primarily from lack of clear reporting.

CONCLUSION

MRI for T staging of UBCa demonstrates higher specificity and overall accuracy for DWI compared to only T2W-MRI. Caution is warranted; most comparisons were indirect and the majority of studies had moderate risk of bias in at least one domain.

CLINICAL RELEVANCE/APPLICATION

T-staging accuracy of UBCa (>T2) with MRI demonstrates variability with higher accuracy identified using DWI compared to T2W-MRI alone. Neither DWI nor T2W-MRI met our pre-specified criteria of >95% sensitivity suggesting that MRI is not an appropriate replacement test for re-resection of tumor following initial TURBT identifying.

SST05-09  Bladder Cancer: MRI as an Alternative to Repeat Transurethral Resection of Bladder Tumor for Local Staging

Friday, Dec. 1 11:50AM - 12:00PM Room: E351

Awards
Student Travel Stipend Award

Participants
Christian B. Van Der Pol, MD, Boston, MA (Presenter) Nothing to Disclose
Atul B. Shinagare, MD, Boston, MA (Abstract Co-Author) Advisory Board, Arog Pharmaceuticals, Inc.; Research grant, GTx, Inc.
Sreeharsha Tirumani, MBBS, MD, Boston, MA (Abstract Co-Author) Nothing to Disclose
Mark Preston, Boston, MA (Abstract Co-Author) Nothing to Disclose
Mark Vangel, PhD, Charlestown, MA (Abstract Co-Author) Nothing to Disclose
Stuart G. Silverman, MD, Brookline, MA (Abstract Co-Author) Nothing to Disclose

PURPOSE

Transurethral resection of bladder tumor (TURBT) frequently understages muscle invasive bladder cancer and needs to be repeated. The purpose of this study was to determine test characteristics of multiparametric MRI (mpMRI) for the local staging of bladder cancer following TURBT, using cystectomy as the reference standard.

METHOD AND MATERIALS

This retrospective study was institutional review board approved and is HIPAA compliant. Between August 2011 and October 2016, 45 consecutive patients (median age 73 years) met inclusion criteria, which included a TURBT procedure followed by mpMRI then cystectomy without intervening neoadjuvant or intra-vesical therapies. Median time between TURBT and MRI was 43 days (SD 130, range 17-627 days). Two fellowship-trained abdominal radiologists, blinded to cystectomy staging, reviewed each mpMRI independently to document tumor T stage and regional nodal disease using all available sequences and each sequence in isolation. Sensitivity and specificity for the presence of muscle invasion (>=T2) and peri-vesical invasion (>=T3) were calculated on a stage-by-stage basis. Sensitivity and specificity for presence of regional nodal disease was assessed. Inter-observer agreement was measured using Cohen's Kappa coefficient.

RESULTS

Sensitivity/specificity for presence of muscle invasion was 92%/74% for reader 1 and 88%/84% for reader 2. Sensitivity/specificity for presence of peri-vesical invasion was 72%/92% for reader 1 and 67%/92% for reader 2. Sensitivity/specificity for regional nodal disease was 45%/93% for reader 1 and 45%/90% for reader 2. T2-WI was the most sensitive sequence for both readers for determining the presence of muscle invasion and peri-vesical invasion, while DWI was the most sensitive for regional nodal disease. The most specific sequence varied between readers. Inter-observer agreement was substantial for presence of muscle invasion, peri-vesical invasion and regional nodal disease when all sequences were used.

CONCLUSION

mpMRI is sensitive and specific at determining bladder cancer muscle and peri-vesical invasion in patients who have undergone prior TURBT. mpMRI was specific but not sensitive for assessing regional nodal disease.

CLINICAL RELEVANCE/APPLICATION

Multiparametric MRI is sensitive and specific at bladder cancer local staging following TURBT. Current bladder cancer management guidelines could consider mpMRI as an alternative to repeat TURBT.