Genitourinary Radiology

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

UR001-EB-X

Imaging Associations in Male Infertility

All Day Room: GU/UR Community, Learning Center Hardcopy Backboard

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TEACHING POINTS

Familiarize the radiologist on common male etiologies of infertility Protocols for male infertility imaging Imaging examples of causes of male infertility

TABLE OF CONTENTS/OUTLINE

Approximately 15% to 20% of couples experience infertility at some point, with adverse effects having psychologic, social, and economic implications. It is estimated that 30% of infertility cases can be attributed solely to male factors and up to 50% of all cases involve a male component. Identification of male factors in infertility, some of which are reversible, can strongly impact couples experiencing infertility and can be a critical component in further decision making. Diagnostic imaging provides a non-invasive assessment of the male genital tract, allowing physicians to potentially identify the underlying etiology in cases of infertility. Familiarity with the associated findings allow the radiologist to provide a more detailed and targeted report, and the ability to positively impact patient care. 1. Testicular Etiologies a. Varicocele b. Cryptorchidism c. Testicular insult - infarction, trauma, tumor, post-therapy 2. Extra-testicular Etiologies a. Congenital bilateral absence of vas deferens/seminal vesicles b. Seminal vesicle cysts c. Prostatic cysts d. Ejaculatory duct/epididymal obstruction

UR002-EB-X

Automatic Quantitative Analysis of Kidney Tumor Using 3D Fully Convolutional Network

All Day Room: GU/UR Community, Learning Center Hardcopy Backboard

FDA Discussions may include off-label uses.

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TEACHING POINTS

The purpose of this exhibit is To learn fully-automated segmentation of the kidneys and kidney tumors from CT volume To learn fully-automated quantitative analysis method for kidney tumors To demonstrate deep learning-based analysis system for kidney tumors To show the internal relations between tumor morphology and treatment plan

TABLE OF CONTENTS/OUTLINE

Importance of pre-operative CT image diagnosis in partial nephrectomy How kidney tumor's morphology affects treatment plan What can our assistance system do? Accurate kidney region and kidney tumor segmentation on CT image Extraction of kidney region and kidney tumors using 3D fully convolutional network Quantitative analysis of kidney tumors Analysis of relationship between tumor morphology and treatment Clinical application Deeper insight into relationship between kidney tumors and their treatment More standardized surgical plan for nephrectomy Demonstrate our computer-aided system Fully automated kidney and kidney tumor segmentation (Fig. 1) Calculation of statistical measures of tumors (Fig. 2 and 3) Interactive demonstration of results in 3D rendering and 3D printed model

UR003-EB-X

MRI and Transrectal US Findings 12 Months After MRI-guided Transurethral Ultrasound Ablation (MRI-TULSA) for Localized Prostate Cancer

All Day Room: GU/UR Community, Learning Center Hardcopy Backboard

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TEACHING POINTS

Prostate cancer is the most commonly diagnosed cancer and the second most common cause of cancer death among men in the United States. Due to widespread use of prostate-specific antigen screening, most cases are localized when diagnosed. Standard treatments for localized disease include active surveillance, radiation therapy, or radical prostatectomy. Ablation with cryotherapy or ultrasound (US) may be potential alternatives. Magnetic resonance imaging-guided transurethral ultrasound ablation (MRI-TULSA) is a novel minimally invasive technique that uses real-time MR-thermometry to guide transurethral ablation of prostate tissue with an ultrasound applicator. Unlike high intensity focused US or cryotherapy, MRI-TULSA performs whole gland ablation that drastically alters the appearance of the prostate on MRI and transrectal US, making post-treatment cancer surveillance challenging. This educational abstract provides an overview of MRI-TULSA and demonstrates the spectrum of imaging findings seen on MRI and transrectal US 12 months post-procedure.

TABLE OF CONTENTS/OUTLINE

A) Overview of MRI-TULSA B) Case 1: Complete ablation on MRI, two subcentimeter hypoechoic lesions on US C) Case 2: Non-enhancing hypointense (T2) lesion on MRI D) Case 3: Enhancing hypointense (T2) lesion on MRI E) Case 4: Enhancing hypointense (T2) lesion on MRI

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UR004-EB-X

Uncommon Urinary Bladder Tumors: Different Imaging Features for Urothelial Carcinoma

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TEACHING POINTS

1. Understanding classification of bladder tumors and frequency. 2. Characterization of image feature correlated with cystoscopic and pathological features.

TABLE OF CONTENTS/OUTLINE

We describe the characteristic features about bladder tumors with cystoscopic, pathological and imaging features, following details. 1. Epithelial tumors 1) Urothelial carcinoma 2) squamous cell carcinoma 3) adenocarcinoma 4) small cell carcinoma 5) lymphoma 2. Nonepithelial tumor 1) leiomyoma 2) metastasis 3) lymphoma as secondary involvement 3. bladder tumor mimicking lesion 1) actinomycosis 2) Cystitis cystica glandularis

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UR005-EB-X

The Forgotten Tubes: A Review of Ureteral Pathology

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TEACHING POINTS

The ureter is not as frequently involved as the kidneys or bladder for many of the GU diseases and may therefore be overlooked. Knowledge of the spectrum of disease entities affecting the ureter and periureteral soft tissues is important for the radiologist to more accurately form a differential diagnosis to guide clinical work up and treatment. The purpose of this exhibit: 1. Describe the pathophysiology and clinical presentations of ureteral pathology. 2. Review imaging techniques to evaluate the ureter. 3. Illustrate imaging features of disease entities involving the ureter. 4. Integrate clinical and radiologic findings to guide appropriate diagnosis and treatment.

TABLE OF CONTENTS/OUTLINE

1. Infection a. Bacterial ureteritis b. Emphysematous ureteritis c. Tuberculosis ureteritis 2. Calculi 3. Inflammatory processes a. Amyloidosis b. Ureteritis cystica 4. Malignant neoplasm processes a. Primary: Urothelial cell carcinoma b. Secondary: hematogenous metastases, direct invasion 5. Benign neoplastic processes a. Fibroepithelial polyp b. Inverted papilloma 6. Traumatic and iatrogenic processes a. Urine leak b. Ureteral stent complications: malposition, encrustation, dissection c. Normal and abnormal appearance after urinary diversion d. Strictures e. Fistulas 7. Congenital a. Duplicated collecting system b. Bifid Ureter c. Ectopic ureter c. Megaureter

Printed on: 10/29/20

UR100-ED-X

Clinical Applications of Quantitative Diffusion-Weighted Magnetic Resonance Imaging in the Management of Prostate Cancer: What the Radiologist Needs to Know

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TEACHING POINTS

The purpose of this presentation is: 1. To understand the problems of qualitative diffusion weighted imaging (DWI) in prostate multiparametric prostate MRI 2. To learn the optimization method for clinical application of quantitative DWI in prostate cancer (PC) 3. To demonstrate the various approaches using quantitative DWI for PC management

TABLE OF CONTENTS/OUTLINE

Current role and problems of qualitative DWI including the Prostate Imaging Reporting and Data System Version 2 (PI-RADS v2) Optimization method of quantitative DWI including apparent diffusion coefficient (ADC) - Effects of magnetic field strength, venders, and b value - Fitting models: Gaussian vs. non-Gaussian models (DKI, IVIM, and stretched-exponential model) - Reduced FOV DWI with ADC - ADC measurements: 2D vs. 3D region of interests (ROIs) - ADC measurements: optimal 2D ROI method - ADC histogram analysis - ADC ratio of tumor to normal prostate tissue Clinical applications - Tumor detection - Assessment of tumor aggressiveness - Extracapsular extension - Surgical margin status - Histopathological characterization - Selection of active surveillance (AS) patients - Prediction of outcomes after therapy (Radiotherapy and AS) Advance to personalized medicine using radiomics with quantitative DWI

UR101-ED-X

Clinical Implementation of MRI-Ultrasound Fusion-Guided Prostate Biopsy in the Management of Prostate Cancer: What Radiologists Should Know

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

The purpose of this presentation is: 1. To understand the problems of standard systematic transrectal ultrasound (TRUS)-guided prostate biopsy in patients with elevated PSA levels. 2. To learn the characteristics of MRI-US fusion-guided prostate biopsy 3. To demonstrate the clinical utility of MRI-US fusion-guided prostate biopsy for prostate cancer (PC) management

TABLE OF CONTENTS/OUTLINE

Problems of standard systematic TRUS-guided prostate biopsy - False-negative results for anterior and apical lesion - Underestimation of tumor aggressiveness and tumor size - Unnecessary diagnosis of insignificant PC (isPC) Characteristics of MRI-US fusion-guided prostate biopsy - Technology and state-of-the-art devices - Comparison with cognitive MRI-targeted biopsy and in-bore MRI-targeted biopsy - Optimization of multiparametric MRI (mpMRI) for target biopsy - Work flow: assessment of mpMRI with PI-RADS v2, segmentation of mpMRI, co-registration of MRI with US images, target biopsy, and pathological evaluation - Complications - Limitations - Cost-effectiveness Clinical usefulness - Increased ability to detect clinically significant PC - Limiting detection of isPC - Accurate evaluation of PC risk - Accurate PC mapping - Management of active surveillance: patient selection, observation and prediction of outcome - Focal therapy

UR102-ED-X

Goodness, Gracious, Great Balls of Fire: The Pivotal Role of Doppler in Evaluating the Acute Scrotum

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1. To describe the role of doppler in differentiating the top diagnostic considerations in the evaluation of the acute scrotum. 2. To illustrate pitfalls in doppler evaluation and supplemental US findings that can help make the correct diagnosis. 3. To re-enforce key concepts and provide knowledge self-assessment through case examples in multiple choice format.

TABLE OF CONTENTS/OUTLINE

1. Introduction a. Review of anatomy b. Optimizing Doppler technique c. Algorithm for evaluation 2. Increased flow a. Infection i. Epididymitis ii. Epididymo-orchitis iii. Scrotal cellulitis and Fournier's gangrene 3. Decreased flow a. Torsion i. Testicular ii. Appendageal 1. Testicular 2. Epididymal b. Segmental infarct c. Trauma i. Hematoma ii. Testicular fracture iii. Testicular rupture 4. Pitfalls and limitations 5. Self-assessment cases 6. Summary

Printed on: 10/29/20

UR103-ED-X

Sizing up the Scrotum: Multimodality Approach to Scrotal Neoplasms with Pathology Correlation

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

Scrotal neoplasms often present as a palpable abnormality and can be broadly categorized as intra or extratesticular. While ultrasound is often the first-line imaging modality used to evaluate these lesions, MRI has been shown to add value in certain conditions. As scrotal neoplasms are treated surgically, knowledge of the histologic appearance can better inform pre-operative imaging studies. At the end of this exhibit, the learner will be able to do the following: Elucidate specific indications in which MR imaging is useful in the evaluation of scrotal neoplasms Identify imaging features that allow a specific pre-operative diagnosis Correlate histologic findings to those seen with radiology

TABLE OF CONTENTS/OUTLINE

Normal appearance of scrotum on US and MRI Extratesticular lesions: Adenomatoid tumor, Spermatocele, Lipoma, Fibrous pseudotumor, Spermatic cord metastases, Spermatic cord sarcoma (liposarcoma), Paratesticular cellular angiofibroma Intratesticular lesions: Germ cell tumors (Seminoma, Non-seminoma), Non germ cell tumors (Sertoli, leydig), Epidermoid cysts, Metastases, Lymphoma Summary/Conclusion

UR104-ED-X

Rendezvous with the Retroperitoneum: Radiology-Pathology Correlation of Primary Retroperitoneal Neoplasms

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Awards
Certificate of Merit
Identified for RadioGraphics

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TEACHING POINTS

Primary retroperitoneal neoplasms are rare but are often malignant and can carry high mortality rates. Therefore, determining features that allow an accurate diagnosis is critical. An understanding of the histologic features can aid in identifying these imaging features and allows prognostication and determination of the appropriate treatment regimen. After reviewing this exhibit, the learner will be able to: Describe the fascial planes, spaces and contents of the retroperitoneal compartments Characterize solid and cystic retroperitoneal neoplasms based on their imaging features Correlate imaging features with gross and microscopic histologic findings

TABLE OF CONTENTS/OUTLINE

• Tricompartmental retroperitoneal (RP) anatomy • Solid: • Adipocytic: Lipoma, Liposarcoma • Fibroblastic: Solitary Fibrous Tumor, Malignant Solitary Fibrous Tumor, Myxofibrosarcoma • Skeletal muscle: Embryonal Rhabdomyosarcoma, Alveolar Soft Part Sarcoma • Smooth muscle: Leiomyoma, Leiomyosarcoma • Neurogenic & peripheral nerve sheath: Neurofibroma, Schwannoma, Malignant Peripheral Nerve Sheath Tumor, Ganglioneuroma, Ganglioneuroblastoma, Neuroblastoma, Paraganglioma, Pheochromocytoma • Miscellaneous: Undifferentiated Pleomorphic Sarcoma • Cystic: Mucinous cystadenoma; Lymphangioma • Features allowing differentiation of primary RP neoplasms • Conclusion

UR105-ED-X

Update on Imaging the Perinephric Space: How MRI Can Add Value to Achieve a Final Diagnosis

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

To provide an overview of the anatomical significance of the perinephric space in the pathogenesis of various diseases. A case based review of diseases which present or extend to or secondarily manifest in perinephric space will be presented with highlights of salient imaging features, especially MRI.

TABLE OF CONTENTS/OUTLINE

Insights and cheat-sheets for most controversies and complications in the imaging of the perinephric spaces: Origin: Where is the lesion arising from - kidney vs. perinephric space? How to differentiate and clinical significance? Anatomy: Is the lesion in the perinephric space? Pararenal space? Para-aortic? Peritoneal? Quick anatomy review of these spaces. Imaging of perinephric space: MR sequences and challenges with MRI. Significance of perinephric space in the spread of renal cell carcinoma: Including the updated TNM classification. Perinephric fat stranding: What does it signify? Perinephric fat amount and surface area: Independent predictor of metabolic risk? Common, uncommon, weird and wacky lesions in the perinephric space: The usual culprits (lymphoma, metastasis), unusual diseases (IgG4-related disease, Erdheim-Chester), and some incredibly rare entities (pheochromocytoma resulting in trans-differentiation into brown fat). Role of biopsy: biopsy techniques while approaching perinephric space lesions.

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Voiding Cystourethrography Imaging: Album of Essential Urethral Pathology

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

To understand normal urethral anatomy correlating with demonstrative voiding cystourethrography imagesTo review at a glance frequent male urethral pathology

TABLE OF CONTENTS/OUTLINE

Normal anatomy of the male urethraVoiding cystourethrography technique and potential pitfallsUrethral stricturesUrethral calculiNeoplasmsAcquired inflammatory diseasesUrethral rupture due to traumatic injuryUrethral diverticula

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UR107-ED-X

The Many Faces of Prostatic Lesions: Rare Tumors and Atypical Presentation of Adenocarcinoma

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

The purposes of this study are:to show the prostate cancer zonal distribution;to review the less common location of prostatic adenocarcinomas (PCa) such as anterior and central zone tumors;to describe uncommon imaging patterns of PCas such as subcapsular posterior lesions and those mimicking benign lesions;to suggest a systematic approach for prostate MR imaging reading emphasizing the main features and location of these lesions;to improve the detection of these often missed lesions and to suggest different ways of dealing with doubtful findings.

TABLE OF CONTENTS/OUTLINE

Prostate lesions epidemiology highlighting the uncommon locations and histology: Zonal anatomy; Histologic components. Systematic approach reading prostate MR images: MRI Sequence based approach. Atypical presentation of prostate adenocarcinoma: Central zone PCa; Transition zone PCa: Anterior lesion;Hypointense nodule with obscured margins. PZ PCa: subcapsular crescentic tumor; infiltrative (ill-defined lesions); midline posterior tumor; prostatitis hiding tumor; periurethral tumor. Less common histologic types:Mucinous adenocarcinoma; Prostate Lymphoma; Prostate stromal tumor of uncertain malignant potential (STUMP); Neuroendocrine tumor; Prostatic metastasis; Prostatic sarcoma; Prostatic cystadenoma; How to deal with doubtful findings.

UR108-ED-X

New Radiologic Classification of Renal Angiomyolipomas

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1. To introduce the radiologic classification of angiomyolipoma (AML) and the clinical implications for patient care. 2. To show the imaging features of each type of AML. 3. To describe which types of AML should be biopsied to differentiate them from renal cell carcinoma (RCC).

TABLE OF CONTENTS/OUTLINE

1. Classification 1) Fat-rich, fat-poor, fat-invisible AML using CT and MRI quantitative values 2. Imaging features 1) US features 2) CT features 3) MRI features 3. Differential diagnoses 1) Fat-rich AML versus fat-containing renal cell carcinoma 2) Fat-poor AML versus clear cell renal cell carcinoma 3) Fat-invisible AML versus non-clear cell renal cell carcinoma 4) AML versus renal cell carcinoma: morphologic differentiation 4.Biopsy indications

Printed on: 10/29/20

UR109-ED-X

When the Frame Outshines the Painting: A Quick Guide of Pelvic Bone Lesions for Body Radiologists Reporting Prostate MRI

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1 - Multiparametric MRI of the prostate has been widely performed for biopsy guidance and staging of prostate cancer, moreover its use is increasing in the scope of diagnosis. 2 - Bone metastasis is a relevant issue in the management of prostate cancer as the major cause of pain and death in such patients. 3 - A variety of other bone lesions can incidentally be found in pelvic bones during evaluation of prostate MRI. 4 - This work aims to be a practial guide to differential diagnosis of common eskeletal lesions for the abdominal radiologist in the setting of prostate MRI.

TABLE OF CONTENTS/OUTLINE

Pelvic bones are the commonest site of metastatic bone spread in prostate cancer. This work illustrates common lesions ocurring in the pelvis and hips, including malignant (matastases, myeloma, and primary neoplasms) and benign (insufficiency/avulsion fractures, cysts, fibrous dysplasia, Paget, infection...), some of wich may mimic neoplasms.

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UR110-ED-X

New Light Towards the End of the Tunnel: Differential Diagnosis for Ureteral Structure

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TEACHING POINTS

Ureterolithiasis is by far the most common cause of hydronephrosis in clinical practice. However, a range of common and uncommon, benign and malignant, intrinsic and extrinsic lesions may affect the ureters. A case based review of ureteric involvement in such conditions will be made in order to improve differential diagnosis.

TABLE OF CONTENTS/OUTLINE

Starting from ureteral obstruction as a common outcome, this work abroads differential diagnosis including several intrinsic (neoplasm, infection, idiopathic) and extrinsic (malignancy, endometriosis, fibrosis) pathologies and discusses its mechanisms.

UR111-ED-X

Whole-body MRI for Advanced Prostate Cancer: A Comprehensive Atlas for Disease Staging and Follow-Up

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1. Advanced prostate cancer is associated with metastatic bone, nodal and visceral disease, which can be detected using whole body MRI (WB-MRI). 2. Modern WB-MRI protocol comprises T1-weighted and T2-weighted imaging of the spine; as well as axial diffusion-weighted MRI (using b-values of 50 and 900 s/mm2) and DIXON T1-weighted images (used to calculate relative fat-fraction images). 3. Diffusion-weighted and relative fat-fraction images are useful for disease detection and assessing treatment response. 4. Knowledge of interpretative pitfalls is important to avoid mistakes.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Role of modern imaging e.g. WB-MRI and PET for disease assessment 3. WB-MRI protocol 4. Patterns of disease on WB-MRI (especially on DWI) • Bone i. Focal: uniform, heterogeneous, ring, double ring, necrotic. ii.Diffuse. • Lymph nodes: common sites and morphological patterns • Other: viscera, peritoneum , brain 5. How to assess treatment response • MET-RADS-P • Visual assessment • Semi-quantitative assessment: relative fat fraction • Quantitative assessment: disease volume and ADC • Heterogeneous response 6. Interpretative pitfalls • False positives and false negative lesions.

UR112-ED-X

TEST the TESTIS: An Ultrasound Diagnostic Algorithm from SSSSimple to Complex Pathology

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Awards
Cum Laude

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TEACHING POINTS

Ultrasound (US) represents the first-line examination of the scrotum and its contents. Despite the high sensitivity and specificity in identifying the abnormality, there still is no entitled US diagnosis algorithm. An accurate interpretation of the US findings is vital to guiding further interventions and treatment management. The ultimate goal is reducing the unnecessary radical surgical procedures and avoiding possible infertility causes by better lesion characterization. Thus, we propose an easy approach diagnostic algorithm to depict the broad spectrum of scrotum abnormalities. Aims: A. Review the scrotum US technique; B. Discuss and illustrate US anatomy of the normal testis and paratesticular compartment; C. Highlight essential US features of various benign and malignant testis pathologies, using the 4 S's diagnosis algorithm: 1.Site, 2.Size, 3.Structure, 4.Small vessels flow. We also include the SLC acronyms (S- solid, L-liquid, C-calcified) in the Structure category, to point out the predominant component of the US abnormality D. Assessment of paratesticular pathologies E. Complex pathology cases presented in a challenging quiz format

TABLE OF CONTENTS/OUTLINE

1. US scrotum technique: 2D, Doppler, Elastography 2. Normal testis US anatomy 3. Testis cascading diagnosis algorithm 4. Paratesticular pathology 5. TEST the TESTIS: case based quiz

UR113-ED-X

Contrast-Enhanced Ultrasound as a Tool for Characterizing Renal Cysts: Our Experience

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

• Simple cysts are fully characterized with ultrasound (US) whereas complex cysts require further characterization, which is obtained by contrast- enhanced Computer Tomography (CT), Magnetic Resonance (MR) and Contrast-enhanced ultrasound (CEUS) • CEUS has been proved to be a useful imaging modality to characterize complex renal cysts using the Bosniak classification in a similar way as CT. • Explain CEUS' important role in the evaluation of indeterminate cystic lesions on CT or MR. • Underline CEUS unique advantages over traditional modes: lack of nephrotoxicity, absence of ionizing radiation and ability to evaluate the enhancement pattern of renal lesions quickly and in real-time.

TABLE OF CONTENTS/OUTLINE

A) Background B) Bosniak classification, CT and CEUS. C) CEUS' evaluation of indeterminate cystic lesions on CT and MR D) Advantages and disadvantages of CEUS E) Conclusions

Printed on: 10/29/20

UR114-ED-X

Pitfalls in Renal Ultrasound

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Awards
Certificate of Merit

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TEACHING POINTS

1. Use optimal technique including gray scale, color Doppler and cine, while recognizing limitations. 2. Assess renal size and echogenicity accurately. 3. Recognize hydronephrosis and separate from mimics. 4. Distinguish pseudomasses and appreciate subtle true masses. 5. Improve accuracy in detecting calculi. 6. Evaluate location of renal related collections and recognize misses.

TABLE OF CONTENTS/OUTLINE

1) Technique a) Appropriate transducer b) Color and spectral Doppler c) Scanning orientation d) Cine and contrast 2) Size a) Renal length correlates with height, age, hydration b) Small, echogenic kidneys correlate with poor GFR c) Cortical thickness may correlate better with GFR than length d) Normal sized kidneys may still be abnormal 3) Hydronephrosis a) Mimics: Dilated vein, parapelvic cyst, megacalyces, hypoechoic sinus fat in ESRD b) Misses i) Complex urine: blood, pus ii) Slight dilation (compare to other kidney) iii) Urothelial thickening c) Dilation without obstruction i) Due to distended bladder, patulous collecting system, pregnancy ii) Use ureteral jets 4) Cysts and mimics 5) Masses: misses/overcalls a) Pseudomass: focal scar, splenule, pancreatitis, focal pyelonephritis 6) Calculi a) Twinkle artifact: lower focal zone, increase PRF b) Optimize shadowing 7) Collections: misses/mimics

UR115-ED-X

Changing Paradigms in Urothelial Imaging: New Approaches to Diagnosis and Reporting

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Awards
Certificate of Merit

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TEACHING POINTS

1) While imaging remains an important tool in the management of hematuria, the long-held approaches to upper tract imaging are in evolution. Current expert panel guidance recommends that all patients with hematuria undergo radiologic evaluation. Yet, ideally, recommendations should be based on risk-stratified evidence that is only beginning to emerge. 2) In the lower tract, VI-RADS 1.0 has recently been introduced to define a standardized approach to imaging and reporting MRI for bladder cancer, defining the risk of muscle invasion. 3) Finally, new approaches to imaging the urethra with MRI have been introduced, better identifying anatomy and disease. This reviews these evolving opportunities to improve imaging of urothelium.

TABLE OF CONTENTS/OUTLINE

1) Describe the current consensus guidelines on imaging of the upper and lower urinary tracts with emphasis on the evaluation of hematuria and provide updated review of literature that may alter future recommendations. 2) Review VI-RADS reporting system for multiparametric MRI of bladder cancer. 3) Review technique and findings for MR urethrography.

UR116-ED-X

Imaging of Urachal Anomalies Revisited: Cross-Sectional Imaging Spectrum

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Awards
Cum Laude

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TEACHING POINTS

Review of embryological development and anatomy of urachus Discuss classification of congenital urachal anomalies & their cross-sectional imaging spectrum. Review role of imaging in management of urachal anomalies & associated complications

TABLE OF CONTENTS/OUTLINE

Introduction Embryological development and anatomy Classification of congenital urachal anomalies a) Patent urachus/urachal fistula b) Urachal cyst c) Umbilical-urachal sinus d) Vesico-urachal diverticulum Complications: Infection and neoplasms Role of different imaging modalities Management of congenital urachal anomalies and its complications Conclusion Summary: Clear understanding of imaging findings of all urachal anomalies aids in better patient care by early identification of anomaly, which not only optimizes appropriate medical and surgical management but also to prevent potential complications.

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UR117-ED-X

The Prostate Imaging Reporting and Data System (PI-RADS) Version 2.1: New (or Old) Challenges?

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1-The PI-RADS version 2 was rapid validated, with good acceptance and global applicability. PI-RADS Steering Committee proposed solutions to improve some aspects, maintaining framework of scoring using individual sequences, so a version 2.1 has been published2-Despite changes, some limitations are already noted in this new version: -Lack of guidance on classifying atypical / suspicious prostate lesions with low PI-RADS (PR) score;-Non-establishment main sequence for central zone lesions;-No criteria regarding temporal evolution of lesions;-Absence of laboratory criteria for scoring, like PSA density, which may help assess limitations for low graded lesion on high risk patients;-Importance of objective ADC values for grading difficult lesions;-New definitions of P2 lesions in transition zone and their update criteria for P3 may increase P3 lesions and there are no follow-up suggestions;-Criteria to define good quality of exams, specially on DWI;-Dichotomized assessment of extraprostatic extension.-No criteria on how to rate lesions after treatment.3-Propose solutions for problems detected.

TABLE OF CONTENTS/OUTLINE

Concepts of PI-RADS version 2.1.Ilustration of several cases showing limitations are already noted in this new version.Propose improvements for next version.References.

Printed on: 10/29/20

UR118-ED-X

Comprehensive Review of Genitourinary Trauma

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

- Describe the spectrum of injuries that can occur in genitourinary trauma. - Discuss the role of imaging in the management of patients with penetrating and blunt genitourinary trauma. - Review the classification of the genitourinary injuries .

TABLE OF CONTENTS/OUTLINE

INTRODUCTION - Epidemiology of genitourinary trauma. INJURIES MECHANISM - Blunt abdominal trauma. - Penetrating abdominal trauma. SYSTEMATIC APPROACH - Clinical manifestations. - Main imaging study indications. • Ultrasound. • Retrograde urethrography. • Computed Tomography. • Angiography. - Pitfalls. INTERACTIVE CASE-BASED DIDACTICS - A didactic diagnostic approach with illustrated teaching cases from our department emphasizing the imaging features that may contribute to the diagnosis and trauma injury grading. • Kidney. • Ureter. • Adrenal. • Bladder. • Testes. • Urethra.

UR119-ED-X

MRI: Transrectal Ultrasound Fusion-Guided Biopsy of the Prostate

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

To understand the significance of the current prevalence versus mortality rate of prostate cancer. To discuss shortcomings of the standard diagnostic work-up of prostate cancer with transrectal ultrasound-guided (TRUS) biopsy of the prostate. To address the current role of MRI - transrectal ultrasound fusion guided biopsy in the diagnosis of prostate cancer. To explain the process of how MRI - transrectal ultrasound fusion guided biopsies are obtained. To present cases of prostate cancer in which MRI - transrectal ultrasound fusion guided biopsy results changed clinical management.

TABLE OF CONTENTS/OUTLINE

Prevalence and mortality rate Anatomy of the prostate Normal imaging features and sequences of multiparametric MRI (mpMRI) of the prostate Standard diagnostic work-up of prostate cancer Digital rectal exam and PSA level Gleason Score Transrectal ultrasound guided biopsy Work- up with the addition of mpMRI and MRI- transrectal ultrasound fusion guided biopsy mpMRI of the prostate PI-RADs version 2 MRI - transrectal ultrasound fusion guided biopsy Management Cases with MRI - transrectal ultrasound fusion guided biopsy results

UR120-ED-X

Spilling the Beans: An Inside Scoop on the Imaging of Renal Parenchymal Disease

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

The spatial distribution and character of renal calcifications can be used to formulate a focused differential diagnosis. The spatial distribution and size of renal cysts are the most important features for reaching the correct diagnosis. There is substantial overlap in the imaging appearances of infiltrative parenchymal diseases; clinical history is critical in this setting. Other parenchymal diseases have characteristic imaging appearances that allow for confident imaging-based diagnoses.

TABLE OF CONTENTS/OUTLINE

Calcific: nephrolithiasis; medullary nephrocalcinosis (medullary sponge kidney, hyperparathyroidism, distal renal tubular acidosis); cortical nephrocalcinosis (cortical necrosis, chronic glomerulonephritis, transplant rejection) medullary + cortical nephrocalcinosis (oxalosis, prior tuberculosis) Cystic: ADPKD, chronic glomerulonephritis, acquired cystic renal disease, lithium nephrotoxicity, etc. Infiltrative: malignant (lymphoma/leukemia, atypical renal cell carcinoma, metastatic disease); infectious/inflammatory (acute pyelonephritis, xanthogranulomatous pyelonephritis, renal replacement lipomatosis, lupus nephritis, sarcoidosis, etc.) Other: acute tubular necrosis, chronic kidney disease, papillary necrosis, medullary ischemia, tubular ectasia, cortical siderosis, dehydration, etc.

UR121-ED-X

Symptomatic Adrenal Glands: The Role of Imaging in Clinical Practice

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1. To describe pathophysiology and general characteristics of symptomatic adrenal pathologies2. To assess the role of the imaging modality of choice in symptomatic adrenal conditions3. Correlate symptomatic syndromes and diseases of the adrenal glands with key imaging findings

TABLE OF CONTENTS/OUTLINE

1. Review of general characteristics and detailed analysis of pathophysiology of adrenal syndromes to learn the role of imaging studies 2. Learn the imaging modality of choice for each symptomatic syndrome3. Describe the key imaging findings of CT, MRI and nuclear imaging of the following syndromes and pathologies:a. Primary aldosteronism: Adrenal adenoma (Conn syndrome), adrenal hyperplasia, neoplasiab. Hypercortisolism (Cushing syndrome): Adrenal adenoma, adrenal hyperplasia, neoplasiac. Primary adrenal insufficiency (Addison disease): lymphoma, tuberculosis, hemorrhage, neoplasia, infectionsd. Elevated catecholamines and hypertension: Pheochromocytoma4. Conclusion

UR122-ED-X

MRI for Assessment of the Post-treatment Prostate

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

The expected MR findings in patients following treatment for prostate cancer will be described. The MR features consistent with recurrence of prostate cancer will be illustrated. Mimics of prostate cancer recurrence in the treated prostate will be demonstrated.

TABLE OF CONTENTS/OUTLINE

Introduction and definitions of reecurrent prostate cancer depending on mode of treatment. Normal appearances after radical prostatectomy Recurrence after prostatectomy Normal and post-recurrence findings following external beam radiotherapy Brachytherapy findings follwing treatment and in recurrence. Focal therapies (cryotherapy, HIFU, Phototherapy, irreversible electroporation), description of the techniques used and examples of normal appearances and recurrent disease. MR mimics of recurrence in the treated prostate.\ Summary

Printed on: 10/29/20

UR123-ED-X

Lymph Node Dissemination of Main Pelvic Tumors: When the Cross-Sectional Imaging Avoids Metabolic Studies

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

To review the anatomic location of pelvic lymph nodes and the main routes of lymphatic dissemination of the most prevalent cancers in male and female pelvis. To review the main oncologic staging systems and how the route of dissemination affects N-staging; discuss the concept of regional versus non-regional dissemination and how radiologists may indicate the best surgical approach for sampling/resecting suspected lymph nodes. To discuss the prognostic and therapeutic implications of nodal staging, limitations of cross-sectional methods compared to metabolic imaging and when differentiation between hyperplastic and malignant nodes is possible using conventional imaging.

TABLE OF CONTENTS/OUTLINE

- Anatomy of lymph nodes in the pelvis - Pathologic staging of nodal involvement, including extra-mural deposits. - Imaging criteria for lymph nodes metastasis: size, form, internal architecture and contours. - The pattern of dissemination in the pelvis: a) dissemination occurs along routes; b) sentinel lymph node is common; c) skip metastasis are rare. - The four main routes for pelvic nodal dissemination. - Diagnostic accuracy for N-staging of main pelvic tumors for CT, MRI and PET-CT. - Patterns and cases for illustrating dissemination of bladder, prostate, penile, rectum, cervix, endometrium, ovaries and vaginal cancers.

UR124-ED-X

Complications of Renal Transplantation: Beyond the Usual Suspects

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

To discuss the general surgical techniques of renal transplantation as a basis for understanding their potential complications. To analyze the clinical and imaging features of renal transplantation complications.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Surgical anatomy: Description of surgical technique, including pediatric en bloc and dual kidney transplants 3. Imaging Modalities 4. Complications of Renal Transplantation. The main objective of this section is to describe and illustrate imaging appearance and diagnostic clues of the most common (and uncommon) complications of renal transplantation through several cases seen in a tertiary-level hospital. The list of cases includes: Vascular complications: Renal artery/vein stenosis and thrombosis, vascular kinking, arteriovenous fistulas, pseudoaneurysms, external iliac artery dissection, arterioureteral fistula and postbiopsy graft bleeding. Urologic complications: urine leaks, obstruction, and ureteral necrosis. Fluid Collections: seroma, hematoma, urinoma, lymphocele, and abscess. Allograft infection Allograft rejection Neoplasms: urologic neoplasms and posttransplantation lymphoproliferative disorder. Intestinal and Herniation Complications Other complications: postsurgical wall bleeding, foreign body (gossypiboma), neurologic complications (PRES,...), etc. 5. Summary

UR125-ED-X

Gigantic Balls: Quest to Unravel Paratesticular Lesions on Cross-Sectional Imaging

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

Sonography is the most common and most sensitive investigation to detect scrotal lesions. Limited imaging appearances on alternative investigations like MRI or CT are enlisted in literature. This pictoral assay provides wide variety of imaging appearances of Paratesticular masses.

TABLE OF CONTENTS/OUTLINE

1. MR imaging anatomy of structures encompassing paratesticular area. 2. Enlisting causes of Paratesticular masses based on structure of origin & etiology (Nonneoplastic lesions - epididymal cysts, spermatoceles, fibrous pseudotumors, spermatic cord cysts, spermatic cord lipomatosis; Neoplastic lesions : benign (adenomatoid tumors, papillary cystadenomas, fibroma, benign mesenchymal tumors) or malignant (Angiosarcoma, metastasis, Sarcoma, Lymphoma); Vascular Malformations ; infections & inflammatory etiologies (necrotising Fascitis, Fournier's gangrene, abscess, sinus tracts) and miscellaneous (Scrotal Foreign body, scrotal hematoma) 3. Discussing salient Cross Sectional imaging features and tips to diagnose these conditions. 4.Clinical Aid and/or biopsy confirms diagnosis.

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UR126-ED-X

Male Artificial Urinary Sphincter: What Every Radiologist Must Know

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

FDA Discussions may include off-label uses.

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TEACHING POINTS

1. To realize a pictographic review of the most frequent artificial urinary sphincter (AUS) currently used in men. 2. To describe the components and the use mechanism of the AUS. 3. To review the importance of the different imaging techniques in the evaluation of the correct functioning of AUS. 4. To describe the most common features related to the tipical radiological imaging findings in dysfunctional AUS.

TABLE OF CONTENTS/OUTLINE

1. We realize a pictographic review of the imaging findings in normal and dysfunctional AUS in imaging methods based on retriewed cases describing: Type and components of the most frequent AUS used in our institution. Relationship of AUS with male pelvis anatomy. Most frequent causes of artificial sphincter dysfunction. 2. We create and propose an organized systematic protocol that describes the radiological assessment with the basics elements in a "check list" form that each radiologist should know and consider in the evaluation of patients with AUS. 3. Debate about the future directions and summary of AUS.

Printed on: 10/29/20

UR127-ED-X

Dynamic MR Angiography Identifies Vascular Etiologies of Erectile Dysfunction

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

Erectile dysfunction (ED) is experienced by adult men of all ages and presents significant quality of life issues, especially to younger patients. When standard pharmacologic treatments for organic ED fail, such as phosphodiesterase-5 inhibitors or intracavernosal injections, the implications are vasculogenic causes, often impaired arterial inflow and/or abnormal veno-occlusive mechanism. Vasculogenic ED can be due to a variety of factors ranging from atherosclerosis, venous leak, and congenital or trauma-induced anatomical variations. Prior imaging modalities for full pelvic vascular anatomy have either been invasive (angiography, cavernosography) or limited in temporal resolution (contrast enhanced MRI, CT-angiography). MR Angiography (MRA) allows for a better temporal and spatial resolution and has proven to be a versatile technique. Combined surgical-radiologic approaches allow for better visualization of abnormal venous drainage for optimal surgical planning, confirming, and at times adding to, suspected abnormalities as evaluated on penile Doppler ultrasound.

TABLE OF CONTENTS/OUTLINE

1. Brief Overview of ED 2. Vascular Etiologies of ED a.Arteriogenic impotence b.Venous leakage 3. Imaging Evaluation a.Penile Doppler Ultrasound b.Dynamic MRA i.Patient preparation ii.Protocol iii.Normal MRA 4. Abnormalities on penile MRA

UR128-ED-X

Is Bigger Better? Let's Talk About Erectile Dysfunction

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

Have a clear idea of what are de normal imaging features during the different phases of a normal erectionKnow what we should be doing during a Doppler ultrasound evaluation of erectile dysfunctionLearn what could be altered in the spectral waveform Vascular alterations can be seen as arterial insufficiency and altered venooclusive mechanism

TABLE OF CONTENTS/OUTLINE

- Basic principles and importance of erecile dysfuncion- Normal sonograpic appearance of the penus anatomy- Mechanism of erection- Ultrasound protocol for erectile dysfunction evaluation- Arterial Insufficiency- Venous leak- Peyronie's disease

UR129-ED-X

Chromophobe Renal Cell Carcinoma: A Reappraisal of Classic, Variant, Hereditary, and Hybrid Forms

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1. To review sporadic and syndromic (Birt-Hogg-Dube syndrome and Tuberous Sclerosis) forms of chromophobe RCC, the 3rd most common kidney cancer histotype. 2. To describe the classic and uncommon (eosinophilic and sarcomatoid) histological variants of Chromophobe RCCs as well as hybridomas (components of chromophobe RCC and oncocytoma). 3. To discuss the common and rare imaging manifestations of chromophobe RCCs and correlate with pathological findings and prognostic factors.

TABLE OF CONTENTS/OUTLINE

• Introduction • Epidemiology, histogenesis and natural history of sporadic and syndromic chromophobe RCC • Classic and uncommon histopathological (eosinophilic and sarcomatoid) variants. Ultrastructural changes of abundant dysmorphic and dysfunctional mitochondria within tumor cells. • Birt-Hogg-Dube syndrome and Tuberous Sclerosis: synopsis of hereditary predisposition syndromes • Role of folliculin in the pathogenesis of tumors, tumor genetics and pathways • Common and uncommon imaging findings of chromophobe RCC variants and hybridomas (sporadic and hereditary forms). Common and rare metastatic patterns. • Implications on management and prognosis • Conclusion

UR130-ED-X

Contrast-Enhanced Ultrasound for the Evaluation and Characterization of Indeterminate Renal Lesions

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1. Contrast enhanced ultrasound (CEUS) approach to the diagnosis of focal renal lesions. 2. Discuss applications of CEUS in imaging renal masses and post contrast appearances of various benign and malignant renal lesions with their CT or MRI correlates. 3. Institutional experience with tips and tricks to obtain the optimal contrast enhanced ultrasound images.

TABLE OF CONTENTS/OUTLINE

1. Case by case approach to diagnosing indeterminate lesions on CT and MRI with contrast enhanced ultrasound. 2. Post contrast appearances of Individual entities: i. Solid tumors ii. Pseudo lesions iii. Complex cysts and CEUS features favoring malignancy iv. Evaluation during and post ablation of renal masses 3. Safely profile for CEUS. 4. Unique utility of CEUS in patients with renal failure and CT and MRI contrast allergies. 5. Pitfalls of contrast enhanced ultrasound.

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UR131-ED-X

Prostate MRI and MR-Directed Biopsy (MRDB) Service: A Template for Quality Assurance Program and Peer-Collaborative Learning

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Awards
Certificate of Merit

Participants
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TEACHING POINTS

1. Illustrate peer learning opportunities of Prostate MR technique and interpretation.2. Illustrate recognition of different types of discordance/errors (false positives and false negatives) of PI-RADS and MRDB.3. Discuss strategies to improve performance of PI-RADS and MRDB both at per patient level and per lesion level in each of the clinical groups.4. Introduce Quality measures to assess performance of MRDB program.

TABLE OF CONTENTS/OUTLINE

1. Interpretative and Technique related learning opportunities: Perceptual, Cognitive, satisfaction of search and Great calls.2. Examples with strategies per clinical group/high risk2A. MRDB concordance (True positives and True negatives): Saturation biopsies, Penumbra, False discordance of MRDB and systematic biopsies2B: MRDB Discordance (False positives and False negatives): Misregistration of fusion, Tumor heterogeneity, of PI-RADS and MRDB, of MRDB and systematic biopsies2C: Per patient concordance, but per lesion discordance: Underestimation of index tumor volume or number of lesions. Directly impacts choice of focal therapy.3. Need for Quality measures: Positive predictive value and negative predictive value rates per prostate zone, per lesion size, per PI-RADS score, per pathological grade, per reader experience, per center, per ERC/no ERC, per magnet strength and per biopsy technique.

Printed on: 10/29/20

UR132-ED-X

Imaging of the Acute Scrotum: Keys to a Rapid Diagnosis of Acute Scrotal Disorders

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Awards
Certificate of Merit

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TEACHING POINTS

1. Acute scrotal swelling with or without pain can generally be divided into infectious, traumatic, or ischemic etiologies. 2. Rapid diagnosis and initiation of treatment is vital for testicular salvage in cases of testicular ischemia. Ultrasound is a well-established modality for first line imaging to differentiate acute surgical versus non-surgical scrotal disease. 3. Testicular neoplasms, although not typically acutely presenting, can be incidentally discovered in up to 10-15% of patients with scrotal trauma and must be considered in each case. 4. Scrotal hematoma, focal infection, and segmental testicular infarction can mimic tumors on imaging. For equivocal cases that don't require immediate surgical intervention, CT or MRI can be considered to help further characterize scrotal pathology.

TABLE OF CONTENTS/OUTLINE

1. Normal Anatomy 2. Acute Scrotum Overview 3. Infectious a. Epididymitis b. Epididymitis with Abscess Formation c. Epididymo-Orchitis d. Granulomatous Epididymitis e. Orchitis f. Fournier Gangrene 4. Ischemic a. Testicular Torsion Overview b. Acute Testicular Torsion c. Subacute Testicular Torsion d. Torsed Testicular Appendage e. Segmental Testicular Infarct 5. Trauma a. Testicular Fracture b. Testicular Rupture 6. Neoplastic a. Testicular Tumors 7. Other a. Idiopathic Acute Scrotal Edema

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UR133-ED-X

A Practical Guide to Renal Masses: What the Radiologist Needs to Know

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

The purpose of this education exhibit is: - To provide a practical diagram for renal masses - To review the differentials in cystic masses, solid renal masses and infiltrating renal masses, and to provide tips and tricks to make the differential diagnosis - To learn to recognize pseudotumours and tumour mimickers - To familirize the general public with new entities in the 2016 WHO renal tumour classificiation and rarer tumours like tubulocystic renal cell carcinoma and epithelioid angiomyolipoma

TABLE OF CONTENTS/OUTLINE

Overview of the diagram Part 1: cystic renal masses Part 2: solid renal masses Part 3: infiltrating renal masses Part 4: pseudotumours and tumour mimickers Cases Summary

Printed on: 10/29/20

UR134-ED-X

Imaging Features of Cystic Renal Lesions in the Era of the 2016 WHO Classification

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

We focus on imaging features of cystic renal lesions. First, we describe matters which have been significantly revised in the 2016 WHO classification of renal tumors. We focus on renal tumors with cystic imaging features. Second, we show radiologic-pathologic correlations of renal tumors with cystic imaging features in the 2016 WHO classification. Third, we introduce the diagnostic capability of renal tumors with cystic imaging features by the Bosniak classification through examination with CT versus MRI. Finally, we mention useful radiological findings for differentiation among renal tumors with cystic imaging features before and after the revision of 2016 WHO classification of renal tumors.

TABLE OF CONTENTS/OUTLINE

1. Concise description of the revision in the 2016 WHO classification of renal tumors 2. Renal tumors with cystic imaging features in the 2016 WHO classification 3. Radiologic-pathologic correlations of renal tumors with cystic imaging features in the 2016 WHO classification 4. The current diagnostic capability of CT versus MRI by Bosniak classification 5. Useful radiological findings for differentiation among cystic renal lesions before and after the revision of the 2016 WHO classification

UR135-ED-X

Penile Tumor: Beyond Squamous Cell Carcinoma

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

Review the basic anatomy of the penis with MRI correlation; Provide a MRI protocol for penile imaging with oncology emphasis; Discuss clinical and epidemiological features of penile malignancies; Describe, discuss and illustrate the MR imaging findings in a wide spectrum of neoplastic penile conditions, including rare primary lesions and metastatic disease; Correlation between MRI findings and histology; Demonstration of the clinical evolution of patients with penile tumor

TABLE OF CONTENTS/OUTLINE

Introduction: Anatomy; MRI protocol; Penile tumors: concept, etiology and MRI features: Squamous cell carcinoma - Penile sarcomas - Penile melanoma - Penile and urethral metastasis; Main findings; Histology findings.

UR136-ED-X

Problem Solving in Penile and Scrotal Imaging with CT and MRI

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Participants
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TEACHING POINTS

Imaging of the penis and scrotum is often performed for specific problem solving indications. Targeted CT and MRI protocols can be crucial to thorough evaluation. While ultrasound is usually the first line modality for evaluation of the penis and scrotal contents, MR and CT are useful for evaluation of uncommon or inconclusive findings. Both modalities can be essential to treatment planning. After reviewing this education exhibit, the learner will be able to: -Identify indications for CT or MRI to assess penile and scrotal pathology -Develop appropriate protocols for CT and MRI -Describe normal penile and scrotal anatomy -Recognize penile and scrotal pathology on CT or MRI

TABLE OF CONTENTS/OUTLINE

-CT and MRI protocols for penile and scrotal imaging -Normal penile & scrotal anatomy -Imaging features of penile pathology in case review format: --Trauma & painful conditions --Peyronie's disease --Implanted devices --Penile malignancies -Imaging features of uncommon scrotal pathology in case review format: --Extratesticular masses (such as vasitis nodosa, lipomatous neoplasm, adenomatoid tumors) --Fistulas & fluid collections

UR137-ED-X

Primary Retroperitoneal Masses in Adults: A Systematic Approach with Emphasis on Differential Diagnosis

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

Determine whether a tumor is located in the retroperitoneal space Recognize the various primary solid and cystic retroperitoneal masses Realize a systematic approach of the main imaging features aiming at the differential diagnosis

TABLE OF CONTENTS/OUTLINE

- INTRODUCTION Epidemiology of primary retroperitoneal masses - SYSTEMATIC APPROACH We propose an evaluation of retroperitoneal lesions into three steps as follow: STEP 1 Recognize the anatomy of retroperitoneal space STEP 2 Locate the retroperitoneal masses: primary or secondary of retroperitoneum? STEP 3 Systematic approach based on imaging patterns: SOLID LESIONS Fat Lipoma Liposarcoma Teratoma Extra-adrenal myelolipoma Necrosis High-grade tumors (e.g., leiomyosarcoma) Myxoid stroma Neurogenic tumor Myxoid sarcoma Myxofibrosarcoma 'Veil' growth pattern Systemic diseases (e.g., retroperitoneal fibrosis, histiocytosis, lymphoma) Hypervascular Paraganglioma Hemangiopericytoma CYSTIC LESIONS Intracystic aggressiveness signs? No: probably benign (e.g., cystic mesothelioma, lymphangioma) Yes: probably malignant (e.g., cystadenocarcinoma)

UR138-ED-X

The Utility of Dual-Energy CT Imaging in Evaluation of Incidentally Discovered Renal Lesions

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

Teaching Point 1: Spectral CT is a technology that is being increasingly used, and has a variety of applications that can be applied to imaging renal masses. Teaching Point 2: Material specific images allow the radiologist to determine the iodine concentration within a renal mass, which can distinguish between enhancing and non-enhancing lesions on a single phase of acquisition. Teaching Point 3: Color-coded iodine overlay images have been shown to increase radiologists' diagnostic confidence in assessment of complex cystic renal lesions. Teaching Point 4: Measurements of tumor iodine concentration have shown promise in distinguishing between different renal neoplasms, particularly papillary and renal cell carcinoma.

TABLE OF CONTENTS/OUTLINE

Part 1: Spectral CT Technique Description, Virtual Non-Contrast Image, Virtual Monoenergetic Image and Iodine Map Image Part 2: Diagnostic Paradigm Using Dual Energy CT Part 3: Review of Imaging Findings (Case Examples) Part 4: Conclusions and Future Directions

Printed on: 10/29/20

UR139-ED-X

Genitourinary Malignant Lymphoma: Multimodality Imaging and Differential Diagnosis

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

Primary genitourinary lymphoma is exceedingly rare. The purpose of this exhibit is To understand multimodality imaging and clinical manifestation of rare genitourinary malignant lymphoma. To discuss the differential diagnosis and to clarify the diagnostic clue

TABLE OF CONTENTS/OUTLINE

1, Case presentation; 1) Renal malignant lymphoma, adrenal malignant lymphoma, Urinary bladder malignant lymphoma, prostatic malignant lymphoma, and testicular malignant lymphoma 2) Ovarian malignant lymphoma and uterus malignant lymphoma 2, To discuss differential diagnosis and diagnostic clue.

Printed on: 10/29/20

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UR140-ED-X

Establishing a Minimally Invasive Localized Prostate Cancer Treatment Service Line: A Comprehensive Resource

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

FDA Discussions may include off-label uses.

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TEACHING POINTS

The purpose of this exhibit is: To provide rationale for minimally invasive prostate cancer (PCa) treatment. *The 'index' lesion is responsible for driving the risk associated with PCa. However, imaging underestimates lesion volume & it is important to have adequate treatment zone margins.* To review modalities and devices available for minimally invasive PCa treatment. *Understanding the nuances of available devices along with their FDA approval/ reimbursement status and current evidence about their efficacy is crucial towards building a successful PCa treatment program.*

TABLE OF CONTENTS/OUTLINE

Need for minimally invasive prostate cancer (PCa) therapy. Defining the index lesion. Treatment margins - How much prostate should you ablate? Pros and Cons of using MRI versus US guidance for ablation. Treatment modality specific review including device capabilities/limitations, cost, side effect profile, case examples and efficacy evidence. Modalities reviewed are: Therapeutic Ultrasound including High Intensity Focused Ultrasound (HIFU) & High Intensity Directional Ultrasound (HIDU) Laser Ablation Cryoablation Photodynamic Therapy Irreversible Electroporation 6. FDA approval status and insurance reimbursements for minimally invasive PCa treatment.

UR141-ED-X

Pitfalls of Prostate Imaging

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1) Review technical pitfalls in prostate MRI2) Review common false positives3) Review common false negatives

TABLE OF CONTENTS/OUTLINE

1. Basic MRI prostate anatomy and MRI signal characteristics2. Description of common mimics of prostate tumors with imaging correlates, signal characteristics, and diagnostic strategies:a. Central zone (variations in normal anatomy)b. Surgical capsule thickeningc. Periprostatic venous plexusd. Neurovascular bundlee. Postbiopsy hemorrhage f. Stromal BPH noduleg. Post inflammatory/infectious scars and atrophyh. Granulomatous prostatitisi. Anatomic distortion on DWI sequences with high b-valuej. Incomplete suppression on DWI sequences with low b-valuek. Suboptimal windowing on ADC map

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UR142-ED-X

Adrenal Imaging in the Era of Radiomics: Current Indications and Future Perspective

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1. Review various methods for contouring of the adrenal gland on imaging studies. 2. Discuss current applications of Radiomics in adrenal imaging. 3. Explore a number of interesting future indications for Radiomics.

TABLE OF CONTENTS/OUTLINE

1. Introduction to the field of radiomics. 2. The role of Radiomics in adrenal imaging. 3. Overview of Image Texture Analysis. a. Definition of Texture Analysis b. Schematic of the process from A to Z c. Illustration of various texture features involved. 4. Current applications of radiomics: a. The characterization of adrenal masses. b. The prediction of tumor histology. c. The prediction of tumor recurrence and Ki-67 index. d. Survival prediction in adrenal malignancies. 5. Methods of segmentation of the adrenal glands on imaging. 6. Overview of the segmentation process. 7. Current limitations in the field of Radiomics. 8. Future research.

Printed on: 10/29/20

UR143-ED-X

Non-Scrotal Causes of Acute Scrotum

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

Although unusual, non-scrotal pathologies can present clinically as an 'acute scrotum', sometimes without any signs or symptoms suggesting their non-scrotal origin. Pathophysiology of clinical presentation, clues for diagnosis, and imaging features are described

TABLE OF CONTENTS/OUTLINE

Acute scrotum makes up to about 1% of emergency room presentations. Possible causes are numerous and often limited to the scrotal content. However, also extra-scrotal pathologies can present with isolated acute scrotal symptoms. It is essential to consider them in patients presenting with acute scrotum who have normal scrotal content and extent imaging investigations to prevent missing potentially severe conditions. Non-scrotal causes of acute scrotal pain were pooled from three different institutions. There were patients with renal colic, inguinal hernia, acute pancreatitis, retroperitoneal bleeding, appendicitis, retroperitoneal tumor, tight lesions. 1. Introduction 2. Pathophysiology 3. Renal colic 4. Incarcerated hernia 5. Acute pancreatitis 6. Leaking abdominal aneurysm 7. Other causes of retroperitoneal hemorrhage 8. Appendicitis 9. Retroperitoneal tumors 10. Tight lesions 11. Conclusion 12. References

UR144-ED-X

Prostate MRI and Time-resolved MR Angiography Prior to Prostate Artery Embolization for Symptomatic Benign Prostatic Hyperplasia

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1. To review prostate artery anatomy and challenges of prostate artery embolization (PAE). 2. To discuss role of MRI in evaluation of prostate cancer, benign prostatic hyperplasia (BPH) and tailored protocol for evaluation of prostate artery anatomy, including Dynamic Time-Resolved MR angiography (MRA)3. To explain the utility of MRI and particularly of Time-Resolved MRA over other methods of evaluation of prostate/vessels

TABLE OF CONTENTS/OUTLINE

Overview and treatment options for BPHBenefits, risks and challenges of PAEProstate artery anatomy and variantsCurrent state of clinical practice, including pre-procedure CTA and intra-procedural digital subtraction angiography and cone beam CTDetailed MRI protocol with inclusion of Dynamic Time-Resolved MRA sequenceDiscussion of advantages of MRI/Time Resolved MRA over other planning imaging methods. These include evaluation of prostate gland for suspicious lesions that would require biopsy and decrease of procedure time, radiation exposure and iodinated contrast requirement during PAEReview of imaging findings, including prostate artery identification on time-resolved MRA and 3D reconstructionsIncidental findingsSample cases

UR145-ED-X

Pitfalls in Prostate MRI: How to Avoid Them?

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

- To describe epidemiological and radiologic features of prostatic cancer. - To identify and describe common pitfalls in prostate MRI due to histologic variant of cancer. - To identify and describes para-physiologic appearances and benign lesions of the prostate which can mimic prostatic cancer.

TABLE OF CONTENTS/OUTLINE

1. Epidemiology about the main prostatic cancers. 2. Reminder of the MRI aspect of acinar adenocarcinoma using PI-RADS v.2 3. Common pitfalls due to histologic variant of cancer. Sarcoma STUMP : stromal tumors of uncertain malignant potential Ductal carcinoma Neuroendocrine tumors Lymphoma Metastasis 4. Para-physiologic appearances and benign lesions of the prostate which can mimic prostatic cancer. a. Anatomic pattern b. Benign lesions

UR147-ED-X

Benign Prostatic Lesions: Beyond BPH

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

• To review the main benign prostatic and periprostatic lesions that radiologists can encounter in their practice and discuss their differential diagnosis. • To show the radiological features of this lesions in US and/or RM. • To present some cases with benign prostatic lesions from our hospitals data base to help reader to consolidate and incorporate this new knowledge.

TABLE OF CONTENTS/OUTLINE

• Introduction o Clinical Presentation o Types of Lesions • Imaging Techniques • Lesions Location Scheme o Prostatic Cystic Lesions - Middle Line Cysts • Utricle Cyst • Müllerian Duct Cyst - Paramedian Cysts • Ejaculatory Duct Cysts - Lateral Cysts • Retention Cysts • Cystic Degeneration Of BPH - Tumor Associated Cystic Lesions o Extraprostatic Cystic Lesions - Seminal Vesicle Cysts - Vas Deferens Cysts - Cowper Cysts o TURP Defect o Prostatitis - Acute Bacterial Prostatitis - Chronic Bacterial Prostatitis - Chronic Prostatitis and Chronic Pelvic Pain Syndrome (CPPS) - Asymptomatic Inflammatory Prostatitis - Granulomatous Prostatitis o Benign Tumor Lesions - Multilocular Cystadenoma of Prostate - Solitary Fibrous Tumor of Prostate - Leiomyoma - Others • Evolution and Management • Summary

UR148-ED-X

Cystic Adrenal Masses: Spectrum of Multi-Modality Imaging Features and Pathological Correlation

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1) Describe the different adrenal cystic lesions with emphasis on their imaging features. 2) Illustrate the pathological features of adrenal cystic lesions. 3) Identify the adrenal malignancies that present with cystic changes. 4) Suggest clues for discrimination of adrenal cystic lesions by imaging. 5) Discuss the impact of imaging features on management.

TABLE OF CONTENTS/OUTLINE

1) Imaging modalities for assessing adrenal cystic lesions. 2) Cystic adrenal lesions: a) Simple cyst, b) Pseudocyst, c) Lymphangiomatus cyst d) Abscess e) Parasitic cysts. b) Adrenal solid masses with cystic changes: Neuroblastoma, adrenal cortical carcinoma, pheochromocytoma, ganglioneuroma, ganglioneuroblastoma and metastasis. 3) Imaging and pathological features of different adrenal cystic lesions. 4) Management of adrenal cystic lesions and indications of surgical interference.

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UR149-ED-X

Rare Adrenal Tumors, Tumor-like Conditions, and Mimics

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Participants
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TEACHING POINTS

1. Describe unusual adrenal masses with emphasis on their imaging appearance. 2. Discuss other pathologies that may mimic adrenal masses on imaging. 3. Suggest clues for avoiding pitfalls of adrenal masses misdiagnosis by imaging.

TABLE OF CONTENTS/OUTLINE

1) Adrenal imaging protocol. 2) Rare adrenal tumors and tumor like conditions : a. Adrenal hemangioma b. Primary adrenal lymphoma c. Neurogenic tumors (ganglioneuroma, ganglioneuroblastoma and schwannoma) d. Adrenal sarcoma e. Adrenal oncocytoma f. Infectious masses. 3) Characteristic imaging signatures of some rare adrenal masses. 4) Mimics of adrenal masses: a. Retroperitoneal masses mimicking adrenal mass b. Exophytic liver mass c. Gastric diverticulum d. Retroperitoneal varices e. Castleman's disease 5) Management of rare adrenal masses.

UR150-ED-X

If it Seems Erratic, Think Lymphatic: Lymphoma of the Genitourinary Tract

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Participants
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TEACHING POINTS

- In the majority of cases, lymphoma has typical presentations in the genitourinary tract that suggest the diagnosis; some of these are rare but quite distinctive - Lymphomatous deposits have characteristic appearances on CT / MRI / PET CT, independent of location - Consider lymphoma in the differential diagnosis when the imaging characteristics, clinical details and patient demographics are indicative but also when the pattern of disease does not correspond to the usual pathologies of the region of concern.

TABLE OF CONTENTS/OUTLINE

1. Introduction 2. Overview of lymphomatous involvement of the genitourinary tract 3. Case reviews of typical and unusual presentations of lymphoma in the male and female GU tract 4. Imaging characteristics of lymphomatous tissue on cross-sectional modalities (CT / MRI / PET CT) 5. Conclusions

Printed on: 10/29/20

UR151-ED-X

A Practical Guide of Genitourinary Trauma

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Awards
Certificate of Merit
Identified for RadioGraphics

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TEACHING POINTS

1. Recognize the importance of imaging modalities in the diagnosis and assessment of most common genitourinary traumas.2. Review and illustrate the main classification systems.3. Comprehend what should be reported to the multidisciplinary trauma team.4. Be familiar with future directions of imaging in genitourinary trauma.

TABLE OF CONTENTS/OUTLINE

A. INTRODUCTION• Epidemiology.• Mechanisms of trauma.B. MAIN CLASSIFICATION SYSTEMS• Illustrate and review the most used classification systems.C. IMAGING INTERPRETATION• Systematic approach to imaging assessment.• Comparing different imaging methods in genitourinary trauma.D. INTERACTIVE CASE-BASED DIDACTICS• Sample cases to illustrate and solidify concepts.E. FUTURE DIRECTIONS• What's on the horizon for imaging techniques in the assessment of genitourinary trauma.

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UR152-ED-X

Usual and Not so Usual Findings in Urethrocystography/Voiding Cystourethrography (VCUG): What Should Sometimes Be Expected

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

- To update findings in uretrocistography.- To illustrate rare findings in urethrocystography / Voiding cystourethrography (VCUG).- To shown that is more frequent find findings in urethrocystogram/ Voiding cystourethrography (VCUG) in males than women.

TABLE OF CONTENTS/OUTLINE

The uretrocystogram / VGUC is a very useful imaging method for diagnosing bladder and urethral injuries.Among the most common findings is the stenosis of the urethra as a consequence of trauma after foley catheter placement.Other findings less frequently seen are:- Diverticulum, can be in the anterior and posterior urethra.- Synechia, less frequent, associated with dilatation of the distal segment.- Trabeculation of the bladder in relation to chronic cystitis.- Reflux vesicoureteral.- The formation of "membranes", like circular scars.- Fistulas. In man, they can be communicated to the scrotum, seminal vesicles or rectum. In the woman communicated to vagina and cervix as more frequent.It is a very useful study and quick and concise diagnosis, especially for the surgical approach of urologists.

UR153-ED-X

Scrotal and Penis Emergencies: What Should a Radiologist Know?

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

(1) We have tried to summarize the most common scrotal and penis emergencies after blunt trauma. (2) We made a compilation of the most important US and CT signs in order to make the right diagnosis. (3) We pointed out the most important differential diagnosis.

TABLE OF CONTENTS/OUTLINE

(1) The population is exposed to various risk factors which include complications of disease until the acute trauma and imaging examinations can help to solve most of them; (2) The most common emergencies include testicles torsion, trauma and tumor bleeding. Testicle torsion can occur spontaneous or after trauma and show an increase of testicle size, small fluid and lack of vascularization inside the testicle. Traumas can also cause testicle rupture or fracture. Fournier is caused by a anaerobic infection with skin necrosis and air bubbles; (3) The penis trauma can cause dorsal vein thrombosis (Mondor symdrome), hematomas and perforation of albuginea with posterior complications as Peyronie; (4) Encarcerated hernias can occur with subsequently ischemia; (5) US is the first choice for scanning those organs since it detects very well fluid collections and Doppler can evaluate thrombosis or ischemia; (5) On the other hand CT is the best choice for evaluating skin and deep extension; (6) In this study is pointed out the main signs of each situation.

UR154-ED-X

There is No 3 Physiological Narrowings in the Upper Urinary Tract: A Cutting-Edge Concept of the Retroperitoneal Anatomy Around the Ureter

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Awards
Magna Cum Laude

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TEACHING POINTS

The well-known dogma of three points of physiological narrowing, namely at the ureteropelvic junction (UPJ), the pelvic brim where the ureter crosses over the iliac vessels, and the ureterovesical junction (UVJ), turned out to be incorrect. Recent studies assessing upper urinary tract stone distribution using computed tomography (CT) reveal that there are only two narrow points in the upper urinary tract: the upper ureter and the UVJ. In this exhibit, we aim to demonstrate the mechanism why stones lodge at the upper ureter, by reviewing the updated anatomy of the retroperitoneum around the ureter.

TABLE OF CONTENTS/OUTLINE

- Briefly review the classic description of anatomy of the ureter. - Summarize recent updates concerning physiological narrow points of the upper urinary tract. - Review the anatomical aspects, mainly focusing on the structures around the ureter in the retroperitoneum. - Summarize related radiological and clinical issues concerning this new anatomical concept of the retroperitoneum.

UR155-ED-X

Renal Vasculature: Everything the Radiologist Needs to Know

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Awards
Identified for RadioGraphics

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TEACHING POINTS

1. Understand renal vessels are commonly overlooked on routine abdominal imaging 2. Appreciate the involvement of renal vasculature in a wide variety of disease conditions with recent updates

TABLE OF CONTENTS/OUTLINE

• Embryology of renal vasculature in understanding of renal diseases • Anatomical variants - accessory, prehilar branching and delayed venous confluence; why are they significant? Beyond just pre-transplant workup • Renal Doppler in Renovascular hypertension (emphasis on ACR appropriateness), transplant imaging - Renal Doppler as an index of cardiac health, oxygen-demand supply and cardiac risk-stratification • Nutcracker syndrome-anterior vs posterior; Renal arterial compression syndromes • RCC - emphasis on revised 8th TNM classification - T3a: extension into renal vein or segmental brances o Renal vein and IVC involvement - Radiomics in assessment of wall invasion o Angiomyolipoma - Intratumoral aneurysms, likelihood of bleeding; when to intervene • Vascular neoplasms- leiomyomas, hemangiomas, hemamgiopericytoma and pecomas • The injured vessel - implications in trauma, post-biopsy (active bleed, fistula, clot colic) and post-dissection • Structural diseases including fibromuscular dysplasia and vasculitis • Elusive vascular malformations - AVMs and AVFs

UR156-ED-X

Imaging Findings of Complications After Robot-Assisted Prostatectomy

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

• Comprehend the surgical technique of robot assisted prostatectomy. • Gain familiarity with the expected imaging findings during postoperative period. • Review the common locoregional and distant complications after robot assisted prostatectomy. • Comprehend the role and limitations of each imaging modality. • Recognize the suspicious signs of recurrence after locoregional therapy.

TABLE OF CONTENTS/OUTLINE

• Prostate cancer epidemiology • Advantages and disadvantages of robot-assisted prostatectomy • Normal findings in the postoperative period • Main categories of complications after robot-assisted prostatectomy: o Urinary leaks o Anorectal injuries o Vascular injuries and bleeding complications o Neuropathies o Miscellaneous • Overview of each imaging modality and their role in the evaluation of postoperative prostate cancer, including ultrasound, CT, and MRI. • Example cases.

UR157-ED-X

PI-RADS™ v2.1: A Case-based Review with Template Utilization and Institutional Feedback

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1. Briefly review updates to the new ACR 2019 PI-RADS v2.1. 2. Review the ACR 2019 PI-RADS v2.1 utilizing case based examples. 3. Review the ACR PI-RADS v2.1 report template with comparison to our own institutional preferences based on feedback from surveyed urologists.

TABLE OF CONTENTS/OUTLINE

I. Introduction a. Benefits of template utilization b. Updates to reporting recommendations for 2019 PI-RADS v2.1 II. Template Utilization and Pictorial Review with case-based examples a. Basic Principles b. Review Benign Prostatic Findings c. Case Based Examples PI-RADS v2.1 Assessment Categories III. Reporting a. Template Considerations b. Optimization c. Institutional Feedback IV. Summary V. References

Printed on: 10/29/20

UR158-ED-X

Congenital Anomalies of Kidneys and Urinary Tract: It's Much Easier Than You Think

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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Identified for RadioGraphics

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TEACHING POINTS

1 - To improve the understanding of urinary system embryology and anatomy using a didactic approach by graphics and illustrations. 2 - To show the typical imaging characteristics of kidneys and urinary tract congenital anomalies. 3 - To highlight the importance of recognizing of the common complications related to these anomalies.

TABLE OF CONTENTS/OUTLINE

1 - Review of the embryological development and anatomy of the urinary system through illustrative graphics, also defining their relationship with others structures. 2- Illustration of typical imaging features of kidneys and urinary tract congenital anomalies supported by the use of graphics and cross-sectional imaging cases, such as: - Horseshoe kidney - Pancake kidney - Kidney agenesis - Supernumerary kidney - Duplex collecting system - Primary megaureter - Ectopic kidney - Crossed renal ectopia - Ureterocele - Renal hypoplasia - And others 3- Discussion of the main complications associated with these anomalies. 4 - Summary and take home messages.

UR159-ED-X

Blood Oxygen Level Dependent on MR Imaging of Kidney: Usefulness and Limitation

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

The purpose of this exhibit is: To introduce basic principles of blood oxygen level-dependent (BOLD), for kidney disease (chronic kidney disease, polycystic kidney disease, unilateral ureteral obstruction, renal cell carcinoma, etc.). To discuss the advantage of BOLD MR imaging for kidney disease. To discuss the incremental value of BOLD MRI.

TABLE OF CONTENTS/OUTLINE

1. The principle of BOLD MRI 2. The appearance of normal kidney on BOLD MRI. 3. BOLD MRI for Kidney Disease 4. Limitation of BOLD MRI 5. Usefulness of R2'

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UR160-ED-X

PI-RADS v 2.0 versus PI-RADS v 2.1: What to Add to Your Checklist

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1. Discuss the main differences between the PIRADS v 2.0 and the PIRADS v 2.1 in the scoring of prostate lesions. 2. Describe the MRI technical differences between the PI-RADS 2.0 and the PI-RADS 2.1 versions. 3. Illustrate examples in which the previous assigned score using PIRADS 2.0 has changed when applying the PI-RADS 2.1 versions.

TABLE OF CONTENTS/OUTLINE

1. Introduction. 2. Differences in MRI technical specifications between the PI-RADS 2.0 and the PI-RADS 2.1 versions 3. Discussion of the differences between the PI-RADS 2.0 and the PI-RADS 2.1 versions in the topics of scoring prostate lesions: Transitional Zone AFMS Central Zone We have performed a new scoring using PI-RADS v2.1 of 300 cases in which targeted MRI/US fusion biopsy was done, previously scored with PI-RADS v2.0. 4. Conclusions

UR161-ED-X

The Dilemma of the Incidental, Non-Palpable, Asymptomatic Testicular Lesion: Imaging, Clinical and Surgical Management for Testis Sparing

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

FDA Discussions may include off-label uses.

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TEACHING POINTS

The discovery of a focal intra-testicular lesion may cause anixety and unnecessary surgery when up to 80% of these lesions are benign. The ability of B-mode US, color Doppler US and the newer techniques of contrast-enhanced US and tissue elastography (multiparametric US) enable a confident imaging diagnosis. Addition of MR imaging is only useful in a small numebr of cases. Confirdent diagnosis of benign disesae allows for testicular sparing surgery or watchful waiting. Testis sparing surgery ensures maximum fertility. Imaging pathways will be discussed to maximise the clinical diagnosis to achieve preservation of functional testicular tissue.

TABLE OF CONTENTS/OUTLINE

Incidence of focal testicular lesions, divided into benign and malignant. Use of all aspects of US imaging to ascertain the nature of the lesion. How to employ the newer techniques of contrast enahnced US and tissue elastography to help in diagnosis. To be able to select lesions that require immediate orchidectomy. To ascertain those that require or would benefit form testis sparing surgery. To ascertain those that can be safely watched. Use MR imaging only when needed. The preservation of fertility is paramount to the imaging mangement of focal, incidental, asymptomatic testicular lesions.

UR162-ED-X

Be Familiar with VI-RADS - A Pictorial Review Regarding Multiparametric MRI for Bladder Cancer: What the Radiologist and Radiology Technologist Need to Know

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1) To review basic facts of bladder cancer (BC) & clinical significance of multiparametric MRI (mpMRI) for BC 2) To describe technical considerations for mpMRI for BC based on VI-RADS (Vesical Imaging-Reporting And Data System) 3) To illustrate mpMRI appearances of BC of various VI-RADS categories pathologically confirmed by presenting clinical images

TABLE OF CONTENTS/OUTLINE

1) Basic facts of BC & clinical significance of mpMRI for BC Non-muscle-invasive vs. muscle-invasive BC Transurethral resection (TUR) vs. radical cystectomy MRI bladder anatomy Reduced BC staging error 2) Technical considerations for mpMRI for BC MRI timing/bladder treatments Patient preparation Imaging sequences: T2-weighted (T2WI)/Diffusion-weighted (DWI)/Dynamic contrast enhanced (DCE) imaging Imaging techniques/parameters & image quality: imaging plane/slice thickness/matrix size/spatial resolution/signal-noise ratio/deep learning reconstruction to reduce image noise/artifacts/fat suppression 3) mpMRI appearances of BC of various VI-RADS categories Morphology: size/growth pattern/stalk T2-elongated thickened inner layer/inner layer enhancement Typical BC signal pattern & its variations (incl. differentiation from benign pathologies) Post TUR assessment Structural category by T2WI CE category by DCE imaging DW category by DWI Final VI-RADS category

UR163-ED-X

Prostate Cancer: Pictorial Review of Complex Cases and Mimics

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1. Understand prostate anatomy and classic imaging findings of prostate cancer. 2. Identify variable MRI presentations of advanced prostate cancer. 3. Recognize prostate cancer mimicking other malignancies.

TABLE OF CONTENTS/OUTLINE

1. Brief overview of prostate anatomy on magnetic resonance imaging (MRI) a. Normal anatomy b. Benign prostatic hyperplasia c. Classic findings of prostate cancer 2. Case based review of advanced prostate cancer a. Tumor centered within the seminal vesicles b. Encapsulated, high grade tumors c. Necrotic, cystic tumors d. Bladder, rectal, urogenital diaphragm and pelvic sidewall invasion 3. Mimickers: Prostate cancer mimicking other malignancies, and benign processes mimicking prostate cancer a. Prostate cancer mimicking bladder, penile, and urethral cancers b. BCG prostatitis and IgG4 prostatitis mimicking prostate cancer c. Mixed epithelial and stromal tumor (MEST) of the seminal vesicle

Printed on: 10/29/20

UR164-ED-X

Small Renal Cortical Lesions: A Pictorial Roadmap

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

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TEACHING POINTS

1 - To describe the renal cortical tumors epidemiology. 2 - To discuss the management of these lesions smaller than 4.0 cm, based on last guideline of American Urological Association (AUA). 3 - To show typical imaging features of the commons renal cortical tumors. 4 - To provide a practical and didactic flowchart that aids the radiologist in narrowing the differential diagnoses and support urological management.

TABLE OF CONTENTS/OUTLINE

1. Prevalence of renal tumors and related genetic syndromes. 2. Typical imaging features of the most common tumors, supported by the use of illustrations, radiological and pathology images, for example: - Renal Cell Carcinoma (RCC) subtype clear cell - RCC subtype papillary - RCC subtype chromophobe - Angiomyolipoma - Oncocitoma 3. Case-based illustration of the kidney cortical tumors staging. 4. Simplified diagnostic flowchart using the main imaging features presented by renal cortical tumors

UR165-ED-X

'Rolling Stones in Flank Pain': Update, Management, and Complications

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Awards
Certificate of Merit

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TEACHING POINTS

1. To show the updated Surgical Guideline on Urolithiasis of European Association Urology (EAU). 2. To improve the understanding of the surgical therapeutic methods using didactic graphics and imaging cases, making that easy to radiologist. 3. To describe relevant imaging information that radiologists must provide after treatment. 4. To emphasize that radiologists must be aware of the complications related to urolithiasis and its surgical treatment.

TABLE OF CONTENTS/OUTLINE

1. Brief review of the classification of renal and ureteral calculi, highlighting the imaging features 2. Specific indications of cross-sectional imaging methods and pitfalls. 3. Imaging cases of urolithiasis complications. 4. Latest updates of the European Association Guideline (2018), proposing an evaluation algorithm to assist the radiologist. 5. Presentation of each surgical treatment by a didactic approach using dynamic illustrations. 6. Complications related to urolithiasis surgical treatment using illustrative cases. 7. Illustrated structured report and evaluation algorithm.

UR166-ED-X

The Role of Image in Biochemical Recurrence of Prostate Cancer

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Participants
Karla Schoen, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
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Publio C. Viana, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

The purpose of this review is to: • Review the definitions of biochemical recurrence, and prostatic cancer local recurrence. • Review the indications of imaging modalities in the biochemical recurrence, including MRI and PSMA PET/CT. • Resume the therapeutic management of these patients, according with the extension of recurrence.

TABLE OF CONTENTS/OUTLINE

Introduction: Outline the epidemiology and impact of prostate cancer worldwide, the most important guidelines and the definition of biochemical recurrence. Imaging techniques: The indications of each imaging modalitites methods in the biochemical recurrence to evaluate each site of possible involvement, and the protocol of the methods used. Imaging Findings: Illustrate the multiple scenarios we can find patient with biochemical recurrence with cases from our institution. Demonstrate the findings in pelvic MRI and PSMA PET/CT related to treatment, the suspected findings and how to differentiate them. Management: A literature review of the management of the patient with biochemical recurrence according with the imaging findings and the treatment options.

UR167-ED-X

Around the Kidneys in 30 Slides: Imaging of Perinephric Pathologies

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Awards
Certificate of Merit

Participants
Jordan LeGout, MD, Jacksonville , FL (*Presenter*) Nothing to Disclose
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TEACHING POINTS

Teaching points: There are a broad range of pathologies involving the perinephric space. Knowledge of the anatomy in this region and of the imaging appearance of the various patholgies can help narrow the differential diagnosis and guide patient management. The objectives of this exhibit include: Reviewing retroperitoneal and perinephric anatomy Recognizing the imaging appearance of pathologies of the perinephric space Formulating a differential diagnosis based on disease patterns

TABLE OF CONTENTS/OUTLINE

1. Introduction a. Retroperitoneal/perinephric anatomy 2. Non-neoplastic a. Hemorrhage b. Infection/inflammation c. Urine 3. Solid lesions a. Differential with case examples (ex: neurogenic tumors, metastases, etc.) 4. Lesions with fat a. Differential with case examples (ex: extra-adrenal myelolipoma, liposarcoma, etc.) 5. Rind-like lesions a. Differential with case examples (ex: lymphoma, retroperitoneal fibrosis, etc.) 6. Summary

UR168-ED-X

Test Your Knowledge: Genitourinary Trauma

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Participants
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TEACHING POINTS

Blunt and penetrating traumas can cause significant genitourinary injuries. CT imaging is critically important in diagnosing these injuries, assessing their severity and extent, and guiding management. This exhibit will illustrate the spectrum of injuries that can occur in the genitourinary system in a case presentation format.After view this exhibit, the learner will be able to 1. Describe the spectrum of post traumatic genitourinary trauma after viewing this exhibit2. Become familiar with key imaging features of trauma related genitourinary injuries.

TABLE OF CONTENTS/OUTLINE

1. Review statistics of genitourinary trauma and indication for imaging2. Spectrum of genitourinary trauma in a case presentation formata. Examples of renal trauma imaging features, grading of injuries, and managementb. Examples of ureteral trauma imaging features, mechanism, and managementc. Examples of bladder trauma imaging features, grading of injuries, and managementd. Examples of urethral trauma imaging features, mechanism, and management

UR169-ED-X

Unravelling the Prostate Transition Zone Using PIRADS v2.1

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Participants
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Alina D. Dragan, MRCS,FRCR, Watford, United Kingdom (*Presenter*) Nothing to Disclose

TEACHING POINTS

Demonstrate prostate MRI imaging features in accordance with PIRADS version 2.1 in the transition zone Highlight and illustrate the updated imaging criteria focussing on transition zone findings, including typical and atypical BPH nodules and regions between nodules Illustrate the revised criteria for diffusion weighted imaging (DWI) Show the added value of DWI in categorising lesions in the transition zone Distinguish between transition zone cancers and involvement of the central zone and anterior fibromuscular stroma

TABLE OF CONTENTS/OUTLINE

Summary of PIRADS v2.1 imaging features on T2W, DWI and dynamic contrast enhanced sequences illustrating how lesion scores are obtained by combining sequence scores Examples of typical and atypical BPH nodules and regions between nodules on T2W Examples of DWI influencing categorisation of atypical BPH nodules Examples of scoring regions between BPH nodules

Printed on: 10/29/20

UR171-ED-X

Hormonal Hare: Imaging Spectrum of Adrenal Lesions, Incidentalomas, and Diagnostic Algorithm-A Radiologist's Guide

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Participants
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TEACHING POINTS

1.Review the available diagnostic modalities including USG, CT, MRI to evaluate the adrenal gland. 2.Forming the standard imaging protocol and diagnostic algorithm to decipher the SOLs. 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 individual roles, strengths and limitations. 3.Forming appropriate imaging protocols, standard diagnostic approach and algorithm. 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 -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 Intervention.

UR172-ED-X

Infection After Penile Fillers: Imaging Features, Extensions, and Pitfalls

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Participants
Sherif A. Abo-Hedibah, MSc, MD, Kuwait City, Kuwait (*Abstract Co-Author*) Nothing to Disclose
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TEACHING POINTS

Different types of penile fillers & MR appearance. Imaging features of infection after penile fillers, associated extensions & pitfalls.

TABLE OF CONTENTS/OUTLINE

• Introduction: A lot of men are not satisfied with the penis size and the demand to increase it is high using all kinds of injectables. • Types of penile fillers and MR imaging features: There are 2 main classes: reversible and irreversible (rather than temporary vs permanent). Hyaluronic acid and collagen fillers are examples of reversible fillers. Irreversible dermal fillers include silicone oils, polymethyl methacrylate (PMMA), polyacrylamide gel & poly-L lactic acid (PLLA). • Aetiology of penile fillers associated infection: The skin of the penis is thin with almost no subcutaneous fat, so the injected material has little protection. Also many small traumas at the deformed filler may happen due to sexual intercourse raising the risk of infection. • Imaging assessment of the location of related infection and extensions: Subcutaneous edema & enhancement can be considered as low-grade inflammation. Subcutaneous abscesses related to the fillers. Extensions may occur into the scrotum, perineum and pelvis. The abscess may extend into the penile corpora and affect the related urethra. • Possible pitfalls: Asymmetric injection and thin marginal enhancement may simulate abscess formation

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UR173-ED-X

Routine Utilization of Contrast-Enhanced Ultrasound in Renal Mass Characterization: A New Paradigm

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Participants
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TEACHING POINTS

CEUS can be used to assess renal masses in patients who cannot receive CT/MRI contrast, show sub-threshold enhancement on CT, small masses difficult to assess for enhancement, and renal transplant patients where there is a concern about using intravenous contrast material.

TABLE OF CONTENTS/OUTLINE

In this exhibit we review CEUS appearance of normal kidneys and hemodynamic features of different renal masses. Due to its higher contrast resolution compared with contrast enhanced CT and MRI and 100% negative predictive value for absence of vascularity, CEUS is useful in the following situations:1. A solid mass with less than 20 HU postcontrast enhancement on CT2. A cyst with indeterminate wall or septal enhancement on CT/MRI 3. In the evaluation of masses or RFA ablation zones in patients who cannot receive CT or MRI contrast4. Evaluation of small "<1cm" masses and avoiding the influence of pseudoenhancement that may be encountered on CT or MRI5. Confirmation of nodular enhancement in a cystic RCC6. Differentiating tumor from bland thrombus when doubtful on CT or MRIBased on our experience in using contrast enhanced US for renal mass characterization in 10 years, we propose a new algorithm, with integration of CEUS, for assessment of small renal masses that may reflect a new paradigm to assess renal masses

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UR175-ED-X

Contrast-Enhanced Ultrasound: A Multimodality Imaging Review of the Indeterminate Kidney Lesion

All Day Room: NA Digital Education Exhibit

Participants
Solomon Kim, MD, Rochester, NY (*Presenter*) Nothing to Disclose
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TEACHING POINTS

Conventional sonography is the first line imaging modality for evaluation of the kidneys, however real time characterization of tissue perfusion characteristics is limited. Contrast enhanced ultrasound (CEUS) uses microbubble-based IV contrast with conventional grayscale ultrasonography. This allows for dynamic, real time evaluation of tissue characteristics by detecting contrast enhancement and wash out of a lesion. One of the main advantanges of CEUS is its non-toxic nature, making it useful in patients with renal dysfunction. Due to this and other advantages, CEUS has quickly become an essential complimentary tool for further assessment of lesions. In this this multimodality case-based review, we will explore the basics of CEUS technique, uses, and example cases. The aim of this exhibit is to highlight its value in evaluating indeterminate renal lesions, specifically those that were incompletely characterized by CT and MRI.

TABLE OF CONTENTS/OUTLINE

1.Introduction to conventional grayscale ultrasound 2.Review of renal anatomy 3.Overview of Contrast Enhanced Ultrasound: Advantages and disadvantages, Instances CEUS comes into play when conventional imaging modalities are not an option, Phases of contrast-enhancement and wash out 4.Case-based presentations: Benign and malignant lesions, renal transplant, pseudolesions, trauma, miscellaneous 5.Summary

Printed on: 10/29/20

UR181-ED-X

Adrenal Mass Characterization with Spectral CT: Principles, Clinical Implementations, and Pitfalls

All Day Room: GU/UR Community, Learning Center Digital Education Exhibit

Participants
Yasunori Nagayama, MD, Kumamoto, Japan (*Presenter*) Nothing to Disclose
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TEACHING POINTS

Adrenal tumors are often identified in patients undergoing abdominal CT. While most incidental adrenal nodule is adenoma, the risk of malignancy substantially increases if there is a history of extra-adrenal malignancies. Accurate lesion characterization is crucial for appropriate patient care, but it is sometimes challenging with conventional CT. Spectral CT potentially allows for optimal assessment of adrenal lesions. This presentation aims to describe how to utilize the spectral CT technologies for adrenal mass characterization in clinical practice.

TABLE OF CONTENTS/OUTLINE

1. Epidemiology of incidental adrenal lesions 2. Adrenal mass characterization using conventional CT and MRI A) Tumor size and tumor growth B) Attenuation on unenhanced CT C) CT histogram analysis D) Chemical shift imaging E) Washout CT 3. Basic principles of spectral CT 4. Spectral image acquisition and post-processing A) Virtual unenhanced imaging B) Virtual monochromatic imaging C) Material density imaging D) Effective Z imaging 5. Implementation of spectral CT techniques for characterizing the adrenal lesions A) Spectral curve analysis on unenhanced CT B) Attenuation measurement on virtual unenhanced image C) Washout CT protocol utilizing virtual unenhanced image D) Material density measurement on contrast-enhanced image 6. Current limitations and future directions

ED006-SU

Genitourinary Sunday Case of the Day

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

AMA PRA Category 1 Credit ™: .50

Participants

Lori Mankowski Gettle, MD , Madison, WI (*Presenter*) Nothing to Disclose
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Adam Kinzel, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
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Kumaresan Sandrasegaran, MD, Phoenix, AZ (*Abstract Co-Author*) Nothing to Disclose
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Matthew A. Zarka, MD, Scottsdale, AZ (*Presenter*) Nothing to Disclose

TEACHING POINTS

1) Recognize imaging findings seen in disorders of the genitourinary systems. 2) Develop differential diagnosis based on the clinical information and imaging findings. 3) Explain the clinical importance of the diagnosis.

SSA10

Science Session with Keynote: Genitourinary (Benign Gynecologic Disease)

Sunday, Dec. 1 10:45AM - 12:15PM Room: N228

GU MR

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

Participants
Jean-Yves Meuwly, MD, Lausanne, Switzerland (*Moderator*) Nothing to Disclose
David D. Childs, MD, Clemmons, NC (*Moderator*) Nothing to Disclose
Elaine M. Caoili, MD, MS, Ann Arbor, MI (*Moderator*) Nothing to Disclose

Sub-Events

SSA10-01 Genitourinary Keynote Speaker: New Frontier in Imaging the Benign Female Pelvis

Sunday, Dec. 1 10:45AM - 10:55AM Room: N228

Participants
Nicole M. Hindman, MD, New York, NY (*Presenter*) Nothing to Disclose

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SSA10-02 The Additional Value of Expertise and Structured Reporting in Pelvic MRI Assessment of Endometriosis: A Comparison of Three Review Methods for Diagnosis and Staging

Sunday, Dec. 1 10:55AM - 11:05AM Room: N228

Participants
Adrian M. Jaramillo-Cardoso, MD, Boston, MA (*Presenter*) Nothing to Disclose
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PURPOSE

To compare the diagnostic characteristics of Routine-Read, Structured-Reported read, and Structured Expert-Read pelvic MRI for the diagnosis and staging of pelvic endometriosis in a tertiary care academic medical center.

METHOD AND MATERIALS

530 patients with pathological confirmation of endometriosis were found from 2013-2018; 59/530 (11.1%) had surgical staging and adequate preoperative pelvic MRIs for review. Reports on file were considered routine-read (RR); MRI studies were independently reassessed with a structured-reporting template (SR) and by an structured expert reader (SER). Involvement was recorded by compartment [anterior (AC), middle (MC), posterior (PC), adnexal (AX), and other compartments (OC)]. Using surgical-pathologic staging as the gold standard, diagnostic discrepancy between the RR, SR and SER was assessed with the McNemar's test for paired nominal data. Agreement between SR and SER was assessed using Cohen's unweighted kappa.

RESULTS

295 compartments were assessed in 59 women (mean age= 38.8 y; range= 20-69) and 147/295 (49.8%) were involved surgically/pathologically. Diagnostic comparison results: (1) sensitivity: RR=42.9%; SR=86.4%; SER=74.2%. SR's increased sensitivity was significant for the PC, MC, AC (all, $p=0.001$) and AX ($p=0.038$) but not OC ($p>0.05$). Higher sensitivity by SER was significant for the PC and AC ($p<0.001$), and MC ($p=0.004$), but not AX or OC ($p>0.05$); (2) overall specificity: RR=95.3%; SR=45.9%; SER=81.8%. Neither SR nor SER found different results for specificity in OC ($p>0.5$) when compared to RR. RR sensitivity relied heavily on detection of AX involvement whereas SR and SER showed additional sites of disease (mainly in the PC, MC and AC), while maintaining a comparable specificity for SER. Agreement between SR and SER was fair at $k=0.342$ (95% CI: 0.25, 0.44).

CONCLUSION

Even at a tertiary care academic center, SER outperforms both SR and RR in the assessment of pelvic endometriosis. Although lack of expertise may reduce specificity, the use of a structured reporting template can significantly increase sensitivity the detection and staging of endometriosis; especially in the posterior, middle and anterior compartments.

CLINICAL RELEVANCE/APPLICATION

Structured reporting in conjunction with expertise can assist in surgical planning and counseling of patients living with endometriosis. MRI can play a vital role in surgical candidacy determination and surgeon selection.

SSA10-03 Vaginal and Rectal Gel Filling Improves the Diagnostic Performance of Endometriosis MRI in Detecting

Deep Infiltrating Peritoneal and Rectal Endometriosis

Sunday, Dec. 1 11:05AM - 11:15AM Room: N228

Participants
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PURPOSE

No consensus exists in the literature on the value of vaginal and rectal filling in the pre-operative MRI diagnostics of DIE. The aim of our study was to investigate this.

METHOD AND MATERIALS

103 patients, operated 2015-2017 with preoperative 1,5 T and 3 T pelvic MRI with or without vaginal and rectal gel opacification blinded to intraoperative findings were analyzed retrospectively by a specialized gynecologic radiologist and then compared to intraoperative findings by looking at the operation report, postoperative diagnosis and intraoperative images and videos. All lesions were histopathological proven (except bowel lesions not being resected). Statistical analysis was performed with SPSS (Vers 25.0) with ANOVA and Excel (Crosstabs, confusion matrix, correlation coefficient, T-test).

RESULTS

103 patients were analyzed, 45% with, 55% without gel filling. Mean age was 33,2 years (18-46), mean BMI 23.0 (16.1-36.8) and the women had a mean of 1,4 previous surgery. The prevalence of endometriosis in the study population was 0.80. 32.6% of the patients had a rASF °I and° II endometriosis, 55.9% °III and °IV. The detection accuracy of DIE improved significantly when proceeding MRI with vaginal and rectal gel filling (filling / non-filling group: Sens. 0.92/0.82, Spec. 0.56/0.41, PPV 0.89/0.84, NPV 0.63/0.38, Acc. 0.85/0.74). 22% of the patients underwent a bowel resection. The overall detection of rectal endometriosis (serosal, musc. propria, mucosal) was higher in the filling group (Correl. 0.68 vs. 0.46) and clearly superior in the detection of deeper rectal endometriosis (musc. propria and mucosal layers) : filling-group: Sens. 100%, NPP 100% / non-filling-group: Sens. 13%, NPP 53%. Sigma endometriosis was observed in 17/103 patients (17%), 9 of them underwent bowel resection.

CONCLUSION

Adapted MRI protocols with vaginal and rectal gel opacification lead to better preoperative diagnostic in peritoneal deep infiltrating endometriosis and in evaluation the depth of the intra-intestinal endometriosis. The feasibility of this so called 'MRI-jelly method' was high.

CLINICAL RELEVANCE/APPLICATION

For planning surgery and weighing the indication to bowel resection accurate pre-operative diagnostic of DIE is crucial. Adapted MRI protocol with vaginal and rectal gel application is recommendable non-invasive method.

SSA10-04 Uterine Junctional Zone Thickness in Patients with Intrauterine Device (IUD): Is There a Difference from the General Female Population?

Sunday, Dec. 1 11:15AM - 11:25AM Room: N228

Participants
Leticia M. Nunes, MD, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
Barbara B. Zanoni, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Fernando I. Yamauchi, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

Our purpose is to evaluate the thickness of the uterine junctional zone in patients with IUD and compare with literature values for the general female population.

METHOD AND MATERIALS

This is an observational retrospective IRB approved study. From the period of January 2016 until March 2018, 292 pelvic MRI of women of reproductive age (between 17 and 50 years old) and with IUD were evaluated. Exclusion criteria were direct signs of adenomyosis (periendometric cysts, adenomyomas and asymmetric thickening of the junctional zone). The thickness of the junctional zone was measured in the sagittal T2-weighted TSE sequences without fat suppression. In addition, the relationship between the thickness of the junctional zone and the thickness of the entire myometrium was measured at the same location.

RESULTS

The mean thickness of the junctional zone was 8 mm (range: 2 to 27 mm). The mean ratio of junctional zone thickness to myometrium thickness was 0.47 (range: 0 to 1.55). The junctional zone of 135 patients (46.2%) showed normal value thickness (< 7 mm). Moderate thickening (between 7 and 12 mm) of the junctional zone was seen in 136 women (46.6%). Exuberant thickening (> 12 mm) was seen in 21 patients (7.2%), with no other findings of adenomyosis. The relation between junctional zone thickness

and myometrium were 0.4 or less in 106 patients (36.3%) - within normal range based on the literature - and greater than 0.4 in 186 women (63.7%). When we compared our findings with normal values of the literature (normal up to 7 mm), the results showed to be statistically significant (p<0.001), suggesting that junctional zone of --patients with IUD is thicker).

CONCLUSION

IUD is associated with thickening of the uterine junctional zone beyond normal values, a finding that should not be mistaken for adenomyosis.

CLINICAL RELEVANCE/APPLICATION

The knowledge of new values --considered normal for the uterine junction zone thickness in patients with IUD helps to avoid the misdiagnosis of adenomyosis based on this indirect sign alone.

SSA10-05 Multi-parametric MR Relaxometry of Adenomyosis: Assessment of Symptom and Prediction of Response to Gonadotropin Releasing Hormone Analogue

Sunday, Dec. 1 11:25AM - 11:35AM Room: N228

Participants
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PURPOSE

To investigate whether MR relaxometry can evaluate symptoms of adenomyosis including dysmenorrhea and abnormal uterine bleeding, and to explore whether MR relaxometry can further predict the therapeutic response to gonadotropin releasing hormone analogue (GnRHa) in patients with adenomyosis.

METHOD AND MATERIALS

Between Nov 2017 and Aug 2018, 52 patients clinically diagnosed as adenomyosis underwent multi-parameter uterine MR examinations including T1, T2 and T2* relaxometry on a 3T MR scanner (Ingenia CX, Philips Healthcare, the Netherlands) during peri-ovulatory period. Visual analogue scale (VAS) of dysmenorrhea and blood hemoglobin level were collected before GnRHa injections and 6 months after. T1, T2, and T2* relaxation times of lesions were measured blindly by two radiologists via Intellispace Portal (version 10.1.0.64190, Philips Healthcare, the Netherlands) on slices showing maximum lesion area, as well as maximum diameters of lesions on sagittal T2W images. Spearman rank correlation coefficients were calculated to determine the relationship between relaxation times and VAS. Student t tests were performed to compare the difference of lesions' features between patients with different therapeutic responses. A p value <0.05 was considered statistically significant.

RESULTS

A moderate, negative correlation was found between T2* relaxation time of lesions and VAS (r=-0.4808, p=0.0004). Twenty-three patients received GnRHa injection, and 14 of them achieved complete response (CR, VAS=0 and normal Hgb) after 6 months, while 9 patients with partial response (PR, VAS>0 or anemia). T2* relaxation times of lesions were shorter in patients with CR than those with PR (43.73±2.019 ms vs. 55.43±5.465 ms, p=0.0295). Differences were found regarding T2 relaxation times and lesion maximum diameters but they were not statistically significant (63.12±1.913 ms vs. 71.07±3.685ms, p=0.0501, and 61.46±6.899 mm vs. 41.69±5.721 mm, respectively).

CONCLUSION

T2* relaxation time of lesions can quantitatively assess dysmenorrhea severity in patients with adenomyosis. Furthemore, T2* relaxometry showed potential as a quantitative imaging marker to predict GnRHa therapeutic response in patients with adenomyosis.

CLINICAL RELEVANCE/APPLICATION

T2* relaxometry can make both assessment and prediction as a non-invasive method, and guide different patients to GnRHa or other therapeutic plans based on different findings.

SSA10-06 Uterine Fibroid Embolization: MRI Texture Analysis as a Predictor of Radiological Outcome

Sunday, Dec. 1 11:35AM - 11:45AM Room: N228

Participants
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PURPOSE

To assess the association of morphologic and texture features on pre-embolization contrast-enhanced MRI with the radiological

response of uterine artery embolization (UAE) for uterine fibroids

METHOD AND MATERIALS

This retrospective study analysed the pre-embolization pelvic MRI studies of 80 patients that underwent UAE in our tertiary care centre. Cases were chosen to have good representation of two types of post MRI embolization response: 1) good - > 70% fibroid necrosis (48 cases) and 2) poor < 70% fibroid necrosis (32 cases). Quantitative differences of multiple texture parameters between the two groups were assessed on the venous phase of the pre-embolization MRI. The dominant fibroid on the venous phase was delineated in 3D with semi-automatic in-house software. Volume and six histogram-derived texture features (mean, variance, skewness, kurtosis, entropy, uniformity) were computed for each region of interest. Univariate t-tests were computed to test for statistical difference between the two outcome-based groups. Accounting for Bonferroni correction for multiple comparisons, features with $p<(0.05/7)=0.0071$ were selected and univariate diagnostic models were built separately for each selected feature. 95% confidence intervals were estimated using 1000 bootstrap iterations.

RESULTS

Three features with $p<0.0071$ were found, with the following diagnostic performance (95% confidence interval shown in parentheses): The AUC, Sensitivity and Specificity for Volume 0.86 (0.71,0.92) 0.88 (0.74,1.0) 0.79 (0.48,0.86) Mean 0.75 (0.63,0.85) 0.78 (0.53,0.94) 0.70 (0.29,0.78) Skewness 0.73 (0.59, 0.82) 0.44 (0.27,0.55) 0.76 (0.73,1.0) respectively.

CONCLUSION

Among the three selected features, volume appears to be the single best feature and outperformed other histogram-based texture features. In future work, we will collect an independent testing dataset, at which time machine learning techniques will be used to optimize a predictive model.

CLINICAL RELEVANCE/APPLICATION

Volume and regional texture features (mean, skewness) can help predict radiological outcomes of UAE and such studies may eventually allow better patient selection for UAE

SSA10-07 A Retrospective Study of the Ultrasound Characteristics of Surgically-proven Ovarian Torsion

Sunday, Dec. 1 11:45AM - 11:55AM Room: N228

Participants
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PURPOSE

Ovarian torsion can be a challenging diagnosis to confirm or exclude with ultrasound. In this 5-year retrospective study, we aimed to evaluate the ultrasound characteristics of the ovaries in women who underwent surgery for the presumed diagnosis of ovarian torsion.

METHOD AND MATERIALS

We queried our institution's electronic medical record system for all women who were admitted or discharged from two hospitals in our healthcare system between November 2012 and November 2017 and had an ICD-9 or ICD-10 code diagnosis of ovarian torsion. All patients who underwent surgery for the treatment of ovarian torsion were included in the study. The pre-surgical ultrasound studies were then reviewed by an attending radiologist and two radiology residents to determine ovarian volumes, ovarian parenchymal echotexture, ovarian color and spectral flow patterns, ovary location, ascites, presence of an adnexal mass, and presence of the whirlpool sign. We then reviewed the operative notes and corresponding pathology reports to determine which patients had confirmed ovarian torsion. Statistical analysis was performed using SAS.

RESULTS

A total of 64 patients were admitted or discharged with a diagnosis of ovarian torsion. Of these, 55 patients underwent surgery and were included in the analysis. The average patient age was 30 years old. At surgery, 39 patients had confirmed ovarian torsion (71%) and 16 did not (29%). The average volume of torsed ovaries was 202 ml (CI 125 - 279 ml) and for non-torsed ovaries 135 ml (CI 58 - 212 ml). The distribution of ovarian volumes was positively skewed, and no significant difference was found between the torsed ovaries and non-torsed ovaries ($P = 0.12$). The positive predictive values (PPV) were 86% for absent flow on color doppler, 79% for absent arterial flow on spectral doppler, and 75% for absent venous flow. PPV for the presence of heterogenous stroma was 74%, peripheral follicles 88%, presence of a mass 73%, moderate or large volume of ascites 80%, and for the whirlpool sign was 90%.

CONCLUSION

False positive rates remain high (29%), and no single sonographic finding is specific to ovarian torsion. Positive predictive values for common findings ranged from 75% for absent venous flow to 90% for whirlpool sign, which was only seen in 10 patients.

CLINICAL RELEVANCE/APPLICATION

Our results suggest evaluation of the vascular pedicle for whirlpool sign may be of utility when looking for ovarian torsion.

SSA10-08 Differentiation Between Ovarian Ischemia and Hemorrhagic Infarction by MRI in Cases of Adnexal Torsion

Sunday, Dec. 1 11:55AM - 12:05PM Room: N228

Participants
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PURPOSE

To demonstrate the role of magnetic resonance (MR) imaging findings, in differentiating between ovarian infarction and ischaemia and consequently the rate of ovarian salvage in cases of adnexal torsion.

METHOD AND MATERIALS

25 patients with surgically proven ovarian torsion were evaluated by two radiologists regarding the following MR findings: Ovarian enlargement, ovarian parenchymal hypointensity on T2-weighted images (WI), Hyperintensity on T1 (WI) with fat saturation, Recognition of twisted pedicle, Diffusion restriction and Ovarian parenchymal enhancement.. Also Pelvic fluid collection,and Uterine deviation These MR findings were statistically correlated with the operative findings and histopathological results (for cases of ovarian infarction).

RESULTS

Pathologically, ovarian haemorrhagic infarction was confirmed in 6 out of 25 cases. Ovarian hyposignal on T2 WI was seen in all cases with infarction 6/6. Ovarian hyperintensity (compared to the contralateral sides) was observed in 4/6 and 5/6 cases with infarction on T1WI and DWI, respectively Ovarian enlargement, fluid collections, uterine deviation and twisted pedicle were detected in most cases with or without haemorrhagic infarction. Poor parenchymal contrast enhancement was observed in all cases without or with necrosis

CONCLUSION

Detection of ovarian infarction is of prognostic importance in cases of torsion to assess salvageability, and thus may affect the surgical decision. Swollen hypointense ovarian parenchyma on T2 WI with lack of contrast uptake are the most reliable MRI signs, followed by hypersignal on T1 WI fat sat and DWI.

CLINICAL RELEVANCE/APPLICATION

MRI is not commonly employed as a first-line imaging study in suspected torsion, but can be very helpful in pregnant patients with an inconclusive US or as a problem solver in equivocal cases. It is important to assess salvageablity of the torsed ovary preoperatively.

SSA10-09 Prevalence of Pathologies in Infertile Women Identified by MR Virtual Hysterosalpingography

Sunday, Dec. 1 12:05PM - 12:15PM Room: N228

Participants
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PURPOSE

CT Virtual Hysterosalpingography (CT-VHSG) emerged as a good non-invasive modality to evaluate the gynecologist system using very low radiation dose. Recently MR-Virtual Hysterosalpingography (MR-VHSG) appears with the advantage of lacking of ionizing radiation. The objective of this paper is to evaluate the usefulness of MR-VHSG in infertility versus CT-VHSG, and determine the prevalence of disease in each anatomic region of the gynecologist system.

METHOD AND MATERIALS

Patients were studied by CT-VHSG and MR-VHSG. CT studies were performed in a 128-slice CT scanner (Discovery CT750 HD, GE Healthcare) and MR studies in a high filed 3T scanner (Discovery HXT, GE Healthcare). Findings in each modality were reported by two different radiologists in a blinded fashion according to different anatomic regions: cervix, uterine wall, uterine cavity and fallopian tubes. Sensitivity (S), Specificity (SP), Positive Predictive Value (PPV) and Negative predictive Value (NPV) were determined by the exact binomial method for each region. Disease prevalence was reported in each region.

RESULTS

Fifty two infertile women were studied. In the cervix, 21 patients presented pathological findings: 6 polyps, 6 C-section scars, 3 stenosis,1 sinequiae, 7 hypertrophic folds, 5 glandular dilatation. Prevalence of disease: 9,77 %. Per patient S, Sp, PPV and NPV were: 96%, 95%,96% and 95%. Per lesion S, Sp, PPV and NPV were 89%, 95%, 92%, 98%. In the uterine wall, 6 patients presented anomalies (1 septate, 3 unicorn, 2 arcuate uterus). S, Sp, PPV and NPV 100%. In uterine cavity, 13 patients presented pathology (6 polyps,1 submucosal myoma, 5 sinequiae,1 hyperplasic folds). Disease prevalence 5.24 %. Per patient S, Sp, PPV and NPV were 100%, 94%, 85%, 100%. Per lesion S, Sp, PPV and NPV were 92%, 98%, 80%, 99%. In the fallopian tubes 8 patients presented pathology: tubal occlusion, dilatation, hidrosalpinx and negative Cotte. Per patient, S, Sp, PPV and NPV were 82%, 92%,72%, 97%. Disease prevalence 17,65%. Per lesion S, Sp, PPV and NPV were 88%, 99%, 88%, 99%.

CONCLUSION

MR-VHSG showed very good results in the evaluation of the gynecological system. These promising results should be validated in a larger number of patients so as to determine its the role in clinical work.

CLINICAL RELEVANCE/APPLICATION

MR-VHSG is a promising, ionizing radiation-free examination for the evaluation of the infertile woman.

Printed on: 10/29/20

SSA11

Genitourinary (Renal Neoplasia)

Sunday, Dec. 1 10:45AM - 12:15PM Room: N230B

CT GU

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

FDA Discussions may include off-label uses.

Participants
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Sub-Events

SSA11-01 Diagnostic Accuracy of the Clear Cell Likelihood Score (ccLS) in Clinical Practice: Impact of Tumor Stage

Sunday, Dec. 1 10:45AM - 10:55AM Room: N230B

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PURPOSE

The paradoxical lack of decreased mortality from renal cell carcinoma despite the increased incidental detection of renal masses demonstrates a need for risk stratification prior to intervention. As the most common and aggressive histologic subtype, identification of clear cell renal cell carcinoma (ccRCC) during radiologic evaluation would be valuable. Previous work has shown the predictive value of a clear cell likelihood score (ccLS) derived from multiparametric magnetic resonance imaging (mpMRI). Here we assess the prospective performance of ccLS for renal masses across all stages in clinical practice.

METHOD AND MATERIALS

We conducted a retrospective, multi-institution analysis of prospectively generated clinical data. The ccLS was incorporated into the clinical report of mpMRI at 2 different institutions in 06/2016. Prospectively assigned ccLS of renal masses evaluated between 06/2016 and 10/2018 were reviewed. ccLS were correlated with histologic diagnosis when available. Diagnostic performance for diagnosing ccRCC and post-test probabilities of ccLS were quantified by contingency table analysis.

RESULTS

634 mpMRIs were obtained for renal mass evaluation and prospectively assigned ccLS by 1 of 16 fellowship-trained radiologists. Of these, 255 renal masses (244 patients) had pathologic tissue diagnosis after the mpMRI via renal biopsy (34) or surgical excision (221) and represent the study cohort. Overall, 24% were ccLS 1-2, 12% ccLS 3, and 64% ccLS 4-5. 45.1% of the masses were clinical stage T1a, 24.7% T1b, 3.5% T2, 24.3% T3, 2.4% T4. The figure shows the distribution of histologic diagnosis across ccLS. The sensitivity and specificity of ccLS >=4 in diagnosing ccRCC are 87.8% and 80.2%, respectively. The sensitivity and specificity of ccLS >=3 in diagnosing ccRCC are 98.2% and 64.8%, respectively. Diagnostic accuracy improved in higher stage tumors (Cochran-Armitage trend test, p = 0.0025).

CONCLUSION

A non-invasive diagnosis of ccRCC in patients with renal masses using mpMRI can be achieved with reasonable clinical performance in a busy clinical practice with a large number of interpreting radiologists. ccLS performance improved in larger tumors.

CLINICAL RELEVANCE/APPLICATION

Implementation of ccLS in clinical practice can help reduce the number of renal biopsies prior to surgical resection (95.1% of ccLS 4-5 were malignant). Histologic prediction with mpMRI is improved in larger tumors.

SSA11-02 Infiltrative Renal Masses: Are We Reporting What's There? Impact on Patient Outcome

Sunday, Dec. 1 10:55AM - 11:05AM Room: N230B

Participants
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PURPOSE

To determine the prospective reporting rate of infiltrative features in radiologically identified renal masses and to evaluate the impact on patient outcomes.

METHOD AND MATERIALS

522 patients with renal tumors managed with partial or radical nephrectomy (2012-2014) with locally-advanced and/or aggressive histology were analyzed. Preoperative CT/MRI were retrospectively, independently reviewed by 2 radiologists. Infiltrative renal masses (IRM) were defined as having poorly-defined interface with parenchyma and non-elliptical shape in one or more distinct and unequivocal areas and features were identified as extensive or focal. Cancer-specific mortality (CSM) was estimated using Kaplan-Meier. Significant, independent predictors of CSM were evaluated using Cox-proportional-hazards analysis.

RESULTS

Image-review confirmed 133 IRMs (25%), including 103 RCCs, 59 with sarcomatoid or poorly-differentiated features on pathology. IRMs were larger and more often symptomatic compared to non-IRMs, and disseminated-disease was also more common (all $p<0.001$). Overall, 109 IRMs were imaged at our center; 42 were documented as IRM in preoperative radiology reports, while infiltrative features were not documented in 67 (61%). Only 4 (6%) of these 67 were documented as infiltrative by the surgical team. 2-year CSM was 29% and 6% for IRM and non-IRM patients, respectively ($p<0.001$, Figure A). CSM difference was found documented versus undocumented IRMs ($p=0.04$, Figure B) and both showed significantly increased CSM compared to non-IRMs (both $p<0.001$). Among IRMs, extensive infiltrative-features and disseminated-disease were associated with CSM, while documentation-status failed to associate. Among IRMs, extensive infiltrative-features and disseminated-disease were associated with CSM, while documentation-status failed to associate.

CONCLUSION

Twenty-five percent of locally-advanced and/or histologically-aggressive renal tumors exhibited infiltrative features, although many were not documented prospectively. Even within this high-risk population, infiltrative-features were independent predictors of CSM, whether documented or not.

CLINICAL RELEVANCE/APPLICATION

Infiltrative features in renal tumors have a strong impact on patient prognosis and should be routinely assessed and documented during radiologic evaluation of renal masses.

SSA11-03 Evaluating Distribution of Renal Tumor Growth Rate in Hereditary Cancers: A Single Center Study

Sunday, Dec. 1 11:05AM - 11:15AM Room: N230B

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PURPOSE

To investigate the distribution of growth rate across different subtypes and sizes of renal tumors associated with hereditary renal cancers, using serial volumetric imaging.

METHOD AND MATERIALS

A registry of patients with hereditary renal cancers was retrospectively reviewed for patients with a minimum of two preoperative cross-sectional imaging. Longest diameter of the tumor was measured for all time points using less than 3 mm slice thickness CT in corticomedullary phase of high-resolution T2-WI MRI. Tumor growth rate between every two consecutive instances of imaging was calculated using the same modality (CT/MRI), and was used as a data point for statistical evaluation. Association between tumor size at each instance and its subsequent growth rate was analyzed using repeated-measures statistical models, which were also used to compare growth rates across renal tumor subtypes.

RESULTS

Images included 1142 CT scans and 734 MRI. Tumors included pathologically confirmed cases of Clear Cell renal cell carcinoma

(ccRCC, n=197), Papillary type 1 (n=47), and Oncocytoma (n=12) from patients with Von Hippel-Lindau syndrome (n=75), Hereditary Papillary Renal Carcinoma (n=13), and Birt-Hogg-Dube syndrome (n=7). The number of pairs of consecutive of measurements, their median growth rate (in mm per 365 days), and interquartile range were: n=777, median=2.35, IQR=(0.00, 6.67) for ccRCC; n=134, median=1.00, IQR=(0.00, 4.66) for Papillary Type I; and n=27, median=1.44, IQR=(0.00, 4.89) for Oncocytoma. The data did not show any evidence of an association between tumor size at presentation and its subsequent growth rate, for any of the 3 subtypes. There was no evidence of average tumor growth rates being different between tumor subtypes in hereditary renal tumors. Based on all 3 subtypes combined (n=938), the median growth rate was 1.97 mm per 365 days, with an interquartile range of (0.00, 6.27).

CONCLUSION

The data analyzed showed no evidence of an association between renal tumor growth rate and tumor size in ccRCC, Papillary, and oncocytoma associated with hereditary renal syndromes, and showed no evidence of a difference in average growth rate among the 3 subtypes.

CLINICAL RELEVANCE/APPLICATION

Tumor size at presentation measured on serial images does not seem to be a reliable measure to estimate future growth, hence it is not suggested as a marker to schedule surveillance frequency of renal masses associated with hereditary renal cancers.

SSA11-04 The Arrowhead Sign (AS) a Novel, Reproducible Radiographic Indicator of Intramuscular Venous Branch Invasion (pT3a) in Patients with Renal Cell Carcinoma

Sunday, Dec. 1 11:15AM - 11:25AM Room: N230B

Participants
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PURPOSE

Accurate preoperative prediction of T3a disease in renal cell carcinoma (RCC) is a clinical challenge. Knowledge of renal intramuscular venous invasion can influence clinical decision-making regarding the suitability of nephron-sparing surgery. We report and validate the observation that tumors that exhibit invasion into the muscular branches of the venous vasculature form a 'beak-shaped' irregularity as they grow towards the renal sinus fat and resembles an 'arrowhead'. We sought to determine if the 'Arrowhead Sign (AS)' CT finding could be used as a preoperative predictor of proximal venous invasion on final histopathologic evaluation

METHOD AND MATERIALS

We queried our IRB-approved, kidney cancer database and identified 174 patients with localized renal tumors who underwent surgical resection between 2009 and 2018 and had a pre-operative contrast imaging within 90 days of surgery. Two fellowship-trained junior abdominal radiologists and a senior radiologist with 25 years of experience blindly and independently reviewed the imaging. To evaluate for likelihood of tumor venous invasion on final histopathology, images were assessed for the following radiographic predictors of cT3a disease: sinus fat infiltration, perinephric invasion, and AS.Indicators were scored on a 1- 4 scale according to reader's degree of confidence in the finding, with a score of 1 - definitely present,to 4 - definitely absent. Statistical analyses were performed.

RESULTS

Final pathologic staging revealed pT1=116 (66.6%), pT2=9 (5.1%), pT3=48 (27.5%) and pT4=1 (0.006%). The sensitivity and specificity of AS for predicting muscular venous invasion were 92% and 73%, respectively. Perinephric invasion had 62% sensitivity and 85% specificity, while sinus fat infiltration was 89% sensitive and 73% specific. Inter-reader agreement for AS was moderate (x = 0.64).

CONCLUSION

The arrowhead sign is a novel and potentially clinically actionable predictor of muscular venous invasion in patients with RCC. Of the three indicators, it had the highest sensitivity and moderate intra-reader agreement. These initial findings justify further investigation.

CLINICAL RELEVANCE/APPLICATION

The ability to stage pT3a (RCC) with imaging can influence surgical management and eligibility for clinical trials. Of the three commonly reported imaging features the,' arrowhead sign,' had the highest sensitivity and larger validation studies are warranted.

SSA11-05 Renal Mass Characterization with Dual-energy CT: Validation of a Dual-layer Spectral CT Platform in an Anthropomorphic Renal Phantom Model

Sunday, Dec. 1 11:25AM - 11:35AM Room: N230B

Participants
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PURPOSE

To validate the application of a dual-layer spectral CT platform for renal mass characterization using dual-energy CT (DECT).

METHOD AND MATERIALS

A custom renal phantom model consisting of three cylinders simulating unenhanced state (A) (0 mgI/mL), nephrographic (B) (7 mgI/mL) and excretory phases (C) of the kidneys (5 mgI/ml) was used. In addition, six rods were fabricated to mimic simple and hyperdense cysts (0 mgI/mL), unenhanced (0 mgI/mL) and contrast-enhanced minimally- (0.5 mgI/mL), moderately- (1 mgI/mL), and avidly-enhancing (3 mgI/mL) solid renal masses (labelled 1-6 respectively). Simulated kidneys with varying renal masses were inserted into an anthropomorphic human phantom (ATOM 701, CIRS Inc.) in three body sizes (small, medium, large) and scanned with 120 kV single-energy and dual-energy CT using a dual-layer spectral CT (IQon Spectral CT; Philips Healthcare). For each scan, full radiation dose and 40% radiation dose-reduced acquisitions were obtained. Single-energy, dual-energy 70 keV monochromatic and iodine maps were reconstructed and computed. The effect of body habitus and radiation exposure on renal mass characterization was also assessed.

RESULTS

Consistent and statistically significant attenuation differences were observed between the unenhanced, minimally-, moderately-, and avidly- enhancing lesions ($p<0.05$ for all comparisons) without variation between the small and medium body sizes. No statistically significant attenuation difference was found among the renal lesions when standard radiation dose was compared to 40% reduced dose with the exception of the moderately enhancing renal lesion in nephrographic phase in a small body size. Iodine quantification was variable with statistical significance between phase of contrast, body size and radiation dose.

CONCLUSION

Attenuation changes calculated from dual energy CT data using a dual-layer platform can be used to differentiate among different renal lesion types, without significant variation with different radiation dose levels. However, the iodine quantification technique shows significant variation as a function of study phase, body size and radiation dose.

CLINICAL RELEVANCE/APPLICATION

Radiation dose reduced acquisition can be implemented for renal mass characterization with DECT on a dual-layer platform. However, circumspection should be paid when using the iodine quantification with different study phases, body size and radiation dose levels.

SSA11-06 Cost-Effectiveness of Dual-Energy CT Versus MRI for Characterization of Small Incidental Indeterminate Renal Lesions

Sunday, Dec. 1 11:35AM - 11:45AM Room: N230B

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PURPOSE

To develop a Markov Monte Carlo decision-analytic model to evaluate the cost effectiveness of dual-energy (DE) CT versus multiphasic single-energy (SE) CT and MRI for characterizing small incidentally detected indeterminate renal lesions.

METHOD AND MATERIALS

A decision analytic Markov model was constructed to estimate life expectancy and lifetime costs for otherwise healthy 64-year-old patients with small (<= 4 cm) incidentally detected, indeterminate renal lesions on routine imaging (e.g. ultrasound or single-phase CT). Three strategies for evaluating renal lesions for enhancement were compared: multiphase SECT (e.g. true unenhanced and nephrographic phase), multiphasic MRI, and single-phase DECT (nephrographic phase only in dual-energy mode). Model incorporated modality specific diagnostic performance, incidence and prevalence of incidental renal cell carcinomas (RCCs), effectiveness, costs, and outcomes. An incremental cost-effectiveness analysis was performed to identify strategy preference at a willingness-to-pay (WTP) thresholds of $50,000 and $100,000 per quality-adjusted life-year (QALY) gained. Deterministic and probabilistic sensitivity analysis were performed by using Monte Carlo simulations (100,000 runs).

RESULTS

Under the base-case assumptions, DECT was the dominant strategy as it was most cost-effective with a higher effectiveness (mean 0.95) and lower cost ($2108) compared to MRI (mean of 0.93 and $3105) and multiphasic SECT (0.93 and $2851). Results were robust to changes in model parameters based on sensitivity analysis. The probability that the single-phase DECT imaging strategy was cost-effective was 76% at a willingness to pay of $50,000/QALY.

CONCLUSION

Dual-energy CT is more cost-effective than multiphasic single-energy CT and MRI for characterizing small incidentally detected indeterminate renal lesions.

CLINICAL RELEVANCE/APPLICATION

Incidental indeterminate renal lesions are commonly encountered and often warrant additional imaging workup. DECT is a more cost-effective than MRI and SECT to determine whether there is renal lesion enhancement and should be considered the preferred workup strategy.

SSA11-07 Apparent Diffusion Coefficient Predicts Malignancy in T1-Hyperintense Small Renal Masses

Sunday, Dec. 1 11:45AM - 11:55AM Room: N230B

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PURPOSE

Small renal masses (<4 cm) can be difficult to accurately classify as benign or malignant, particularly if they are T1 hyperintense on MRI. This intrinsic signal, potentially related to intralesional hemorrhage, may limit evaluation of contrast enhancement and signal intensity on other sequences. The purpose of this study was to test whether apparent diffusion coefficient (ADC) measurements may predict malignancy.

METHOD AND MATERIALS

This IRB-approved single-center retrospective study identified patients with a T1-hyperintense renal mass less than 4 cm on MRI. Malignant lesions were pathologically proven; a benign mass was established by a predefined hierarchy of pathologic proof, follow-up ultrasound, or follow-up imaging (MR/CT) showing more than 5 years of stability. T1 hyperintensity, defined as a signal intensity equivalent to or greater than the adjacent cortex, was confirmed by an abdominal radiologist with over 20 years of abdominal imaging experience. Two additional abdominal radiologists independently measured ADC values by drawing the largest region of interest within the lesion. This was normalized to the ADC of the ipsilateral background kidney (i.e. ADClesion / ADCipsilateral) and represented as ADCratio. (Figure). Inter-reader reliability was assessed using intra-class correlation coefficient (ICC). Multivariate binary logistic regression was used to control for lesion size.

RESULTS

There were 58 benign and 37 malignant renal lesions in 95 patients (51 [54%] males; age 61 ± 13 years; size 1.9 ± 0.9 cm). Inter-reader agreement for lesion and ipsilateral kidney was excellent (ICC of 0.94 [CI: 0.91, 0.96] and 0.84 [CI: 0.76, 0.89] respectively). ADCratio was significantly lower in malignant compared to benign lesions (0.65 ± 0.29 vs. 1.03 ± 0.32, $p<0.001$ [Figure]). Malignant lesions were significantly larger than benign lesions (2.7 ± 0.9 vs. 1.5 ± 0.6 cm, $p<0.001$). After controlling for lesion size, ADCratio remained a significant predictor of malignancy; each 0.1 unit decrease in ADCratio conferred a 1.49 times higher odds of malignancy (95% CI: 1.20, 1.84; $p<0.001$).

CONCLUSION

ADCratio is a significant predictor of malignancy in small T1-hyperintense renal lesions.

CLINICAL RELEVANCE/APPLICATION

Small renal masses with intrinsic T1 hyperintensity on MRI can be difficult to classify as benign versus malignant. ADCratio may serve as a useful differentiating feature.

SSA11-08 Accuracy of Contrast-enhanced Ultrasound for Characterization of Complex Cystic Renal Masses and Its Agreement with CT for the Bosniak Classification

Sunday, Dec. 1 11:55AM - 12:05PM Room: N230B

Participants
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PURPOSE

To evaluate the diagnostic accuracy of contrast-enhanced ultrasound (CEUS) for characterization of complex cystic renal masses according to Bosniak classification system and its agreement with CT.

METHOD AND MATERIALS

This prospective study approved by the Institutional Review Board comprised of 50 patients with complex cystic renal masses, detected on gray-scale ultrasound. All patients were evaluated by both CEUS and CT, after obtaining informed consent. CEUS was performed on a single ultrasound machine with a 1-6 MHz curvilinear using second generation contrast agent. Contrast CT was performed on the same 128-slice scanner in all patients. All patients were classified according to the Bosniak classification using both modalities. Imaging follow up was performed for Bosniak II and IIF lesions and histopathological diagnosis was obtained for Bosniak III and IV lesions. Mc Nemar test was used to compare sensitivity and specificity of the two methods. p value < 0.05 was considered statistically significant. Inter rater kappa agreement was used to find out agreement between CEUS and CT.

RESULTS

Out of 50 patients, 12 were female and 38 were male with ages ranging from 18 to 78 years. On CEUS, complex cysts were characterized as follows: 18 as Bosniak II, 18 as Bosniak IIF, 10 as Bosniak III and 4 as Bosniak IV. On CT, these complex cysts were characterized as follows: 20 as Bosniak II, 16 as Bosniak IIF, 12 as Bosniak III and 2 as Bosniak IV. CEUS upgraded two Bosniak II cysts into Bosniak IIF and two Bosniak III cysts into Bosniak IV. Mean septal thickness and mean number of septae was significantly higher on CEUS as compared to CT (p value < 0.05). Strength of agreement was excellent (k value of 0.818) between the two modalities for all categories of Bosniak classification.

CONCLUSION

CEUS has similar diagnostic accuracy to CT in characterization complex cystic renal masses for all categories of Bosniak classification.

CLINICAL RELEVANCE/APPLICATION

In patients with complex renal cysts, CEUS can be used as safer alternative to CT to prevent radiation exposure and for those with chronic kidney disease, where iodinated contrast is contraindicated.

SSA11-09 Morphometric Image Analysis Predicts Surgical Outcomes During Level II-IV Level Inferior Vena Cava Tumor Thrombectomy

Sunday, Dec. 1 12:05PM - 12:15PM Room: N230B

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PURPOSE

To assess if the scored morphometric analysis of renal vein and Inferior Vena Cava (IVC) tumor thrombus diameters and renal cell carcinoma (RCC) volume extracted from preoperative CECT and MRI can predict surgical outcomes and complications of level II-IV IVC tumor thrombectomy.

METHOD AND MATERIALS

In this IRB approved, HIPAA compliant retrospective study, we queried CECT and MRI imaging studies of 83 patients performed over a 10-year window (Nov 2007 - Dec 2017). Manual segmentation of the venous thrombus was performed by an experienced radiologist in Synapse 3D. The 3D regions of interest (ROIs) included IVC, renal vein, thrombus and renal mass. Segmental volumetric-analysis was performed separately on the suprarenal and infrarenal IVC, the caval thrombus volume included both tumor as well as bland thrombus. In all cases, maximum diameter of the IVC and renal vein, as well maximal bowing of the IVC and renal vein ostium diameter were measured. The radiological variables were compared to a measure of complications captured by Clavien-Dindo (CD) score. Random forest was used as the machine learning tool to build the composite prediction models with all candidate predictors. Leave-one-out procedure was used to assess the robust prediction accuracy. Area under the curve was used to assess the prediction accuracy for binary surgical outcome and R2 was used for continuous outcome.

RESULTS

Five composite prediction models were built using random forest. The leave-one-out validation showed that the composite prediction models using imaging-based morphometric predictors alone can achieve a robust and statistically significant AUC=0.7 95% CI (0.58 0.81) in predicting CD. We also found that the models can robustly explain significant amount of total variance of natural log-transformed (ln) ln(Estimated Blood loss): 15% (p<0.01); ln(Number of units transfused): 7% (p=0.01); ln (Operation time): 6% (p=0.02) and ln(Trans): 5% (p=0.06).

CONCLUSION

Imaging-based morphometric models can be accurately used to predict surgical outcomes and complications. This can be used to assist with surgical planning and patient counseling.

CLINICAL RELEVANCE/APPLICATION

Radiologic morphometric analysis in patients with RCC with level II-IV IVC thrombus can help predict surgical outcomes and complications.

SSA16

Nuclear Medicine (Genitourinary Oncology Nuclear Medicine and PET)

Sunday, Dec. 1 10:45AM - 12:15PM Room: S505AB

CT GU NM OI

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

FDA Discussions may include off-label uses.

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Sub-Events

SSA16-01 AI Pipeline System for Detection of Bone Metastases on PET-CT

Sunday, Dec. 1 10:45AM - 10:55AM Room: S505AB

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PURPOSE

To develop a machine learning system for the detection of bone metastases from the data of CT based on ground truth generated from 18F-fluorodeoxyglucose (FDG) PET.

METHOD AND MATERIALS

In this study, 198 whole body PET-CT examinations (105 men and 93 women; mean age, 63.8 years ± 12.9 [standard deviation]) with one or more bone metastases were retrospectively evaluated. At first, an automated annotation generation tool for bone metastases was created to extract lesions from PET. A binary bone mask was obtained from CT and multiplied with the rescaled PET volume. This resulted in a PET volume with FDG uptake in bones only. A convolutional neural network (CNN), ResNet-50, was then used to discard high FDG uptake regions which did not correspond to bone metastases, such as brain or bladder. Each candidate of bone metastasis was assigned a unique lesion number before it was converted into slice-wise bounding boxes. Secondly, one of the authors labeled each automatically extracted lesion with osteoblastic metastasis, osteolytic metastasis, intertrabecular metastasis and other. The 198 examinations were split in 173 examinations for training and 25 examinations for validation. A Mask R-CNN model was trained on the training set using labeled bounding boxes as ground truth. Finally, prediction accuracy was measured on the validation set.

RESULTS

In a total of 198 examinations, 1263 lesions were detected with the annotation tool and composed of 364 osteoblastic metastases, 365 osteolytic metastases, 24 intertrabecular metastases, and 510 others such as normal lesions, postoperative lesions, degenerative changes, and inflammation. The sensitivity was 77.8% for osteoblastic metastases, 54.2% for osteolytic metastases, and 100% for penetrating metastases with a false positive per image of 0.701 in the validation datasets.

CONCLUSION

We successfully developed an AI pipeline system to detect bone metastases from the data of CT and FDG-PET. This is the first report on an AI-based automatic annotation system for PET-CT. Some limitations such as the low sensitivity for osteolytic metastases and too many false positives should be improved.

CLINICAL RELEVANCE/APPLICATION

Since the sensitivity for osteoblastic metastases was higher than that in the previous paper on human detection, our AI system can reduce the oversight of radiologists to detect bone metastases on CT.

SSA16-02 Detection of Seminal Vesicle Involvement and Extra-Prostatic Extension of Primary Prostate Cancer by Fluciclovine PET-CT

Sunday, Dec. 1 10:55AM - 11:05AM Room: S505AB

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PURPOSE

To evaluate the diagnostic performance of fluciclovine PET-CT in determining the extent of primary prostate cancer specifically seminal vesicle involvement (SVI) and extra-prostatic extension (EPE).

METHOD AND MATERIALS

51 patients with high risk primary prostate cancer, without conventional imaging findings of systemic metastasis, deemed eligible for potential curative surgery were recruited and underwent fluciclovine PET-CT after obtaining informed consent. Image interpretation was performed by a board-certified nuclear medicine physician blinded to other clinical and imaging data. Abnormal or absent uptake indicating the presence or absence of SVI and EPE was recorded. Histologic findings of SVI and EPE were compared with preoperative imaging results. Measures of diagnostic performance of fluciclovine PET-CT were assessed. Equivocal interpretations were analyzed as negative.

RESULTS

44/51 patients with a mean ± SD PSA of 25.8 ± 31.1 ng/ ml underwent radical prostatectomy and extended lymph node dissection within 11.8 ± 9.9 days of imaging. The remaining 7 were excluded from the final analysis as they were either still awaiting surgery or considered unsuitable for curative surgery. 28/44 and 20/44 patients were interpreted as positive for SVI and ECE respectively on fluciclovine PET-CT. On histology, 20/44 and 36/44 were positive for SVI and ECE respectively. Consequently, sensitivity, specificity and positive predictive value (PPV) of fluciclovine PET-CT for determination of SVI were: 80%, 50% and 57.1% respectively. For assessment of EPE, sensitivity, specificity and PPV of fluciclovine PET-CT were: 50%, 75% and 90% respectively.

CONCLUSION

Fluciclovine PET/CT showed high sensitivity and moderate PPV in the detection of SVI in primary prostate cancer. It also demonstrated high positive predictive value and moderate specificity in the detection of EPE.

CLINICAL RELEVANCE/APPLICATION

Fluciclovine PET/CT may be of use in preoperative determination of tumor extent in primary prostate cancer and consequently choice of therapy. Further studies with PET/MR with better anatomic definition may therefore be beneficial.

SSA16-03 Combined Hybrid Axumin (18F- Fluciclovine) PET/MRI Interpretation Compared to the Individual Interpretation of Axumin PET and Dedicated Prostate MRI in Evaluating for Prostate Cancer Local Recurrence

Sunday, Dec. 1 11:05AM - 11:15AM Room: S505AB

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PURPOSE

To determine if evaluation for prostate cancer local recurrence with a combined reading of hybrid Axumin PET/MRI leads to more confident interpretation with fewer indeterminate results when compared to separate reading of Axumin PET and multiparametric prostate MRI (mpMRI).

METHOD AND MATERIALS

This is a retrospective study of 60 patients with biopsy-proven prostate cancer who have had definitive therapy with concern for recurrence, who underwent a hybrid Axumin PET/MRI. PET and MRI images were reviewed separately by a nuclear medicine and an abdominal imaging specialist, respectively, each blinded to the other. Lesions were assigned a likelihood of local recurrence score. Axumin PET/MRI images were then jointly interpreted and a consensus likelihood of local recurrence score was assigned. The scores were based on qualitative 5-point scales outlined by each reader prior to the study. Scores were compared between individual PET or MRI and combined PET/MRI interpretations using Chi-Square and linear-by-linear association tests.

RESULTS

We evaluated 60 Axumin PET-MRI exams with a total of 68 lesions. 39 (65%) patients had radical prostatectomy while 21 (35%)

had local therapy only. The average patient age was 69 years old (range 45-85). There is a significant difference in the interpretation scores between individual mpMRI and combined Axumin PET/MRI interpretation (p=0.006). Of the 24 lesions with scores of 2-4 on MRI, 9 (38%) lesions were downgraded to a score of 1 and 10 (42%) lesions were upgraded to a score of 5 on combined interpretation. There is a trend toward a significant difference between individual PET and combined PET/MRI, with a linear-by-linear association of 1.1 (p = 0.139). Of the 17 lesions assigned scores of 2-4 on PET, 5 (29%) lesions were upgraded to a score of 5 and 4 out of 43 lesions (9%) with a PET score of 1 were upgraded to a score of 5 on combined interpretation.

CONCLUSION

The combined interpretation of Axumin PET/MRI showed significantly more confidence in assessing for locally recurrent prostate cancer over interpretation of MRI alone and a trend toward significance in confidence over interpretation of PET alone.

CLINICAL RELEVANCE/APPLICATION

Combined reading of Axumin PET/MRI increases confidence in local recurrence detection, facilitating management in prostate cancer patients with clinical concern for recurrent disease after treatment.

SSA16-04 Tumor Foci Size but Not Lymph Node Size Affects 18F-fluciclovine PET/CT Detection of Metastatic Lymph Nodes in Primary Prostate Cancer

Sunday, Dec. 1 11:15AM - 11:25AM Room: S505AB

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PURPOSE

To determine the effect of sizes of lymph node (LN) and metastatic foci (MF) on the diagnostic performance of preoperative fluciclovine PET/CT for identifying LN metastasis (LNM) in patients with primary prostate cancer.

METHOD AND MATERIALS

51 patients with intermediate to high-risk prostate cancer underwent fluciclovine PET/CT (Dose: 366.3±22.2 MBq) prior to radical robotic prostatectomy (RP) with extended pelvic lymph node dissection (EPLND). LNs were excised according to 12 predefined templates and correlated to PET findings. Metastatic LNs and MF in LNs were measured bidimensionally by a board certified urologic pathologist. Sizes of metastatic LNs and MF in templates with positive and negative PET findings were compared using t-test. For every LN packet (LNP), the greatest long axis diameter of LN and MF were utilized as the most conservative surrogate for the LNP.

RESULTS

EPLND was performed in 45/51 patients with median PSA 18.0 ng/ml (range 0.58-147.03 ng/ml) and Gleason score (Grade group) 8 (4) within 7 days (range 1-41 days) after fluciclovine PET. Of these, 24/45 (53.3%) patients had histologically confirmed LNM. 508 LNPs (mean 11 packets per patient) were analyzed. LNM were detected in 82/508 (16.1%) LNPs on histology. Fluciclovine PET detected LNM in 36/82 (43.9%) LNPs (true positives) while 46/82 (56.1%) LNPs were either benign or not seen (false negatives) on fluciclovine PET. Of the remaining 426/508 LNPs, 3/426 (0.7%) were read as equivocal on PET but were benign on histology (false positives). There was no significant difference in the mean long axis diameters of true positives (15.1 mm [range 3.0-40.0 mm]) and false negatives (13.1 mm [range 3.0-52.0 mm]; p=0.13) LNPs. In contrast, the mean long axis diameters of MF within true positive LNPs (11.4 mm [range 1.0-40.0 mm]) were significantly higher than false negative LNPs (3.9 mm [range 0.4-14.0 mm]; p<0.01). 13/52 (25.0%) LNPs with MF <=7 mm were detected on fluciclovine PET while 23/30 (76.7%) LNPs with MF >7 mm were detected on fluciclovine PET.

CONCLUSION

Fluciclovine PET detection rate of LNM was influenced by the size of metastatic foci but not lymph node size. Metastatic foci >7 mm were more likely to be detected on fluciclovine PET than MF <=7 mm.

CLINICAL RELEVANCE/APPLICATION

The ability of preoperative fluciclovine PET/CT to detect lymph node metastasis in patients with primary prostate cancer is influenced by the size of the metastatic focus within the lymph node.

SSA16-05 Difference in the Spectrum of Metastatic Disease on 68Ga PSMA PET/CT after Radical Prostatectomy and after Radical Radiotherapy in Patients of Carcinoma Prostate with Biochemical Recurrence

Sunday, Dec. 1 11:25AM - 11:35AM Room: S505AB

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PURPOSE

To determine the pattern of metastatic disease with 68Ga PSMA PET/CT in patients with biochemical recurrence after definitive treatment

METHOD AND MATERIALS

A retrospective analysis of subjects with carcinoma prostate, who had undergone definitive treatment (Radical prostatectomy or Radiotherapy) and presented with biochemical recurrence, was done by 68Ga PSMA PET/CT. The data collected was analysed to establish temporal occurrence and patterns of regional and distant metastatic disease in both the groups and correlated with serum PSA levels.

RESULTS

The study included 200 subjects with history of adenocarcinoma prostate. In the post radical prostatectomy group (n=144), median serum PSA was 1.8 ng/ml, the overall metastatic detection rate was 39.3% for PSA 0.2 to < 0.5 ng/ml, 47.3% for PSA 0.5 to < 1 ng/ml, 68.4% for PSA 1 to < 2 ng/ml and 93.1% for PSA >=2 ng/ml. In this group local recurrence was identified in 28.73 % and lymph nodal metastases in 65.1%, with the pelvic lymph nodal metastases being the most common site of metastasis followed by bone metastases. The mean time for serum PSA recurrence in the radical prostatectomy group was 49.77±44.44 months (range 2-184 months). In the post radiotherapy group, median serum PSA was 5.2 ng/ml, the detection rate was 88.8 % for PSA 2 to < 4 ng/ml and 100 % for PSA >= 4 ng/ ml. Local recurrence after radiotherapy was present in 79.5 % of the group and 63.6 % had lymph nodal metastases. The mean time for serum PSA recurrence following radiotherapy was 49.15± 24.32 months, (range 12-111 months).

CONCLUSION

Radical prostatectomy and Radical radiotherapy are the two standard treatment options for localized carcinoma prostate. Although the extent and patterns of recurrence differed in the two groups, the temporal occurrence of metastatic disease remained comparable.

CLINICAL RELEVANCE/APPLICATION

68Ga-PSMA has been suggested as a novel tracer for detection of prostate cancer relapse and metastases with high specificity and sensitivity.

SSA16-06 Correlation of Findings on 18F-Fluciclovine PET/CT with Failure-Free Survival of Salvage Radiotherapy in Post-Prostatectomy Patients with Biochemical Recurrence

Sunday, Dec. 1 11:35AM - 11:45AM Room: S505AB

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PURPOSE

To examine the impact of fluciclovine PET on failure-free survival (FFS) of radiotherapy (RT) ± androgen deprivation therapy (ADT) in recurrent prostate cancer patients post-prostatectomy.

METHOD AND MATERIALS

69 post-prostatectomy patients with biochemical recurrence in the experimental arm of a randomized controlled study (NCT01666808/NIH R01CA169188) underwent fluciclovine PET prior to RT±ADT. RT was based on PET and clinical findings: no

uptake/prostate bed only uptake - RT to prostate bed only, pelvic nodal uptake - RT to prostate bed+pelvis, extrapelvic nodal uptake - no RT. RT (median 66.6 Gy in 1.8 Gy fractions) was initiated 17±10 days after PET scan. 21 patients received RT+short course ADT. 8 patients at 12 months and 3 additional patients at 18 months post-RT were censored due to lack of follow-up. Treatment failure was defined as either serum prostate-specific antigen (PSA) >=0.2 ng/ml+post-RT nadir followed by another higher value, a continued rise in the serum PSA despite RT, initiation of systemic therapy after completion of RT, or clinical progression. FFS based on fluciclovine PET findings were compared using Fisher's exact test.

RESULTS

53/69 (76.8%) patients had positive fluciclovine PET findings. 4/69 patients were ineligible for RT due to systemic disease, hence, FFS was assessed in 65 patients (median PSA 0.32 [range 0.02-9.79] ng/ml). FFS at 6, 12 and 18 months was 63/65 (96.9%), 52/57 (91.2%), and 43/54 (79.6%), respectively. In patients with no uptake, FFS was 16/16 (100%), 15/15 (100%), 12/13 (92.3%) at 6, 12, and 18 months, respectively. In patients with uptake in the prostate bed only, FFS was 27/27 (100%), 21/22 (95.5%), 18/21 (85.7%) at 6, 12, and 18 months, respectively. In patients with pelvic±prostate bed uptake, FFS was 20/22 (90.9%), 16/20 (80.0%), 13/20 (65.0%) at 6, 12, and 18 months, respectively. FFS trends did not reach statistical significance at any timepoint.

CONCLUSION

Findings on fluciclovine PET/CT correlate with failure-free survival, potentially reflecting metabolic tumor burden and may have prognostic value. Longer follow-up duration and comparison to a control group not undergoing PET, are required to fully evaluate the value of fluciclovine PET based radiotherapy.

CLINICAL RELEVANCE/APPLICATION

Findings on fluciclovine PET/CT correlate with failure-free survival of salvage radiotherapy and may have prognostic value in post-prostatectomy patients with biochemical recurrence.

SSA16-08 Significant Interval Decrease in Bone Mineral Density in Osteopenic Patients: A Notable Limitation of FRAX Analysis in Dual-energy X-ray Absorptiometry

Sunday, Dec. 1 11:55AM - 12:05PM Room: S505AB

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PURPOSE

Bone mineral density (BMD) evaluation, considered to be the standard measure for the diagnosis of osteoporosis and fracture risk assessment, is most commonly measured by dual-energy x-ray absorptiometry (DXA). For patients diagnosed with osteopenia, the Fracture Risk Assessment Tool (FRAX) was developed, which incorporates clinical factors to aid the clinician in patient management. If the FRAX score in an osteopenic patient predicts a 10-year fracture risk of 20% or greater for a major osteoporotic fracture or 3% or greater for a hip fracture, therapy is warranted. However, any significant decline in BMD when compared to a prior DXA is not reflected in the FRAX analysis. Our goal was to determine the frequency with which there is a significant decline in BMD in patients diagnosed with osteopenia by DXA, but whose FRAX score predicts a fracture risk of less than 20% for a major osteoporotic fracture or less than 3% for a hip fracture.

METHOD AND MATERIALS

Over a period of 12 months, the number of patients diagnosed with osteopenia by DXA were counted, who (1) had a significant decrease in BMD when compared to a prior DXA and (2) the FRAX scores were both less than 20% for a major osteoporotic fracture and less than 3% for a hip fracture.

RESULTS

A total of 278 patients with osteopenia by DXA had a significant decrease in spine and/or hip BMD when compared to a previous DXA, yet the FRAX scores were both less than 20% for a major osteoporotic fracture and less than 3% for a hip fracture.

CONCLUSION

Fracture risk assessed by FRAX analysis is often underestimated in osteopenic patients whose BMD has significantly declined from a prior DXA. Therefore, in this clinical setting, a low FRAX score should not influence the therapeutic decision.

CLINICAL RELEVANCE/APPLICATION

The following sentence should be added to the DXA scan report in the above clinical scenario: "It should be noted that a significant decrease in BMD from a prior DXA is not reflected in FRAX analysis."

SSA16-09 Effect of Tumor Histology on Detection of Pelvic and Para-Aortic Nodal Metastasis with FDG-PET in Stage IB Cervical Cancer

Sunday, Dec. 1 12:05PM - 12:15PM Room: S505AB

Participants
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PURPOSE

To determine if the detection of FDG-avid pelvic and para-aortic lymph nodes in early stage cervical cancer patients is dependent on tumor histology.

METHOD AND MATERIALS

Patients with IB1-2 cervical cancer who underwent pre-surgical FDG-PET between 1997-2018 were identified in a tertiary academic center database. All patients had radical hysterectomy with pelvic and para-aortic lymph node dissection. The detection of pelvic and para-aortic lymph nodes by FDG-PET vs. surgical dissection was compared. FDG-PET sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were determined and stratified by tumor histology. Freedom from relapse (FFR) was analyzed with Kaplan-Meier analysis and Cox proportional hazards models.

RESULTS

We identified 212 patients with early-stage cervical cancer (84% FIGO IB1, 16% IB2) who underwent pre-surgical FDG-PET; 137(65%) had squamous carcinoma and 75(35%) had adenocarcinoma. PET/CT was performed in 189(89%) patients and 23(11%) had PET only. Surgical dissection revealed positive pelvic and para-aortic lymph nodes in 25% and 3.3% of patients, respectively. For squamous carcinoma, the sensitivity, specificity, PPV and NPV of FDG-PET for pelvic nodal metastasis were 44%, 99%, 95% and 78%, respectively. For adenocarcinoma, the corresponding results for pelvic nodal metastasis were 25%, 99%, 67% and 92%, respectively. The overall sensitivity, specificity, PPV and NPV of FDG-PET for para-aortic nodal metastasis was 29%, 99%, 67%, and 98%, respectively. With a median follow up of 9.3 years, the 5-year FFR for squamous carcinoma and adenocarcinoma was 83% vs. 96% (p=0.008), respectively.

CONCLUSION

Pelvic nodal metastasis was less likely to be detected by FDG-PET in patients with early-stage adenocarcinoma than with squamous carcinoma. Patients with adenocarcinoma had a better prognosis than those with squamous carcinoma.

CLINICAL RELEVANCE/APPLICATION

FDG-PET was half as sensitive for detecting pelvic lymph nodes in adenocarcinoma vs. squamous carcinoma.

Printed on: 10/29/20

GUS-SUA

Genitourinary Sunday Poster Discussions

Sunday, Dec. 1 12:30PM - 1:00PM Room: GU/UR Community, Learning Center

CT GU MR OB US OI BQ AI

AMA PRA Category 1 Credit ™: .50

FDA Discussions may include off-label uses.

Participants

Aradhana M. Venkatesan, MD, Houston, TX (*Moderator*) Nothing to Disclose

Sub-Events

GU201-SD-SUA2 Clinical Usefulness of Thin-Slice T2-Weighted Imaging Using a 3T MR Scanner with Deep Learning Reconstruction for VI-RADS Evaluation of Bladder Cancer

Station #2

Participants

Masanaka Watanabe, Tokyo, Japan (*Presenter*) Nothing to Disclose
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PURPOSE

VI-RADS using T2-weighted (T2WI), diffusion-weighted (DWI), and dynamic contrast-enhanced (DCE) imaging has been recently introduced to evaluate transmural extent of bladder cancer (BC). A 3T MR scanner with deep learning reconstruction (DLR) to reduce image noise has newly become clinically available. We assessed clinical usefulness of thin-slice T2WI using this MR scanner with DLR for VI-RADS evaluation.

METHOD AND MATERIALS

We retrospectively enrolled consecutive 18 patients with BC undergoing preoperative MR with this scanner for VI-RADS evaluation and transurethral resection for the BC. On 2-mm-thick T2WI with and without DLR in each patient, we placed ROIs in the largest BC and normal bladder wall to measure their signal intensity (SI) and SD and calculate contrast-noise ratio (CNR) with the following equation: CNR=(SI in the BC-SI in the bladder wall)/SD in the bladder wall; 2 readers subjectively assessed image contrast between the BC and bladder wall, VI-RADS score, and diagnostic confidence (1 [maybe] to 3 [definite]). A radiologist definitely graded VI-RADS category for each patient using T2WI, DWI, DCE, and histological results. The VI-RADS scores and categories of 1-3 were diagnosed as non-muscle-invasive BC and otherwise, as muscle-invasive BC. Between the both T2WI types, we compared diagnostic accuracy of this differentiation, used paired t-test to compare CNR, and used Wilcoxon signed-rank test to compare the subjective contrast and, if accurate, diagnostic confidence.

RESULTS

The CNR and mean subjective contrast were significantly greater with DLR (17.2±17.7 and 3.5±0.8, respectively) than without DLR (6.6±4.0 and 3.1±1.0) ($P<0.05$ for both). The diagnostic accuracy was the same between the both T2WI types for Reader 1 (89%) and greater with DLR (100%) than without DLR (94%) for Reader 2. The diagnostic confidence was significantly greater with DLR than without DLR for both Readers 1 (2.6±0.5 vs. 2.3±0.8) and 2 (2.8±0.4 vs. 2.3±0.7) ($P<0.05$ for both)

CONCLUSION

Thin-slice T2WI with DLR can improve tumor contrast and diagnostic confidence for VI-RADS evaluation of BC.

CLINICAL RELEVANCE/APPLICATION

Use of thin-slice T2WI with DLR allows more accurate and confident evaluation regarding transmural extension of BC based on VI-RADS without administration of contrast media.

GU202-SD-SUA3 Utility of T2-Weighted (T2W)-MRI to Differentiate Lipid-Rich and Lipid-Poor Adrenal Adenomas from Adrenal Metastases Using Subjective and Quantitative Analysis

Station #3

Participants

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PURPOSE

To compare T2W-MRI features in benign adrenal adenomas and adrenal metastases.

METHOD AND MATERIALS

With IRB approval, we identified 40 consecutive adrenal metastases with MRI between 2010-2019. During the same study period, 40 consecutive adrenal adenomas with MRI formed the control group. A blinded Radiologist measured:T2W signal-intensity(SI).ratio (adrenal nodule/psoas muscle), chemical-shift SI.index and calculated texture analysis features. Two blinded Radiologists assessed T2W-SI relative to muscle and T2W-homogeneity (using 5-Point Likert scales). Comparisons were performed between groups using multi-variate analysis and ROC.

RESULTS

Subjectively, T2W-SI.ratio (p<0.0001) and T2W.homogeneity (p<0.0001-0.0659) were higher in metastases for both Radiologists, but with overlap between groups. Agreement was moderate for T2W.SI (K=0.40) but fair for T2W.homogeneity (K=0.17). After multi-variate regression, metastases had significantly higher T2W-SI.ratio (3.62±1.67 [0.23-8.16] versus 1.95±0.88 [0.45-4.28], p<0.001) and T2W-entropy (6.63±0.64 [4.93-7.46] versus 5.80±0.70 [4.13-7.16], p<0.001). Chemical-shift SI.index was higher in adenomas (52.8±31.4% [-21.6-90.2%] versus 0.41±19.9% [-40.6-69.4%], p<0.001) with 19.5% (8/41) adenomas lipid-poor and 7.5% (3/40) metastases with SI.index >16.5%. There was no difference comparing T2W-SI.ratio (0.5932) or T2W-entropy (0.099) in lipid-rich or lipid-poor adenomas. Area under ROC curve (AUC) for T2W-SI.ratio, T2W-entropy and chemical-shift SI.index were: 0.816 (SE 0.049), 0.814 (SE 0.047) and 0.91 (0.04). A logistic-regression model combining T2W-SI.ratio+Entropy yielded AUC, sensitivity/specificity of 0.864 (SE 0.406) and 82.5%/72.5%.

CONCLUSION

Higher T2-weighted signal intensity and heterogeneity, assessed subjectively and with texture analysis may differentiate metastases from both lipid-rich and lipid-poor adrenal adenomas. Quantitative results were more robust compared to subjective assessment.

CLINICAL RELEVANCE/APPLICATION

In patients with adrenal nodules showing heterogeneously increased signal intensity on T2W and a history of malignancy, a diagnosis of metastasis should be strongly considered. This may help to better characterize lipid-poor adenomas (which appeared similar to lipid-rich adenomas on T2W) and metastases containing microscopic fat on chemical-shift MRI.

GU236-SD-SUA4 The Arrowhead Sign (AS) a Novel, Reproducible Radiographic Indicator of Intramuscular Venous Branch Invasion (pT3a) in Patients with Renal Cell Carcinoma

Station #4

Participants
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Richard E. Greenberg, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Accurate preoperative prediction of T3a disease in renal cell carcinoma (RCC) is a clinical challenge. Knowledge of renal intramuscular venous invasion can influence clinical decision-making regarding the suitability of nephron-sparing surgery. We report and validate the observation that tumors that exhibit invasion into the muscular branches of the venous vasculature form a 'beak-shaped' irregularity as they grow towards the renal sinus fat and resembles an 'arrowhead'. We sought to determine if the 'Arrowhead Sign (AS)' CT finding could be used as a preoperative predictor of proximal venous invasion on final histopathologic evaluation

METHOD AND MATERIALS

We queried our IRB-approved, kidney cancer database and identified 174 patients with localized renal tumors who underwent surgical resection between 2009 and 2018 and had a pre-operative contrast imaging within 90 days of surgery. Two fellowship-trained junior abdominal radiologists and a senior radiologist with 25 years of experience blindly and independently reviewed the imaging. To evaluate for likelihood of tumor venous invasion on final histopathology, images were assessed for the following radiographic predictors of cT3a disease: sinus fat infiltration, perinephric invasion, and AS.Indicators were scored on a 1- 4 scale according to reader's degree of confidence in the finding, with a score of 1 - definitely present,to 4 - definitely absent. Statistical analyses were performed.

RESULTS

Final pathologic staging revealed pT1=116 (66.6%), pT2=9 (5.1%), pT3=48 (27.5%) and pT4=1 (0.006%). The sensitivity and specificity of AS for predicting muscular venous invasion were 92% and 73%, respectively. Perinephric invasion had 62% sensitivity and 85% specificity, while sinus fat infiltration was 89% sensitive and 73% specific. Inter-reader agreement for AS was moderate (x = 0.64).

CONCLUSION

The arrowhead sign is a novel and potentially clinically actionable predictor of muscular venous invasion in patients with RCC. Of the three indicators, it had the highest sensitivity and moderate intra-reader agreement. These initial findings justify further investigation.

CLINICAL RELEVANCE/APPLICATION

The ability to stage pT3a (RCC) with imaging can influence surgical management and eligibility for clinical trials. Of the three commonly reported imaging features the,' arrowhead sign,' had the highest sensitivity and larger validation studies are warranted.

UR176-ED-SUA6 Have You Seen It? Then Take a Glance at These Prostate Lesions!

Station #6

Awards

Certificate of Merit

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TEACHING POINTS

Briefly review prostate MRI protocols and understand its anatomy and relationships on male pelvis. Describe the clinical and imaging features of typical prostate lesions Expand the differential diagnosis of unusual prostate carcinomas subtypes correlated with imaging pearls and histopathology correlation

TABLE OF CONTENTS/OUTLINE

Briefly review prostate anatomy and its relationships on male pelvis Briefly review the MRI protocol used in our institution Clinical and epidemiologic data of usual and unusual prostate lesions A pictorial review with histopathologic correlation Epithelial tumors Adenocarcinoma (acinar) Carcinoma with spindle cell differentiation Ductal adenocarcinoma Uroepithelial carcinoma Squamous cell carcinoma Basal cells tumors 2. Hematolymphoid Lymphoma Leukemia 3. Stromal Tumors Stromal tumor of uncertain malignat potential (STUMP) Stromal sarcoma 4. Mesenchymal tumors Leiomyosarcoma Rhabdomyosarcoma Angiosarcoma Malignant fibrous histiocytoma Hemangiopericytoma Malignant peripheral nerve sheats 5. Miscellaneous tumors 6. Benign lesions

UR174-ED-SUA7 Penile Ultrasound in Trauma

Station #7

Participants
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TEACHING POINTS

Depict the normal anatomy of the penis and identify such structures unltrasonographically Learn the epidemiology of trauma, the main mechanisms and the usefulness of ultrasound in this pathology

TABLE OF CONTENTS/OUTLINE

Background Anatomy Normal Anatomy Vascular supply Penile fracture Mechanisms of Trauma Ultrasonographic evaluation Ultrasonographic Characteristics of the Penile Body Findings in Penile Rupture

GUS-SUB

Genitourinary Sunday Poster Discussions

Sunday, Dec. 1 1:00PM - 1:30PM Room: GU/UR Community, Learning Center

GU

AMA PRA Category 1 Credit ™: .50

Participants

Aradhana M. Venkatesan, MD, Houston, TX (*Moderator*) Nothing to Disclose

Sub-Events

GU203-SD-SUB1 Preoperative Identification of Low-Risk Endometrial Cancer Patients by Preoperative Endometrial Biopsy and MRI Compared with Intraoperative Findings Including Frozen Sections

Station #1

Participants

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PURPOSE

To compare the utility of preoperative endometrial biopsy (pre-B) and magnetic resonance imaging (MRI) data against intraoperative findings including frozen section histology (FS) in the detection of low-risk patients.

METHOD AND MATERIALS

A total of 172 patients who underwent surgery between January 2013 and September 2016 were included. In this study, low-risk patients are defined as those with a histological low-grade tumor (LGT), namely, atypical endometrial hyperplasia (AEH) or grade 1 or 2 endometrioid (G1 or G2) cancer invading less than half of the uterine myometrium. A low-stage tumor (LST) is defined as a tumor invading less than half of the uterine myometrium. The MRI protocol included T2-weighted, contrast-enhanced, and diffusion-weighted imaging. The postoperative histology was considered as the reference standard. We compared (1) detection of LGT using pre-B versus FS, (2) detection of LST using MRI versus FS, (3) detection of low-risk patients using MRI + pre-B versus FS including intraoperative biopsy (FS + B), and (4) number of patients with lymph node metastasis (LM) in the low-risk group diagnosed by MRI + pre-B versus FS + B. McNemar's test was used to compare paired proportions. All P values less than 0.05 were considered significant.

RESULTS

(1) The sensitivity, specificity, positive predictive value, and negative predictive value for detecting LGT were 98.4%, 59.6%, 86.6%, and 93.3% for pre-B versus 99.2%, 55.3%, 85.5%, and 96.3% for FS respectively (P=0.44). (2) These figures for detecting LST were 82.5 %, 69.6 %, 88.1 %, and 59.3 % for MRI versus 99.2 %, 39.1 %, 81.7 %, and 94.7 % for FS (P<0.0001). (3) These figures for detecting low-risk patients were 85.2 %, 76.1 %, 83.5 %, and 78.3 % for MRI + pre-B versus 99.0 %, 57.8 %, 76.9 %, and 97.6 % for FS + B (P<0.0001). Positive likelihood ratios for MRI + pre-B and FS + B were 3.56 and 2.35. (4) No patient diagnosed as low-risk by postoperative histology or MRI + pre-B had LM, whereas 3 patients diagnosed by FS + B had LM.

CONCLUSION

The positive likelihood ratio for MRI + pre-B for detection of low-risk patients with endometrial cancer was significantly higher than that for FS due to its higher specificity for detection of low-stage tumors.

CLINICAL RELEVANCE/APPLICATION

The higher number of false positive cases diagnosed by FS might lead to unnecessary lymph node dissection in patients with low-risk endometrial cancer.

GU204-SD-SUB2 The Utility of Multiparametric Magnetic Resonance Imaging at Re-Assessment to Predict Pathological Progression on Active Surveillance for Gleason Score 3+3 Prostate Cancer

Station #2

Participants

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PURPOSE

The role of multiparametric magnetic resonance imaging (mpMRI) is not fully understood when used for monitoring patients on active surveillance (AS) with low risk prostate cancer. The purpose of this study is to investigate the utility of mpMRI in the re-assessment of patients on AS for prostate cancer.

METHOD AND MATERIALS

All men were enrolled in AS between November 2001 and December 2018. Men were included if they underwent confirmatory biopsy and mpMRI within 6 months prior to any biopsy. Men evaluated with 1.5 Tesla MRI or with Gleason score (GS) 3+4 were excluded. A subset analysis was performed among patients who underwent serial MRI during AS. A lesion with score of >= 3 on Prostate Imaging Reporting and Data System version 2.0 was considered an MRI-positive lesion. MRI progression was defined as an increase in PIRADS score in patients with PIRADS >= 3, or the appearance of any new lesion with PIRADS >= 3, or lesion enlargement detected on follow up MRI compared to previous MRI imaging. Pathological progression was defined as the increase of Gleason score to 3+4 or more at confirmatory or follow up biopsy. Multivariate logistic regression analysis was performed to evaluate predictors of pathological progression.

RESULTS

54 out of 181 (30%) patients with pathological progression were identified. Higher PSA density (p=0.00013) and positive MRI (p=0.00029) at last biopsy were significantly associated with pathological progression. 70 patients who underwent serial MRI were examined as a subset analysis. Only MRI progression was significantly associated with pathological progression (p=0.0003). The major limitation of this study is its retrospective nature and its relatively small sample size.

CONCLUSION

We demonstrated that the utility of mpMRI as an imaging modality for re-assessment of patients on AS for GS 3+3 prostate cancer is significant. MRI progression was a strong predictor for pathological progression.

CLINICAL RELEVANCE/APPLICATION

We investigated the utility of magnetic resonance imaging (MRI) on active surveillance for prostate cancer. MRI progression was closely associated with disease progression.

GU205-SD-SUB3 Cluster Analysis Using Gaussian Mixture Model for Apparent Diffusion Coefficient Value: A Novel Approach to Evaluate the Grades of Uterine Endometrioid Adenocarcinoma

Station #3

Participants
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PURPOSE

Preoperative histological grade of endometrioid adenocarcinoma plays an important role in deciding the management such as surgical procedure or fertility preservation option. The purpose of our study was to perform cluster analysis of voxel-based apparent diffusion coefficient (ADC) data using Gaussian mixture model (GMM) algorism and evaluate the relationship between the ratio of clusters and the grades.

METHOD AND MATERIALS

Between May 2015 and July 2018, 63 patients with endometrioid adenocarcinoma were underwent IRB approved magnetic resonance imaging including diffusion-weighted imaging with b values of 0 and 800 sec/mm2 before surgical treatment. The ADC data of entire lesion were obtained retrospectively by manual segmentation on each slice of ADC map for all patients. The ADC data of all patients were summed and fitted using GMM algorism to classify them into three Gaussian distributions. The ADC range of each cluster (C1, C2 and C3) was defined by the Maharabinos distance between the mean ADC values of each Gaussian distribution. The ratio of each cluster to the entire lesion volume per patient was calculated and correlated with the postoperative histological grades. A value of $p<0.05$ was considered statically significant.

RESULTS

The postoperative histological grades of 63 patients were Grade 1 (n=34), Grade 2 (n=19) and Grade 3 (n=10). The ADC range of each cluster was calculated as follows: C1 (0.49-0.69×10-3mm2/sec), C2 (0.70-0.93×10-3mm2/sec) and C3 (over 0.94×10-3mm2/sec). There was a significant correlation between the grades and the ratio of C1 or C3 (ρ=0.34, p=0.005; ρ=-0.25, p=0.042). In the ratio of C1, there was a significant difference between high-grade (Grade 3) and low-grade (Grade 1 and 2) lesions (p=0.008) and receiver operating characteristic curve analysis revealed that the area under the curve of the ratio of C1 was 0.77, with sensitivity, specificity, positive predictive value and negative predictive value of 70%, 76%, 35% and 93%, respectively.

CONCLUSION

Cluster analysis of voxel-based ADC data using GMM algorism was effective for grading of endometrioid adenocarcinoma. The ratio of C1, which included low ADC data, was significantly correlated with the grades.

CLINICAL RELEVANCE/APPLICATION

Cluster analysis of voxel-based ADC data using GMM algorism was effective for grading of endometrioid adenocarcinoma and might improve preoperative diagnosis of the grades.

GU239-SD-SUB5 Role of Sonosalpinogography in Female Subfertility: Diagnostic or Therapeutic Tool?

Station #5

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PURPOSE

Sonosalpingography (SSG) has long been in radiology as a less commonly used tool for assessing the patency of fallopian tubes in subfertile females. It's significance is undermined by laparoscopic evaluation (LE) of tubal patency as latter also allows simultaneous therapeutic procedures to restore its patency, if the obstruction exists. But LE is invasive and expensive. Hence, we evaluated the role of SSG not only in diagnosis of tubal obstruction but also its role in diagnosing the cause and if possible relieving the obstruction.

METHOD AND MATERIALS

Fifty subfertile females with normal appearing uterus and ovaries on transvaginal ultrasonography were included in our study. SSG was performed to evaluate tubal patency by recording free peritoneal spill. If peritoneal spill was absent bilaterally then the patient underwent laparoscopic evaluation. However, if unilateral or bilateral peritoneal spill was noted, then patient was recruited for assisted reproductive techniques (ART) and the results were correlated with pregnancy.

RESULTS

Out of 50 patients, SSG was able to demonstrate free peritoneal spill at least unilaterally in 46 patients who conceived with ART. In rest of the four patient, with lack of bilateral spill on SSG, two revealed unilateral partial block while other two revealed bilateral tubal block. In all patients SSG correctly depicted the site of obstruction. In nine, patient it revealed PID (tubercular) by demonstrating flimsy peritubal adhesions and in 14 patients, higher pressure exerted during SSG restored the patency with sharp abdominal pain.

CONCLUSION

Our study reveals that SSG is not only a diagnostic Golden Old Tool but a New Therapeutic Platinum tool as well. Hence, SSG should be used more often and can be used to segregate patients who prudently need laparoscopic evaluation

CLINICAL RELEVANCE/APPLICATION

The study demonstrates the clinical relevance of sonosalpingography before more invasive hysterolaparoscopy in subfertile females especially in developing countries like India given the ease of procedure and comfort of the patient.

UR179-ED-SUB6 Dual-Energy CT of the Renal Lesions

Station #6

Participants
Takuya Mori, Hiroshima City, Hirosima Prefecutre , Japan (*Presenter*) Nothing to Disclose
Yukiko Honda, MD, Kure, Japan (*Abstract Co-Author*) Nothing to Disclose
Toru Higaki, PhD, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose
Chikako Fujioka, RT, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose
Yuko Nakamura, MD, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose
Kazuo Awai, MD, Hiroshima, Japan (*Abstract Co-Author*) Research Grant, Canon Medical Systems Corporation; Research Grant, Hitachi, Ltd; Research Grant, Fujitsu Limited; Research Grant, Bayer AG; Research Grant, DAIICHI SANKYO Group; Research Grant, Eisai Co, Ltd;
Hiroaki Terada, MD, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose
Motonori Akagi, MD, Hiroshima, Japan (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

We focus on the diagnosis of renal lesions using dual-energy CT. First, we describe principle of dual-energy CT and types of CT scanners along with their advantages and disadvantages. Secondly, we show the optimal energy for a specific clinical questions. .Thirdly, we introduce the image and parameters calculated using dual-energy CT and also show clinical applications. Finally, we mention the pitfalls and emerging problems.

TABLE OF CONTENTS/OUTLINE

1. Concise description of the principle of dual-energy CT. 2. Types of CT scanners with their advantages and disadvantages. 3. The optimal energy for a specific clinical questions. 4. The image and parameters for the analysis using dual-energy CT. 5. The clinical applications. 6. The pitfalls and emerging problems.

UR177-ED-SUB7 Cystogram: Still Alive and Useful

Station #7

Awards
Certificate of Merit

Participants
Javier Azpeitia Arman, MD, Madrid, Spain (*Presenter*) Nothing to Disclose
Rosa M. Lorente-Ramos, MD, PhD, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose
Pedro Torres Rubio, MD, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose

Elena Barcina-Garcia, MD, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose
Rodrigo Pastorin, Madrid, Spain (*Abstract Co-Author*) Nothing to Disclose
Carolina Ramirez Lozano, Madrid , Spain (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

- To understand the utility of cystogram, indications and contraindications. -To review the study protocol. -To describe normal anatomy and normal imaging appearances of the bladder. -To illustrate appearances of various frequent and unfrequent pathological entities. CT, US , MR and pathology correlates will also be shown.

TABLE OF CONTENTS/OUTLINE

In spite of the use of endoscopy and cross-sectional imaging techniques, cystography has still nowadays a role in bladder evaluation. We review cystograms indications and contraindications, describe how to perform the studies and analyze image interpretation, emphasizing pitfalls and clues to differential diagnosis. We also provide correlation with CT, US, MR and pathology.We present: - Normal anatomy of the bladder. - Basic protocol, and protocols in different indications: to assess vesicoureteral reflux, to detect contrast leaks or fistulas, after radical prostatectomy, incontinence in women. - Imaging findings in normal studies. - Pathology. Filling defects (lithiasis, ureterocele, blood clot), Addition images (diverticula), Bladder wall lesions (Tumors: leyomioma, carcinoma, sarcoma, Inflammatory: cystica, polypoid, papillary, granulomatous BCG cystitis), extrinsic lesions: Prostate (hyperplasia and carcinoma), gynaecology (uterine and ovarian tumors), gastrointestinal (colonic cancer, diverticulitis)

UR178-ED-SUB8 Immunoglobulin G4-Related Disease of the Genitourinary Tract: The Great Imitator

Station #8

Awards
Cum Laude
Identified for RadioGraphics

Participants
Ji Woon Oh, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Sung Eun Rha, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Seo Yeon Youn, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Dong Hwan Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yu Ri Shin, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Soon Nam Oh, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Joon-Il Choi, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Moon Hyung Choi, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

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TEACHING POINTS

Immunoglobulin G4-related disease (IgG4-RD) is an increasingly recognized fibroinflammatory condition with a characteristic histopathologic appearance. Although IgG4-RD was initially reported as occurring in the pancreas, it is now well-known that multiple different organs including genitourinary tract can be involved by IgG4-RD. We'll focus on 1) the imaging findings of genitourinary tract involvement of IgG4-RD and address 2) the differential diagnosis and clinicopathologic features.

TABLE OF CONTENTS/OUTLINE

1. Clinicopathologic overview of IgG4-RD 2. Imaging spectrum of genitourinary tract involvement by IgG4-RD 1) IgG4-RD involving kidney: renal parenchymal lesions (multiple nodules, patchy infiltrative lesions), renal pelvis and perinephric lesions (diffuse wall thickening of renal pelvis, soft tissue mass encasing the renal pelvis) 2) IgG4-RD involving ureter: inflammatory pseudotumor, secondary involvement by IgG4-related retroperitoneal fibrosis 3) IgG4-RD involving prostate gland: diffuse prostatitis, periprostatic infiltrative lesion 4) IgG4-RD involving retroperitoneum: retroperitoneal fibrosis, inflammatory pseudotumor 5) IgG4-RD involving urinary bladder and urethra: inflammatory pseudotumor, interstitial cystitis, urethral caruncle 3. Imaging differential diagnosis of genitourinary tract involvement by IgG4-RD

RC107

Urolithiasis: Urologist Perspective, Recent Imaging Advances, and Relevance to Practice (Interactive Session)

Sunday, Dec. 1 2:00PM - 3:30PM Room: S103CD

GU

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

Participants
Avinash R. Kambadakone, MD, Boston, MA (*Moderator*) Research Grant, General Electric Company; Research Grant, Koninklijke Philips NV

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LEARNING OBJECTIVES

1) Understand the urologist's perspective on stone disease and the value of imaging in the decision-making process. 2) Learn the imaging advances in diagnosis of urolithiasis including Dual energy CT techniques. 3) Discuss the multi-modality imaging techniques in diagnosis of stone disease including re-emergence of ultrasound. 4) Review the management updates in stone disease and its relevance to radiology practice.

Sub-Events

RC107A Urologist Perspective on Urolithiasis

Participants
Brian H. Eisner, MD, Boston, MA (*Presenter*) Advisory Board, Sonomotion

RC107B Imaging Approach for Flank Pain in the Emergency Department (Basics and What's New in ED)

Participants
Jennifer W. Uyeda, MD, Boston, MA (*Presenter*) Consultant, Allena Pharmaceuticals, Inc

LEARNING OBJECTIVES

1) List the various imaging modalities used to evaluate right flank pain. 2) Compare the various available types of imaging modalities to assess right flank pain. 3) Identify CT appearances of nephroureterolithiasis and associated complications. 4) Apply structured reporting of nephroureterolithiasis on CT.

RC107C Advances in CT and Radiation Dose

Participants
Avinash R. Kambadakone, MD, Boston, MA (*Presenter*) Research Grant, General Electric Company; Research Grant, Koninklijke Philips NV

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LEARNING OBJECTIVES

1) Describe the advances in the imaging diagnosis of urolithiasis with focus on DECT. 2) Learn about CT radiation dose concerns and apply strategies to diminish the risk.

RC107D Case Presentations

Participants
Nicole M. Hindman, MD, New York, NY (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Learn the most common chemical stone compositions, risk factors for developing, ways to image and appropriate treatment for each type. 2) Learn imaging techniques for stone diagnosis, including Dual Energy Techniques. 3) Learn information Urologists need to know for diagnosis, monitoring and management of renal stones. 4) Review updated surgical and medical management of renal stones.

RC113

Pediatric Series: Fetal/Neonatal Imaging

Sunday, Dec. 1 2:00PM - 3:30PM Room: E353B

GU OB PD

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

FDA Discussions may include off-label uses.

Participants
Eva I. Rubio, MD, Cincinnati, OH (*Moderator*) Nothing to Disclose
Amy R. Mehollin-Ray, MD, Pearland, TX (*Moderator*) Nothing to Disclose
Dorothy I. Bulas, MD, Washington, DC (*Moderator*) Editor with royalties, Wolters Kluwer nv

Sub-Events

RC113-01 Fetal Imaging of Spinal Dysraphisms

Sunday, Dec. 1 2:00PM - 2:20PM Room: E353B

Participants
Usha D. Nagaraj, MD, Cincinnati, OH (*Presenter*) Author with royalties, Reed Elsevier

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LEARNING OBJECTIVES

1) To review the differential diagnosis of spinal dysraphisms identified on fetal imaging. 2) Present examples of some of the most commonly diagnosed fetal spinal dysraphisms.

RC113-02 Pre- and Postnatal MRI Findings in Open Spinal Dysraphism Following Intrauterine Repair via Open versus Fetoscopic Surgical Techniques

Sunday, Dec. 1 2:20PM - 2:30PM Room: E353B

Participants
Usha D. Nagaraj, MD, Cincinnati, OH (*Presenter*) Author with royalties, Reed Elsevier
Karin Bierbrauer, Cincinnati, OH (*Abstract Co-Author*) Nothing to Disclose
Charles Stevenson, MD, Cincinnati, OH (*Abstract Co-Author*) Nothing to Disclose
Jose L. Peiro, Barcelona, Spain (*Abstract Co-Author*) Nothing to Disclose
Foong-Yen Lim, Cincinnati, OH (*Abstract Co-Author*) Nothing to Disclose
Beth M. Kline-Fath, MD, Cincinnati, OH (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To examine MRI findings of the brain and spine on prenatal and postnatal MRI following prenatal repair of open spinal dysraphism (OSD) by the open and fetoscopic approaches.

METHOD AND MATERIALS

Single center HIPAA compliant and IRB approved retrospective analysis of fetal MRIs with open spinal dysraphism from 1/2011 through 12/2018 that underwent prenatal repair of OSD. Only patients with diagnostic quality postnatal brain and spine MRIs within first 3 months of life were included. Images were reviewed by 2 board certified fellowship-trained pediatric neuroradiologists.

RESULTS

62 patients met inclusion criteria, 47 underwent open repair, 15 underwent fetoscopic repair, average gestational age at initial MRI 22.6 ± 1.4 weeks. 17.7% (11/62) had follow-up fetal MRIs after surgery, 45.5% (5/11) status post open repair and 54.5% (6/11) status post fetoscopic repair. 90.9% (10/11) of these had improved hindbrain herniation status post repair (5/5 open, 5/6 fetoscopic). 54.5% (6/11) had larger lateral ventricular size status post repair (3/5 open, 3/6 fetoscopic), remaining 45.5% (5/11) had stable ventricular size. On postnatal MRI, spinal cord syrinx was seen in 34% (16/47) open repair versus 33.3% (5/15) fetoscopic repair (p=0.96). Degree of postnatal hindbrain herniation by a modified scale (1-4) demonstrated no significant difference in hindbrain herniation between the open (2.6 ± 0.9) versus fetoscopic (2.3 ± 0.7) repair groups (p=0.28). Lateral ventricular size was significantly larger in the open repair (20.9 ± 6.7) versus the fetoscopic repair (16.1 ± 4.9) group (p=0.01).

CONCLUSION

Though lateral ventricular size in the open repair group was larger than the fetoscopic repair group, this can likely be explained by selection criteria used for fetoscopic repair. Other post-operative imaging parameters were not significantly different between the

two groups.

CLINICAL RELEVANCE/APPLICATION

By sharing our experience with fetal and postnatal MRI findings in patients with open spinal dysraphisms undergoing both open and fetoscopic intrauterine repair, we hope to improve our understanding of the disease process and establish the groundwork of what can be expected when evaluating MRIs in this patient population.

RC113-03 Role of Fetal MRI in Diagnosis of Genitourinary Anomalies: Is There an Added Value?

Sunday, Dec. 1 2:30PM - 2:40PM Room: E353B

Participants
Sepideh Sefidbakht, MD, Powel, OH (*Abstract Co-Author*) Nothing to Disclose
Bijan Bijan, MD, Sacramento, CA (*Presenter*) Nothing to Disclose
Hamid Foroutan, Shiraz, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Meisam Hoseinyazdi, Shiraz, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Pedram Keshavarz, Shiraz, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To retrospectively review fetal MRI's performed over 5 years in our center to establish the added value of MRI in diagnosis of fetal GU anomalies.

METHOD AND MATERIALS

IRB approved study. Out of771 fetal MRI's performed in our center, 65 were done either primarily to evaluate a GU anomaly seen in ultrasound or an anomaly related to the GUT was incidentally detected. Interpretation of MRI's were done by a single radiologist who was not blinded to the ultrasound results. Final diagnosis was established through phone calls and national registery search. Post-delivery images also surgical notes and biopsy results were obtained when available. The added value of MRI was discussed with a pediatric surgeon, pediatric urologist, perinatologist and radiologist.

RESULTS

Final diagnoses included bilateral/unilateral renal agenesis(8/4), multicystic dysplastic kidneys(4), urinary tract obstruction(3), duplicate collecting system with obstruction(2), simple renal cyst(3), adrenal cyst(4), posterior urethral valve(5), crossed fused ectopia(1), autosomal recessive/dominant polycystic kidney disease(3/2), glomerulocystic disease(2), bilateral UPJO and isolated mild bilateral pelvocaliectases, normal outcome(25). FMRIwas considered to have an impact on diagnosis/counseling/management in 26(confirming presence/absence of kidneys in severe oligohydramnios (8 & 9), confirming probable normal renal function in hyperintense/hyperechoic fetal kidneys(3), multicystic dysplastic kidney diagnosed as pelvocaliectasis in ultrasound(3), crossed fused ectopia(1), megacystis microcolon(1), &bilateral UPJO(1).

CONCLUSION

Fetal MRI had significant additional benefit to ultrasound in congenital genitourinary anomalies which affected either management (27%) or counseling (12%) as a result of more accurate diagnosis.

CLINICAL RELEVANCE/APPLICATION

While ultrasound is very sensitive in detecting urinary tract abnormalities in the prenatal period, Fetal MRI can add significant clinically relevant data which can affect management and counseling.

RC113-04 Comparison of Mediastinal Shift Angles Obtained with Ultrasound and Magnetic Resonance Imaging in Fetuses with Isolated Left Congenital Diaphragmatic Hernia

Sunday, Dec. 1 2:40PM - 2:50PM Room: E353B

Participants
Chiara Carducci, MD, Rome, Italy (*Presenter*) Nothing to Disclose
Sara Savelli, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Stefano Bascetta, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Anita Romiti, Rome , Italy (*Abstract Co-Author*) Nothing to Disclose
Silvia Salvi, Rome , Italy (*Abstract Co-Author*) Nothing to Disclose
Leonardo Caforio, Rome , Italy (*Abstract Co-Author*) Nothing to Disclose
Paolo Toma, Roma, Italy (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To compare ultrasound (US) and magnetic resonance imaging (MRI) in the assessment of mediastinal shift angles (MSA) in fetuses affected by isolated left congenital diaphragmatic hernia (CDH). To investigate the potential role of MRI-MSA and US-MSA as prognostic factors for postnatal survival in fetuses with left CDH.

METHOD AND MATERIALS

This was an observational study of 29 fetuses with prenatally diagnosed isolated left CDH, assessed with both US and MRI examinations between January 2015 and December 2018. The US-MSA measurements performed within two weeks from the MRI assessment were considered for the analysis. The primary outcome was postnatal survival rate.

RESULTS

No significant difference between US and MRI MSA values was detected (p=0.419). Among the 29 cases there were 21 alive infants, for an overall postnatal survival rate of 72.41%. After stratification for postnatal survival, the best cut-offs in terms of sensibility and specificity were 42.1° for US-MSA and 39.1° for MRI-MSA since they have demonstrated the highest discriminatory power between survivors and non-survivors. The performance of MRI-MSA in predicting postnatal survival was close to that of US-MSA in terms of sensitivity (62.5% vs. 50.0%), specificity (80.9% vs. 90.5%), positive predictive value (55.6% vs. 66.7%), negative predictive value (85.0% vs. 82.6%) and accuracy (75.9% vs. 79.3%). There was no statistically significant difference between the two modalities (p > 0.05 for all).

CONCLUSION

MRI and US can be used interchangeably for the assessment of MSA in prenatally diagnosed isolated left CDH. Moreover, MSA measured by both US and MRI was confirmed to be correlated with perinatal outcome in terms of survival.

CLINICAL RELEVANCE/APPLICATION

Mediastinal shift angle is a simple, quick and repeatible US and MRI measurement that seems to be a promising diagnostic tool in predicting survival in prenatally diagnosed left CDHs.

RC113-05 Fetal MRI Assessment of Mediastinal Shift Angle (MSA) in Isolated Left Congenital Diaphragmatic Hernia: A New Postnatal Survival Predictive Tool?

Sunday, Dec. 1 2:50PM - 3:00PM Room: E353B

Participants
Stefano Bascetta, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Sara Savelli, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Chiara Carducci, MD, Rome, Italy (*Presenter*) Nothing to Disclose
Milena Viggiano, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Enza Carnevale, MD, Roma, Italy (*Abstract Co-Author*) Nothing to Disclose
Leonardo Caforio, Rome , Italy (*Abstract Co-Author*) Nothing to Disclose
Paolo Toma, Roma, Italy (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To quantify mediastinal shift angle (MSA) in isolated left congenital diaphragmatic hernia (CDH) by fetal MRI and to assess the feasibility of MSA in predicting postnatal survival at discharge.

METHOD AND MATERIALS

A prospective database including fetuses with CDH who underwent fetal MRI from January 2013 to January 2018 was retrospectively reviewed and fetuses from singleton pregnancies with isolated left CDH were selected. Cases were matched for gestational age with controls from singleton fetuses without thoracic, cardiac or mediastinal malformations. For all fetuses MSA was determined twice by two experienced operators (MSA1 and MSA2). Interoperator variability and statistical difference between MSA values in cases and controls were investigated. Total Fetal Lung Volume (TFLV) was also determined in cases and correlation between MSA and TFLV was assessed. Furthermore cases were divided into two groups based on postnatal survival (group 1-survivor, group 2-non survivor) and predictive value of MSA was determined.

RESULTS

From a total of 56 fetuses with prenatal diagnosis of CDH in our database, 34 fetuses with isolated left CDH were included as cases and matched with 42 fetuses as controls. 24 cases survived until discharge (G1) and 10 didn't (G2). An excellent interoperator reliability was obtained in measuring MSA (0.985, interclass correlation coefficient 98% , CI 0.7-1.000) with a statistically significant difference between MSA values in cases and controls. After survival stratification of cases statistical analysis confirmed an inverse correlation between MSA values and survival (p value <0.0001) and a direct correlation between TFLV and survival (p value <0.005), as well as a statistically significant inverse correlation between MSA and TFLV. Area under the ROC curve detected an excellent discriminatory accuracy for MSA in separating survivor and non-survivor (0.931, 95%, CI 0.851-1.000) with the best cutoff at 38.2°.

CONCLUSION

MSA is a promising tool for correlation with postnatal survival in patients with isolated left CDH, alone or in association with TFLV. The possible prognostic role of MSA should be investigated also for early treatments in utero or at birth in future clinical trials.

CLINICAL RELEVANCE/APPLICATION

Mediastinal shift angle can be easily assessed by fetal MRI, it is correlated with pulmonary volume and it could predict survival in left CDH redefining the objectives of future clinical trials.

RC113-06 The Normal Fetal Lung Volume: One Size Does Not Fit All Populations

Sunday, Dec. 1 3:00PM - 3:10PM Room: E353B

Participants
Sepideh Sefidbakht, MD, Powel, OH (*Abstract Co-Author*) Nothing to Disclose
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Bijan Bijan, MD, Sacramento, CA (*Presenter*) Nothing to Disclose

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PURPOSE

To measure the lung volume using fetal MR images in normal fetuses; in order to establish gestational age-dependent reference data in our population.

METHOD AND MATERIALS

342 fetuses that underwent fetal MRI in our institution during Jan 2016-2017 (gestational age 18-36 weeks). All MRI's were done on a 1.5T Seimens Avanto. 241 fetuses were proven to have normal lung structure and function post-delivery and had technically adequate images for evaluation of the lungs. Fetal lung volumes were measured by manual tracing of consecutive slices on T2 HASTE, or trufisp images in axial planes, whichever was technically acceptable. The volumes were correlated with gestational age. This resulted in a formula calculating the expected fetal lung volume dependent using gestational age.

RESULTS

Normal FLV increased with gestational age. The expected fetal lung volume was derived from the following formula: Fetal lung volume (mL) = 0.002× (GA^2.913), in which GA is the gestational weeks. Our data distribution was closest to Osada et al. rather than Rypens et al and Meyers et al.

CONCLUSION

Fetal lung volumes correlate with gestational age. The exact relationship between lung volumes and gestational age might vary in different populations.

CLINICAL RELEVANCE/APPLICATION

Fetal lung volumes have prognostic significance. In some common anomalies such as congenital diaphragmatic hernia the expected fetal lung volume is used for clinical management and decision-making. Accurate population-specific data is necessary for accurate risk stratification and management in these cases.

RC113-07 The Fetal Airway: In Utero Imaging, Decision Making, and Surgical Planning

Sunday, Dec. 1 3:10PM - 3:30PM Room: E353B

Participants
Mariana L. Meyers, MD, Aurora, CO (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the normal fetal airway appearance by fetal MRI and ultrasound Identify the main imaging features of fetal neck and chest pathologies affecting the airway. 2) Recognize how fetal MRI aids in the diagnosis of different neck pathologies.

RC129

MRI O-RADS (Interactive Session)

Sunday, Dec. 1 2:00PM - 3:30PM Room: N227B

GU MR OB

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

Sub-Events

RC129A Overview and O-RADS 0-1

Participants
Caroline Reinhold, MD, MSc, Montreal, QC (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To introduce MRI O-RADS (Ovarian-Adnexal Reporting and Data Systems) 2) To review the MRI O-RADS governing concepts. 3) To know the main terms for O-RADS MRI scores 0 and 1. 4) To understand the application of O-RADS MRI scores 0 and 1 to adnexal masses and the associated risk of malignancy. 5) To recognize O-RADS MRI score 1 lesions by review of cases.

RC129B O-RADS 2

Participants
Evan S. Siegelman, MD, Media, PA (*Presenter*) Advisory Board, Spreemo Health; Consultant, BioClinica, Inc; Consultant, ICON plc; Consultant, inviCRO, LLC

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LEARNING OBJECTIVES

1) Describe the MR terms that characterize adnexal lesions that are almost certainly benign (O-RADS 2). 2) Identify those MR imaging features that would upgrade an adnexal lesion to a higher O-RADS category. 3) Illustrate MR imaging examples of O-RADS 2 lesion such as endometrioma, cystadenoma, mature cystic teratoma, hydrosalpinx and peritoneal inclusion cyst.

RC129C O-RADS 3

Participants
Isabelle Thomassin-Naggara, MD, Paris, France (*Presenter*) Researcher, General Electric Company; Research funded, General Electric Company; Researcher, Canon Medical Systems Corporation; Research funded, Canon Medical Systems Corporation; Research funded, Hologic, Inc; Research funded, Siemens AG; Research funded, Guerbet SA

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LEARNING OBJECTIVES

1) To combine all useful MR features to characterize indeterminate adnexal masses. 2) To describe how to perform DCE MR analysis on solid tissue. 3) To identify how lesions should be classified O-RADS 3. 4) To specify which adnexal lesions will be rated O-RADS 3

RC129D O-RADS 4-5

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

LEARNING OBJECTIVES

1) To know the main terms for O-RADS MR score 4 and 5. 2) To be familiar with the application of O-RADS MR score 4 and 5 to adnexal masses. 3) To recognise O-RADS MR score 4 and 5 lesions by review of cases.

ABSTRACT

The preponderant contribution of MRI in adnexal mass evaluation is its specificity because it provides confident diagnosis of many benign adnexal lesions A standardization of the MR reporting may allow a tailored, patient-centered approach, allowing avoidance of over-extensive surgery and/or fertility preservation where appropriate, whilst ensuring early detection of lesions with high likelihood of malignancy. O-RADS classification is accurate and based on 5 categories related to the rik of malignancy. An adnexal lesion with a solid tissue that enhances according a time intensity curve type 2 or 3 or which is associated with peritoneal implants should be categorized O-RADS 4 or 5. A lesion classified O-RADS 5 has a risk of malignangy higher than 95% and must be referred to a gynecological oncologist

RC129E Case Review

Participants
Elizabeth A. Sadowski, MD, Madison, WI (*Presenter*) Nothing to Disclose

Caroline Reinhold, MD, MSc, Montreal, QC (*Presenter*) Nothing to Disclose

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esadowski@uwhealth.org

LEARNING OBJECTIVES

1) Understand the basic sequences necessary for characterizing adnexal lesions. 2) Classify adnexal masses using the ACR ORADS MRI system, based on their signal characteristics and enhancement patterns. 3) Assign an ACR ORAD MRI risk score based on the MRI appearance of an adnexal lesion and clinical information.

Printed on: 10/29/20

ED006-MO

Genitourinary Monday Case of the Day

Monday, Dec. 2 7:00AM - 11:59PM Room: Case of Day, Learning Center

AMA PRA Category 1 Credit ™: .50

Participants
Lori Mankowski Gettle, MD , Madison, WI (*Presenter*) Nothing to Disclose
Maitraya K. Patel, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Adam Kinzel, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Ely R. Felker, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Michael Bergquist, MD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Kathryn L. McGillen, MD, Hershey, PA (*Abstract Co-Author*) Nothing to Disclose
Sparsh Gola, MD, Hershey, PA (*Abstract Co-Author*) Nothing to Disclose
Christine M. Peterson, MD, Hummelstown, PA (*Abstract Co-Author*) Nothing to Disclose
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Nagaraj-Setty Holalkere, MD, Boston, MA (*Abstract Co-Author*) Founder and CEO, Imaginglink Inc
Kumaresan Sandrasegaran, MD, Phoenix, AZ (*Abstract Co-Author*) Nothing to Disclose
Akira Kawashima, MD, PhD, Scottsdale, AZ (*Abstract Co-Author*) Nothing to Disclose
Lejla Aganovic, MD, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Matthew A. Zarka, MD, Scottsdale, AZ (*Presenter*) Nothing to Disclose

TEACHING POINTS

1) Recognize imaging findings seen in disorders of the genitourinary systems. 2) Develop differential diagnosis based on the clinical information and imaging findings. 3) Explain the clinical importance of the diagnosis.

RC207

Novel Anti-cancer Agents in Genitourinary Malignancies: What Your Reports Should Include

Monday, Dec. 2 8:30AM - 10:00AM Room: S102CD

GU OI

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

Participants
Priya R. Bhosale, MD, Bellaire, TX (*Presenter*) Nothing to Disclose
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LEARNING OBJECTIVES

1) Know the mechanisms of action and rationale behind use of various novel anticancer agents available to treat advanced renal, bladder, prostate and gynecologic malignancies. 2) Identify the typical and atypical patterns of tumor response with the novel anticancer agents using a combination of size-based, morphologic and immune-response criteria, and avoid common pitfalls in response assessment. 3) Detect adverse events and complications associated with the novel anticancer agents including immune-related adverse events, and understand the role of certain adverse events as imaging biomarkers.

ABSTRACT

Molecular targeted therapies, immune checkpoint inhibitors and hormonal therapies represent three classes of novel anticancer agents with distinct mechanisms of action, response patterns and toxicities. With the burgeoning use of these agents to treat advanced GU malignancies, the role of the radiologist as a key member of the treatment team has evolved. After attending this course, attendees will know how novel anticancer agents change the radiologic assessment of advanced genitourinary cancers, including their typical and atypical response patterns and common toxicities seen on imaging. This knowledge will inform the radiologists how to render appropriate reports of imaging exams and conduct an effective dialogue with the referring physicians about the management of genitourinary cancers.

RC211

Nuclear Medicine Series: New PET Tracers for Prostate Cancer

Monday, Dec. 2 8:30AM - 12:00PM Room: S505AB

GU NM

AMA PRA Category 1 Credits ™: 3.50
ARRT Category A+ Credits: 4.00

FDA Discussions may include off-label uses.

Participants
Terence Z. Wong, MD, PhD, Chapel Hill, NC (*Moderator*) Consultant, Lucerno Dynamics, LLC;
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Sub-Events

RC211-01 Logistics: Incorporating New PET Tracers into Practice

Monday, Dec. 2 8:30AM - 8:55AM Room: S505AB

Participants
Nancy M. Swanston, RT, Houston, TX (*Presenter*) Nothing to Disclose

RC211-02 Potential Use of Fluciclovine PET/CT as Follow-Up Modality in Patients with Biochemically Recurrent Prostate Cancer

Monday, Dec. 2 8:55AM - 9:05AM Room: S505AB

Participants
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PURPOSE

The feasibility of fluciclovine PET/CT imaging as follow-up modality for biochemically recurrent prostate cancer patients undergoing treatment or surveillance.

METHOD AND MATERIALS

A retrospective chart review was conducted for biochemically recurrent prostate cancer patients (Pts) who underwent two fluciclovine PET/CT scans between August 2016 and March 2019. Outcomes of follow-up scans were recorded as: Progression (new and/or increased uptake), partial response (combination of decreased and persistent uptake), improved (decreased uptake), and resolved (complete resolution). The PSA changes (%) for each interval outcome were calculated. The maximum standardized uptake values (SUV max) of lesions suspicious for malignancy and their interval changes were collected. Differences in SUV max values in Pts who demonstrated progression of disease were evaluated using the Wilcoxon Rank Sum Test.

RESULTS

Among 260 Pts who underwent fluciclovine PET/CT, 12 Pts had 2 scans with average interval time (±SD) of 12 ±5.2 months. One patient was excluded due to poor management records. In total, 11 Pts with 22 scans were included in the analysis. Types of interval management were: 4 surveillance (S), 1 radiation therapy (RT) + selective lymph node dissection (sLND), 3 initiated androgen deprivation therapy (iADT), 2 continued previously initiated ADT (cADT), and 1 RT. Interval progression was noted in 6 Pts (55%): 4 S, 1 RT + sLND, 1 cADT. Partial response in 1 cADT Pt (9%). Improved outcome in 3 Pts (27%): 2 iADT, 1 RT. Resolution in 1 iADT Pt (9%). PSA level reduced by 86.9%, 86.7%, and 100% in partial response, improved, and resolved outcome scans, respectively. PSA level increased by 223.2% in the progressed outcome scan. Among the progressed outcome scans, average SUV max for positive lesions was 4.4 ±1.9 at baseline PET/CT (n=16) and 4.3 ±2.2 at follow-up (n=28). Although no statistical significance of uptake difference was noted ($p>0.05$), 12 new lesions were reported overall.

CONCLUSION

Fluciclovine PET/CT can potentially be used as follow-up for treatment management in Pts with biochemically recurrent prostate cancer.

CLINICAL RELEVANCE/APPLICATION

The usage of fluciclovine PET/CT scan as a modality to assess response to therapy is not known.

RC211-03 Preoperative 18F-fluciclovine PET/CT Findings are Predictive of Optimal Post-Operative Prostate-Specific Antigen (PSA) in Patients with Intermediate to High-Risk Prostate Cancer

Monday, Dec. 2 9:05AM - 9:15AM Room: S505AB

Awards
Trainee Research Prize - Fellow

Participants
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PURPOSE

To evaluate factors associated with optimal post-operative PSA following fluciclovine PET/CT guided radical prostatectomy and extended pelvic lymph node dissection (RP+EPLND).

METHOD AND MATERIALS

35 patients with intermediate to high risk prostate cancer underwent 18F-fluciclovine PET/CT before robotic RP+EPLND. Image interpretation was performed by a board-certified nuclear medicine physician blinded to other clinical and imaging data. Fluciclovine uptake in the prostate and extraprostatic sites were reviewed with the surgeon preoperatively. Histologic assessment was completed and results correlated with the preoperative PET/CT. Post-operative PSA were obtained 52 (range 23-139) days after surgery. Undetectable PSA was considered optimal. Univariate analysis was performed to determine factors associated with optimal post-operative PSA. Patients ineligible for curative surgery were not included in this analysis. Statistical significance was set as $p<0.05$.

RESULTS

Local prostate disease was found in 23/35 (65.7%) patients and nodal disease was found in 12/35 (34.3%) patients [7 regional pelvic lymph nodes (N1), 5 non-regional lymph nodes (M1a)] on fluciclcovine PET. Optimal post-operative PSA was present in 14/35 (40%) patients. Absence of nodal disease on PET was significantly associated with optimal post-operative PSA (OR 1.64(95%CI 1.03-2.59, p=0.04). Also, histologic finding of localized prostatic disease (21/25 patients) was associated with optimal post-operative PSA (OR 2.79(95%CI 1.50-5.19, $p<0.01$). Though not statistically significant, pre-operative PSA in patients with optimal post-operative PSA was lower than the patients with those who has suboptimal post-operative PSA (16.68±17.13 vs 36.14±40.73 ng/ml, p=0.06). There was no significant difference in the Gleason scores, Grade groups or resection margins between patients who achieved optimal post-operative PSA and those who did not ($p>0.05$). All patients with non-regional LN metastasis (M1a) on PET (n=5) or histology (n=5) had sub-optimal post-operative PSA.

CONCLUSION

Findings on preoperative fluciclovine PET is predictive of achieving optimal post-operative PSA after RP+EPLND. Fluciclovine PET may have prognostic value in selecting patients that will benefit from surgery and those that may require adjuvant therapy.

CLINICAL RELEVANCE/APPLICATION

Findings on preoperative fluciclovine PET/CT is predictive of post-operative PSA. This may be of value in overall treatment planning for patients with high grade prostate cancer.

RC211-04 18F-Fluciclovine PET/CT for Response Assessment in Patients with Metastatic Castration Resistant Prostate Cancer Treated with Docetaxel

Monday, Dec. 2 9:15AM - 9:25AM Room: S505AB

Participants
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PURPOSE

To determine the value of fluciclovine PET/CT in evaluation of response to docetaxel chemotherapy in patients with metastatic castration resistant prostate cancer (mCRPC).

METHOD AND MATERIALS

Seven patients with mCRPC were evaluated in this study. Each patient had fluciclovine PET/CT prior to commencement, after 1 and 6 cycles of docetaxel. Fluciclovine uptake parameters were recorded in the prostate/bed and up to 5 metastatic bone and soft tissue lesions. The same lesions were evaluated on subsequent scans. Therapy response was assessed using the summed changes in SUVmax between PET scans (PET response) on per patient basis. Decrease in summed SUVmax of >=30% was considered response, while appearance of new lesions or >30% increase in summed SUVmax was considered progressive disease. Prostate specific antigen (PSA) levels were assessed at baseline and before each dose of chemotherapy. Assessment of response was based on recommendations from Prostate Cancer Clinical Trial Working Group 3 for PSA, bone scan and RECIST 1.1. A decrease in PSA of >= 50% was considered response. Results on fluciclovine PET were compared to standard of care bone scan and CT and correlated with PSA response.

RESULTS

All patients in the study complete the 1st and 2nd fluciclovine PET/CT, while 4/7 patients completed all 3 PET/CT scans. PSA response was seen in 1/7 (14.3%), 4/7(42.9%) had stable PSA while 2/7 (28.6%) had PSA progression after 1 cycle of docetaxel. After 6 cycles of docetaxel, 3/4 (75%) patients had PSA response, while 1/4 (25%) patient had progression. PET response correlated with PSA response in 3/7 (42.9%) patients after 1 cycle of docetaxel. After 6 cycles of docetaxel, PET response was concordant with PSA response in 3/4 (75%) patients, while bone scan and CT correlated with PSA response in 1/4 (25%) patients. Fluciclovine PET correlated with CT and bone scan in 2/4(50%) patients.

CONCLUSION

Fluciclovine PET seems to better correlate with PSA response than CT or bone scan in the assessment of therapy response in patients with mCRPC on docetaxel. Larger studies are required to confirm the value of fluciclovine PET as an imaging biomarker for response assessment.

CLINICAL RELEVANCE/APPLICATION

Fluciclovine PET may be useful for assessment of treatment response in patients with metastatic castration resistant prostate cancer on docetaxel. Further investigation is warranted.

RC211-05 Q&A

Monday, Dec. 2 9:25AM - 9:35AM Room: S505AB

RC211-06 Landscape of New and Future PET Tracers for Prostate Cancer

Monday, Dec. 2 9:35AM - 10:00AM Room: S505AB

Participants
Andrei Iagaru, MD, Emerald Hills, CA (*Presenter*) Research Grant, General Electric Company Research Grant, Progenics Pharmaceuticals, Inc Research Grant, Advanced Accelerator Applications SA

LEARNING OBJECTIVES

1) List some of the molecular imaging targets that are used in prostate cancer. 2) Understand underlying biology and mechanism of action for some of the new PET radiopharmaceuticals in prostate cancer. 3) Discuss patterns of prostate cancer appearance when using some of the new PET radiopharmaceuticals.

ABSTRACT

Data from the American Cancer Society suggests that prostate cancer will continue to be the leading cancer diagnosis in men with 174,650 estimated new cases and will have the second highest mortality (after lung cancer) with 31,620 estimated deaths for 2019 in the United States. Initial and subsequent treatment of prostate cancer may involve surgery, radiation therapy, hormonal therapy, chemotherapy, or a combination of these. Additional molecular pathways in prostate cancer lead to the identification of new targets that may be amenable to diagnostic and therapeutic intervention with novel agents. Areas of interest for the Nuclear Medicine and Molecular Imaging community include mainly aminoacid analogues (Fluciclovine) and the prostate specific membrane antigen (PSMA), but also gastrin releasing peptide receptors (GRPR).

RC211-07 Clinical Impact of 68Ga-PSMA-11 PET on Patient Management for Staging Intermediate to High-Risk Prostate Cancer Patients

Monday, Dec. 2 10:00AM - 10:10AM Room: S505AB

Participants
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PURPOSE

Accurate staging is of major importance for prognosis assessment and treatment approach for patients with prostate cancer. Positron emission tomography (PET) with prostate specific membrane antigen (PSMA) is a promising technique that already outperformed conventional imaging in the detection of nodal and distant metastasis in previous studies. However, it is still unclear whether this superior sensitivity and specificity of PSMA PET would translate into a significant impact on management. The aim of this study was to assess the detection rate of disease and impact on management of 68Ga-PSMA-11 PET in patients that underwent a 68Ga-PSMA-11 PET scan for staging prostate cancer.

METHOD AND MATERIALS

In this retrospective analysis, approved by the local ethics committee, from all 137 patients that underwent 68Ga-PSMA-11 PET/CT or 68Ga-PSMA-11 PET/MRI scans for staging intermediate and high-risk prostate cancer between April 2016 and May 2018, 116 patients gave written informed consent for retrospective analysis of their data and were included into the study. The potential 68Ga-PSMA-11 PET impact on patient management was assessed within a simulated multidisciplinary tumour board where clinical and conventional imaging information was used to define treatment option pre-68Ga-PSMA-11 PET and information from the 68Ga-PSMA-11 PET was added to define treatment post-68Ga-PSMA-11 PET.

RESULTS

The primary tumour was positive on 68Ga-PSMA-11 PET in 113 patients (97%). Nodal metastasis were detected in 27 (23%) and bone metastasis in 14 patients (12%). Compared to clinical staging and conventional imaging, 68Ga-PSMA-11 PET brought new information in 42 of 116 patients (36%), leading to a change in management in 32 (27%) of them. In 15 patients (13%) a new therapy modality was chosen and in 17 patients (14%) the therapy details would be adjusted based on 68Ga-PSMA-11 PET findings (e.g. modification of radiotherapeutic field).

CONCLUSION

68Ga-PSMA-11 PET changed the management in in more than a fourth of intermediate to high-risk prostate cancer patients. Whether tailor-made therapies based on 68Ga-PSMA-11 PET will improve patient outcome will need further investigation.

CLINICAL RELEVANCE/APPLICATION

68Ga-PSMA-11 PET have an impact on patient management in the staging setting for intermediate and high-risk prostate cancer patients.

RC211-08 The Impact of 18F-DCFPyL PET-CT Imaging on Staging and Clinical Management of Men with De Novo Prostate Cancer: A First Experience within Veterans Healthcare System

Monday, Dec. 2 10:10AM - 10:20AM Room: S505AB

Participants
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Nicholas Nickols, MD, Los Angeles, CA (*Abstract Co-Author*) Research Grant, Johnson & Johnson; Research Grant, Varian Medical Systems, Inc; Research Grant, Bayer AG; Consultant, Genes Sciences Inc; Consultant, Progenics Pharmaceuticals, Inc;
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PURPOSE

Positron emission tomography with computed tomography (PET-CT) utilizing novel prostate-specific membrane antigen (PSMA) tracers has shown efficacy in detecting extraprostatic disease not otherwise seen on conventional imaging. Although most published studies with PSMA PET-CT were conducted in the recurrent/salvage setting and utilized a gallium-based probe, this study aimed to evaluate the effect of 18F-DCFPyL PET-CT on staging and clinical management of patients with newly-diagnosed, untreated prostate cancer.

METHOD AND MATERIALS

From 9/2018 to 3/2019, 39 Veterans with untreated prostate cancer were prospectively enrolled on a single-arm Phase II clinical trial to receive 18F-DCFPyL PET-CT, in addition to conventional imaging, for staging of prostate cancer. Enrollment criteria was defined as: prostate specific antigen greater than 10 ng/mL, Gleason Score 4+3 or higher, or clinical stage T2c or higher. Upon completion of 18F-DCFPyL PET-CT, management recommendations for each case were formulated by a multi-disciplinary physician team consisting of a urologic oncologist, medical oncologist, and radiation oncologist, based upon predetermined recommendations associated with clinic-pathologic criteria and imaging findings in accordance with current guidelines.

RESULTS

Of the 39 patients initially enrolled, clinic-pathologic features and conventional imaging enabled designation of 5 unfavorable-intermediate cases, 26 high-risk cases, 3 node-positive cases, and 5 metastatic cases. Following 18F-DCFPyL PET-CT, 12 patients were upstaged and 3 were downstaged. Modified treatment recommendations were made to initiate long-term abiraterone in 9 (23%) patients, extend abiraterone duration in 3 (8%) patients, extend ADT course in 12 (31%) patients, boost pelvic nodes in 4 (10%) patients, deliver metastasis-directed therapy (MDT) in 8 (21%) patients, and forgo RT to primary in 1 (3%) patient. Three patients (7.5%) initially thought to have M1 disease were downstaged and no longer recommended to receive abiraterone or MDT.

CONCLUSION

In conjunction with conventional imaging, 18F-DCFPyL PET-CT appears to significantly alter the staging and management of newly-diagnosed untreated prostate cancer patients.

CLINICAL RELEVANCE/APPLICATION

Patients with unfavorable-intermediate (or higher) prostate cancer may benefit from upfront 18F-DCFPyL PET-CT to improve

staging and designation of individuals for combination and/or systemic therapy.

RC211-09 Interim Analysis Results of a Prospective Study of 68Ga-RM2 PET/MRI in Patients with Biochemically Recurrent Prostate Cancer and Negative Conventional Imaging

Monday, Dec. 2 10:20AM - 10:30AM Room: S505AB

Participants
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PURPOSE

68Ga-RM2 is a synthetic bombesin receptor antagonist targeting gastrin-releasing peptide receptors (GRPr) that are overexpressed in several human tumors, including prostate cancer (PC). We present data from the use of 68Ga-RM2 in patients with biochemically recurrent (BCR) PC and negative conventional imaging (CI).

METHOD AND MATERIALS

We enrolled 91 men with BCR PC, 53-83-year-old (mean±SD: 68.8±6.3). Imaging started at 40-89 minutes (mean±SD: 53.6±8.8 after injection of 127.5-152.6 MBq (mean±SD: 141.8±5.3) of 68Ga-RM2 using a time-of-flight (TOF)-enabled simultaneous positron emission tomography (PET) / magnetic resonance imaging (MRI) scanner. T1-weighted (T1w), T2-weighted (T2w) and diffusion-weighted images (DWI) were acquired. Standardized uptake value (SUVmax) measurements in up to 6 lesions with highest uptake was collected in 35 patients for this analysis.

RESULTS

All patients had rising prostate specific antigen (PSA) (range: 0.2-124 ng/mL; mean±SD: 7.6±18.5) and negative CI (CT or MRI, and 99mTc MDP bone scan) prior to enrollment. 68Ga-RM2 PET identified recurrent PC in 64 of the 91 participants, while the simultaneous MRI scan identified findings compatible with recurrent PC in 25 of the 91 patients. PSA velocity (PSAv) values were 0.29±0.44 ng/ml/year (range: 0.03-1.9) in patients with negative PET scans and 2.29±2.01 ng/ml/year (range: 0.13-8.68) in patients with positive PET scans (P: 0.0042). We detected 73 lesions in 35 patients (45 lymph nodes, 9 prostate bed, 5 seminal vesicles, 9 bone, 2 liver and 2 lungs), mean±SD SUVmax was 9.19±11.23.

CONCLUSION

68Ga-RM2 PET identifies GRPr expression in BCR PC lesions despite negative CI, indicating it is a promising PET radiopharmaceutical in this clinical scenario. 68Ga-RM2 may identify higher risk patients given the highly statistically significant difference PSA velocity values between patients with negative and positive scans.

CLINICAL RELEVANCE/APPLICATION

68Ga-RM2 is a promising tracer for assessment of GRPr expression in patients with BCR PC.

RC211-10 Automatic Acquired 18F-Choline PET/CT Biomarkers Association with Prognostic Value in High-Risk Prostate Cancer Patients

Monday, Dec. 2 10:30AM - 10:40AM Room: S505AB

Participants
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CONCLUSION

Automated deep learning-based measurements of 18F-choline uptake in the prostate gland were significantly associated with prostate cancer specific survival in patients with hormone-naive prostate cancer. This type of deep learning-based methods could be applied to other prostate cancer PET tracers as well, for example PSMA.

Background

Biomarkers are not routinely used in PET/CT explorations, one of the motives could be that automated quantitative PET/CT assessments are often lacking. Although few research groups are incorporating deep learning in PET/CT management and have successfully used to delineate or identify gross tumoral volume in different malignancies, the use of biomarkers acquired with the aid of deep learning is almost unheard of in 18F-choline PET/CT in prostate cancer.

Evaluation

The core of the automated segmentation method is a fully convolutional neural network (CNN) taking both the PET and the CT image. The CNN works directly on the three-dimensional images and produces segmentations of the prostate as well as the urinary bladder (Figure 1). Based on these segmentation, prostate volume, lesion volume, SUVmax and total lesion uptake (TLU, defined as the product SUVmean x lesion volume) are calculated. The CNN was trained on a separate training set of manually segmented PET/CT scans. After the training, the method was applied to a separate validation group of patients with prostate cancer who had undergone 18F-choline PET/CT for primary metastasis staging before treatment. Associations between automated deep learning-based PET/CT measurements, age, PSA, Gleason score, T stage, and prostate cancer specific survival were studied using a univariate Cox proportional hazards regression model.

Discussion

A total of 77 patients were included in the validation group and twelve of them died from prostate cancer during follow-up. Median survival time was 4.9 years (range 1.7-7.0 years) compared to a median follow-up time of 6.6 years (range 1.8-8.5 years) in the remaining patients. TLU (p=0.01), prostate volume (p=0.02), lesion volume (p=0.001), and PSA (p=0.03) were significantly associated with prostate cancer specific survival, while SUVmax, age, T stage and Gleason score were not.

RC211-11 Q&A

Monday, Dec. 2 10:40AM - 10:50AM Room: S505AB

RC211-12 Clinician's Perspective: Impact and Applications

Monday, Dec. 2 10:50AM - 11:15AM Room: S505AB

Participants
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LEARNING OBJECTIVES

1) Review current and emerging PET radiotracers for prostate cancer. 2) Assess how these new PET imaging radiotracers can address unmet clinical needs in prostate cancer. 3) Address remaining clinical and research questions arising from new PET radiotracers in prostate cancer.

RC211-13 Prospective Comparison of 18F-DCFPyL PET/CT with 18F-NaF PET/CT for Detection of Skeletal Metastases in Biochemically Recurrent Prostate Cancer

Monday, Dec. 2 11:15AM - 11:25AM Room: S505AB

Participants
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PURPOSE

18F-DCFPyL is a promising 18F-labeled agent for PSMA PET imaging, available at our institution through a research access program. Here we compared 18F-DCFPyL PET/CT and 18F-NaF PET/CT for the detection of skeletal metastases in patients with biochemically recurrent prostate cancer (BCR PC).

METHOD AND MATERIALS

We prospectively enrolled 50 patients (52-91 years old, 71.2 ± 7.4 years) who had 18F- DCFPyL PET/CT at BCR PC after definitive treatment with prostatectomy (30 patients) and/or radiation therapy (20 patients). A total of 16 of the 50 patients (63-86 years old, 73.6 ± 5.9 years) also had 18F-NaF PET/CT for identification of bone metastases. Up to 7 bone lesions were recorded per patient for each tracer.

RESULTS

Three patients did not have bone metastases. A total of 41 skeletal lesions were found. 18F DCFPyL PET/CT identified 32 bone lesions (78%) and 18F NaF PET/CT identified 35 lesions (85.4%). Congruent findings between 18F-DCFPyL and 18F NaF were found in 26/41 (63.4%) lesions. 18F DCFPyL identified 1 lesion missed on 18F NaF in 4 participants (4/41, 9.8%). However, 18F DCFPyL was negative in 2 patients with lesions found on 18F NaF (4/41 lesions, 9.8%). CT alone identified 21 lesions (51.2%).

CONCLUSION

The performance of 18F DCFPyL PET/CT for detecting bone metastases is similar to that of 18F NaF PET/CT. Taken together with the accuracy of 18F-DCFPyL PET/CT in the detection of non-bone metastases and disease at low PSA presented separately, 18F DCFPyL PET/CT may be used as a "one stop shop" for evaluation of patients with BCR PC. However, more patients have to be evaluated to support these findings.

CLINICAL RELEVANCE/APPLICATION

18F DCFPyL PET/CT is a very promising diagnostic tool for evaluating patients with BCR PC.

RC211-14 Rapid High Definition Na18F Digital PET/CT for Whole-Body Osteoblastic Disease Assessment: A Phase I Intra-Individual Comparison Study

Monday, Dec. 2 11:25AM - 11:35AM Room: S505AB

Participants
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PURPOSE

In this Phase Ib intra-individual comparison study we assess the clinical feasibility of a substantially faster, high-definition whole-body Na18F PET approach using digital photon counting PET detector (dPET) technology in the evaluation of osteoblastic metastatic disease and compare to standard PET image acquisition times (60 - 120 s/bed).

METHOD AND MATERIALS

Whole-body Na18F dPET/CT imaging (Vereos, Philips) was performed in 29 male oncologic patients using a target Na18F dose of 185 MBq. At 70 min post injection, dPET acquisitions were performed using a substantially faster acquisition time of 30 s/bed. At 85 min post injection, dPET acquisitions were performed using standard 90 s/bed. All dPET image data sets were reconstructed using Time-of-Flight and high-definition approaches with voxel volume = 2x2x2 mm3. A blinded reader panel using an Intellispace Portal workstation to assess background quality, image quality and lesion detectability reviewed the data sets.

RESULTS

All patients had evaluable dPET data sets (n = 58) for qualitative assessment of 18F biodistribution and osteoblastic activity. Faster dPET acquisitions demonstrated comparable 18F-avidity in both normal bone and osteoblastic lesion conspicuity when compared to standard acquisitions with no discordant osteoblastic lesions. Average SUVmean were comparable for 30 s/bed and 90 s/bed acquisitions for background skeletal muscle (0.8 +/- 0.1 and 0.7 +/- 0.1, respectively) and normal vertebral bone (7.1 +/- 1.6 and 7.6 +/- 1.7, respectively). Average SUVmax of 48 osteoblastic lesions were also comparable for 30 s/bed and 90 s/bed acquisitions (32.4 +/- 27.9 and 35.9 +/- 30.8, respectively).

CONCLUSION

There is an unmet clinical need to reduce PET image acquisition time for patients with symptomatic bony disease. This Phase Ib study demonstrates the clinical feasibility of rapid whole-body high-definition PET imaging with dPET technology.

CLINICAL RELEVANCE/APPLICATION

Digital PET technology enables substantially faster (3x) whole-body Na18F PET imaging with no loss of lesion detectability, image quality or quantitative accuracy.

RC211-15 Ga-68-PSMA Activity Optimization Based on List-Mode Phantom and Patient Data

Monday, Dec. 2 11:35AM - 11:45AM Room: S505AB

Participants
Jette Wielaard, MSc, Nieuwegein, Netherlands (*Presenter*) Nothing to Disclose
Jan Habraken, Nieuwegein, Netherlands (*Abstract Co-Author*) Nothing to Disclose
Peter Brinks, PhD, Nieuwegein, Netherlands (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

A study on optimization of Gallium-68 (68Ga) activity for 68Ga-prostate specific membrane antigen positron emission tomography/computed tomography (68Ga PSMA PET/CT) studies is achieved by finding the highest coefficient of variation (COV) acceptable for reliable image interpretation and quantification.

METHOD AND MATERIALS

To obtain images with different COV, lower activities were mimicked by reconstructions with shorter acquisition times. A 20 min/bed (2 bed positions) scan of the NEMA Image Quality phantom is acquired in list mode PET (Philips Gemini PET/CT), of which sphere 1 (d=10mm) is analysed (activity ratio 9:1 for spheres compared to background). First, to evaluate impact on image interpretation, the relationship of COV and contrast-to-noise ratio (CNR) is studied and assuming that the CNR should remain greater than 5 (Rose criterion). Secondly, the effect of COV on the difference between quantification results of two equivalent studies is analysed. Pairs of equivalent images were obtained by reconstruction of two non overlapping parts of list-mode data. Comparison was done by calculating the percentage difference of the SUVmean. The maximum allowable percentage difference was set at 20%.

RESULTS

Results show that at a COVmax <= 25% image interpretation (CNR >= 5) as well as image quantification (percentage difference >= 20%) are within acceptable limits. The phantom scan with a COV of 25% was acquired with an acquisition time of 114 s and a background activity concentration of 0.71 MBq/kg. This is translated to the clinical protocol by taking into account decay between injection and acquisition time and urine clearance, resulting in a clinical activity regimen of 3.5 MBq/kg*min at injection. To verify this activity regimen, 16 patients (6 MBq/kg*min) with a total of 27 lesions are included. Additional reconstructions were made to mimic the proposed activity regimen. Based on the CNR criterion no lesions greater than 10 mm are missed with this proposed activity regimen.

CONCLUSION

A COVmax of 25% leads to a proposed activity regimen of 3.5 MBq/kg*min at injection, which indicates that activity can be reduced by almost 50% for diagnostic readings of scans. This is supported by clinical images: none of the included lesions were missed using the newly proposed activity regimen.

CLINICAL RELEVANCE/APPLICATION

The injected activity for 68Ga-PSMA imaging studies can be reduced for diagnostic readings of scans.

RC211-16 Panel Discussion

Monday, Dec. 2 11:45AM - 12:00PM Room: S505AB

Participants
Nancy M. Swanston, RT, Houston, TX (*Presenter*) Nothing to Disclose
Andrei Iagaru, MD, Emerald Hills, CA (*Presenter*) Research Grant, General Electric Company Research Grant, Progenics Pharmaceuticals, Inc Research Grant, Advanced Accelerator Applications SA
Steve Cho, MD, Madison, WI (*Presenter*) Research Grant, General Electric Company; Consultant, Advanced Accelerator Applications SA;

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LEARNING OBJECTIVES

1) Discuss questions and issues related to new and emerging PET imaging agents for prostate cancer.

MSMI22

Molecular Imaging Symposium: Oncologic MI Applications

Monday, Dec. 2 10:30AM - 12:00PM Room: S405AB

BQ GU MR MI OI

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

FDA Discussions may include off-label uses.

Participants
Peter L. Choyke, MD, Rockville, MD (*Moderator*) License agreement, Koninklijke Philips NV; Researcher, Koninklijke Philips NV; License agreement, ScanMed; License agreement, Rakuten Medical; Researcher, Rakuten Medical; Researcher, General Electric Company; Researcher, Progenics Pharmaceuticals, Inc; Researcher, Novartis AG; ; ; ; ;
Vikas Kundra, MD, PhD, Houston, TX (*Moderator*) Institutional license agreement, Introgen Therapeutics, Inc; Research Grant, General Electric Company

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LEARNING OBJECTIVES

1) To understand current advances in PET molecular imaging and clinical applications. 2) To understand new applications of advanced MRI techniques. 3) To improve understanding of theranostic agents based on targeted imaging agents. 4) To improve understanding of imaging delivered gene expression.

Sub-Events

MSMI22A Hyperpolarized MRI of Cancer

Participants
Daniel B. Vigneron, PhD, San Francisco, CA (*Presenter*) Research Grant, General Electric Company;

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MSMI22B Imaging of Delivered Gene Expression

Participants
Vikas Kundra, MD, PhD, Houston, TX (*Presenter*) Institutional license agreement, Introgen Therapeutics, Inc; Research Grant, General Electric Company

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LEARNING OBJECTIVES

1) To improve understanding of imaging of delivered gene expression. 2) Multiple modalities and reporter systems will be discussed.

MSMI22C PSMA Imaging in Prostate Cancer

Participants
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LEARNING OBJECTIVES

1) To understand the basic biology of PSMA and its role in prostate cancer. 2) To describe the sensitivity of PSMA PET with regard to other PET agents for prostate cancer. 3) To demonstrate potential pitfalls and unexpected findings with PSMA PET imaging.

ABSTRACT

PSMA PET imaging is a highly sensitive method of detecting prostate cancer. It can be used in the initial diagnosis and staging, for recurrence and to assess metastatic disease. PSMA is expressed in aggressive cancers but not in low grade or highly undifferentiated cancers. It is superior to all other PET agents in terms of sensitivity especially in the recurrence setting. It can be used to determine if lesions seen on CT or MRI are related to prostate cancer. Pitfalls include false negatives in highly aggressive disease, the diagnosis of additional malignancies and false positives in the cisterna chyli and fibrous dysplasia. PSMA PET will have a

profound impact on the management of prostate cancer.

MSMI22D Gastrin Releasing Peptide Receptors: When in the Course of Prostate Cancer Will They Be Useful?

Participants
Andrei Iagaru, MD, Emerald Hills, CA (*Presenter*) Research Grant, General Electric Company Research Grant, Progenics Pharmaceuticals, Inc Research Grant, Advanced Accelerator Applications SA

LEARNING OBJECTIVES

1) List some of the radiopharmaceuticals targeting gastrin-releasing peptide receptors that are used in prostate cancer. 2) Understand underlying biology and mechanism of action for the radiopharmaceuticals targeting gastrin-releasing peptide receptors in prostate cancer. 3) Discuss patterns of prostate cancer appearance when using the radiopharmaceuticals targeting gastrin-releasing peptide receptors.

ABSTRACT

Various radiopharmaceuticals targeting different molecules have been studied in prostate cancer (PC). One recent class of tracers are the gastrin releasing peptide (GRP) analogs. Bombesin (BBN) is analog to the mammalian GRP, and it binds with high affinity to its transmembrane receptors, the GRP receptors (GRPR). Preclinical evaluation in PC cells and animal models have reported encouraging results; therefore, they are currently investigated as targets both for PC imaging and therapy. Increases in GRPR expression have been shown in 63-100% of intraprostatic PC, and 50-80% of nodal and osseous metastases. High density expression of GRPR has been reported in primary PC in contrast to surrounding healthy tissues and hyperplastic prostate, allowing for detection of early neoplastic events in the prostate with high specificity.

MSMI22E Iron Oxide Enhanced MR Imaging in GU Malignancies

Participants
Baris Turkbey, MD, Bethesda, MD (*Presenter*) Research support, Koninklijke Philips NV; Royalties, Invivo Corporation; Investigator, NVIDIA Corporation

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LEARNING OBJECTIVES

1) Understand mechanism of iron-oxide enhanced MRI. 2) Understand imaging findings of iron-oxide enhanced MRI. 3) Understand pitfalls and limitations of iron-oxide enhanced MRI.

ABSTRACT

n/a

MSRO26

BOOST: Gynecologic-Anatomy and Treatment Planning (Interactive Session)

Monday, Dec. 2 10:30AM - 12:00PM Room: S103CD

GU OI RO

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

Participants
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LEARNING OBJECTIVES

1) Describe the appropriate indication and use of pre treatment imaging in the management of patients with endometrial, cervical and vulvar cancer. 2) Describe updates in the primary surgical treatment of patients with endometrial and cervical cancer. 3) Describe the appropriate use of radiation therapy in the treatment of patients with uterine, cervical and vulvar cancer.

ABSTRACT

At the conclusion of this session, attendees will be able to describe updates in the pre treatment imaging of patients with endometrial, cervical and vulvar cancer. Participants will also be able to describe updates in the surgical and radiation treatment of patients with endometrial, cervical and vulvar cancer.

Printed on: 10/29/20

SSC07

Science Session with Keynote: Genitourinary (Prostate MRI in Biopsy, Therapy, and Surveillance)

Monday, Dec. 2 10:30AM - 12:00PM Room: E260

GU MR OI

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

FDA Discussions may include off-label uses.

Participants
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Ronaldo H. Baroni, MD, Sao Paulo, Brazil (*Moderator*) Nothing to Disclose

Sub-Events

SSC07-01 Genitourinary Keynote Speaker: Next Generation Prostate Imaging

Monday, Dec. 2 10:30AM - 10:40AM Room: E260

Participants
Daniel J. Margolis, MD, New York, NY (*Presenter*) Consultant, Blue Earth Diagnostics Ltd

PURPOSE

Prostate imaging has transformed over the past decade, with the advent of iterations on multiparametric MRI in addition to small-molecule PET agents targeting the extracellular domain of prostate specific membrane antigen (PSMA) and high-resolution ultrasound. These innovative magnetic resonance imaging techniques both facilitate new treatment methods, and more importantly, allow for assessment of the efficacy of these new treatments. From MRI-ultrasound image fusion targeted biopsy and ablation to quantitative assessment of treatment response of medical and ablative therapies, the field of prostate imaging is rife with novel applications. These techniques individualize patient care through more accurate identification of the location and stage of prostate cancer so that only significant cancers receive treatment, and then monitor the response to directed therapies. Perhaps most intriguing is the application of artificial intelligence, which augments the radiologist's acumen, improving the value we deliver to our patients. We stand on the cusp of the age of radiologist-driven prostate cancer management.

SSC07-02 MR-US Fusion Prostate Biopsy: The Added Value of Systematic Core Biopsy to MR-Targeted Cores for Prostate Cancer Grading

Monday, Dec. 2 10:40AM - 10:50AM Room: E260

Participants
Sohrab Afshari Mirak, MD, Los Angeles, CA (*Presenter*) Nothing to Disclose
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Anthony Sisk, DO, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

To investigate the value of the systematic core biopsy (S-Bx) to MR-US fusion targeted core biopsy (MR-F Bx) for detection and grading of prostate cancer (PCa) using whole mount histopathology (WMHP) as reference.

METHOD AND MATERIALS

This IRB approved, HIPAA compliant observational study cohort comprises 295 patients with 716 pathology PCa lesions, who underwent MR-F bx prior to radical prostatectomy, between 7/2010-2/2019. All patients had MR-F Bx and S-Bx. The pathology reports of all of the cores were evaluated and the characteristics of patients with higher reported Gleason score (GS) for S-Bx as compared to MR-F bx were assessed.

RESULTS

Mean patient age and PSA were 62.9±6.3 years and 8.9±10.5 ng/ml, respectively. Mean PCa lesion number on WMHP was 2.4 (1-6). Mean S-Bx and MR-F bx cores were 11.4 (6-16) and 5.3 (1-10), respectively. Mean positive cores for S-Bx was 3 (0-12) and for MR-F Bx was 3.3 (0-10). The per-patient performance of S-Bx and MR-F Bx for PCa detection were 82.4% (243/295) and 95.6% (282/295), respectively. Overall, 37.6% (111/295), 48.8% (144/295) and 13.6% (40/295) of cases had similar GS in S-Bx and MR-F Bx, higher GS in MR-F Bx and higher GS in the S-Bx, respectively. In 4.1% (12/295) of all cases, S-Bx cores upgraded PCa from GS 6 to GS>6. Among cases with higher GS in S-Bx, 32.5% (13/40) cases had benign findings on MR-F bx. 82.5% (33/40) of the higher GS cases in S-Bx were taken from the same lesion as MR-F Bx as a result of wider sampling and the characteristics of these lesions

were as follows: 51.5% (17/33) PIRADSv2 score 3, 33.3% (11/33) score 4 and 15.2% (5/33) score 5; 14.5% (15/33) in apex, 33.3% (11/33) in midgland and 21.2% (7/33) in base; 42.4% (14/33) in a different sextant for the same lesion in contralateral side (3/14) or a different level (11/14). In 22.5% (9/40) of all cases with higher GS in S-Bx and in 8.3% (1/12) of upgraded cases from GS 6 to >6 in S-Bx, the report of the higher GS was false considering WMHP.

CONCLUSION

Although S-Bx at the time of MR-F Bx can slightly improve PCa grading, however, in almost one quarter of the cases, we found false upgrading. The true rate of upgrading with S-Bx is minimal and significant portion of the upgraded lesions are ipsilateral to the target.

CLINICAL RELEVANCE/APPLICATION

PCa treatment selection depends on the results of the prostate biopsy. S-Bx improves diagnostic yield only slightly for clinically significant disease over MR-F Bx.

SSC07-03 Manual Adjustment in mpMRI-Guided Prostate Biopsy Significantly Improves the Detection Rate of Prostate Cancer: Experience in 400 Patients

Monday, Dec. 2 10:50AM - 11:00AM Room: E260

Participants
Sarah Alessi, MD, Milano, Italy (*Presenter*) Nothing to Disclose
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Gennaro Musi, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose
Roberto Bianchi, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose
Barbara Jereczek-Fossa, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Massimo Bellomi, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Ottavio de Cobelli, Milano , Italy (*Abstract Co-Author*) Nothing to Disclose
Giuseppe Petralia, MD, Milano, Italy (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

to compare the results of software-guided sampling with those obtained after manual adjustment in multiparametric MRI-guided prostate biopsy (mpMRI-PB) and to evaluate whether manual adjustment improves the detection rate of prostate cancer (PCa).

METHOD AND MATERIALS

We enrolled 400 consecutive patients between November 2014 and February 2018, who underwent mpMRI-PB of the target lesion visible on previous mpMRI (average 11.6 mm, range 4-40mm). All mpMRI-PBs were performed on a 1.5T MR scanner (Magnetom Avanto, Siemens Healthineers, Germany) using a commercially available MR transrectal biopsy device (DynaTRIM, Invivo, USA). After calibration of the biopsy device, the first sample was obtained using the coordinates provided by the device software to guide the needle along a trajectory to the target lesion. The trajectory was then manually adjusted to improve localization to the target lesion for further biopsy samples.

RESULTS

225 out of 400 patients were positive for PCa after mpMRI-PB, with PCa diagnosed in 55/62 PI-RADS 5 (88.7%), 136/188 PI-RADS 4 (72.3%), 33/127 PI-RADS 3 (25.9%) and 1/23 PIRADS 2 lesions (4.3%). The first sample was positive for PCa in just 117 cases. After manual adjustment, an additional 108 positive biopsies were obtained, corresponding to an increase in the detection rate of 92.3% ($p < 0.0001$; McNemar's Test). The core involvement averaged 50.3% (range 1-100%). To date, 101 of the 225 PCa patients have undergone surgery, with an average lesion diameter in the surgical specimen of 15.7 mm (range 5-40mm).

CONCLUSION

Manual adjustment of needle trajectory significantly improves the detection rate of PCa when performing mpMRI-PB.

CLINICAL RELEVANCE/APPLICATION

mpMRI guided prostate biopsy is associated with an improvement of detection rate of prostate cancer after manual adjustment of needle trajectory.

SSC07-04 Deep Learning-Based Automated Segmentation of Prostate Cancer on Multiparametric MRI: Comparison with Experienced Uroradiologists

Monday, Dec. 2 11:00AM - 11:10AM Room: E260

Participants
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PURPOSE

To compare the performance of deep learning based prostate cancer (PCa) segmentation with manual segmentation of experienced uroradiologists.

METHOD AND MATERIALS

From 2011 Jan to 2018 Apr, 350 patients who underwent prostatectomy for prostate cancer were enrolled retrospectively. To collect histopathological ground truth, pathologic slides of whole resected prostate were scanned and PCa lesions were drawn by a uropathologist with 25 years' experience. With reference to the histopathological lesion, radiological ground truth of PCa was drawn on the T2 weighted image by a uroradiologist with 19 years' experience. A U-Net type deep neural network, in which the encoder part has more convolution blocks than the decoder, was trained for segmentation. Four different MR sequences including T2 weighted images, diffusion weighted images (b = 0, 1000), and apparent diffusion coefficient (ADC) images, were used as input images after affine registration. Besides the automatic segmentation by the deep neural network, two experienced uroradiologists marked suspected sectors of PCa among 39 sectors provided by PIRADS-v2 after reviewing same images of four MR sequences. The manual segmentation performance of uroradiologists was measured using the number of sectors that coincided with the ground truth PCa lesion.

RESULTS

The dice coefficient scores (DCSs) achieved by two uroradiologists were 0.490 and 0.310 respectively. The DCS was calculated based on the number of sectors. The DCS of automatic segmentation by a deep neural network was 0.558 (calculated by the number of pixels) which is slightly better than the average (0.40) DCSs of uroradiologists.

CONCLUSION

Automated segmentation of PCa on multiparametric MR based on histopathologically confirmed lesion label achieved comparable performance with experienced uroradiologist.

CLINICAL RELEVANCE/APPLICATION

The automated segmentation of prostate cancer using a deep neural network not only reduce time consuming work but also provide reliable location and size information required for treatment decision.

SSC07-05 Multiparametric MRI Can Exclude Prostate Cancer Progression in Patients Under Active Surveillance

Monday, Dec. 2 11:10AM - 11:20AM Room: E260

Participants
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PURPOSE

To assess the ability of multiparametric MRI (mp-MRI) of the prostate to exclude prostate cancer (PCa) progression in patients under active surveillance.

METHOD AND MATERIALS

One hundred and forty-seven consecutive patients under active surveillance with known PCa with a Gleason score of 3+3=6 or 3+4=7a were initially enrolled and received mp-MRI (T2WI, DWI, DCE-MRI) of the prostate at 3T. Of these patients, fifty-five received follow-up MRI after a minimum interval of 12 months with subsequent targeted MR/US fusion-guided (FUS-GB) plus systematic transrectal ultrasound-guided (TRUS-GB) biopsy. Primary endpoint was negative predictive value (NPV) of the follow-up mp-MRI to exclude tumor progression. Secondary endpoints were positive predictive value (PPV), sensitivity, specificity, and cancer upgrade after initial mp-MRI.

RESULTS

Of 55 patients 28 (51%) had a Gleason score upgrade in the re-biopsy. All of the 28 patients showed findings in the follow-up mp-MRI that were suspicious of tumor progress. 16 of 55 patients (29%) showed signs of tumor progress in the follow-up MRI but had a stable re-biopsy. 11 of 55 patients (20%) showed no signs of progress in follow-up MRI and none of these patients had a Gleason score upgrade in the re-biopsy. NPV was 100%. PPV was 64%. Sensitivity was 100% and specificity 59%.

CONCLUSION

MP-MRI can reliably exclude PCa progression in patients under active surveillance. Over 60% of the patients with signs of tumor progress in follow-up mp-MRI had a Gleason score upgrade in repeat biopsy.

CLINICAL RELEVANCE/APPLICATION

Patients under active surveillance should receive follow-up MRI to monitor tumor progress. Standard re-biopsy protocols might be waived if follow-up mp-MRI is stable.

SSC07-06 Post-ablation Prostate Imaging Reporting and Data System (PAPI-RADS): Preliminary Results at 12 Months After Whole-Gland MRI-Guided Transurethral Ultrasound Ablation (TULSA)

Monday, Dec. 2 11:20AM - 11:30AM Room: E260

Participants
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Sandeep S. Arora, MBBS, Nashville, TN (*Abstract Co-Author*) Speaker, Profound Medical Inc Researcher, Profound Medical Inc
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Joyce G. Bomers, Arnhem, Netherlands (*Abstract Co-Author*) Nothing to Disclose
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Thorsten Persigehl, MD, Koeln, Germany (*Abstract Co-Author*) Nothing to Disclose
Kiran R. Nandalur, MD, Bloomfield Hills, MI (*Abstract Co-Author*) Nothing to Disclose
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Mathieu Burtnyk, DIPLPHYS, Toronto, ON (*Abstract Co-Author*) Employee, Profound Medical Inc
David Bonekamp, MD, PhD, Heidelberg, Germany (*Abstract Co-Author*) Speaker, Profound Medical Inc
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Aytekin Oto, MD, 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; Consultant, IBM Corporation; ; ;

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PURPOSE

PI-RADS v2 criteria do not specifically address evaluation of the prostate gland after non-surgical treatment. We present a modified scoring system for MRI detection of prostate cancer (PCa) in the post-ablation setting (PAPI-RADS), comparing the preliminary diagnostic performance of PAPI-RADS and PI-RADS v2 against histopathology.

METHOD AND MATERIALS

PAPI-RADS was defined by consensus among radiologists participating in an IRB-approved, HIPAA-compliant 13-center pivotal trial of whole-gland MRI-guided transurethral ultrasound ablation (TULSA) in 115 men with PCa. The proposed system uses a 5-point likelihood score for residual/recurrent PCa, with the same MRI acquisition parameters recommended by PI-RADS v2. PAPI-RADS criteria give emphasis to focal early enhancement on dynamic contrast-enhanced images, over abnormal T2-weighted hypointensity or diffusion restriction. We present the interpretation by 13 on-site radiologists, in addition to a separate blinded central radiologist who scored all 12-month MRIs according to PI-RADS v2 and PAPI-RADS. Diagnostic accuracy was assessed against histopathology obtained at 12-month post-ablation 10-core biopsy.

RESULTS

At time of this submission, local PI-RADS v2 was available for 111/111 men with 12-month MRI and biopsy, central PI-RADS v2 for 76/111. At 12 months, local and central radiologists identified PI-RADS v2 score >=3 and >=4 lesions in 28/111 (25%) and 13/111 (12%) men, vs. 23/76 (30%) and 15/76 (20%) men, respectively. Local and central PAPI-RADS was available for 55/111 and 29/55 men, with score >=3 and >=4 lesions identified in 12/55 (22%) and 9/55 (16%) of men, vs. 7/29 (24%) and 5/29 (17%). Preliminary diagnostic performance of both criteria against 10-core biopsy (median sampling density 1.0 cores/cc) are listed in Table 1, with higher negative predictive values for PAPI-RADS (local: 96% vs. 89% for score >=4, central: 92% vs. 90%). Results from all patients will be available in December.

CONCLUSION

Preliminary results of 12-month post-ablation mpMRI with the proposed PAPI-RADS scoring system provided improved diagnostic performance for detection of prostate cancer over PI-RADS v2.

CLINICAL RELEVANCE/APPLICATION

PI-RADS v2 was designed for treatment-naïve prostates. The proposed modified post-ablation MRI criteria improves accuracy by addressing prostate tissue changes following ablative therapy for PCa.

SSC07-07 Pivotal Trial of MRI-Guided Transurethral Ultrasound Ablation (TULSA) in Patients with Localized Prostate Cancer

Monday, Dec. 2 11:30AM - 11:40AM Room: E260

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PURPOSE

MRI-guided transurethral ultrasound ablation (TULSA) is an incision-free method for customized prostate ablation using directional ultrasound under MRI thermometry feedback control. We report 12-month (12mo) outcomes from the TULSA-PRO Ablation Clinical Trial (TACT) Pivotal study.

METHOD AND MATERIALS

TACT enrolled 115 men with localized prostate cancer at 13 sites. Treatment intent was whole-gland ablation sparing the urethra and urinary sphincter. Primary endpoints were adverse events and proportion of men with PSA reduction >=75%. Secondary endpoints included 12mo 10-core biopsy, mpMRI, prostate volume reduction, and quality of life.

RESULTS

Median (IQR) age was 65 (59-69) years and PSA 6.3 (4.6-7.9) ng/ml. Pre-treatment, 72/115 (63%) men had Grade Group 2 (GG2) disease. PI-RADSv2 score >=3 lesions were present in 98/115 (85%) men, >=4 in 77 (67%). Ablation times were 51 (39-66) min for targeted prostate volumes of 40 (32-50) cc. MRI thermometry during treatment indicated 98% (95-99%) thermal coverage with ablation precision of ±1.4 mm, confirmed qualitatively by post-treatment CE-MRI. Grade 3 adverse events occurred in 8% of men (all resolved), with no rectal injuries or Grade >=4 events. At 12mo, 1% of men were incontinent (>1 pad/day), and 69/92 (75%) maintained erections sufficient for penetration (IIEF Q2 >=2). PSA reduction >=75% was achieved in 110/115 (96%), with median reduction of 95% and nadir of 0.34 ng/ml. Median perfused prostate volume decreased from 41 to 4 cc at 12mo MRI. Of 68 men with baseline GG2 disease, 54 (79%) were free of GG2 on 12mo biopsy. Overall, 72/111 (65%) had no evidence of any cancer. Of 98 men with PI-RADSv2 >=3 at baseline, 26 had MRI lesions at 12mo, 11/26 with biopsy-confirmed GG2 (negative predictive value, NPV 93%). Multivariate predictors of residual GG2 included intraprostatic calcifications at screening, MRI thermal coverage of target volume, and PI-RADSv2 >=3 at 12mo ($p<0.05$).

CONCLUSION

The TACT Pivotal study of MRI-guided TULSA for whole-gland ablation in men with localized prostate cancer met its primary PSA endpoint in 96% of patients, with low rates of severe toxicity and residual GG2 disease. MRI at 12mo detected residual disease with NPV of 93%.

CLINICAL RELEVANCE/APPLICATION

Whole-gland ablation using MRI-guided TULSA achieves predictable PSA and prostate volume reduction. Multiparametric MRI is promising for post-TULSA follow-up.

SSC07-08 Early Diffusion and Perfusion Changes of Prostate Cancer on IVIM MR Imaging after ADT Therapy

Monday, Dec. 2 11:40AM - 11:50AM Room: E260

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PURPOSE

To investigate the usefulness of intravoxel incoherent motion (IVIM) MR in early detection of therapeutic changes from androgen deprivation therapy (ADT) in prostate cancer patients.

METHOD AND MATERIALS

MR examinations in 22 patients with advanced prostate cancer were performed before and three months after ADT treatment, using a 3.0T system (Ingenia, Philips Healthcare) equipped with a 16-channel body coil. The imaging protocol included axial T1WI ,axial T2WI , coronal T2WI and axial IVIM. The IVIM was performed at 11 b values of 0, 10, 20, 30, 50, 75, 100, 250, 500, 750 and 1000s/mm2. T2WI and IVIM images were qualitatively reviewed by an experienced radiologist. The prostate-specific antigen (PSA) levels were also assessed. The diffusion coefficients (D), perfusion fractions (f) and the perfusion-related diffusion Coefficient (D*) values were quantitatively measured in the prostate cancer area and bone metastasis. Changes in these IVIM measurements between pre- and post-treatment timepoints were evaluated using a paired Student t test. $P<0.05$ indicated a significant difference.

RESULTS

Prostate and tumor volume of the patients showed different degrees of reduction after ADT therapy except for 3 patients. T2-weighted images signal was diffusely reduced after therapy. The signal intensities of most cancerous and non-cancer areas were visually similar. The mean PSA level was significantly reduced. At 3 months after treatment, the D value of cancer area ((0.902±0.118)×10-3mm2/s) was significantly increased as compared with the pretreatment value ((0.585±0.142)×10-3 mm2/s), ($p < 0.001$). The f value of cancer area (0.299±0.074) was significantly increased compared with the pretreatment one (0.254±0.064) ($P < 0.05$). The D and f value of bone metastases was significantly increased after treatment ($P < 0.05$). D* showed no significant changes before and after treatment.

CONCLUSION

T2WI images after ADT therapy are of little value for determining the location and boundary of the tumor. The IVIM MR allows non-invasive quantitative characterization of biological changes (both diffusion and perfusion fraction) of prostate cancer after treatment. This technique may potentially be useful for the evaluation of therapeutic effect and risk for recurrence.

CLINICAL RELEVANCE/APPLICATION

It may have potential technique in the evaluation of therapeutic effect and early prediction of efficacy.

SSC07-09 Baseline Multiparametric MRI Characteristics of Exceptional Pathologic Response to Neoadjuvant Enzalutamide for High-Risk, Localized Prostate Cancer

Monday, Dec. 2 11:50AM - 12:00PM Room: E260

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PURPOSE

To assess multiparametric MRI (mpMRI) characteristics of high-risk prostate cancer patients demonstrating minimal residual disease (MRD) at radical prostatectomy (RP) after neoadjuvant androgen deprivation therapy (ADT) + enzalutamide.

METHOD AND MATERIALS

Patients with untreated high risk prostate cancer enrolled on a clinical trial evaluating neoadjuvant ADT + enzalutamide (160mg/day), receiving mpMRIat baseline and 6-months post-treatment followed by RP. RP specimens were sectioned in same plane as MR using a patient-specific 3D printed mold. Fixed tissue sections of baseline biopsy and tumor on RP specimens were stained, laser capture microdissected, and analyzed using whole exome sequencing to define clonally independent tumors. Non-responding tumors were pathologically defined by residual tumor burden >0.05 cc, measured by an expert GU pathologist. All mpMRI imaging was interpreted by a single expert radiologist. Regions encompassing suspected lesions were contoured at baseline and follow-up. Quantitative characteristics including volume, Apparent Diffusion Coefficients (ADC), and perfusion (Ktrans; calculated using a two compartment Tofts model with standardized arterial input function) were collected. Association between metrics and residual disease was evaluated using appropriate nonparametric statistical testing.

RESULTS

31 patients completed all imaging and RP, with 49 lesions detected on baseline mpMRI, of which 39 remained measurable at 6-mo. follow-up imaging. Two patients had at least 2 clonally independent lesions distinguishable on baseline imaging showing differential response at RP assessment. Lesion burden at both mpMRI timepoints was strongly associated with residual cancer (N=16) on pathology (p=0.002 vs p=0.003, respectively). Baseline summary diffusion (ADC) and perfusion (Ktrans) characteristics showed modest association to residual disease, further enhanced when assessing heterogeneity of signal intensity (ADCentropy 0.003, Ktrans,entropy 0.056).

CONCLUSION

While quantitative mpMRI metrics have shown correlation to Gleason grading and disease burden in untreated cases, distinct features also correlate with likelihood of residual cancer burden after intensive neoadjuvant therapy.

CLINICAL RELEVANCE/APPLICATION

Selection of patients based on these parameters may improve overall responses to treatment in subsequent clinical trials.

GUS-MOA

Genitourinary Monday Poster Discussions

Monday, Dec. 2 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
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Sub-Events

GU206-SD-MOA1 Intrauterine Saclike Fluid Collection in Early Pregnancy: Does it Matter if it Has an Echogenic Rim or a Sonographic "Sign"?

Station #1

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PURPOSE

To determine whether sonographic features of an intrauterine round or oval fluid collection ("saclike structure"), including the presence or absence of an echogenic rim, double sac sign, or intradecidual sign, are helpful in early pregnancy for determining whether the saclike structure is a gestational sac or for predicting prognosis.

METHOD AND MATERIALS

We identified all sonograms performed on women with positive hCG at our institution between 1/1/2012 and 6/30/2018 meeting the following criteria: presence of a saclike structure in the mid-uterus without yolk sac or embryo; no extraovarian adnexal mass; and follow-up information identifying location of the pregnancy as intrauterine or ectopic. Study authors reviewed sonographic images on all cases and recorded the following information: presence or absence of each of: echogenic rim around the collection, double sac sign (DSS), and intradecidual sign (IDS); and mean sac diameter.

RESULTS

650 sonograms met the inclusion criteria. Of these, 599 fluid collections demonstrated an echogenic rim, 182 a DSS, and 348 an IDS (findings not mutually exclusive). In all 650 cases, subsequent sonogram or other clinical follow-up confirmed that the patient had an intrauterine pregnancy. That is, none of the fluid collections proved to be intrauterine fluid with an ectopic pregnancy (sometimes termed "pseudogestational sac"). 41.2% were live at the end of the first trimester and 58.8% miscarried. None of the sonographic features (echogenic rim, DDS, IDS, mean sac diameter) of a saclike structure were predictive of prognosis, with no statistically significant relationship between presence or absence of one or two echogenic rings and outcome (p>.05, chi-squared).

CONCLUSION

In a woman with a positive hCG and no extraovarian adnexal mass, the sonographic finding of a saclike structure in mid-uterus is virtually certain to be a gestational sac. Sonographic features of the structure are of no diagnostic or prognostic value. Concepts introduced 30-40 years ago when ultrasound equipment had far lower resolution than currently, including DDS, IDS, and pseudogestational sac, have no role today in assessing early pregnancy.

CLINICAL RELEVANCE/APPLICATION

In a woman with a positive hCG, any round or oval fluid collection in the mid-uterus should be interpreted as a highly likely gestational sac. Sonographic "signs" are of no diagnostic value.

GU207-SD-MOA2 Phase II Study to Evaluate Transrectal, Magnetic Resonance Image-Guided Laser Focal Therapy of Prostate Cancer in an Outpatient Setting Using Realtime MR-Thermometry: Ten Year Interim Results

Station #2

Participants
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PURPOSE

In the United States alone, new prostate cancer cases for 2018 were estimated at 164,960 and deaths at 29,430 according to the SEER Stat Database: Cancer Stat Facts: Prostate Cancer Statistics at a Glance, Estimated New Cases in 2018 and Estimated Deaths in 2018. Focal therapies for localized prostate cancer are increasingly being explored. Additionally, new treatments for patients with biochemical recurrence of prostate cancer are also under investigation. Our objective is to investigate the efficacy ofoutpatient MR-guided laser focal therapy for MR visible prostate cancer utilizing a transrectal approach for laser applicator placement and therapy delivery.

METHOD AND MATERIALS

All MRI-guided therapy was delivered using a 1.5 Tesla Philips Achieva XR system (Philips Healthcare, Best, The Netherlands) for image acquisition and real-time thermometry. DynaLOC (Invivo, Orlando, FL, USA) software was used for interventional planning. Laser therapy was delivered using a Visualase (Medtronic, Minneapolis, MN, USA) 15W, 980 nm diode laser with cooled (Medtronic, Minneapolis, MN, USA) or non-cooled (Clincal Laserthermia Systems, Framingham, MA, USA) laser fiber introduced transrectally.

RESULTS

136 men were treated. 210 cancer foci were treated. 115 of 136 patients were treatment naïve (85%). The remaining 21 patients were salvage patients (15%). Mean initial PSA was 7.4 ng/mL and the age range 44-87 years (mean = 67 years). Procedure time was1-4 hours. Post-treatment, mean PSA nadir was 3.65 ng/mL (51% mean decline in all patients at 6 months). No serious adverse events or morbidity were reported. 36 treatment regions were positive at six months biopsy for clinically significant prostate cancer (23% marginal recurrence or recurrent prostate cancer rate). We observed no statistically significant change in IPSS and SHIM scores at 12 months post-treatment.

CONCLUSION

Our data indicate that outpatient, transrectally delivered MRI-guided laser focal therapy for prostate cancer is both safe and feasible, achiving oncologic control in 77% of patients.

CLINICAL RELEVANCE/APPLICATION

In the current climate of cost-reduction and emphasis on minimally-invasive treatment of cancer, focal treatment of prostate cancer may be an attractive option. The precise energy delivery under MRI-guidance may have favorable results for cost control and quality of life without eliminating the possibility of whole-gland treatment in the patient's future.

GU208-SD-MOA3 The Development of Deep Learning Based Prostate Cancer Detection System of MRI with Automatically Stitched Histopathologic Gold Standards

Station #3

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PURPOSE

To develop deep learning (DL) based prostate cancer detection system of MRI

METHOD AND MATERIALS

From 2011 Jan to 2018 Apr, a total of 2364 patients who underwent prostatectomy for prostate cancer were enrolled retrospectively. Finally, 350 patients examined with 3T MRI and underwent radical prostatectomy were included in the study. Image sets of T2 weighted images, diffusion weighted images (b=0, 1000) and ADC images were acquired (N=20328). For histopathological gold standard, pathologic slides of whole resected prostate were scanned and automatically stitched by in house developed software. Areas of cancer were drawn by a 25 year experienced uropathologist in slide by slide. Manual segmentation of cancer was done on the T2 weighted image by a 19 year experienced uroradiologist, based on pathology scans and played as gold standards of cancer. MR Images were registered one another by affine transformation. Images from 350 patients were split into learning set (N=300) and test set (N=50). We developed a deep neural network based on the fully convolutional networks (FCN) which predicts prostate cancer from prostate multi-parametric MR image. Our DL model was trained to simultaneously cancer detection and lesion segmentation which facilitates the relevant feature extraction for the categorization. MR images were reviewed by two independent uroradiologists. All readings were done based on PIRADS (Prostate Imaging Report and Data System) V2 and suspected segments of cancer were marked in 39 segments of prostate, suggested from PIRADS V2. ROC curve analysis was done for the evaluation of models from DL. Sensitivity, specificity, PPV, NPV, accuracy of test set were calculated by lesion based and compared with those from DL.

RESULTS

The overall accuracy of developed DL model was 0.85 and AUC of prediction model was 0.89. The accuracies of uroradiologists were from 0.83 to 0.84, which were similar to DL accuracy. Specificity was over 0.92 in two radiologists but sensitivities were varied from 0.22 to 0.46. Sensitivity of DL was highest (0.69) over the uroradiologists.

CONCLUSION

DL can detect prostate cancer as accurate as experienced uroradiologists.

CLINICAL RELEVANCE/APPLICATION

DL prediction of prostate cancer can help the PIRADS scoring of cancer, decision and guidance of biopsy in suspected patients.

GU230-SD-MOA4 A Predictive Nomogram for Individualized Recurrence Stratification of Bladder Cancer Using Multiparametric MRI and Clinical Risk Factors

Station #4

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PURPOSE

To develop and validate a nomogram based on radiomics and clinical predictors for personalized prediction of the first two years (TFTY) bladder cancer (BCa) recurrence after operation.

METHOD AND MATERIALS

The preoperative MRI's of 71 BCa patients (34 recurrent) were evaluated which were divided into training cohort (n=50) and validation cohorts (n=21). The multiparametric MRI sequences obtained on 3.0T MR scanner including T2-weighted (T2W), diffusion-weighted (DW) and dynamic contrast enhanced (DCE) image sequence. Radiomics features were extracted from the T2W, DW, apparent diffusion coefficient and DCE images of each patient. A Rad_Socre model was constructed by using the support vector machine-based recursive feature elimination (SVM-RFE) algorithm and multivariate logistic regression model with the training cohort. Combined with the essential clinical factors mainly including patients' age at the time of initial surgery, gender, tumor histological grade and stage of the archived tumor with the maximal size in bladder lumen, tumor size and number, a radiomics-clinical nomogram was developed. Its performance was evaluated using the training and the validation cohorts. The potential clinical usefulness was demonstrated by using decision curve analysis. Cox proportional hazard models were performed to explore the association between clinical factors and Rad_Score with recurrence.

RESULTS

Of the 1872 features, the 32 with the highest AUC of receiver operating characteristic (0.8634) were selected with the training cohort, and were used for the Rad_Score model construction. The nomogram developed by two independent predictors, muscle-invasive status (MIS) and Rad_Score, showed good performance in the training cohort (Accuracy 88%, AUC 0.915, $p << 0.01$) and the validation cohort (Accuracy 80.95%, AUC 0.838, $p = 0.009$). The decision curve further demonstrated more net benefit by using the radiomics-clinical nomogram model than using radiomics or clinical model alone.

CONCLUSION

The proposed radiomics-clinical nomogram has potential in the preoperative prediction of TFTY BCa recurrence.

CLINICAL RELEVANCE/APPLICATION

MRI is the most ideal and noninvasive imaging modality for recurrence detection in BCa. Radiomics-clinical nomogram based on multiparametric MR imaging features as well as several important clinical factors associated with tumor recurrence has the potential for an accurate prediction for tumor recurrence.

GU231-SD-MOA5 Quantitative Assessment of Diffusion Kurtosis Imaging Depicting Deep Myometrial Invasion: A Comparative Analysis with Diffusion-Weighted Imaging

Station #5

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PURPOSE

To investigate histogram analysis of diffusion kurtosis imaging (DKI) and conventional diffusion-weighted imaging (DWI) to distinguish between deep myometrial invasion and superficial myometrial invasion in endometrial carcinoma (EC).

METHOD AND MATERIALS

A total of 118 pathologically confirmed EC patients with preoperative DWI were included. The data were postprocessed with a DKI (b value of 0, 700, 1400, and 2000 s/mm2) model for quantitation of apparent diffusion values (D) and apparent kurtosis coefficient values (K) for non-Gaussian distribution. The apparent diffusion coefficient (ADC) was postprocessed with a conventional DWI model (b values of 0 and 800 sec/mm2). A whole-tumor analysis approach was used. Comparisons of the histogram parameters of D, K and ADC were carried out for the deep myometrial invasion and superficial myometrial invasion subgroups. Diagnostic performance of the imaging parameters was assessed.

RESULTS

The Dmean, D10th, and D90th in deep myometrial invasion group were significantly lower than those in superficial invasion group ($p<0.001$, <0.001 and $=0.023$, respectively), as well as the ADCmean, ADC10th, and ADC90th ($p=0.001$, 0.001 and 0.042,

respectively). The Kmean and K90th were significantly higher in deep invasion group than those in superficial myometrial invasion group (p=0.002, and 0.026, respectively). The D10th, Kmean, and ADC10th had a relatively higher area under the curve (AUC) (0.72, 0.66, and 0.71, respectively) than other parameters did for distinguishing deep myometrial invasion of EC. D10th showed a relatively higher AUC than ADC10th did for the differentiation of lesions with deep myometrial invasion from those with superficial myometrial invasion (0.72 vs 0.71), but the variation was not statistically significant (p=0.35).

CONCLUSION

Distribution of DKI and conventional DWI parameters characterized by histogram analysis may represent an indicator for deep myometrial invasion in EC. Both DKI and DWI models showed relatively equivalent efficacy.

CLINICAL RELEVANCE/APPLICATION

Histogram analysis of diffusion kurtosis of magnetic resonace imaging can identify deep myometrial invasion in endometrial carcinoma from superfucial myometrial invasion as well as conventional diffusion weighted imaging did.

GU232-SD-MOA6 How 3 Tesla In-Bore MR-Guided Biopsy Improves Detection of Prostate Cancer: A Study on 426 Patients

Station #6

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PURPOSE

This study evaluates the diagnostic yield of 3 Tesla in-bore trans-rectal magnetic-resonance-guided biopsy (3T-MRGB) for prostate cancer (PCa) detection based on Prostate Imaging Reporting and Data System version 2 (PI-RADSv2) scoring in patients with either suspected PCa or under active surveillance.

METHOD AND MATERIALS

This IRB-approved, HIPAA-compliant, single-institution, the retrospective study assessed data of 426 consecutive patients (mean age: 69 years) who underwent 3T multiparametric MRI (mpMRI) and subsequent 3T in-bore prostate MRGB between February 2012 and July 2018. Three subcohorts included patients who were biopsy-naïve (23%, 98/426), those with the history of recent negative template trans-rectal ultrasound-guided biopsy (TRUS-GB) (39%, 166/426) and those under active surveillance (38%, 162/426). Clinically significant disease (CSD) was defined as a Gleason score (GS) >= 3+4. The detection rate was also stratified based on the pre-procedural PIRADSv2 score.

RESULTS

Mean interval time between mpMRI and 3T MRGB was 80 days with mean biopsy time of 54 minutes. MRGB detected PCa in 65.7% (280/426) of patients, of whom 74%(207/280) had CSD. Cancer detection rate was comparable between transitional (64.7%, 147/227) and peripheral zone (66.9%, 133/199) lesions (p>0.5). In-bore MRGB detected PCa in 45% (75/166) of patients with the history of recent negative TRUS-GB, in 64.3% (63/98) of biopsy-naïve patients and 80.2% (130/162) of those under active surveillance. In AS subcohort, in-bore 3T MRGB upgraded GS in 48.1%(78/162) of patients compared to GS from TRUS-GB. The overall PCa and CSD detection rates for PI-RADSv2 categories of 3, 4 and 5 were 35%, 72.6%, 94.2%; and 23.3%, 54%, 71.6% respectively. A moderately high correlation was seen between PIRADSv.2 score and PCa detection rate (rs: 0.55, P<0.001). The rate of urosepsis was 1% (4 patients).

CONCLUSION

3T MRGB was safe and resulted in the detection of PCa in 45% of patients with recent negative TRUS-GB, in 64.3% of biopsy-naïve patients, and upgraded GS in 48.1% of patients under active surveillance. There was a moderately high PIRADS v.2 score correlation with 3T MRGB yield for PCa.

CLINICAL RELEVANCE/APPLICATION

In-bore MRGB has a high diagnostic yield in biopsy-naïve patients and patients with a history of negative TRUS-GB and can upgrade Gleason score in half of the low-grade prostate cancers.

UR180-ED-MOA7 Leave No Nephron Behind: A Review of Nephrometry Scoring Systems

Station #7

Participants
Shimwoo Lee, Los Angeles, CA (*Presenter*) Nothing to Disclose
Monica Deshmukh, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Evan A. Raff, MD, Sylmar, CA (*Abstract Co-Author*) Nothing to Disclose

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TEACHING POINTS

1. Review current management options for renal cell carcinoma. 2. Compare three different nephrometry scoring systems for renal tumors: R.E.N.A.L, P.A.D.U.A., and C-Index. 3. Discuss application of these scoring systems to guide renal tumor management and predict clinical outcomes. 4. Review multiple multimodality renal tumor cases

TABLE OF CONTENTS/OUTLINE

1. Background a. Current management of renal cell carcinoma b. Comparison of surgical and ablative therapies 2. Review of nephrometry scoring systems (Slide 1) a. R.E.N.A.L. b. P.A.D.U.A. c. C-Index 3. Use of scoring systems in preoperative/pretreatment planning (Slide 2) and review of nephrometry outcomes literature 4. Case examples with nephrometry scoring and clinical implications (Slides 3-5)

UR193-ED-MOA8 When, Where, and Why We Make Mistakes: Tips for Avoiding Errors in Genitourinary Exams

Station #8

Awards

Certificate of Merit

Participants
Luisa L. Faria, MD , Juiz de Fora, Brazil (*Presenter*) Nothing to Disclose
Regis Otaviano Bezerra, MD, Sao Paulo , Brazil (*Abstract Co-Author*) Nothing to Disclose
Irai S. Oliveira, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Fernando I. Yamauchi, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Publio C. Viana, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Giovanni G. Cerri, MD,PhD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose

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TEACHING POINTS

The process of radiologic image interpretation is very complex and errors or discrepancies are uncomfortably common. How to minimize mistakes is what every radiologist pursues in daily practice. A commonly used delineation divides radiologic error into cognitive (or interpretative) and perceptual errors. Perceptual errors are far more common, and occur when the radiologist fails to identify the abnormality, while cognitive errors occur when an abnormality is identified but the reporting radiologist fails to correctly understand or report its significance. The purpose of this exhibit is (1) to discuss perceptual and cognitive errors, focusing in genitourinary radiology, in a case-based approach of errors encountered at a large academic hospital and (2) to review how to minimize this errors.

TABLE OF CONTENTS/OUTLINE

(1) When? (a) traps of nonenhanced scan and wrong protocols (b) fail to consult prior imaging studies and clinical history. (2) Where? (a) blind spots (b) fail to consult reconstructions, phases or sequences. (3) Why? (a) satisfaction of search errors (b) satisfaction of report errors (c) anchoring bias. (4) A case-based approach focusing on how to reduce errors: kidney, collecting system, adrenal, bladder, prostate, retroperitoneum and female and male reproductive system.

GUS-MOB

Genitourinary Monday Poster Discussions

Monday, Dec. 2 12:45PM - 1:15PM Room: GU/UR Community, Learning Center

GU

AMA PRA Category 1 Credit ™: .50

FDA Discussions may include off-label uses.

Participants
Yuliya Lakhman, MD, New York, NY (*Moderator*) Nothing to Disclose

Sub-Events

GU209-SD-MOB1 Usefulness of Macroscopic Classification in pT3a Renal Cell Carcinoma

Station #1

Participants
Tetsuya Tachiiri, Kashihara, Japan (*Presenter*) Nothing to Disclose
Nagaaki Marugami, Kashihara, Japan (*Abstract Co-Author*) Nothing to Disclose
Satoshi Yamauchi, Kashihara, Japan (*Abstract Co-Author*) Nothing to Disclose
Kiyoyuki Minamiguchi, Kashihara, Japan (*Abstract Co-Author*) Nothing to Disclose
Ryosuke Taiji, Kashihara, Japan (*Abstract Co-Author*) Nothing to Disclose
Junko Takahama, MD, Kashihara, Japan (*Abstract Co-Author*) Nothing to Disclose
Kimihiko Kichikawa, MD, Kashihara, Japan (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The TNM classification of renal cell carcinoma (RCC) was updated in 2017. In this new classification, T3a consists of tumors with renal and peri-renal vein involvement and tumors with fat invasion. Especially, detection of sinus fat or renal vein invasion is important before partial nephrectomy for preventing pathological upstaging of clinical T1 to pathological T3. The purposed of this study is to evaluate the correlation between simple macroscopic classification of RCC and the pathological T stage (sinus fat or renal vein invasion).

METHOD AND MATERIALS

Materials were consecutive 308 RCC cases histologically proven less than pT3a which underwent surgical resection from January 2007 to October 2017. By using CT and/or MR images, all cases were simply macroscopically classified into 3 groups, mono-nodular, multi-nodular or teardrop shape by two radiologists. The correlation between macroscopic and pathological findings was retrospectively evaluated.

RESULTS

Of the all RCC cases, 83 cases were histologically proven as pT3a including invasion of renal vein or sinus fat. 96% (80 cases) of all pT3a cases were classified as either multi-nodular (72 cases) or teardrop shaped (8 cases). 99%(166/168cases) of mono-nodular carcinomas showed no invasion of sinus fat or renal vein. Macroscopic classification is strongly correlated with tumor size (Pearson coefficient r=0.56, p<0.01). Of RCC smaller than 4cm diameter case, teardrop shape or multi-nodular tumor were more commonly associated with sinus fat invasion than mono-nodular tumor (odds ratio, 55.14; 95% confidence interval, 7.07 to 430.10; p<0.001).

CONCLUSION

Simple macroscopic classification of renal cell carcinoma may be useful for detection of sinus fat or renal vein invasion. 96% (80 cases) of all pT3a cases were classified as either multi-nodular (72 cases) or teardrop shaped (8 cases). 99%(166/168cases) of mono-nodular carcinomas showed no invasion of sinus fat or renal vein.

CLINICAL RELEVANCE/APPLICATION

Before partial nephrectomy, the findings of macroscopic classification of RCC may be added in nephrectomy scoring system.

GU210-SD-MOB2 Contrast-Induced Nephropathy May Be Associated with HMGB1 which is Related to Sterile Inflammation

Station #2

Participants
Hyewon Oh, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Hyung Cheol Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Yong Eun Chung, MD, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

A nucleosome protein, HMGB1 (High mobility Group Box1) is the primary mediators of sterile immune response. Reactive oxygen species (ROS) which induce cytoplasmic translocation and extracellular release of HMGB1, is one of the major causes of contrast induced nephropathy (CIN). So the purpose of this study was to investigate the association between CIN and HMGB1

METHOD AND MATERIALS

The NRK-52E cell line (rat proximal tubular cells) were treated with iopamidol 50mgI, 100mgI, and 200mgI for 2h and harvested. Cell

The NRK-52E cell line (rat proximal tubular cells) were treated with iopamidol 50mgI, 100mgI, and 200mgI for 2h and harvested. Cell viability and oxidative stress were compared between control and iopamidol treated cell groups. Translocation of HMGB1 from nucleus to cytoplasm was assessed by immunohistochemistry and compared between groups. In animal experiment, CIN model was made by administering indomethacin (10mg/kg), L-NAME (15mg/kg), and iopamidol (1ml/kg) in Spargue-Dawley male rats. After 24 hours, blood was collected and blood urea nitrogen (BUN) and creatinine (Cr) were measured to confirm the development of CIN. Oxidative stress measured by TBARS assay and HMGB1 expression was measured by ELISA. Mann-Whitney test and Kruskal-Wallis test were used for the statistical analysis and $P<0.05$ was considered as statistically significant.

RESULTS

In vitro experiment, cell viability decreased (50mgI: 100mgI: 200mgI, 55.6±10.4%: 29.6±2.7%: 15.5±1.5%, compared to control: 100%) and oxidative stress (50mgI: 100mgI: 200mgI, 1.5±0.1: 1.6±0.1: 1.6±0.1, compared to control: 1) increased after iopamidol exposure according to iodine concentration. As the iodine concentration increased, cytoplasmic translocation of HMGB1 was noted in immunohistochemical staining. In vivo experiment, there was significant difference in BUN and Cr between control (BUN:Cr, 13±2.4:0.4±0) and CIN model (191±40.8:1.9±0.5, $P<0.05$). Oxidative stress (CIN/control, 1.4±0.2) and serum HMGB1 level (CIN/control, 2.0±0.7) was significantly increased in CIN model compared to control group ($P<0.05$).

CONCLUSION

Iodinated contrast media induces cytoplasmic translocation of HMGB1 related to sterile inflammation.

CLINICAL RELEVANCE/APPLICATION

HMGB1 may play a role in the development of CIN through sterile inflammation, so HMGB1 may be a new target for the prevention and treatment of contrast induced nephropathy.

GU211-SD-MOB3 Detection of Cervical Cancer Using Diffusion MRI with a Continuous-Time Random Walk Model

Station #3

Participants
Cui Feng, MD , Chicago, IL (*Presenter*) Nothing to Disclose
Guangyu Dan, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Kaibao Sun, BMedSc, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Zheng Zhong, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Muge Karaman, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Daoyu Hu, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Xiaohong Joe Zhou, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the feasibility of using a novel diffusion model based on continuous-time random walk (CTRW) for detecting cervical cancer, and to investigate its possible advantage over the apparent diffusion coefficient (ADC).

METHOD AND MATERIALS

In this retrospective study, forty-five patients with biopsy-proven cervical cancer (13 stage I, 15 stage II, 12 stage III, and 5 stage IV) underwent pre-treatment MRI at 3T. Diffusion-weighted images (DWI), acquired with multiple b-values (0, 50, 80, 100, 150, 200, 500, 800, 1300,1700, 1800 or 2000, 2400, 3000, 3600, 4000, and 4500 sec/mm2), were analyzed using a CTRW diffusion model. For each subject, a region of interest (ROI) was manually selected along the tumor boundary on the slice with maximal area on DWI (b =1000 sec/m2). Three CTRW parameters (anomalous diffusion coefficient Dm, temporal diffusion heterogeneity a, and spatial diffusion heterogeneity ß) as well as conventional ADC were compared between the cervical cancer and normal cervix tissue, followed by a non-parametric Wilcoxon signed-rank test. The diagnostic performances of using the individual CTRW parameters and ADC for detecting cervical cancer were evaluated using receiver operating characteristic (ROC) analyses. Different combinations of the CTRW parameters, (Dm, a), (Dm, ß), (a, ß), and (Dm, a, ß), were also evaluated using a binary logistic regression.

RESULTS

Significant differences were detected in Dm (0.81 ± 0.26 μm2/ms vs. 1.14 ± 0.52 μm2/ms, $p < 0.001$), a (0.95 ± 0.04 vs. 0.92 ± 0.09, $p = 0.034$), and ß (0.79 ± 0.07 vs. 0.70 ± 0.16, $p < 0.001$), and ADC (0.86 ± 0.22 μm2/ms vs. 1.08 ± 0.30 μm2/ms, $p < 0.001$) between the cancerous and normal cervix tissues. The ROC analysis showed that the combination of CTRW parameters (Dm, a, ß) yielded better sensitivity (88.9% vs. 68.9%), specificity (91.1% vs. 88.2%), and area under the curve (0.948 vs.0.777) for detecting cervical cancers as compared to ADC.

CONCLUSION

The CTRW model parameters computed from high-b-value diffusion images outperformed conventional ADC for differentiating cancerous tissue from normal cervix tissue.

CLINICAL RELEVANCE/APPLICATION

With its ability to probe tissue microstructural changes, the CTRW diffusion model can be used for detecting and charactering an increasingly number of cancerous tissues.

GU233-SD-MOB4 Radiomics Features on Diffusion-Weighted Imaging for Differentiating Muscle-Invasive Bladder Cancer from Non-Muscle-Invasive Bladder Cancer

Station #4

Participants
Jianjian Zhang, Shanghai, China (*Presenter*) Nothing to Disclose
Guangyu Wu, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Yongming Dai, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To investigate the value of radiomics features from diffusion-weighted imaging (DWI) in differentiating muscle-invasive bladder cancer (MIBC) from non-muscle-invasive bladder cancer (NMIBC).

METHOD AND MATERIALS

This study included 218 pathologically-confirmed bladder cancer patients (training set: 131 patients, 86 MIBC; validation set: 87 patients, 55 MIBC) who underwent DWI before biopsy through transurethral resection (TUR). Radiomics models based on DWI for discriminating state of muscle-invasive were built using random forest (RF) and all-relevant (AR) methods on the training set and were tested on validation set. Combination models based on TUR data were also built. Discrimination performances were evaluated with the area under the receiver operating characteristic (ROC) curve (AUC), accuracy, sensitivity, specificity, F1 and F2 scores. Qualitative MRI evaluation based on morphology was performed for comparison.

RESULTS

No significant difference was found between RF and AR models. RF model was more sensitive than TUR (0.873 vs 0.655, p=0.019) for discriminating muscle-invasive bladder cancer. When combining RF with TUR, the sensitivity increased to 0.964, significantly higher than TUR model (0.655, p<0.001), MRI evaluation (0.764, p=0.006), and the combination of TUR and MRI (0.836, p=0.046). Combing RF and TUR achieved the highest accuracy of 0.897 and F2 score of 0.946.

CONCLUSION

Combining DWI radiomics feature with TUR could improve the sensitivity and accuracy in discriminating the state of muscle-invasive in bladder cancer for clinical practice.

CLINICAL RELEVANCE/APPLICATION

This study may develop and validate a more sensitive radiomics model from diffusion-weighted (DW) magnetic resonance (MR) imaging for discriminating muscle-invasive bladder cancer.

GU234-SD-MOB5 How Often Do Non-Index Target PI-RADSv2 Lesions Yield Higher Grade Clinically Significant Prostate Cancer than the Index PI-RADSv2 Lesion?

Station #5

Participants
Michael E. Hahn, MD,PhD, San Diego, CA (*Presenter*) Nothing to Disclose
Christopher Kim, MD, MS, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose
Michael T. Booker, MD,MBA, San Diego, CA (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

mpMRI of the prostate is often used to identify suspicious target lesions prior to prostate biopsy, allowing for image-guided biopsy of target lesions. It is not known if sampling of additional target lesions beyond the index target lesion results in a higher rate of clinically significant prostate cancer detection. The purpose of this study was to estimate the fraction of cases with more than one PI-RADS target lesion where higher grade clinically significant prostate cancer was detected in the non-index target lesion as compared to the index target lesion.

METHOD AND MATERIALS

This retrospective study received approval in the form of an IRB-waiver. Reports of 1605 sequential mp-MRI examinations of the prostate obtained at a single institution between 6/5/15 and 1/26/19. We identified patients with mp-MRI reports describing more than 1 PI-RADSv2 target lesion and then determined which of these patients went on to MRI/US fusion guided prostate biopsy. Results of the targeted and concurrently obtained standard 12 core non-targeted systematic biopsies were obtained from the electronic medical record. Clinically significant prostate cancer was defined as Gleason score >= 7.

RESULTS

225 of the 1605 patients had mp-MRI exam reports describing more than 1 PI-RADSv2 target lesion. Of these, 96 patients with a total of 220 target lesions went on to MRI-US fusion guided transrectal prostate biopsy that included sampling of all PI-RADSv2 target lesions and standard 12 core non-targeted systematic biopsies. 3 of the 96 (3.1 %) patients had higher grade clinically significant prostate cancer in non-index target lesions as compared with their index target lesion. In each of these 3 cases, the concurrently obtained non-targeted 12 core systematic biopsy also found clinically significant cancer of equal or greater Gleason score than the non-index target lesion.

CONCLUSION

Sampling of non-index PI-RADSv2 target lesions in addition to the index target lesion results in diagnosis of higher grade clinically significant prostate cancer in only a very small fraction (3.1%) of patients. In the setting of targeted biopsy plus standard systematic biopsy, sampling of non-index target lesions failed to yield higher grade clinically significant prostate cancer.

CLINICAL RELEVANCE/APPLICATION

It may be safe to forego sampling of non-index PI-RADSv2 target lesions, which may mitigate undesirable biopsy related side effects such as bleeding and infection.

GU235-SD-MOB6 Comparative Role of Retro Grade Urethrography (RGU) and Sonourethrography (SUG) in Anterior Urethral Strictures

Station #6

Participants
Neha Jain, MD, New Delhi, India (*Presenter*) Nothing to Disclose
Rajul Rastogi, MD, Greater Noida, India (*Abstract Co-Author*) Nothing to Disclose

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neha11aug@gmail.com

PURPOSE

Sonourethrography (SUG) has starting earning clinical acceptance over Retrograde Urethrography (RGU) recently for evaluation of anterior urethral strictures. Conspicuous delineation of stricture as well as periurethral region is possible with SUG obviating radiation exposure. Urethral management primarily depends upon site & length of stricture, presence or absence of spongiofibrosis and distraction of urethral segments. Hence, this prospective pilot study aims for determining: • Comparative role of RGU & SUG in evaluation of anterior urethral strictures. • Comparative role of RGU & SUG in predicting management of anterior urethral strictures

METHOD AND MATERIALS

Fifteen patients with suspected anterior urethral strictures referred to our department were evaluated by RGU after instilling optimal amounts of non-ionic contrast agent per urethram followed by filming at 45 degrees oblique position with the ipsilateral lower limb flexed at hip & knee joints and penis stretched parallel to leg. SUG was performed with a high-resolution, linear-array transducer through penile & transperineal technique after instillation of sterile gel per urethram followed by soft, penile tip clamp. Data related to site & length of stricture, presence or absence of spongiofibrosis and any other associated abnormality will be recorded in both RGU & SUG.

RESULTS

SUG detected spongiofibrosis in addition to the accurate length of stricture required for management in 5 patients out of fifteen affecting the mode of management

CONCLUSION

SUG is an accurate imaging tool in anterior urethral strictures that not only complements RGU but also affect the mode of management thus affecting the prognosis of the patient, hence should be a routine procedure in all patients with positive findings on RGU

CLINICAL RELEVANCE/APPLICATION

Since SUG is an effective tool for evaluating anterior urethral strictures in males, it should be performed routinely prior to decision making for the mode of managment thus reducing the morbidity associated with the disease

UR182-ED-MOB7 Penile Lumps: From Common to Rare and Unusual Diseases

Station #7

Awards
Cum Laude
Identified for RadioGraphics

Participants
Sandy van Nieuwenhove, MD, Brussels , Belgium (*Presenter*) Nothing to Disclose
Julien Van Damme, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose
Axel Feyaerts, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose
Camilla Sachs, Trieste, Italy (*Abstract Co-Author*) Nothing to Disclose
Etienne Danse, MD, PhD, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose
Frederic E. Lecouvet, MD, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose
Louis Libbrecht, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose
Helene Dano, Brussels, Belgium (*Abstract Co-Author*) Nothing to Disclose
Michele Bertolotto, MD, Trieste, Italy (*Abstract Co-Author*) Nothing to Disclose

TEACHING POINTS

1. To review penile's anatomy on US and MRI. 2. To recognise common disease when imaging plays a crucial role in clinical managment using US and MRI 3. To be aware of uncommon diseases and to correlate abnormalities observed with histopathology

TABLE OF CONTENTS/OUTLINE

1. Anatomy using US and MRI techniques 2. Traumatic diseases 3. Inflammation cases 4. Benign lesions 5. Malignant lesions 6. Summary

UR183-ED-MOB8 Imaging Findings in Genitourinary Tuberculosis

Station #8

Awards
Magna Cum Laude
Identified for RadioGraphics

Participants
Muhammad Naeem, MBBS, Saint Louis, MO (*Presenter*) Nothing to Disclose
Maria Zulfiqar, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Adeel Haq, MBBS, Cincinnati, OH (*Abstract Co-Author*) Nothing to Disclose
Mohammed Azfar Siddiqui, MBBS, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Anup S. Shetty, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Oscar Osorio, MD, Guatemala, Guatemala (*Abstract Co-Author*) Nothing to Disclose
Cristian Varela, MD, Santiago, Chile (*Abstract Co-Author*) Nothing to Disclose
Cary L. Siegel, MD, Saint Louis, MO (*Abstract Co-Author*) Nothing to Disclose
Christine O. Menias, MD, Chicago, IL (*Abstract Co-Author*) Royalties, Reed Elsevier

TEACHING POINTS

1. To review the imaging findings in genitourinary tuberculosis. 2. To review some imaging mimics/differentials in genitourinary tuberculosis.

TABLE OF CONTENTS/OUTLINE

Outline. Renal and Calyceal Tuberculosis. Ureteral, Bladder and Uretheral Tuberculosis. Adrenal tuberculosis. Tuberculosis of the

male and female genital tract. Imaging mimics and differentials in some of the tuberculosis cases such as BCG granuloma after intravesical therapy, salpingitis isthmica nodosa mimicking fallopian TB.

Printed on: 10/29/20

MSCA21

Case-based Review of the Abdomen (Interactive Session)

Monday, Dec. 2 1:30PM - 3:00PM Room: S100AB

GI GU

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

Participants
Julie H. Song, MD, Sharon, MA (*Director*) Nothing to Disclose

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Sub-Events

MSCA21A Pediatric Abdomen

Participants
Pedro Daltro, MD, Rio de Janeiro, Brazil (*Presenter*) Nothing to Disclose

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MSCA21B Hepatobiliary Imaging

Participants
Khaled M. Elsayes, MD, Pearland, TX (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

kmelsayes@mdanderson.org

LEARNING OBJECTIVES

1) Describe a spectrum of interesting hepatobiliary cases. 2) Discuss relevant technical background. pathophysiology and hemodynamics of these cases. 3) Correlate imaging features of these masses with clinical and pathologic findings. 4) Provide useful clues to reach a specific diagnosis.

Active Handout:Khaled M. Elsayes

http://abstract.rsna.org/uploads/2019/19000699/Active MSCA21B.pdf

MSCA21C Gastrointestinal Imaging

Participants
Elizabeth G. McFarland, MD, Lake Saint Louis, MO (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Evaluate GI clinical case review to classify cases into appropriate inflammatory to neoplastic etiologies. 2) Explain pertinent clinical information to increase awareness for appropriate patient management. 3) Define new updated colorectal cancer screening recommendations and how they apply to CT colonography.

MSCA21D Genitourinary Imaging

Participants
Frank H. Miller, MD, Chicago, IL (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To interpret interesting genitourinary CT and MR cases to form a differential diagnosis to reach a definitive diagnosis. 2) To apply the teaching points from the individual challenging cases to future clinical cases seen in practice.

MSRO27

BOOST: GYN/Breast

Monday, Dec. 2 1:30PM - 2:30PM Room: S103CD

BR GU RO

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

Participants
Janice N. Kim, Seattle, WA (*Presenter*) Nothing to Disclose
Janie M. Lee, MD, Bellevue, WA (*Presenter*) Research Grant, General Electric Company;

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Printed on: 10/29/20

SPPH22

Physics Symposium: Highlights of AAPM Clinical Brachytherapy Physics Summer School

Monday, Dec. 2 1:30PM - 5:45PM Room: S503AB

CT GU MR PH

AMA PRA Category 1 Credits ™: 4.25
ARRT Category A+ Credits: 5.00

FDA Discussions may include off-label uses.

LEARNING OBJECTIVES

1) Explain the role of model-based dose calculation algorithms and their affects for several anatomic site. 2) provide an in-depth understanding on the application of brachytherapy for prostate, gynecological, breast, and skin diseases. 3) Clarify emerging technologies such as electronic brachytherapy, clinical modalities, and intensity-modulated brachytherapy.

ABSTRACT

The Symposium will cover the highlights from the 2017 AAPM Summer School on Clinical Brachytherapy Physics. Presentations by the School Program Directors will include the experiences from experts on eight key aspects of clinical brachytherapy physics: model-based dose calculations, prostate brachytherapy, gynecological brachytherapy, skin brachytherapy, breast brachytherapy, electronic brachytherapy, intensity modulated and anisotropic brachytherapy sources, and early clinical advancements in 3D printing, tracking technologies, and robotic brachytherapy.

Sub-Events

SPPH22A Overview of Commercial Algorithms: Needs and Availability

Participants
Luc Beaulieu, PhD, Quebec, QC (*Presenter*) License agreement, Standard Imaging, Inc; Researcher, Elekta AB; Researcher, Koninklijke Philips NV;

LEARNING OBJECTIVES

1) Understand the need for advanced dose calculation algorithms in brachytherapy. 2) Provide an overview of the basis of the underlying algorithms used in brachytherapy commercial treatment planning systems. 3) Know the key strength and limitations of each algorithm.

ABSTRACT

Brachytherapy is a very efficient cancer treatment modality, essentially due to a best in class dose deposition kernel dominated by 1/r2 spearing tissue at a distance from the source. Furthermore, the energy deposition from the ionizing photons emitted by brachytherapy sources can be calculated, in theory, with very high accuracy. Until recently, the field of brachytherapy relied on a factor-based approach, TG-43, to deal for dose calculation. While TG43 is extremely fast for dose computation and optimization, its accuracy is limited to specific conditions, often not met in clinical situations. This presentation will provide an overview of these different situations and provide ballpark estimates of the expected differences. We will further look at alternatives to solve this issue and briefly described the approaches chosen by the major vendors in providing the next generation of dose calculation engines in their treatment planning system offering. We will finally describe how these new algorithms performed under various scenarios, highlighting both their strength and weakness.

SPPH22B Emphasis on MBDCA Commissioning Infrastructure and Process

Participants
Luc Beaulieu, PhD, Quebec, QC (*Presenter*) License agreement, Standard Imaging, Inc; Researcher, Elekta AB; Researcher, Koninklijke Philips NV;

LEARNING OBJECTIVES

1) Review the commissioning requirements set forth in TG186. 2) Provide an overview of the existing infrastructure and resources available to the clinical medical physicists. 3) Understand the various steps necessary in the commissioning of model-based dose calculation algorithms.

ABSTRACT

With the publication in 2012 of the AAPM/ESTRO/ABG TG-186 report, early adopters were provided with a set of guidelines to help in the integration of advanced dose calculation algorithms in brachytherapy, beyond TG43, and ensuring safe and efficient use of the new features that are enabled by these new algorithms. However, the commissioning aspects were minimal in that report. In the following, the work from a subsequent working group, established to tackle this issue, will be presented. It is intended to provide the clinical users (the clinical medical physicists) with a set of comprehensive commissioning guidelines as well as to provide the necessary information for resources that are available to the community in making the transition from TG43 to TG186.

SPPH22C Prostate Brachytherapy: Real-time Intra-operative

Participants
Luc Beaulieu, PhD, Quebec, QC (*Presenter*) License agreement, Standard Imaging, Inc; Researcher, Elekta AB; Researcher, Koninklijke Philips NV;

LEARNING OBJECTIVES

1) Underline the system components of a real-time prostate brachytherapy program. 2) Understand the possible workflows of real-time ultrasounds based prostate brachytherapy. 3) Understand the difference between real-time LDR and HDR prostate brachytherapy workflows.

ABSTRACT

Prostate brachytherapy is a highly effective treatment option for localized prostate cancer. For low-risk prostate cancer patients, LDR seed implants has proven its long-term efficacy. For intermediate risk and high risk localized prostate cancer, both LDR and HDR brachytherapy boost combined to EBRT (either 3D-CRT or IMRT/VMAT) are providing compelling clinical outcomes. Both approaches deliver very high local dose to the cancerous regions while providing enhanced dose spearing to the organs at risk. The move to real-time intra-operative prostate brachytherapy further enables simplified treatment options to patients, in many cases performed as a single day outpatient procedure while improving the overall treatment accuracy by limiting the uncertainties due to moving the patients from the OR to imaging to finally the treatment room. This presentation will look at the key components of an efficient real-time intra-operative as well as the associated workflows.

SPPH22D Prostate Brachytherapy: Post-implant Evaluation Using CT or MR

Participants
Mark J. Rivard, PhD, Providence, RI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Learn the importance of post-implant dosimetric analysis. 2) To convey how to evaluate prostate brachytherapy implants using CT or MRI. 3) Be able to utilize modern techniques for post-implant evaluation of prostate brachytherapy implants.

SPPH22E Gynecological Brachytherapy: MRI Guidance and Targeting

Participants
Bruce R. Thomadsen, PhD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the rationale for MR targeting in gynecological brachytherapy. 2) To become familiar with techniques and difficulties in MR targeting.

ABSTRACT

Cervical brachytherapy has changed greatly over the last few years. The conventional techniques that served well for the last six decades provided many cures; however, failures still plagued the higher staged disease. The challenges to improving outcomes rested with two issues: 1. Visualizing, localizing and assessing the disease, and 2. Adequately treating the disease once it is demarcated. This presentation will address the first of the challenges, imaging and targeting the disease.

Active Handout:Bruce Robert Thomadsen

http://abstract.rsna.org/uploads/2019/19001779/Active SPPH22E.pdf

SPPH22F Gynecological Brachytherapy: Applicators

Participants
Bruce R. Thomadsen, PhD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the evolution of brachytherapy applicators for treatment of cervical cancer. 2) To become familiar with the latest generations of cervical brachytherapy applicators.

ABSTRACT

This presentation continues addressing the challenges for cervical brachytherapy, looking at recent developments in applicator design to facilitate treating the target tissues.

SPPH22G Gynecological Brachytherapy: Comparisons with Conventional

Participants
Bruce R. Thomadsen, PhD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the differences in dosimetry between the conventional approach and the MR-guided approach to cervical brachytherapy. 2) To appreciate the benefits to patients of the newer approach.

ABSTRACT

This presentation completes the discussion of cervical brachytherapy by comparison of the newer approaches with the conventional treatments, reviewing the dosimetry and outcomes.

SPPH22H Skin Brachytherapy

Participants
Mark J. Rivard, PhD, Providence, RI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Develop a sense for the physics concerns surrounding skin brachytherapy. 2) Convey how to dosimetrically evaluate skin brachytherapy treatment plans. 3) Learn several methods for delivering skin brachytherapy.

SPPH22I Breast Brachytherapy: Applications and Applicators

Participants
Bruce R. Thomadsen, PhD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the geometry, dosimetry and nature of applicators used in breast brachytherapy.

ABSTRACT

Breast brachytherapy has been shown to be a highly effective treatment with very low toxicity. Many types of applicators have been developed to perform the procedure, each with strength and limitations. This presentation will discuss the various applicators and how they apply to applications.

Active Handout:Bruce Robert Thomadsen

http://abstract.rsna.org/uploads/2019/19001784/09-10 Breast Brachytherapy2019 RSNA.pptx

SPPH22J Breast Brachytherapy: Plan Evaluation

Participants
Bruce R. Thomadsen, PhD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand what should be checked during a treatment plan review for breast brachytherapy. 2) To understand the quantities used in performing the reviews.

ABSTRACT

Review of a treatment plan serves to help improve quality and prevent errors in treatment. Plan evaluations are crucial for breast brachytherapy. This presentation will discuss the techniques used, and quantities evaluated during a treatment plan review.

SPPH22K Electronic Brachytherapy

Participants
Mark J. Rivard, PhD, Providence, RI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the radiological physics differences between electronic brachytherapy and radionuclide-based brachytherapy. 2) Describe several different systems, contrasting and comparing them. 3) Learn how electronic brachytherapy is used clinically.

SPPH22L Intensity Modulated and Anisotropic BT Sources

Participants
Mark J. Rivard, PhD, Providence, RI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Comprehend the designs and goals for intensity modulated and anisotropic brachytherapy sources. 2) Explain how intensity modulated and anisotropic brachytherapy sources can provide improved dose distributions over conventional brachytherapy sources. 3) Learn how to evaluate and commission intensity modulated and anisotropic brachytherapy sources.

SPPH22M 3D Printing and Tracking Technologies

Participants
Luc Beaulieu, PhD, Quebec, QC (*Presenter*) License agreement, Standard Imaging, Inc; Researcher, Elekta AB; Researcher, Koninklijke Philips NV;

LEARNING OBJECTIVES

1) Understand the potential role of 3D printing in brachytherapy. 2) Have an overview of various tracking technologies that can be integrated into catheters, needles and applicators. 3) Discuss envisioned usage in the brachytherapy clinical workflow.

ABSTRACT

This portion of the AAPM summer school was dedicated to an outlook of the use of novel technologies tot her field of brachytherapy. First, brachytherapy relies heavily on applicators in which one or more sources can travel. As such, custom-made applicators derived from patient-specific 3D imaging or any other relevant information constitute a potential use of 3D printing technology. Second, to proceed with an optimal treatment the location in space of one or more applicators as well as the full 3D path (called channels in brachytherapy) the source will be traveling needs to be known with precision. Tacking technology can simplify the acquisition and validation of this information, thus simplifying the overall clinical workflow. This presentation will look at the various technologies involved with both the steps described above and how they could impact the current clinical workflows. Prerequisites for clinical use will also be discussed.

SPPH22N Robotics and Brachytherapy

Participants
Bruce R. Thomadsen, PhD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand some of the principles of robotics in brachytherapy. 2) To learn about some of the robots, their designs and limitations.

ABSTRACT

As with much of medicine, and life in general, automation is improving consistency and ability. Robots have become part of the surgical landscape and are found in most large pharmacies. Robots are just coming into brachytherapy but promise to improve dose distributions and access to procedures. This presentation will review the current, dynamic sate of robotic brachytherapy.

Active Handout:Bruce Robert Thomadsen

http://abstract.rsna.org/uploads/2019/19001789/Active SPPH22N.pdf

Active Handout:Bruce Robert Thomadsen

http://abstract.rsna.org/uploads/2019/19001789/Active SPPH22N.pdf

Printed on: 10/29/20

MSRO28

BOOST: Gynecologic-Case-based Multidisciplinary Review (Interactive Session)

Monday, Dec. 2 3:00PM - 4:15PM Room: S103CD

GU OI RO

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

Participants
Aoife Kilcoyne, MBBCh, Boston, MA (*Moderator*) Author, Wolters Kluwer nv
Susanna I. Lee, MD,PhD, Boston, MA (*Presenter*) Royalties, Wolters Kluwer nv; Royalties, Springer Nature
Lilie Lin, MD, Houston, TX (*Presenter*) Investigator, AstraZeneca PLC

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LEARNING OBJECTIVES

1) Describe the surgical treatment and systemic therapies for gynecologic cancers based on standard of care current treatment strategies. 2) Describe the use of radiotherapy techniques used for the adjuvant and definitive treatment of gynecologic cancers. 3) Identify key imaging findings and avoid pitfalls when reading MRI and PET CT for gynecologic cancers.

ABSTRACT

This is a case based, multidisciplinary review of gynecologic malignancies including uterine cervical and endometrial cancer, vulvar cancer, and ovarian cancer.

SSE11

Genitourinary (New Techniques in Pelvic Imaging)

Monday, Dec. 2 3:00PM - 4:00PM Room: S502AB

GU

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

Participants
Harriet C. Thoeny, MD, Fribourg, Switzerland (*Moderator*) Nothing to Disclose
Claudia P. Huertas, MD, Medellin, Colombia (*Moderator*) Nothing to Disclose

Sub-Events

SSE11-01 CT Virtual Hysterosalpingography: Impact on Radiation Dose and Discomfort Regarding Physicians Experience in Performing the Study

Monday, Dec. 2 3:00PM - 3:10PM Room: S502AB

Participants
Patricia M. Carrascosa, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Research Consultant, General Electric Company
Carlos Capunay, MD, Buenos Aires, Argentina (*Presenter*) Nothing to Disclose
Jimena B. Carpio, MD, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose
Mariano Baronio, Buenos Aires, Argentina (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

CT-Virtual hysterosalpingography (CT-VHSG) is a good non-invasive method to evaluate the complete gynecologist system. It allows to detect intraluminal pathology in the cervix, uterus and fallopian tubes. The image acquisition lasts few seconds and it does not produce discomfort in the majority of the patients. The objective of this paper is to determine the importance of the physicians experience in performing CT-VHSG regarding radiation dose and discomfort.

METHOD AND MATERIALS

A group of women with infertility were studied with 64,128 and 256 Multi-detector CT scanners. Technical parameters were slices 0.6 mm width, mAs: 100-200, kV: 80-120, scan length:10 cm. They were adapted according to patients size . Half of the patients were performed by a 4th year resident (Group A) and the other half by an experienced radiologist (> 10 years) (Group B). Different issues were evaluated: • Level of discomfort classified in 4 grades: no discomfort, mild, moderate or severe discomfort. • Total number of acquisitions to perform an accurate diagnosis. • Total radiation dose received by the patients. • Total duration time since the patient enters until she leaves the CT room • Patients containment during the procedure by the physician: they were asked to answer if they felt emotionally comprehended.

RESULTS

Patients of Group A presented higher number of scans (2,6) to perform an adequate diagnosis giving more radiation dose to the patients (1,3 mSv). Eighty percent presented no or mild discomfort and only 65% replied that they felt a good containment during the procedure. Total time to perform the study: 28+/-11 minutes Contrary patients from Group B ninety one percent had no or mild discomfort during the procedure. A mean of 1,3 acquisitions were performed per patient with a mean radiation dose of 0,52 mSv. Regarding containment during the study 92% considered being emotionally comprehended. Total time to perform the study 22+/- 6 minutes.

CONCLUSION

It is important the physicians experience to perform the CT-VHSG Experienced radiologists performed a better tolerated study (no or mild discomfort in the majority of the patients), gave significant lower radiation dose and carried out a quicker study. Additionally and very important, patients answered in a higher percentage they felt emotional supported during the complete procedure.

CLINICAL RELEVANCE/APPLICATION

CT-Virtual hysterosalpingography as a method to evaluate the gynecologist system.

SSE11-02 Combination Between the Retrograde Urethrogram and the Virtual Urethroscopy as Urethral Structure Screening Profile: An Inexpensive Imaging Diagnostic Tool Compared to the Urological Urethroscopy in the Evaluation of the Male Anterior Urethra

Monday, Dec. 2 3:10PM - 3:20PM Room: S502AB

Participants
Ching Hsien Huang Liu, MD, Santo Domingo, Dominican Republic (*Presenter*) Nothing to Disclose
Mario J. Hidalgo, MD, Santo Domingo, Dominican Republic (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To analyze the feasibility of the combination of the retrograde urethrogram and the virtual urethroscopy (urethral ultrasound) as urethral stricture screening profile due to their inexpensive cost compared to the urological urethroscopy, furthermore, in order to avoid the use of the invasive urethroscope as the initial diagnostic imaging tool.

METHOD AND MATERIALS

A total of 21 patients were included. The correlation of the localization between two methods was carried out. We also analyzed the feasibility of the measurement about the spongiofibrosis's extension and the resulted stenosis percentage.

RESULTS

9 of 21 patients presented findings of urethral stricture with a total of 10 strictures. Significant correlation was found between both modalities regarding the localization of the narrowing in the anterior urethra, there was a correlation in 100% of the cases of the anterior urethra stricture (95% confidence level, p: <0.05). It was evidenced that 100% of the cases of the anterior urethra narrowing detected by conventional retrograde urethrogram, all showed spongiofibrosis with the realization of urethral ultrasound. We realized, that the measured diameter of the permeable portion of the affected lumen can be converted to the French catheter scale in order to avoid the use of the invasive urethroscope for the measurement.

CONCLUSION

The urethral stricture screening profile is useful as the initial approach and follow-up for patients with diagnosis or suspicion of urethral stricture.

CLINICAL RELEVANCE/APPLICATION

The urethral stricture screening profile is a minimally invasive and inexpensive tool compared to the invasive urethroscope as a diagnostic tool. That means, the conventional urethroscope as an invasive diagnostic tool, should not have any major diagnostic role in the anterior urethra narrowing until the patient makes the decision to accept any surgical intervention in order to evaluate the urethral mucosa.

SSE11-03 Clinical Role of Translabial Ultrasound in Midurethral Mesh Complications

Monday, Dec. 2 3:20PM - 3:30PM Room: S502AB

Participants
Pei-Shan Yang, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Kalesha Hack, MD, FRCPC, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Sender Herschorn, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Phyllis Glanc, MD, Toronto, ON (*Presenter*) Nothing to Disclose

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PURPOSE

To determine if transperineal or translabial ultrasound assists in clinical management,surgical decision and planning in patients with midurethral sling complications.

METHOD AND MATERIALS

This is a retrospective study enrolling consecutive patients who underwent midurethral sling insertion, presented to urology clinic for urologic symptoms, and received translabial ultrasound. The presenting symptoms, including pain, dysuria, dyspareunia, recurrent urinary tract infection, urinary frequency, urinary urgency and nocturia were documented. This descriptive data also includes the postoperative outcome (pain, incontinence), location of erosion in the operative finding to determine if translabial ulltrasound assisted in clinical management, surgical decision and planning..

RESULTS

48 patients were identified from 2010 - 2018 inclusive with midurethral sling complications. 26 patients had retropubic procedure, 14 patients had transobturator procedure, 2 patient had both and 6 patients were unable to recall their surgical history. More than half of our patients suffered from pain, recurrent urinary infection, urinary urgency, nocturia and urinary incontinence. 36 patients underwent surgery, 23 erosions were found at urethra(11), bladder(6) and vagina(6). 25 patients were pain-free after the surgery. In chart review, 25 ultrasound studies helped with surgical decision, furthermore 17 ultrasound studies were of assistance in identifying the location of the complication

CONCLUSION

Translabial ultrasound is helpful in clinical and surgical planning in patients with midurethral sling related complications.

CLINICAL RELEVANCE/APPLICATION

Translabial ultrasound is important to perform prior to clinical and surgical planning for patients with midurethral sling complications.

SSE11-04 Endometrial Total Choline Levels on 1H MR Spectroscopy Predict High-Risk Group for Nodal Metastasis and Reflect Underlying Tissue Choline Metabolism

Monday, Dec. 2 3:30PM - 3:40PM Room: S502AB

Participants
Gigin Lin, MD, Taoyuan, Taiwan (*Presenter*) Nothing to Disclose
Shang-Yueh Tsai, Taipei, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Chiao-Yun Lin, Taoyuan, Taiwan (*Abstract Co-Author*) Nothing to Disclose

Ren-Chin Wu, Taoyuan, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Chyong-Huey Lai, Taoyuan, Taiwan (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To investigate and characterize the values of endometrial total choline levels on 1H MR spectroscopy in predicting high-risk group for nodal metastasis, with tissue metabolomics and biochemistry corroboration.

METHOD AND MATERIALS

1H MR spectroscopy using external phase array coil was prospectively conducted in 353 consecutive endometrial cancer patients at 3 Tesla (T) to evaluate tumor choline levels in vivo (δ 3.2 ppm), according to their nodal metastasis status (n=10, 11, 236 in stage N2, N1, N0, respectively). Endometrial tumors were further analyzed (n=81) using a 600MHz high-resolution nuclear magnetic resonance (NMR) system to correlate the tissue levels of choline-related metabolites-free choline, phosphocholine (PC) and glycerophosphocholine (GPC). We corroborated the expression of a key enzyme in choline metabolism-endometrial carcinoma differential 3 (EDI3). Statistical methods included Mann-Whitney U test, Kruskal-Wallis H test, logistic regression and Pearson's correlation. A P value < 0.05 was considered a significant statistical difference.

RESULTS

Total choline levels were significantly higher in endometrial cancers with nodal metastasis (N2: 14.93±6.23mM, N1: 6.20±2.42mM, N0: 6.04±0.60mM, mean ± standard error of mean, P = .039), measured using in vivo MR spectroscopy. Elevated choline levels on MR spectroscopy significantly increased the risk of para-aortic lymph node metastasis (odds ratio 1.06; 95% confidence interval 0.99-1.13, P = .046). Changes of choline on MR spectroscopy significantly correlated with the tissue levels of GPC (r = 0.322 P = .002), but not PC (P = .588) nor free choline (P = .697). The key enzyme in choline metabolism EDI3 overexpressed in tumors from endometrial cancer with nodal metastasis (P = .040).

CONCLUSION

Increased endometrial total choline levels on 1H MR spectroscopy depicted high-risk cancer group for nodal metastasis, supported by increased tissue GPC levels and overexpression of EDI3.

CLINICAL RELEVANCE/APPLICATION

MR spectroscopy using external phase array coil has potentials to add dimensions of clinical phenotyping to guide treatment and predicting nodal metastasis for women diagnosed with endometrial cancer.

SSE11-05 Characterization of Brown Adipose Tissue in PCOS Patients by Z-Spectrum Imaging (ZSI)

Monday, Dec. 2 3:40PM - 3:50PM Room: S502AB

Participants
Li Li, Wuhan , China (*Presenter*) Nothing to Disclose
Alessandro Scotti, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Jicheng Fang, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Nael M. Khayyat, MD, Burr Ridge, IL (*Abstract Co-Author*) Nothing to Disclose
Chong Wee Liew, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Zhu Wenzhen, MD, PHD, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose
Kejia Cai, PhD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Given that the majority of patients with polycystic ovary syndrome (PCOS) demonstrate obesity and chronic insulin resistance and targeting brown fat represents a novel treatment strategy for metabolic diseases, the purpose of the study is to characterize brown adipose tissue (BAT) in PCOS patients in comparison to healthy subjects using MR Z-spectral imaging (ZSI).

METHOD AND MATERIALS

ZSI data were collected on 19 normal control females (NCF, 24-34 years old), 17 males (NCM, 22-35years old), and 13 PCOS patients (female, 20-33 years old) with a CEST saturation pulse of 1 μT, 200 ms long and fast spin echo readout. Z-spectral data were fitted with multiple Lorentzian curves to quantify the direct saturation of water and fat. Fat water fraction (FWF) maps were then computed based on the fitted amplitudes of water and fat direct saturation. FWF thresholds were prescribed for the differentiation and segmentation of white adipose tissue (WAT), BAT, or Muscle (Figure). At last, two parameters were extracted from the analysis: the average FWF value within the segmented BAT (FWF(BAT)) and the fraction of BAT over the total fat depot, defined as BATf=BATarea/ (BATarea+WATarea). The two parameters were compared among the 3 study groups and correlated to subjects' BMI.

RESULTS

FWF(BAT) correlated linearly with BMI in healthy subjects, whereas there was an inverse correlation between BATf and BMI (Figure). The PCOS group had higher FWF(BAT) than the NCF group (P<0.001), while the BATf of the PCOS group was smaller than the controls (P<0.001). The FWF(BAT) of the NCF group was found to be higher than the NCM group (P<0.05), while there was no significant difference between male and female in BATf (Figure).

CONCLUSION

Normal subjects with higher BMI show less BATf and have increased FWF(BAT), indicating relatively higher level of metabolic passive WAT depot and relatively reduced metabolism in their BAT depots. PCOS patients have the least BATf and the highest FWF(BAT), suggesting decreased BAT mass and function in PCOS.

CLINICAL RELEVANCE/APPLICATION

MR Z-spectral imaging has been demonstrated to noninvasively identify and characterize BAT mass and function in PCOS patients,

providing insights on the comorbidities mechanism, diagnosis, and treatment of PCOS.

SSE11-06 Comparative Role of Retrograde Urethrography (RGU) and Sonourethrography (SUG) in Anterior Urethral Structures

Monday, Dec. 2 3:50PM - 4:00PM Room: S502AB

Participants
Neha Jain, MD, New Delhi, India (*Presenter*) Nothing to Disclose
Rajul Rastogi, MD, Greater Noida, India (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

Sonourethrography (SUG) has starting earning clinical acceptance over Retrograde Urethrography (RGU) recently for evaluation of anterior urethral strictures. Conspicuous delineation of stricture as well as periurethral region is possible with SUG obviating radiation exposure. Urethral management primarily depends upon site & length of stricture, presence or absence of spongiofibrosis and distraction of urethral segments. Hence, this prospective pilot study aims for determining: • Comparative role of RGU & SUG in evaluation of anterior urethral strictures. • Comparative role of RGU & SUG in predicting management of anterior urethral strictures

METHOD AND MATERIALS

Fifteen patients with suspected anterior urethral strictures referred to our department were evaluated by RGU after instilling optimal amounts of non-ionic contrast agent per urethram followed by filming at 45 degrees oblique position with the ipsilateral lower limb flexed at hip & knee joints and penis stretched parallel to leg. SUG was performed with a high-resolution, linear-array transducer through penile & transperineal technique after instillation of sterile gel per urethram followed by soft, penile tip clamp. Data related to site & length of stricture, presence or absence of spongiofibrosis and any other associated abnormality will be recorded in both RGU & SUG.

RESULTS

SUG detected spongiofibrosis in addition to the accurate length of stricture required for management in 5 patients out of fifteen affecting the mode of management

CONCLUSION

SUG is an accurate imaging tool in anterior urethral strictures that not only complements RGU but also affect the mode of management thus affecting the prognosis of the patient, hence should be a routine procedure in all patients with positive findings on RGU

CLINICAL RELEVANCE/APPLICATION

Since SUG is an effective tool for evaluating anterior urethral strictures in males, it should be performed routinely prior to decision making for the mode of managment thus reducing the morbidity associated with the disease

SSE12

Genitourinary (Scrotum and Bladder)

Monday, Dec. 2 3:00PM - 4:00PM Room: S505AB

GU

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

FDA Discussions may include off-label uses.

Participants
Rosa Maria Alanis Salazar, MD, Guadalupe, Mexico (*Moderator*) Nothing to Disclose
Sebastian Feuerlein, MD, Tampa, FL (*Moderator*) Nothing to Disclose

Sub-Events

SSE12-01 Qualitative and Quantitative Multiparametric Ultrasound Evaluation of Focal Testicular Lesions

Monday, Dec. 2 3:00PM - 3:10PM Room: S505AB

Participants
Dean Y. Huang, FRCR, London, United Kingdom (*Presenter*) Nothing to Disclose
Majed R. Alsadiq, MD,FRCR, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Eleni Konstantatou, MD, MSc, Patras, Greece (*Abstract Co-Author*) Nothing to Disclose
Filippo Pesapane, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Nicholas Beckley-Hoelscher, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Kirsten M. Christensen-Jeffries, PhD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Robert J. Eckersley, PhD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Maria E. Sellars, MD, FRCR, London, United Kingdom (*Abstract Co-Author*) Speaker, Bracco Group; Speaker, Samsung Electronics Co, Ltd
Paul S. Sidhu, MRCP, FRCR, London, United Kingdom (*Abstract Co-Author*) Speaker, Koninklijke Philips NV; Speaker, Bracco Group; Speaker, Hitachi, Ltd; Speaker, Siemens AG; Speaker, Samsung Electronics Co, Ltd; Advisory Board, Samsung Electronics Co, Ltd; Advisory Board, Itreas Ltd

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PURPOSE

To evaluate the diagnostic accuracy of multiparametric ultrasonography (MP-US), consisting of gray-scale US, color Doppler US (CDUS), strain elastography (SE), and contrast-enhanced US (CEUS) in the assessment of focal testicular lesions.

METHOD AND MATERIALS

166 MP-US examinations for testicular focal lesions performed between 2009 and 2017 were analysed. SE was performed to assess tissue elasticity, and hard lesions were defined as malignant. CDUS and CEUS were performed to determine lesion vascularity. Avascular lesions were defined as benign. Qualitative and quantitative CEUS assessments with time-intensity curves analysis were performed for vascular lesions. Histopathologic results or follow-up of a minimum of 6 months served as reference standards. Sensitivity, specificity, and positive and negative predictive values, and accuracy of benign or malignant classification were calculated.

RESULTS

Of the 166 MP-US examinations, 108 revealed benign (lesions size = 10.66 +/- 10.15 mm) and 58 malignant (lesion size = 23.82 +/- 14.01mm) diagnosis. Single-modality sensitivities, specificities, PPV, NPV and classification accuracies were 91.38%, 52.78%, 50.96%, 91.94%, and 66.27% for CDUS; 100%, 42.59%, 48.33% and 100% and 62.65% for CEUS; 86.96%, 35.90%, 44.44%, 82.35% and 54.84% for SE respectively. Used in combination, MP-US improved accuracy of classification to 70.16%. The feature of prolonged hyperenhancement on qualitative CEUS assessment is statistically significant ($p = 0.012$) in differentiating seminoma and Leydig cell tumors (LCT), the two largest histological sub-types of benign and malignant vascular neoplasms. Quantitative CEUS analysis reveals a more rapid inflow rate for LCT when compared to seminoma ($p = 0.002$).

CONCLUSION

We demonstrated that used in combination, advanced US techniques improved accuracy of classification. In addition, the additional features of absence of prolonged enhancement and a more rapid inflow on qualitative and quantitative CEUS further differentiate between benign vascular LCT and malignant seminoma.

CLINICAL RELEVANCE/APPLICATION

Multiparametric US improves accuracy of pre-operative classification of testicular lesions for avoiding unnecessary orchiectomies and for testis-sparing strategies to be implemented.

SSE12-02 The Value of Whole Tumors Volume-Based ADC Histogram Analysis for Differential Diagnosis in Testicular Germ Cell Tumors

Monday, Dec. 2 3:10PM - 3:20PM Room: S505AB

Participants
Qianqian Chen, Zhengzhou, China (*Presenter*) Nothing to Disclose
Zhang Yan, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose
Cheng Jingliang, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose
Bai Jie, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose
Gao Ankang, Zhengzhou, China (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

Germ cell tumors are the most common tumors in the testis, which are further divided into seminoma and nonseminogenic germ cell tumors, which are quite different in metastasis, treatment, and prognosis. seminoma is very sensitive to radiotherapy and chemotherapy, most prognosis is good. Nonseminogenic germ cell tumor is more invasive than seminoma, and which has poor response to radiotherapy.Purpose of this study to is explore the value of whole tumors apparent diffusion coefficient (ADC) gray histogram analysis or differential diagnosis in testicular germ cell tumors.

METHOD AND MATERIALS

The date of 43 patients pathologically confirmed of testicular germ cell tumors was analysis retrospectively. Among them, there were 22 cases of seminomas germ cell tumors, 21cases of nonseminomatous germ cell tumors(NSGCTs)(5 cases of mixed germ cell tumors, 6 cases of Embryonal carcinoma, 2 cases of Yolk sac tumors, 8 cases of Mature teratoma). Retrospectively draw the region of interest(ROI)in the ADC maps of two groups on each layer of tumor level by using Mazda software and analyze the gray histogram, including mean, variane, kurtosis, skewness, pere.01%, pere.10%, pere.50%, pere.90%, pere.99%. The statistical analysis was performed on the histogram parameters to find out the different characteristics between the two groups, and the ROC curve was drawn to evaluate its diagnostic efficacy for two groups tumors.

RESULTS

Through histogram analysis of 9 parameters, these 7 parameters were statistically significant (all $p<0.05$), including mean, variane, kurtosis, pere.10%, pere.50%, pere.90%, pere.99%.The largest AUC of the ROC curve to differentiate two groups was pere.10%, the AUC was 0.866, the sensitivity was 81.0%, the specificity was 90.9%.

CONCLUSION

The ADC gray histogram analysis based whole tumors is helpful for the diagnosis to preoperatively differentiate seminomas from NSGCTs.

CLINICAL RELEVANCE/APPLICATION

MRI features has become the primary method for preoperative diagnosis of testicular germ cell tumors. However, testicular seminoma is similar to nonseminogenic germ cell tumor in MRI manifestations. For example, the age of onset, tumor capsules, the characteristics of uniform signal and uneven enhancement. The global histogram analysis can reflect the overall data of each layer of the lesion ROI, which can better reduce the sampling error caused by delineating the local global ROI, which may be more reliable and accurate.

SSE12-03 Value of Dixon-MRI in the Localization of Non Palpable Undescended Testes with Laparoscopic Correlation - A Preliminary Study

Monday, Dec. 2 3:20PM - 3:30PM Room: S505AB

Participants
Mohamed S. Shaaban, Alexandria, Egypt (*Presenter*) Nothing to Disclose
Sandy S. Sharaf, Alexandria , Egypt (*Abstract Co-Author*) Nothing to Disclose
Baher S. Louka, Alexandria , Egypt (*Abstract Co-Author*) Nothing to Disclose
Shadia Abo Seif, Alexandria , Egypt (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To study the potential value of Dixon MRI in localization of the non-palpable undescended testes and correlation with the laparoscopy

METHOD AND MATERIALS

This is a prospective study conducted upon patients with non-palpable undescended testes referred to the MRI unit to localize the undescended testes in the period between August 2018 and April 2019. Each patient was subjected to 3T MRI examination including conventional sequences of T1 TSE, T2 TSE, STIR, and DWI, in addition to T2 DIXON sequence with generated in-phase/out-of-phase, fat only, and water only images. Images were reviewed by two independent radiologists for the location of the undescended testes in Dixon images and conventional MRI each separated. Laparoscopic exploration was done for all patients to determine the site of the testes.

RESULTS

The current study was conducted upon 15 patients. Ages ranged from 2 months to 26 years. Eight patients had clinically non-palpable testes on the left side (47.1%), 6 had non-palpable testes on the right side (35.3%), and 3 patients had non palpable testes bilaterally (17.6%), giving a total of 20 non-palpable undescended testes. Laparoscopy could not localized 4 testes (20%), while 5 testes were found in the pelvis (25%), 5 testes were found in the right inguinal region (25%), 4 testes were found in the left inguinal region (20%) and 2 ectopic testes in the scrotal neck (10%). Conventional MRI was able to correctly localize 11 testes (55%) but failed to localize 9 (45%). The located testes were 4 in the left inguinal region (20%), 4 in the right inguinal region

(20%), 2 in the left scrotal neck (10%), and one intra-pelvic testis (5.0%). On Dixon technique using water-only and fat-only images; 4 were not detected (20 %), the located testes were 5 intra-pelvic (25.0%), 5 right inguinal (25%), 4 left inguinal (20.0%), and 2 in the scrotal neck (10%). Using laparoscopy as gold-standard, conventional MRI had a sensitivity of 68.7%, Specificity of 100%, NPV of 44.4%, PPV 100%, and accuracy of 75%. On the other hand, Dixon technique scored 100% in its sensitivity, specificity, NPV, PPV, and accuracy.

CONCLUSION

Dixon technique is a promising tool for more accurate localization of the non-palpable undescended testes compared to the conventional MRI

CLINICAL RELEVANCE/APPLICATION

Dixon technique offers potential inclrease in the accuracy of MRI in the localization of undescended testes

SSE12-04 Implementation of mpMRI and VI-RADS for High-Risk Non-Muscle Invasive Bladder Cancer (NMIBC) Candidate for Secondary Trans-Urethral Resection (Re-TURBT): Preliminary Results form a Prospective Single-Center Experience

Monday, Dec. 2 3:30PM - 3:40PM Room: S505AB

Participants
Martina Pecoraro, MD, Roma , Italy (*Presenter*) Nothing to Disclose
Francesco del Giudice, Roma , Italy (*Abstract Co-Author*) Nothing to Disclose
Stefano Cipollari, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Riccardo Campa, MD, Roma , Italy (*Abstract Co-Author*) Nothing to Disclose
Carlo Catalano, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose
Valeria Panebianco, MD, Rome, Italy (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To prospectively evaluate the use of mpMRI with VI-RADS to identify patients with high-risk NMIBC could potentially avoid unnecessary Re-TURBT.

METHOD AND MATERIALS

Two-hundred and twenty-two patients with newly suspected bladder lesions (at ultrasound, CT scan and/or cystoscopy) were prospectively enrolled and underwent mpMRI before Photodynamic Diagnosis (PDD) assisted TURBT. All patients eligible for Re-TURBT with high-risk NMIBC, absence of carcinoma in situ at multiple random intraoperative biopsies and absence of upper urinary tract lesions at preoperative CT scan were included in the study. Exclusion criteria were: diagnosis of muscle-invasive bladder cancer (MIBC) at first TURBT, low-risk NMIBC, absence of detrusor muscle in TURBT specimen, incomplete or doubt about completeness during initial resection, non-urothelial carcinomas. Correlation analysis was performed to compare results of TURB and Re-TURBT with VI-RADS score of pre-operative mpMRI.

RESULTS

Thirty nine (17.4%) patients with MIBC, 67 (30%) with low-risk NMIBC, 16 (7.1%) with no detrusor in the specimen and 6 (2.6) with incomplete or doubtful resection were excluded. A total of 95 high-risk NMIBCs who underwent TURBT and Re-TURBT were included in the final analysis. Median age was 63 (range 45 - 68). At Re-TURBT 84 (88.4%) patients reveled absence of cancer in the specimen and among them 81 (96.4%) were diagnosed with VI-RADS 1-2 lesions. Among the 8 (8.4%) patients diagnosed as MIBC, 7 (87.5%) were diagnosed with preoperative VI-RADS 3-5. Four (4.2%) showed persistent high-risk disease, all of whom presenting at first TURBT with multifocal and large tumor dimensions (i.e. > 3cm). A good correlation was demonstrated (Pearson's r = 0,71, $p<0.05$) between preoperative VIRADS score and re-TURBT histological reports.

CONCLUSION

Implementation of mpMRI in the pre-TURBT setting is reliable in differentiating MIBC from NMIBC. Selected patients with high-risk NMIBC and VI-RADS score 1-2 have a low risk of being understaged and could therefore avoid Re-TURBT.

CLINICAL RELEVANCE/APPLICATION

The use of Multiparametric MRI and the VI-RADS score might further stratify the category of high risk patients with non invasive bladder cancer that should undergo Re-TURBT.

SSE12-05 Radiomics Prediction of Detrusor Muscle Invasion in Bladder Cancer Based on Multiparametric MR Imaging

Monday, Dec. 2 3:40PM - 3:50PM Room: S505AB

Participants
Fan Zhang, Guangzhou, China (*Presenter*) Nothing to Disclose
Huanjun Wang, MD, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Jian Guan, MD, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Xiao-Pan Xu, PhD, Xian, China (*Abstract Co-Author*) Nothing to Disclose
Xi Zhang, Xian, China (*Abstract Co-Author*) Nothing to Disclose
Yang Liu, Xian, China (*Abstract Co-Author*) Nothing to Disclose
Hongbing Lu, PhD, Xi'an, China (*Abstract Co-Author*) Nothing to Disclose
Yan Guo, MD, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To explore a radiomics approach for the preoperative prediction of muscle invasion in bladder cancer (BCa).

METHOD AND MATERIALS

This retrospective study involved 121 BCa patients from two clinical centers with different MR scanners. The datasets from one of the two centers were used for model training and the other for independent testing. A total of 1404 features were extracted from the largest possible tumorous regions of interest (ROIs) by manual delineation in preoperative multiparametric MR images, including T2-weighted (T2W), diffusion-weighted (DW) and apparent diffusion coefficient (ADC) images. Support vector machine-based recursive feature elimination (SVM-RFE) approach was used to determine an optimal feature subset with the training group to construct a model for predicting muscle invasion of BCa. Then the performance of the proposed model was quantitatively evaluated by the testing group.

RESULTS

Of the 1404 features extracted from T2W, DW and ADC images, an optimal subset containing 31 features was selected and confirmed with the best area under the curve (AUC) of receiver operating characteristic, which consists of 11 features from T2W images, 13 features from DW images and 7 features from ADC maps, and used to construct the prediction model. Its averaged accuracy and AUC after 100-round classifications with 10-fold cross-validation were 93.31%, 0.9778 (95% CI: 0.9771, 0.9782) in the training group, and 88.10%, 0.9475 (95% CI: 0.9463, 0.9486) in the validation group, respectively.

CONCLUSION

With the radiomics signature selected from multiparametric MRI features, especially the features from DW images, the proposed prediction model is an effective tool for preoperative prediction of muscle invasion in BCa patients.

CLINICAL RELEVANCE/APPLICATION

Clinical management of bladder cancer is mainly determined on the basis of distinguishing non-muscle invasive (stage T1 or lower) from muscle invasive ones (stage T2 or higher) because the treatment options differ considerably. MRI is the best imaging modality for the noninvasive evaluation before surgery. With the radiomics signature selected from multiparametric MRI features, a prediction model can be established, which can be used as an effective tool for preoperative prediction of muscle invasion in BCa patients.

SSE12-06 MDCT Urography for Prediction of Pathologic Complete Response after Neoadjuvant Chemotherapy in Muscle-Invasive Bladder Cancer: Diagnostic Performance Using 5-Point Grade and Comparison with RECIST Criteria

Monday, Dec. 2 3:50PM - 4:00PM Room: S505AB

Participants
Sejin Choi, MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Kye Jin Park, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Mi-Hyun Kim, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jeong Kon Kim, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

The purpose of this study was to investigate imaging criteria based on urothelial phase CT (UP CT) for evaluation of the complete response after neoadjuvant chemotherapy (NACT) in patients with muscle-invasive bladder cancer (MIBC) and to compare its diagnostic performance with the current response evaluation criteria in solid tumors (RECIST).

METHOD AND MATERIALS

A total of 50 patients were included who underwent NACT and subsequent radical cystectomy for MIBC between January 2017 and February 2019. UP CT findings after NACT were divided into five grades [UP grades] as follows: grade 1, no bladder wall thickening or inner layer enhancement; grade 2, thin inner layer enhancement without bladder wall thickening; grade 3, inner layer enhancement with low-attenuated wall thickening; grade 4, enhancing wall thickening; and grade 5, nodular enhancement or enhancing soft tissue. Two radiologists independently evaluated UP grades. An experienced reader separately assessed the treatment response per RECIST criteria. Area under the Receiver-operating-characteristic curve (AUC) was used to evaluate the diagnostic performance of UP grades and RECIST criteria to predict complete pathologic response. To determine the optimal cutoff of the UP grades, sensitivity, specificity, PPV, NPV, and accuracy were assessed. Interreader agreement of UP grades was assessed using a weighted kappa coefficient.

RESULTS

Sixteen patients (32%) were confirmed as pathologic complete response. The AUCs of UP grades were 0.89 (95% CI, 0.77, 0.96) and 0.87 (95% CI, 0.75, 0.95) in both readers, which showed a significant increase over the AUC of RECIST criteria (0.65; 95% CI, 0.50, 0.78). Using grade 1 or 2 as a criterion of clinical complete response, the sensitivity, specificity, PPV, NPV, and accuracy were 75.0%, 85.3-88.2%, 70.6-75.0%, 87.9-88.2%, and 82.0-84.0% in both readers. Interreader agreement for UP grade was substantial (K=0.78).

CONCLUSION

Grading system using UP CT may show better diagnostic performance than the conventional size-based RECIST criteria with high interreader agreement. No or thin inner layer enhancement without bladder wall thickening may indicate pathologically complete response after NACT in MIBC.

CLINICAL RELEVANCE/APPLICATION

A grading system based on urography CT can be useful for assessment of treatment response following neoadjuvant chemotherapy.

SSE25

Science Session with Keynote: Radiation Oncology (Gynecologic Cancers)

Monday, Dec. 2 3:00PM - 4:00PM Room: E263

GU RO

AMA PRA Category 1 Credit ™: 1.00
ARRT Category A+ Credit: .50

Participants
Eric Leung, MD, FRCPC, Toronto, ON (*Moderator*) Nothing to Disclose
Tracy M. Sherertz, MD, Seattle, WA (*Moderator*) Nothing to Disclose

Sub-Events

SSE25-01 Optimization and Evaluation the Random Forest Model in Prediction the Efficacy of Chemoradiotherapy for Advanced Cervical Cancer Based on Radiomics Signature Coming from High-Resolution T2WI Images

Monday, Dec. 2 3:00PM - 3:10PM Room: E263

Participants
Defeng Liu, BA, Qinhuangdao, China (*Presenter*) Nothing to Disclose
Xiaohang Zhang, MS, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Qinglei Shi, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Juan Du, Qinhuangdao , China (*Abstract Co-Author*) Nothing to Disclose
Yongji Wang, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Lanxiang Liu, Qinhuangdao, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To establish and optimize a random forest model, and to evaluate the predictive ability of it in prediction the treatment effect of advanced cervical cancer (>IIb) treated with neoadjuvant chemotherapy-radiation therapy based on radiomics signatures coming from high resolution T2WI images.

METHOD AND MATERIALS

This retrospective study included 82 patients with locally ACC (squamous carcinoma 74, adenocarcinoma 8; pathological stage: IIb 40, IIIa 23, IIIb 10, Iva 4, IVb 5) scanned from March 2013 to May 2018. All these patients received concurrent chemoradiotherapy, and all MR examinations were performed before treatment within one month at a 1.5 T scanner (MAGNETOM Avanto, Siemens Healthcare, Erlangen , Germany). According to curative effect, patients were divided into complete remission and partial remission group. Radiomics signatures were extracted using an open source tool named Pyradiomics (https://pyradiomics.readthedocs.io/en/latest/index.html). The model of RF was established and optimized based on the open source toolkit scikit-learn (https://scikit-learn.org/stable/). Through optimization the number of decision trees, the criteria for selecting final partition index, the minimum number of samples partitioned by each node, the performance of RF was evaluated.

RESULTS

The number of decision trees in random forests demonstrated important impact on the performance of the model. When the number of decision trees was set to 10, 25, 40, 55, 70, 85 and 100 respectively, the performance of random forest model shows a trend of rising firstly and then declining. Criteria in selecting final partition index have significant effects on the generation of decision tree. In this study, Gini index demonstrated a better effect compared with information gain index. After optimization, when the number of decision tree is set to 55 and the selection criterion of optimal partition index is set to Gini, the AUC value can reach 0.917.

CONCLUSION

After optimization, the random forest model seems can provide valuable information and showed potential in prediction treatment effect for advanced cervical cancer (>IIb) treated with neoadjuvant chemotherapy-radiation therapy based on a high resolution T2WI images.

CLINICAL RELEVANCE/APPLICATION

The optimized RF model seems can provide valuable information and showed potential in prediction treatment effect for advanced cervical cancer (>IIb) treated with neoadjuvant chemotherapy-radiation therapy.

SSE25-02 Survival Outcomes in Cervical Cancer Patients Who Undergo Radiotherapy Followed by Hysterectomy or Exenteration

Monday, Dec. 2 3:10PM - 3:20PM Room: E263

Participants
Andrew Huang, MD, Madison, WI (*Presenter*) Nothing to Disclose
Karen E. Huang, MS, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
John K. Chan, San Francisco, CA (*Abstract Co-Author*) Speaker, F. Hoffmann-La Roche Ltd

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PURPOSE

While definitive radiotherapy regimens have been shown to be an excellent upfront alternative to surgery for cervical cancer, a small proportion of women still undergo a hysterectomy or exenteration either as an adjuvant or salvage therapy. We wished to determine the outcomes of these women compared to other women in the same cancer stage.

METHOD AND MATERIALS

We queried a custom Surveillance, Epidemiology, and End Results Program (SEER) database that included chemotherapy and radiotherapy treatment variables. Patients staged between 2004-2010 were included in the analysis and stratified by AJCC 6th edition stage. The primary endpoint was 5-year overall survival. We selected for patients who first underwent both external radiotherapy and brachytherapy who then later underwent hysterectomy or pelvic exenteration. We then compared these patients against all-comers within each stage using the Fischer-Exact test. We excluded patients with stage IA, IIIA, and IV disease as there were <20 patients who met our selection criteria in each of these cohorts.

RESULTS

There were 32,028 patients that met our initial selection criteria of having cervical cancer, a specific AJCC stage, and 5-year survival data available. Of these, 311 received both external beam radiotherapy and brachytherapy, followed by either a hysterectomy or pelvic exenteration. Five-year survival stratified by initial stage was 69% (IB1, n=24), 90% (1B2, n=95), 68% (IIA, n=30), 69% (IIB, n=66), and 63% (IIIB, n=62). Compared to all-comers, patients with IB1 disease who underwent surgery had a lower 5-year survival (69 vs 90%, p=0.006) while patients with IB2 disease who underwent surgery had a higher 5-year survival (90 vs 74%, p<0.001, Table 1). No statistical differences in survival were seen in IIA (68 vs 62%, p=.705), IIB (69 vs 64%, p=.366), and IIIB (63 vs 51%, p=.056) patients.

CONCLUSION

Surgical resection after both external beam radiotherapy and brachytherapy in the treatment of cervical cancer is associated with decreased overall survival in Stage IB1 patients but increased overall survival in IB2 patients.

CLINICAL RELEVANCE/APPLICATION

There is still controversy whether adjuvant hysterectomy after definitive radiotherapy for cervical cancer improves outcomes in cervical cancer; our study hopes to contribute to the body of evidence related to this question.

SSE25-03 Bone Fragility After Pelvic Chemoradiotherapy for Cervix Cancer

Monday, Dec. 2 3:20PM - 3:30PM Room: E263

Participants
Alina D. Dragan, MRCS,FRCR, Watford, United Kingdom (*Presenter*) Nothing to Disclose
Anwar R. Padhani, MD,FRCR, Northwood, United Kingdom (*Abstract Co-Author*) Advisory Board, Siemens AG; Speakers Bureau, Siemens AG; Speakers Bureau, sanofi-aventis Group; Speakers Bureau, Johnson & Johnson; Speakers Bureau, Astellas Group
Romaana Mir, MRCP,FRCR, Northwood, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Peter J. Hoskin, Middlesex, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Bone insufficiency fractures after pelvic radiotherapy are reported to have a low incidence and delayed onset when assessed on CT scans. Our aim was to determine the prevalence of pelvic insufficiency fractures (PIFs) after chemoradiotherapy (CRT) for cervical cancer (CxCa) on MRI follow-up, noting time of onset, symptoms, interval to healing and ADC values on diffusion MRI scans.

METHOD AND MATERIALS

In our institution, locally advanced CxCa patients undergo external beam RT (45-50Gy, 25#) including the sacral alar, cervix brachytherapy (24-28Gy, 4#) and weekly Cisplatin. They are followed up with serial MRI pelvis at 3, 12 and 24 months post-treatment. 20 consecutive women were retrospectively reviewed by an oncologic radiologist for the presence of PIFs, defined by linear low T1W and high STIR signal intensity. Features were graded for severity according to displacement, multiplicity, extent of bone oedema. ADC values were measured at the sites of fracture; when no fracture was seen, ADC was measured in the sacral alar. Correlations with symptoms was performed.

RESULTS

15 patients had 55 MRI scans (7 pre- and 48 post-treatment), average follow-up 22 months. 12/15 patients were aged over 50. 13/15 were staged as 2B. 9/15 patients had PIFs, majority diagnosed at 3 months (8/9 patients), 1 at 12 months. PIFs were graded as mild-1, moderate-5 or severe-3. 25 fracture sites were identified (18 sacral, 3 pubic, 1 iliac, 1 acetabular, 2 L4-5). Mean ADC values were 731 um2/s (204-1482) for all visible sacral fractures and 177 um2/s (33-499) for non-fractured sites (MW Test: p<0.001). Healing occurred at 5/25 fracture sites (in 6-23 months), with only 1 patient showing healing of all affected sites. 2 patients had related bone pain. 2 patients with PIFs sustained displaced pelvic fractures after falls. Only 1 patient had pelvic tumour recurrence at 12 months (no PIF).

CONCLUSION

PIFs on MRI are common after CRT for locally advanced CxCa, with an early onset post-treatment. Majority of patients are asymptomatic, but might have increased risk of displacement after trauma. Further research will be done into radiation dose distribution/techniques and any correlation with bone changes.

CLINICAL RELEVANCE/APPLICATION

PIFs are common on MRI follow-up after CRT for CxCa. Although mostly asymptomatic, only 20% healed during follow-up, with 2/15 patients suffering displaced pelvic fractures after minor trauma.

SSE25-04 Vaginal Recurrence of Endometrial Cancer Treated with Image-Guided Brachytherapy: Prognostic Value of MRI Characteristics

Monday, Dec. 2 3:30PM - 3:40PM Room: E263

Participants
Aida K. Kiviniemi, MD, Brookline, MA (*Presenter*) Nothing to Disclose
Gabriela Alban, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Teresa Cheng, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Pierre McLaughlin, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Tina Kapur, PhD,MSc, Boston, MA (*Abstract Co-Author*) Research Grant, Siemens AG Consultant, Varian Medical Systems, Inc
Martin T. King, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Clare M. Tempany-Afdhal, MD, Charlestown, MA (*Abstract Co-Author*) Research Grant, InSightec Ltd; Research Grant, Gilead Sciences, Inc; Advisory Board, Profound Medical Inc; Spouse, Employee, Spring Bank Pharmaceuticals, Inc; Spouse, Director, Trio Healthcare; Spouse, Consultant, Gilead Sciences, Inc; Spouse, Consultant, Merck & Co, Inc; Spouse, Consultant, Echosens SA; Spouse, Consultant, Shinogi; Spouse, Consultant, Ligand Pharmaceuticals, Inc; Spouse, Stock options, Spring Bank Pharmaceuticals, Inc; Spouse, Stock options, Allurion; Spouse, Stock options, Trio Healthcare; ;
Larissa J. Lee, Boston, MA (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

Imaging characteristics and related prognostic determinants for vaginal recurrence of endometrial cancer (EC) are poorly understood. This study evaluates the prognostic significance of MRI appearance, tumor location, and volume in patients treated with salvage radiotherapy.

METHOD AND MATERIALS

Patients with available pelvic MRI at vaginal recurrence of EC treated from 2004-2017 with external beam radiotherapy (EBRT) and image-guided brachytherapy (BT) were retrospectively identified. Extracted qualitative MRI features included tumor location, morphology, T2 signal intensity, enhancement, necrosis, and diffusion appearance. Recurrent tumor volumes were segmented at baseline and pre-BT MRI when available. The association of recurrence location and primary EC characteristics was evaluated by Fisher's exact test. Rates of recurrence-free survival (RFS) and overall survival (OS) were compared by logrank or univariate Cox regression.

RESULTS

In total, 36 patients with baseline pelvic MRI (1.5T or 3T) were included. Pre-BT MRI was available in 67% (24/36). Vaginal recurrence of EC was most commonly located in the vaginal cuff (72%) and showed nodular irregular morphology (82%), restricted diffusion (100%), hypoenhancement (88%), and an enhancing peripheral rim (73%). Tumor involvement of the lower third vagina was associated with lymphovascular invasion (17% without LVI, 63% with LVI) in the hysterectomy specimen ($p<0.05$) and prior adjuvant RT ($p<0.05$). The median tumor volumes at baseline and pre-BT MRI were 9.1 cm3 and 2.5 cm3, respectively, with a median tumor shrinkage of 69% after EBRT. Tumor volume both at baseline and pre-BT predicted OS (HR 1.04, 95% CI 1.01-1.06, $p<0.05$ and HR 1.06, 95% CI 1.00-1.12, $p<0.05$) whereas % shrinkage and BT dose were not prognostic. Diffuse growth pattern along the vaginal wall and the lack of an enhancing rim were associated with worse RFS ($p<0.001$ and $p<0.05$). Tumor T2 heterogeneity and necrosis were not prognostic.

CONCLUSION

Tumor volume at baseline and pre-BT MRI, and the absence of rim enhancement were prognostic for survival. This study represents the first systematic evaluation and prognostication of MRI features in vaginal recurrence of EC treated with salvage BT.

CLINICAL RELEVANCE/APPLICATION

The study provides valuable diagnostic and clinical information for salvage radiation treatment of vaginal recurrence of EC.

SSE25-05 Radiation Oncology Keynote Speaker: Gynecology

Monday, Dec. 2 3:40PM - 4:00PM Room: E263

Participants
Bryan J. Traughber, MD, Cleveland, OH (*Presenter*) Research Grant, Koninklijke Philips NV; Research Grant, Elekta AB

ED006-TU

Genitourinary Tuesday Case of the Day

Tuesday, Dec. 3 7:00AM - 11:59PM Room: Case of Day, Learning Center

AMA PRA Category 1 Credit ™: .50

Participants
Lori Mankowski Gettle, MD , Madison, WI (*Presenter*) Nothing to Disclose
Maitraya K. Patel, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Adam Kinzel, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Ely R. Felker, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Michael Bergquist, MD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Kathryn L. McGillen, MD, Hershey, PA (*Abstract Co-Author*) Nothing to Disclose
Sparsh Gola, MD, Hershey, PA (*Abstract Co-Author*) Nothing to Disclose
Christine M. Peterson, MD, Hummelstown, PA (*Abstract Co-Author*) Nothing to Disclose
Christine O. Menias, MD, Chicago, IL (*Abstract Co-Author*) Royalties, Reed Elsevier
Kenneth S. Zurcher, MD, Phoenix, AZ (*Abstract Co-Author*) Nothing to Disclose
Andrew Soroka, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Alex Li, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Carolina E. Reveron-Arias, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Payal P. Gupta, MD, Woburn, MA (*Abstract Co-Author*) Nothing to Disclose
Hoon Ji, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Nagaraj-Setty Holalkere, MD, Boston, MA (*Abstract Co-Author*) Founder and CEO, Imaginglink Inc
Kumaresan Sandrasegaran, MD, Phoenix, AZ (*Abstract Co-Author*) Nothing to Disclose
Akira Kawashima, MD, PhD, Scottsdale, AZ (*Abstract Co-Author*) Nothing to Disclose
Lejla Aganovic, MD, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Matthew A. Zarka, MD, Scottsdale, AZ (*Presenter*) Nothing to Disclose

TEACHING POINTS

1) Recognize imaging findings seen in disorders of the genitourinary systems. 2) Develop differential diagnosis based on the clinical information and imaging findings. 3) Explain the clinical importance of the diagnosis.

SPDL30

Houston, We Have a Problem (Case-based Competition)

Tuesday, Dec. 3 7:15AM - 8:15AM Room: E451B

CA GI GU MK NR OB PD PH SQ VA

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

Participants
Adam E. Flanders, MD, Narberth, PA (*Presenter*) Nothing to Disclose
Sandeep P. Deshmukh, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Christopher G. Roth, MD,MS, Philadelphia, PA (*Presenter*) Nothing to Disclose
Vishal Desai, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose

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Special Information

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

LEARNING OBJECTIVES

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

SPSH30

Hot Topic Session: Patient-facing Nuclear Medicine Clinics for Prostate Cancer

Tuesday, Dec. 3 7:15AM - 8:15AM Room: E450B

GU NM

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

Participants
Phillip J. Koo, MD, Phoenix, AZ (*Moderator*) Advisory Board, Bayer AG; Advisory Board, Johnson & Johnson; Consultant, Blue Earth Diagnostics Ltd; Researcher, Progenics Pharmaceuticals, Inc; Speaker, Astellas Pharm Inc; Advisory Board, Pfizer Inc; Consultant, Merck & Co, Inc; Consultant, Advanced Accelerator Applications SA

Sub-Events

SPSH30A The Value and Challenges of Creating Patient Facing Clinics

Participants
Phillip J. Koo, MD, Phoenix, AZ (*Presenter*) Advisory Board, Bayer AG; Advisory Board, Johnson & Johnson; Consultant, Blue Earth Diagnostics Ltd; Researcher, Progenics Pharmaceuticals, Inc; Speaker, Astellas Pharm Inc; Advisory Board, Pfizer Inc; Consultant, Merck & Co, Inc; Consultant, Advanced Accelerator Applications SA

LEARNING OBJECTIVES

1) Describe the importance of patient facing clinics as radiopharmaceutical based therapies become approved for the treatment of prostate cancer. 2) Identify challenges for creating patient facing clinics.

SPSH30B The Nuclear Medicine Therapy Care Coordination Service: A Model for Radiologist-driven Patient-centered Care

Participants
David M. Schuster, MD, Decatur, GA (*Presenter*) Institutional Research Grant, Nihon Medi-Physics Co, Ltd; Institutional Research Grant, Blue Earth Diagnostics Ltd; Institutional Research Grant, Advanced Accelerator Applications SA; Institutional Research Grant, Telix Pharmaceuticals Inc; Consultant, Syncona Ltd; Consultant, AIM Specialty Health, Inc; ;

LEARNING OBJECTIVES

1) Understand the importance of a creating a patient-centric Nuclear Medicine Therapy Care Coordination Service. 2) Learn key components of operationalizing a nurse navigator within a traditional radiology/nuclear medicine practice. 3) Gain a better understanding of the potential for theranostic approaches for prostate and other cancer, and how radiologists/nuclear medicine physicians can increase their impact in multi-disciplinary care.

SPSH30C Co-Managing Patients with Castration Resistant Prostate Cancer: A GU Oncologist's Perspective

Participants
Alicia K. Morgans, MD,MPH, Chicago, IL (*Presenter*) Speaker, Astellas Group; Speaker, AstraZeneca PLC; Speaker, sanofi-aventis Group; Speaker, Johnson & Johnson; Speaker, Bayer AG

LEARNING OBJECTIVES

1) To understand the treatment decision implications of use of novel PET imaging approaches in prostate cancer from a medical oncology perspective. 2) To understand the oncologic outcome implications of use of novel PET therapeutics in prostate cancer from a medical oncology perspective.

RC307

Genitourinary Series: Imaging with Impact in Gynecologic Oncology

Tuesday, Dec. 3 8:30AM - 12:00PM Room: E353B

GU OI

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

FDA Discussions may include off-label uses.

Participants
Katherine E. Maturen, MD, Ann Arbor, MI (*Moderator*) Royalties, Reed Elsevier; Royalties, Wolters Kluwer nv; ;
Hebert Alberto Vargas, MD, Cambridge, United Kingdom (*Moderator*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Recognize stages in the diagnosis and treatment process for gynecologic cancers where imaging changes management. 2) Identify key sequences for MR imaging in the female pelvis. 3) Understand fundamentals of adnexal mass characterization with US and MRI. 4) Describe important staging considerations in endometrial and cervical cancer. 5) Appreciate the important role of radiotherapy in gynecologic oncology.

Sub-Events

RC307-01 Global Scope and Morbidity of Gynecologic Cancers

Tuesday, Dec. 3 8:30AM - 8:45AM Room: E353B

Participants
Carolyn M. Johnston, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose

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johnstob@umich.edu

LEARNING OBJECTIVES

1) Learn how to do more with less. 2) Develop an awareness of the existing challenges for cancer care in Ghana and Ethiopia. 3) Understand what you can do and how those in the developing world can help.

RC307-02 Imaging and the FIGO Staging Paradigm: Gaps and Opportunities

Tuesday, Dec. 3 8:45AM - 9:00AM Room: E353B

Participants
Stephanie Nougaret, MD, Montpellier, France (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To present the difficulties with the current FIGO staging in female pelvic malignancy. 2) To discuss the gap between FIGO staging and imaging in female pelvic malignancy. 3) To present the need of a staging system incorporating advanced imaging.

RC307-03 Fundamentals of Imaging in Endometrial Cancer

Tuesday, Dec. 3 9:00AM - 9:15AM Room: E353B

Participants
Elizabeth A. Sadowski, MD, Madison, WI (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Understand the current staging and treatment of endometrial cancer. 2) Review the MRI protocol for imaging endometrial cancer. 3) Recognize MRI findings in endometrial cancer which alter treatment.

RC307-04 MRI-Assessed Tumor-Free Distance to Serosa Predicts Deep Myometrial Invasion and Poor Prognosis in Endometrial Cancer

Tuesday, Dec. 3 9:15AM - 9:25AM Room: E353B

Participants

Julie Andrea Dybvik, MD, Bergen, Norway (*Presenter*) Nothing to Disclose
Kristine E. Fasmer, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose
Jone Trovik, MD, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose
Camilla Krakstad, PhD, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose
Ingfrid H. Haldorsen, MD, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

The aim of this study was to explore the diagnostic accuracy of preoperative magnetic resonance imaging (MRI) and MRI-based tumor measurements for prediction of pathological deep (>=50%) myometrial invasion (pDMI) and for prognostication in endometrial carcinomas (EC).

METHOD AND MATERIALS

Preoperative pelvic MRI scans of 357 prospectively included patients with histologically confirmed EC were read independently by three radiologists blinded to clinical information. The radiologists recorded the following imaging data in a standardized registration form: findings suggesting deep (>=50%) myometrial invasion (iDMI) and the tumor measurements: axial anteroposterior tumor diameter (APD), depth of myometrial tumor invasion (DOI) and tumor free distance to serosa (TFD). Receiver operating characteristic (ROC) curves for prediction of pDMI (in 38.1% of the patients) using hysterectomy specimen as reference standard, were plotted for the different tumor measurements and optimal cut-off values were determined. The predictive and prognostic value of the tumor measurements were analyzed using binary logistic regression and Cox proportional hazard model, respectively. Interobserver agreement was assessed using Fleiss' kappa (κ).

RESULTS

TFD yielded the highest area under the ROC-curve (AUC) for prediction of pDMI with an AUC of 0.83 whereas DOI, APD and iDMI yielded AUCs of 0.72, 0.81 and 0.74, respectively. Multivariate analysis (including cut-off based imaging variables and preoperative histological risk-status) for predicting pDMI yielded highest predictive value of TFD<6 mm with OR of 6.1 (p<0.001) and lower figures for DOI >=5mm (OR=2.2; p=0.04), APD >=17mm (OR=3.1, p<0.001) and iDMI (OR=1.1 (p=0.76). Patients with TFD<6 mm also had significantly reduced survival with hazard ratio of 1.9; p=0.01. The interobserver agreement was good for APD>=17mm (κ=0.70) and moderate for TFD<6 mm (κ=0.52), but only fair for DOI >=5mm (κ=0.25) and iDMI (κ=0.36)

CONCLUSION

At preoperative MRI TFD<6 mm was the strongest predictor of pDMI and was associated with poor survival. TFD<6 mm outperforms iDMI for prediction of pDMI and could aid in identifying high-risk disease in endometrial carcinomas.

CLINICAL RELEVANCE/APPLICATION

Preoperative TFD at MRI using cut-off value <6 mm, represents a promising imaging biomarker that could aid in prediction of pDMI and high-risk disease in endometrial cancer.

RC307-05 Integrated Clinical Parameters and Diffusion-weighted Imaging Radiomics for Predicting Lymph Node Metastasis in Endometrial Cancer: Added Values of Computer-Aided Segmentation and Machine Learning

Tuesday, Dec. 3 9:25AM - 9:35AM Room: E353B

Participants
Gigin Lin, MD, Taoyuan, Taiwan (*Presenter*) Nothing to Disclose
Tiing Yee Siow, Taoyuan, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Lan-Yan Yang, Guishan, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Yu-Chun Lin, MSC, Taoyuan, Taiwan (*Abstract Co-Author*) Nothing to Disclose
Chyong-Huey Lai, Taoyuan, Taiwan (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

Precise risk stratification in lymphadenectomy is important for patients with endometrial cancer, to balance the therapeutic benefit against perioperative morbidity and mortality. We aim to investigate added values of computer-aided segmentation and machine learning based on clinical parameters and diffusion-weighted imaging radiomics for predicting nodal metastasis in endometrial cancer.

METHOD AND MATERIALS

This prospective study included 119 women with endometrial cancer who underwent magnetic resonance (MR) before surgery during July 2010-June 2015. Decision-tree machine learning comprised the apparent diffusion coefficient (ADC) of whole tumor volumetric and lymph nodes (LNs) segmentations, MR morphological measurement, and relevant clinical parameters. Areas under the receiver operating characteristics curve (AUCs) were used to compare diagnostic performances of the decision-tree model, mean ADC model, and LN short-axis diameter criteria.

RESULTS

For decision-tree modeling, 106 MR imaging features and 7 clinical factors were extracted. A decision-tree model was constructed based on grade (1 vs 2 and 3), CA125 level (cutoff, 190 U/mL), short-axis diameter of LN (cutoff, 2.2 mm), 75th percentile and minimum ADC of tumor (cutoff, 0.8 × 10-3 and 0.4 × 10-3 mm2/s, respectively), and difference of LN ADC skewness to tumor ADC skewness (cutoff, 1.3). The sensitivity, specificity, accuracy, positive predictive value, and negative predictive value for the decision-tree model were 100%, 91.1%, 92.0%, 56.8%, and 100%, respectively. The AUC of the decision-tree model was 0.96-significantly higher than the mean ADC model (AUC = 0.59) and LN short-axis diameter criteria (AUC = 0.68) (both P < .0001).

CONCLUSION

A combination of clinical and MR radiomics generates a prediction model for LN metastasis in endometrial cancer, with diagnostic performance surpassing the conventional ADC and size criteria.

CLINICAL RELEVANCE/APPLICATION

Computer-aided segmentation and machine learning added values of clinical parameters and diffusion-weighted imaging radiomics for predicting nodal metastasis in endometrial cancer, with a diagnostic performance superior to criteria based on lymph node size or apparent diffusion coefficient.

RC307-06 Preoperative 3D Tumor Texture Features from MRI Predict Aggressive Disease in Endometrial Cancer

Tuesday, Dec. 3 9:35AM - 9:45AM Room: E353B

Participants
Kristine E. Fasmer, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose
Erlend Hodneland, PhD, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose
Julie Andrea Dybvik, MD, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose
Camilla Krakstad, PhD, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose
Ingfrid H. Haldorsen, MD, Bergen, Norway (*Presenter*) Nothing to Disclose

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PURPOSE

To extract whole-volume texture features in primary tumor based on preoperative MRI and explore whether 3D image features relate to stage and outcome in endometrial cancer (EC).

METHOD AND MATERIALS

Preoperative pelvic MRI including contrast-enhanced T1-weighted (T1+c), T2-weighted and diffusion-weighted imaging (DWI) were performed in 99 EC patients. 3D tumor volumes were manually delineated on axial oblique T1+c and the corresponding T2, b1000 and apparent diffusion coefficient (ADC) maps were co-registered to the T1+c images. Grey level histogram features (kurtosis, skewness, entropy), gray level co-occurrence matrix (GLCM) features (energy, homogeneity, contrast, correlation) and tumor cluster analyses (cluster-size and -index) were computed for each of the sequences. Associations between image texture and surgicopathological features were assessed by Mann-Whitney U-tests and controlled for false discovery rates (alpha=0.01). Receiver-operating-characteristics (ROC) curves were used for the three top-ranked significant texture features for prediction of staging parameters and high-risk histology (endometrioid grade 3 and non-endometrioid). Kaplan-Meier, uni- and multivariable Cox regression analyses were applied for survival analysis.

RESULTS

Top-ranked tumor texture features significantly predicting advanced stage were high correlation T1+c (AUC=0.85), homogeneity T1+c (AUC=0.81) and entropy ADC (AUC=0.81) predicting deep myometrial invasion; and high tumor cluster-index T2 (AUC=0.84), entropy ADC (AUC=0.82) and entropy T1+c (AUC=0.82) predicting lymph node metastases. Features predicting high-risk histology were high correlation ADC (AUC=0.76), clustersize b1000 (AUC=0.75) and correlation T1+c (AUC=0.73). High tumor entropy on ADC, b1000 and T1+c all predicted reduced recurrence- and progression-free survival (HR=2.0, p<=0.014 for all).

CONCLUSION

3D tumor texture features derived from MRI, significantly predict deep myometrial invasion, lymph node metastases, high-risk histological subtype and reduced survival in endometrial cancer.

CLINICAL RELEVANCE/APPLICATION

3D MRI tumor texture analyses yield markers that can be utilized for preoperative risk assessment and may ultimately enable more tailored treatment strategies in endometrial carcinomas.

RC307-07 Cervical Cancer Imaging Essentials

Tuesday, Dec. 3 9:45AM - 10:00AM Room: E353B

Participants
Evan S. Siegelman, MD, Media, PA (*Presenter*) Advisory Board, Spreemo Health; Consultant, BioClinica, Inc; Consultant, ICON plc; Consultant, inviCRO, LLC

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LEARNING OBJECTIVES

1) Describe the role of human papilloma virus in the development of cervical cancer and critique the ability of an HPV vaccine to prevent the development of cervical cancer. 2) Apply the FIGO classification system of cervical cancer and explain what imaging features are not incorporated in the FIGO system. 3) Identify the essential MR pulse sequences and imaging findings to accurately stage women with cervical cancer. 4) Assess the utility of PET imaging in the staging of cervical cancer.

RC307-08 MRI-Assessed Tumor Size Parameters Predict Survival in Uterine Cervical Cancer

Tuesday, Dec. 3 10:00AM - 10:10AM Room: E353B

Participants
Njal G. Lura, MD, Bergen, Norway (*Presenter*) Nothing to Disclose
Kari Wagner-Larsen, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose

Mari Halle, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose
Julie Andrea Dybvik, MD, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose
Jone Trovik, MD, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose
Camilla Krakstad, PhD, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose
Ingfrid H. Haldorsen, MD, Bergen, Norway (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

The aim of this study was to compare the value of different tumor size measurements at magnetic resonance imaging (MRI) for predicting disease specific survival in patients with uterine cervical cancer

METHOD AND MATERIALS

A total of 421 patients with histologically confirmed uterine cervical cancer who had a pelvic MRI at primary diagnostic work-up were reviewed. Maximum tumor diameters were measured in three orthogonal planes; anteroposterior (AP), transverse (TV), and craniocaudal planes (CC); maximum diameter irrespective of plane (MAX), and tumor volumes (TVOL) were estimated. Tumor size parameters were analyzed in relation to disease-specific survival and clinical FIGO stage. Kaplan-Meier survival analyses and uni- and multivariate Cox regression analyses were performed. Receiver operating characteristics (ROC) curves for the different tumor measurements were calculated and optimal cut-off values were determined.

RESULTS

All tumor size parameters yielded high area under the ROC curve (AUC) (range of 0.82-0.84 for all), for predicting disease-specific death. All size parameters were significant predictors of disease specific survival in univariate analyses (hazard ratios (HR) ranging from 1.025-1.053; p<0.001 for all); when including all size parameters in a multivariate model, only TV had an independent impact on survival (HR of 1.04; p=0.002). The optimal cut of value for TV was >= 31 mm yielding a sensitivity and specificity of 82 % and 73%, respectively, for predicting disease specific death. TV>=31 mm yielded a HR of 6.9; p<0.001; when adjusting for clinical FIGO stage (4 categories) TV>=31 mm had an independent prognostic impact with HR of 4.0; p<0.001 for TV>=31 mm and HR of 2.1; p<0.001 for FIGO stage.

CONCLUSION

All tumor size parameters from pelvic MRI predict disease-specific survival. TV was the only independent predictor of poor survival amongst the tumor size parameters, and TV>31 mm was a significant predictor of poor survival also when adjusting for clinical FIGO stage. Thus, preoperative tumor measurements including assessment of TV may yield prognostic information in uterine cervical cancer potentially relevant for therapy.

CLINICAL RELEVANCE/APPLICATION

Transverse tumor diameter measurements based on MRI using cut-off of >=31 mm represents a promising imaging marker that may aid in the prediction of aggressive disease in uterine cervical cancer.

RC307-09 Cervical Carcinoma Post-Treatment Neoplasm or Post-Treatment Sequalae: Can Diffusion-Weighted Imaging (DWI) with ADC Mapping Solve the Ongoing Dilemma?

Tuesday, Dec. 3 10:10AM - 10:20AM Room: E353B

Participants
Samar A. Hussein, MSc, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose
Eman F. Kamal, MBChB, Cairo, Egypt (*Abstract Co-Author*) Nothing to Disclose
Rasha M. Kamal, MD, Cairo, Egypt (*Presenter*) Nothing to Disclose

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PURPOSE

To assess the value of each of the applicable MRI pulse sequences include diffusion weighted imaging with ADC mapping in the evaluation of tumor residual, recurrence or post-treatment complications after tumor resection and/or chemotherapy/radiotherapy on cervical cancer. We also aim to assess the possibility of using DW imaging instead of contrast studies especially in patients with impaired renal functions and trying to define cut off ADC values of residual/recurrent lesions.

METHOD AND MATERIALS

The study included 61 patients with pathologically proven cancer cervix and a control group of 60 patients. All patients underwent post treatment Contrast Enhanced and Diffusion weighted MRI examinations to assess, confirm or exclude the presence of residual/recurrence mass lesions or post therapy complications.The reported MRI findings of both studies were correlated with histopathology results and/or with follow -up imaging.

RESULTS

In post-treatment cervical cancer malignant lesions detection and differentiation from benign post treatment changes, contrast enhanced MRI calculated sensitivity and specificity of 86% and 88% respectively. The inclusion of CE MRI resulted in statistically a non-significant improvement of the diagnostic accuracy in post-treatment malignant lesions detection compared to conventional non-enhanced sequences as both had low specificity (88%) with a high false-positive rate. The addition of DW imaging and ADC mapping provided 100 % specificity in post-treatment malignant lesions detection and raised the sensitivity to 97.2%. Mean ADC values of malignant post-treatment lesions (1.019±0.15 x10-3 mm2/sec) were significantly different than those of benign post -treatment changes (1.5482± 0.07 x10-3 mm2/sec) (P < 0.001).The cut off average ADC value for detecting post-treatment malignant lesions was found to be <= 1.2 x10-3 mm2/sec with 100% specificity and 97.2% sensitivity. Patients with lower baseline mean ADC values (<= 0.8 ± 0.024 x10-3 mm2/sec) are more likely to have post-treatment complete response than patients with higher baseline mean ADC values (>= 0.96± 0.045 x10-3 mm2/sec) (P < 0.001).

CONCLUSION

The use of contrast-enhanced MR imaging does not improve the accurate assessment of post-treatment cancer cervix with a high probability of false negative and false positive results . The use of DW imaging with ADC mapping provide added value with improved sensitivity and specificity in detection of cancer cervix post-treatment malignant lesions and differentiating them from post-treatment benign changes.

CLINICAL RELEVANCE/APPLICATION

Addition of DW imaging with ADC mapping further improve detection of post-treatment residual/recurrent lesions in cancer cervix patients and differentiating them form post -treatment sequalae.

RC307-10 Image Based Radiotherapy in Gynecologic Oncology: Radiologists as Partners in Treatment Planning

Tuesday, Dec. 3 10:20AM - 10:35AM Room: E353B

Participants
Aradhana M. Venkatesan, MD, Houston, TX (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Provide an overview of the contemporary role for MRI for radiotherapy (RT) planning and management of gynecologic cancer patients, with an emphasis on HPV-associated gynecologic malignancies. 2) Summarize technical requirements, patient preparation and image acquisition protocols. 3) Describe fundamental radiotherapy concepts and asociated radiologic findings pertinent to management, illustrative of the team-based approach between radiologists and radiation oncologists.

RC307-11 Ultrasound of Adnexal Lesions and Introduction to ACR O-RADS US

Tuesday, Dec. 3 10:45AM - 11:00AM Room: E353B

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

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LEARNING OBJECTIVES

1) Discuss the emerging role of ultrasound in the evaluation of adnexal lesions. 2) Review the ACR Ovarian-Adnexal Reporting Lexicon. 3) Evaluate the new O-RADS Ultrasound Risk Stratification and Management System.

ABSTRACT

Over the last 2 decades there has been an evolution in the approach to incidentally detected ovarian lesions. We will review the key changes which incorporate more conservative therapy for benign lesions and appropriate triage to gynecological oncologists for malignant lesions. We will discuss the recently published O-RADS (Ovarian and Adnexal) lexicon and highlight key features approach to it's use. Finally, we will evaluate the O-RADS Ultrasound risk stratification and mangement system, an international consensus guideline from the O-RADS committee which incorporated the international ovarian tumor analysis (IOTA) group data with other published data to provide a useful risk stratification and management system for patients with ovarian lesions.

Active Handout:Phyllis Glanc

http://abstract.rsna.org/uploads/2019/19000195/Active RC307-11.pdf

RC307-12 MRI Characterization of Adnexal Lesions and Introduction to ACR O-RADS MRI

Tuesday, Dec. 3 11:00AM - 11:15AM Room: E353B

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

LEARNING OBJECTIVES

1) To know the indications of MRI for adnexal mass characterisation. 2) To be familiar with MRI protocol used. 3) To be familiar with the O-RADS MR lexicon. 4) To know how to apply the O-RADS MR score.

ABSTRACT

In this lecture, the indication for MRI characterisation of adnexal masses will be reviewed and the protocol will be described. The key lexicon terms will be presented and a link to the full lexicon will be provided. A systematic approach to applying the O-RADS MR score will be described, with case examples.

RC307-13 Contrast-Enhanced SHI Imaging for Characterization of Adnexal Masses

Tuesday, Dec. 3 11:15AM - 11:25AM Room: E353B

Participants
Priscilla Machado, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose
Lauren J. DeLaney, PhD, Philadelphia , PA (*Abstract Co-Author*) Nothing to Disclose
Mehnoosh Torkzaban, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Andrej Lyshchik, MD, PhD, Philadelphia, PA (*Abstract Co-Author*) Research support, Bracco Group; Advisory Board, Bracco Group; Research support, General Electric Company; Research support, Siemens AG; Research support, Canon Medical Systems

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Christine Kim, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Scott Richard, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Kirk Wallace, PhD, Niskayuna, NY (*Abstract Co-Author*) Employee, General Electric Company
Flemming Forsberg, PhD, Philadelphia, PA (*Abstract Co-Author*) Research Grant, Canon Medical Systems Corporation Research Grant, General Electric Company Research Grant, Siemens AG Research Grant, Lantheus Medical Imaging, Inc

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PURPOSE

To evaluate the use of contrast-enhanced subharmonic ultrasound imaging (SHI) to characterize adnexal masses prior to surgical intervention.

METHOD AND MATERIALS

Ten women scheduled to undergo surgery for adnexal masses underwent a SHI examination of their adnexal region using a modified Logiq E9 scanner (GE, Waukesha, WI). Baseline images were acquired using B-mode and color Doppler using both curvilinear and endocavitary probes. After the baseline imaging, which was also used to locate the region of interest, SHI imaging was done using the endocavitary probe following both bolus and infusion of the ultrasound contrast agent Definity® (Lantheus Medical Imaging, N Billerica, MA). Subjects first received a 1.5 ml Definity bolus injection and, digital clips were acquired up to 5 minutes after injection (time of wash-out). After a 10 minute interval, subjects received an infusion consisting of 1.5 ml of Definity in 25.0 ml of saline over 5 minutes, digital clips were acquired using pulse destruction/replenishment SHI imaging across the lesion. Time intensity curves were created off-line to quantitatively evaluate SHI parameters. These parameters were compared to the pathological findings.

RESULTS

The 10 subjects had a total of 12 adnexal masses, as 2 subjects had bilateral adnexal masses. The final pathological diagnosis determined that 8adnexal masses were benign and 4 were malignant. Qualitative analysis of the CEUS SHI images by an experienced radiologist resulted in a diagnostic accuracy of 70%, compared to 56% without contrast, demonstrating the benefit of SHI. Quantitative analysis of CEUS SHI parameters produced diagnostic accuracy as high as 81%. Peak contrast intensity was significantly greater in malignant than benign masses (0.109 ± 0.088 vs. 0.046 ± 0.030, p = 0.046). Malignant masses also demonstrated significantly greater perfusion than benign masses (24.79 ± 25.34% vs. 7.62 ± 6.50%, p = 0.045).

CONCLUSION

The use of SHI for characterization of adnexal masses may improve the determination of malignancy, reducing cost and risk to patients, while improving diagnostic accuracy.

CLINICAL RELEVANCE/APPLICATION

SHI characterization of ovarian masses is a noninvasive and safe method that could be used in the future to differentiate benign from malignant lesions.

RC307-14 Non-Invasive Prediction of Laparoscopy-Based Score System Using Preoperative CT in Advanced Ovarian Cancer Patients

Tuesday, Dec. 3 11:25AM - 11:35AM Room: E353B

Participants
Nayoung Kim, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Dae Chul Jung, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Kyunghwa Han, PhD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Jeon Jong Seob, Bucheon, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose
Young Taik Oh, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To construct a CT based Fagotti scoring system without staging laparoscopy by analyzing correlation between the laparoscopic findings and the corresponding CT findings in advanced ovarian cancer patients.

METHOD AND MATERIALS

The pre-operative CT and staging laparoscopic records based on Fagotti score system of 157 patients with stage III/IV ovarian cancer were reviewed, who underwent debulking surgery between 2010 and 2018. Ten CT features known as predictor of sub-optimal resection were evaluated by two independent radiologists who were blinded to the laparoscopy and the surgical outcome. Each imaging features were matched with relevant laparoscopic parameters by Spearman correlation between them. Variable selection and Model construction was performed by logistic regression with a least absolute shrinkage and selection operator (LASSO) method. Final CT-based scoring system was internally validated using 5-fold cross validation.

RESULTS

Among the 157 patients, 120 (76.4%) was rated predictive index value (PIV, sum of scores) >= 8 on staging laparoscopy, who assigned to non-resectable group initially. Complete/optimal cytoreduction was achieved in 23 (63.5%)/37(100%) among the remaining 37 patients (PIV < 8), respectively. Table 1 shows regression coefficient between CT features and laparoscopic parameters as result of LASSO regression modeling. The ROC analysis showed that the area under the curve(AUC) was 0.7234 (95% CI 0.6225~0.8243) (Fig.2).

CONCLUSION

Central tumor burden such as mesenteric diseases and paraaortic lymphadenopathy and upper abdominal spread including diaphragm and gastro-transverse-splenic (GTS) space involvement on preoperative CT was identified distinct prediction factor for high PIV. The CT based PIV prediction model may be useful for patient stratification in the era of staging laparoscopy.

CLINICAL RELEVANCE/APPLICATION

Although the achievement of complete cytoreduction was known as the important prognostic factor of advanced ovarian cancer, there is no standardized model for predicting surgical outcome.

RC307-15 Deep Learning in the Differentiation of Benign and Malignant Ovarian Lesions Based on Routine Magnetic Resonance Imaging

Tuesday, Dec. 3 11:35AM - 11:45AM Room: E353B

Participants
Yeyu Cai, MD, Changsha, China (*Abstract Co-Author*) Nothing to Disclose
Robin Wang, BA, Philadelphia, PA (*Presenter*) Nothing to Disclose
Iris Lee, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Hui Liu, Changsha, China (*Abstract Co-Author*) Nothing to Disclose
Jing Wu, Changsha, China (*Abstract Co-Author*) Nothing to Disclose
Ting Huang, Changsha, China (*Abstract Co-Author*) Nothing to Disclose
Harrison X. Bai, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Zishu Zhang, MD, PhD, Changsha, China (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

Ovarian cancer is one of the most common causes of cancer death among women. However, definite diagnosis of benign versus malignant ovarian lesion is difficult based on pre-operative imaging. We proposed using deep learning based on routine MR imaging to distinguish the two using routine MR imaging and compare performance with expert radiologists.

METHOD AND MATERIALS

A total of 335 ovarian lesions were identified from the institution's database with definitive pathology and pre-operative MR imaging. Preprocessing of the images involved n4 bias correction, intensity normalization, and registration. The images were divided into training, validation, and test sets in a 7:2:1 split. Individual models were trained on T2-weighted (T2WI) and T1-contrast enhanced (T1C) sequences independently, using the ResNet50 architecture. A stochastic gradient descent optimizer was used with Nesterov momentum. The training involved 500 epochs with a batch size of 16 and early stopping (patience=300 epochs). An ensemble model was created by combining clinical variables (age and volume), T2WI and T1C sequences with a bagging classifier to predict ovarian tumor outcomes. Final performance was compared with two experts' interpretation (two radiologists with 23 and 10 years of experience reading pelvic MR, respectively).

RESULTS

Among all 335 lesions, the mean age is 51.33 years old ranging from 13 to 90, and there was no significant difference in age (50.9 ± 15.5 vs 53.1±14.9, p=0.425) and tumor location(p=0.966) between benign and malignant group. The final ensemble model achieved a test accuracy of 85.3% with 33.3% sensitivity and 96.4% specificity. In comparison, expert 1 achieved an accuracy of 67.6% with a sensitivity of 100% and specificity of 60.7%. Expert 2 achieved an accuracy of 64.7% with a sensitivity of 66.7% and 64.3% specificity.

CONCLUSION

Deep learning can distinguish benign from malignant ovarian lesions with high accuracy when compared to experts. Further work on optimization of algorithm and incorporation of a larger, more diverse input cohort will boost performance.

CLINICAL RELEVANCE/APPLICATION

Definite diagnosis of benign from malignant ovarian lesions is difficult based on preoperative imaging. A deep learning algorithm based on routine MRI that can distinguish the two with high accuracy can potentially save patients from unnecessary surgeries/biopsies and guide treatment decisions.

RC307-16 Essential and Emerging MRI Techniques for Gynecologic Cancer Diagnosis and Staging

Tuesday, Dec. 3 11:45AM - 12:00PM Room: E353B

Participants
Caroline Reinhold, MD, MSc, Montreal, QC (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To outline patient preparation that will allow the optimization of the MR imaging acquisition. 2) To determine the essential MR pulse sequences to accurately stage women with gynaecological malignancies. 3) To review emerging MR technologies for staging gynaecological cancers.

RC308

Emergency Radiology Series: Current Imaging of the Acute Abdomen

Tuesday, Dec. 3 8:30AM - 12:00PM Room: S401CD

ER GI GU

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

Participants
Douglas S. Katz, MD, Mineola, NY (*Moderator*) Nothing to Disclose
Vincent M. Mellnick, MD, Saint Louis, MO (*Moderator*) Nothing to Disclose

Sub-Events

RC308-01 Abdominal Fluoroscopic Emergencies

Tuesday, Dec. 3 8:30AM - 9:00AM Room: S401CD

Participants
William M. Thompson, MD, Albuquerque, NM (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Know the ins and outs of performing emergency gastrointestinal examinations. 2) Know the common presentations of emergency esophageal and abdominal disorders. 3) Know how to diagnose the common emergency gastrointestinal disorders demonstrated on fluoroscopic examinations.

RC308-02 Diagnostic Performance and Efficiency of Magnetic Resonance Imaging (MRI) in Suspected Acute Appendicitis

Tuesday, Dec. 3 9:00AM - 9:10AM Room: S401CD

Participants
Nicolas Murray, MD, Vancouver, BC (*Presenter*) Nothing to Disclose
David Jung, West Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG; Stockholder, Canada Diagnostic Centres

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PURPOSE

Evaluate the diagnostic performance and efficiency of MRI in suspected acute appendicitis compared to ultrasound (US) and computed tomography (CT).

METHOD AND MATERIALS

Single institution, IRB-approved, retrospective study of adult patients presenting to emergency department with suspected acute appendicitis from May 2017 to May 2018. Diagnostic characteristics of US, MRI, and CT were analyzed using a contingency table. Diagnostic efficiency was examined by average patient wait time, defined between times of initial imaging and final management decision.

RESULTS

599 patients met the eligibility criteria, with 445 US (54.7%), 137 MRI (16.9%), and 231 CT scans (28.4%) performed. Sensitivity, specificity and diagnostic yield of MRI were respectively 91.7% (95%CI, 73.0%-99.0%), 85.0% (95%CI, 77.0%-91.0%), and 88.3% (95%CI, 81.9%-92.7%), not significantly different than CT with respective values of 94.3% (95%CI, 84.3%-98.8%), 88.8% (95%CI, 83.2%-93.0%) and 93.1% (95%CI, 89.0%-95.7%). Using an intention-to-diagnose approach, diagnostic properties of US were significantly lower than both MRI and CT ($p<0.01$) with sensitivity of 61.5% (95%CI, 51.5%-70.9%), specificity of 18.2% (95%CI, 14.2%-22.7%), and diagnostic yield of 29.7% (95%CI, 25.6%-34.1%). Mean wait time for patients undergoing MRI as initial investigation (n=21, 3.5%, 100.6 minutes) was not significantly different from patients examined initially by CT (n=133, 22.2%, 104.3 minutes, $p=0.78$) or US (n=238, 39.7%, 125.6 minutes, $p=0.29$). All imaging routes where patients experienced multiple modalities had significantly longer wait times than routes involving one modality ($p<0.01$).

CONCLUSION

Diagnostic performance of MRI is comparable to CT and superior than US. With favourable patient wait times, MRI can be considered as initial investigation modality in suspected acute appendicitis.

CLINICAL RELEVANCE/APPLICATION

The greater role of MRI as first-line investigation modality in suspected acute appendicitis will reduce exposure to ionizing radiation without compromising diagnostic performance or timeliness.

RC308-03 Intraluminal Gas in an Inflamed Non-Perforated Appendix: A Reliable CT Sign of Gangrenous Changes and Imaging Occult Perforation

Tuesday, Dec. 3 9:10AM - 9:20AM Room: S401CD

Participants
Mohammad Haroon, MD, New Delhi, ON (*Presenter*) Nothing to Disclose
Yashmin Nisha, MD, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Blair MacDonald, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Adnan M. Sheikh, MD, Ottawa, ON (*Abstract Co-Author*) Speaker, Siemens AG
Kashif Iqubal, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Paul Anton Reymond Prakash Sathiadoss, MBBS, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose
Sabarish Narayanasamy, MBBS,MD, Iowa City, IA (*Abstract Co-Author*) Nothing to Disclose
Abhishek Jha, Aligarh, India (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To assess the utility of intraluminal air in an inflamed, apparently non-perforated appendix in predicting gangrenous changes or occult perforation. Determine, if obstructive appendicolith has an added value in predicting the same.

METHOD AND MATERIALS

This retrospective study was done on adult patients (n=554) of histopathologically proven appendicitis who underwent enhanced MDCT prior to surgery, presenting at our hospital over a consecutive period of 3 years. Patients with obvious CT signs of perforation were excluded to create a cohort of acute uncomplicated appendicitis. These CT were reviewed by an Emergency Radiology Fellow and 2 Emergency Radiologists for presence or absence of intraluminal gas and obstructive appendicoliths. These findings were compared with surgical/pathological results regarding presence or absence of gangrenous/perforated appendicitis. Statistical analysis was performed with the help of contingency tables and sensitivity, specificity, positive and negative predictive values were determined and correlation was tested with Chi-squared test and p value < 0.05 was considered statistically significant.

RESULTS

Of the total 554 cases of acute uncomplicated appendicitis on imaging, 130 had intraluminal gas (90 gangrenous), 178 had obstructive appendicoliths (74 gangrenous) and 66 were with both gas and appendicoliths (50 gangrenous). Sensitivity, specificity, positive and negative predictive values for intraluminal gas and presence or absence of gangrene were 69%, 90%, 69% and 90% respectively. These values for obstructive appendicolith were 42%, 72%, 42% and 72% respectively. These values for the presence of both intraluminal gas and appendicolith were 39%, 96%, 75% and 84% respectively. These values for the presence of either intraluminal gas or appendicoliths were 86%, 69%, 46% and 94% respectively. All these results were significant with p value < 0.05.

CONCLUSION

Presence of intraluminal gas in otherwise acute uncomplicated appendicitis on imaging is a reliable sign of underlying gangrenous changes or image-occult perforation. Presence of obstructive appendicolith, although less reliable sign as an independent risk factor as compared to intraluminal gas, it notably adds to the predective value.

CLINICAL RELEVANCE/APPLICATION

These CT signs are reliable in predicting the risk of gangrene and perforation and can help surgeons to avoid delays in surgery thereby reducing incidence of complications.

RC308-04 Intrapatient Analysis of CT Diagnosis of Acute Diverticulitis: Is Non-Contrast CT Enough?

Tuesday, Dec. 3 9:20AM - 9:30AM Room: S401CD

Participants
Tugce Agirlar Trabzonlu, MD, Chicago, IL (*Presenter*) Grant, Siemens AG
Kevin R. Kalisz, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Kamal Subedi, MBBS, Kathmandu, Nepal (*Abstract Co-Author*) Nothing to Disclose
Donald Kim, DO, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Vahid Yaghmai, MD, Orange, CA (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To evaluate the performance of computed tomography (CT) without oral and intravenous (iv) contrast material for the diagnosis of acute diverticulitis by comparing dual energy CT (DECT) contrast enhanced and virtual non-contrast (VNC) images.

METHOD AND MATERIALS

In this retrospective analysis, we reviewed CT studies with oral and IV contrast obtained with DECT scanner for abdominal pain. Cohort included 153 patients with 306 sets of CT images with a radiological diagnosis of acute diverticulitis (n=76) and control cases without evidence of diverticulitis (n=77) scanned between October 2018 and March 2019. In the first session, the virtual non-contrast images were randomized and analyzed for the presence of diverticulitis. The findings and presence of complication (perforation, abscess formation or fistula) were also noted. In the second session, true contrast enhanced images were randomized

and analyzed. Diagnostic performance of VNC images were compared with contrast enhanced CT studies. Sensitivity, specificity and accuracy were calculated.

RESULTS

Out of 153 patients, 76 (49.7%) had acute diverticulitis and 77 (50.3%) did not have findings of acute diverticulitis on contrast enhanced computed tomography (CECT). 18 of 76 (23.7%) patients with acute diverticulitis had findings of complicated diverticulitis on CECT. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of VNC images were 96.1% (95% CI= 88.9-99.2%), 97.4% (95% CI= 90.9-99.7%), 97.3% (CI= 90.3-99.3%), 96.2% (CI= 89.2- 98.7%) and 96.7% (95% CI= 92.5-98.9%) respectively. The complications of acute diverticulitis was detected in 11 of 18 (61.1%) patients with VNC images.

CONCLUSION

When compared to routine CT imaging with iv and oral contrast, non-contrast images have high diagnostic accuracy for acute colonic diverticulitis. However, for the assessment of the signs of complicated diverticulitis, non-contrast CT had much lower diagnostic performance.

CLINICAL RELEVANCE/APPLICATION

Non-contrast CT can be beneficial for diagnosing uncomplicated diverticulitis. However, the use of contrast remains necessary when complicated diverticulitis is present.

RC308-05 CT in the Setting of Suspected Colonic Diverticulitis: Prevalence and Diagnostic Yield for Diverticular Disease and Alternative Diagnosis in a Large Cohort in 1069 Patients

Tuesday, Dec. 3 9:30AM - 9:40AM Room: S401CD

Participants
Julius M. Weinrich, Hamburg, Germany (*Presenter*) Nothing to Disclose
Peter Bannas, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Maxim Avanesov, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Franziska Schlichting, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Leonie Schmitz, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Azien Laqmani, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Gerhard B. Adam, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Frank Oliver G. Henes, MD, Hamburg, Germany (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To assess the prevalence and diagnostic yield of CT in the detection of diverticulitis and alternative diagnoses (AD) in a large cohort of patients with suspected colonic diverticulitis (CD).

METHOD AND MATERIALS

We retrospectively included 1069 patients (560 women) undergoing CT for the evaluation of suspected CD. The final clinical diagnosis derived from the discharge report was used to determine the prevalence of CD and AD and to calculate the diagnostic accuracy of CT. Differences in the prevalence of diagnoses by age (<45;45-69;>=70 y/o) were compared using Cochran-Armitage test with a p-value <0.05 indicating statistical significance.

RESULTS

Prevalence of CD was 52.4% (561/1069) and of AD 40% (427/1069). In the remaining 7.6% (81/1069) no final clinical diagnoses was established. Overall, CT had a sensitivity and specificity of 99.1%/99.8% for diagnosing CD and for AD 92.7%/96.4%, respectively. The prevalence of diverticulitis was significantly lower in patients >=70 y/o (43%; 128/298) when compared with patients <45 y/o (54.1%;100/185) and 45-69 y/o (56.8%;333/586) (p<=0.0004). The most frequent alternative diagnoses were appendicitis (12.6%; 54/427), infectious colitis (10.5%;45/427), infectious enteritis (8.2%;35/427), urolithiasis (6.1%;26/427), and pyelonephritis (4.9%;21/427). Prevalence of specific AD varied significantly according to age (p<0.05). Appendicitis was significantly more frequent in patients <45 y/o (5.4%;10/185), whereas ischemic colitis, hemorrhage and pneumonia were more frequent in patients >=70 y/o. In the latter group colorectal carcinoma was also a frequent AD (10/298).

CONCLUSION

In the clinical setting of suspected diverticulitis the prevalence of acute diverticulitis and alternative diagnoses varies according to age. CT provides high diagnostic accuracy in the diagnosis of both, diverticular disease and alternative conditions.

CLINICAL RELEVANCE/APPLICATION

Clinicians must be aware that in about 40% of patients with suspected diverticulitis alternative diagnoses are the causes for their symptoms, and that there is an age-related prevalence of AD.

RC308-06 Ultrasound of First Trimester Pregnancy

Tuesday, Dec. 3 9:40AM - 10:10AM Room: S401CD

Participants
Mariam Moshiri, MD, Bellevue, WA (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Learn essential criteria for diagnosis of a normal viable first trimester pregnancy. 2) Learn essential criteria for differentiating an ectopic pregnancy from intrauterine pregnancy, and various ectopic pregnancies. 3) Learn appropriate use of such terms as 'pregnancy of unknown location', findings suspicious for early pregnancy failure', etc as outline by SRU lexicon and criteria.

ABSTRACT

Imaging evaluation of first trimester pregnancy especially in an emergent setting can pose dilemmas since in early pregnancy a gestational sac may not be clearly visible. Differentiating an IUP from an ectopic pregnancy is crucial as the latter requires clinical intervention. There is some overlap of serum BhCG levels with IUP, ectopic pregnancy, and spontaneous pregnancy loss. in 2012, SRU consensus panel published their agreed upon criteria and lexicon for reporting first trimester ultrasound exams. We will review the clinical application of these criteria and the lexicon, and review appearance of various types of ectopic pregnancies.

RC308-07 Dual-energy CT of the Acute Abdomen: Current Status

Tuesday, Dec. 3 10:20AM - 10:50AM Room: S401CD

Participants
Savvas Nicolaou, MD, Vancouver, BC (*Presenter*) Institutional research agreement, Siemens AG; Stockholder, Canada Diagnostic Centres

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LEARNING OBJECTIVES

1) Explain the principles of Dual Energy CT/Spectral imaging. 2) Describe and apply 3-material decomposition. 3) Evaluate application of 3-material decomposition in select cases (organ perfusion in trauma, bowel ischemia, active bleeding, renal stone analysis).

RC308-08 Facilitating Acute Bowel Ischemia Diagnosis: Value of Low-keV Monoenergetic Imaging and Color-Coded Iodine Maps in Dual-Energy CT

Tuesday, Dec. 3 10:50AM - 11:00AM Room: S401CD

Participants
Elina Khasanova, MD, Vancouver, BC (*Presenter*) Nothing to Disclose
Sunghan Jung, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Francesco Macri, MD, PhD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Christopher Lunt, MBChB,MRCS, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Yuhao Wu, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Gavin M. Sugrue, MBBCh, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Nicolas Murray, MD, Vancouver, BC (*Abstract Co-Author*) Nothing to Disclose
Savvas Nicolaou, MD, Vancouver, BC (*Abstract Co-Author*) Institutional research agreement, Siemens AG; Stockholder, Canada Diagnostic Centres

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PURPOSE

To assess the impact of virtual monoenergetic imaging (VMI) and color-coded iodine-overlay images (IOI) on reader confidence and image quality (IQ) in the detection of hypoperfused bowel compared to simulated 120-kVp images (s-120-kVp).

METHOD AND MATERIALS

Institutional review board approval was obtained. Acute bowel ischemia was reported in 80 patients imaged with triphasic CT studies with the portal venous phase acquired with dual energy analysis (90-150 snVp; 3rd generation dual source CT) from 01/02/2016 to 31/12/2018. Of 80 patients, 26 (33%) had bowel ischemia confirmed intra-operatively, 11(14%) deceased within 72 hours, 43 (53%) did not qualify for surgery. S-120-kVp, VMI (40, 50, 60 keV) and IOI (40%, 50%, 60% of iodine overlay color-coded saturation) datasets were created for each patient. Quantitative assessment (HU and CNR) on ischemic bowel, normal bowel, and portal vein was performed only on the surgically proven cases (n=26). Two emergency radiologists independently evaluated subjective image quality (IQ) and diagnostic confidence (DC). Time-to-diagnosis (TTD) was recorded on VMI and IOI datasets with the highest IQ and DC and s-120-kVp dataset. One-way ANOVA and Kruskal-Wallis/Wilcoxon rank sign tests were used for statistical analysis.

RESULTS

There was a significant increase in absolute attenuation difference between normal and ischemic bowel in 40, 50, 60 keV datasets (mean±SD 66±5.3, 62±4.3, 54±5.5 HU) compared to s-120-kVp (38±5.6HU). Both readers deemed 50-keV as the best VMI dataset for subjective IQ including image sharpness and resolution (p= 0.0017), DC (p= 0.0003). IOI-50% demonstrated subjective IQ (p= 0.0021) and DC (p= 0.0041). TTD for 50-keV, IOI -50%, and s-120-kvp datasets resulted 37±4 seconds (sec), 39±10 sec, 107±7 sec).

CONCLUSION

Low energy imaging (50-keV) and color-coded IOI (50% saturation) significantly improved bowel wall conspicuity with increased attenuation differences and higher diagnostic confidence between ischemic and non-ischemic bowel compared to simulated 120-kVp. In addition, 50 keV and 50% IOI datasets allowed shorter TTD.

CLINICAL RELEVANCE/APPLICATION

Hypoperfused bowel often goes unrecognized especially for short ischemic segments that blend in with normal bowel loops. Low monoenergetic images and color-coded overlay iodine maps increase bowel wall attenuation differences improving hypoenhanced bowel segments identification.

RC308-09 Dual-Energy CT in Evaluating the Acute Bowel in Emergency: A Real Diagnostic Gain?

Tuesday, Dec. 3 11:00AM - 11:10AM Room: S401CD

Participants
Luca Tarotto, Napoli, Italy (*Presenter*) Nothing to Disclose
Igino Simonetti, MD, Naples, Italy (*Abstract Co-Author*) Nothing to Disclose
Francesco Palumbo, MD, Napoli, Italy (*Abstract Co-Author*) Nothing to Disclose
Luigi Palumbo, MD, Pozzuoli, Italy (*Abstract Co-Author*) Nothing to Disclose
Alfonso Ragozzino, Pozzuoli, Italy (*Abstract Co-Author*) Nothing to Disclose
Stefania Romano, MD, Pozzuoli, Italy (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

Purpose of the study was to retrospectively analyze the processed imaging findings from the Dual Energy CT examinations of patients with acute abdominal symptoms compared with the native axial and multiplanar reconstructions in evaluating the cause of disease.

METHOD AND MATERIALS

A retrospective analysis on 122 patients who underwent DECT examination in emergency for acute abdominal symptoms were considered. All examinations were performed using a dual energy dual source CT 128 detector rows scanner (Drive, Siemens), after administration of i.v. contrast medium (Iomeron 400, Bracco) with mono or double phase acquisition. Native and processed images (i.e. iodine map, fusion series, virtual non contrast) were analysed in evaluation of: mesenteric vessels opacification of major and secundary branches; bowel wall thickening; bowel wall enhancement; abdominal addictional findings (free peritoneal air and fluid, mesenteric stranding, bowel lumen dilatation). Double readers / blinded final diagnosis analysis were performed; a cross-check of imaging and surgical/endoscopic from both native and processed images were made.

RESULTS

In 94/122 patients a correct diagnosis with correlative native imaging findings have been noted. In 39 patients in which the native images were already effective, post processed imaging findings did not add any new informations, whereas among the 28 patients with inconclusive findings at the native scans regarding the final diagnosis, processed images (iodine map) seemed to show altered findings, most of them in inflammatory and ischemic bowel disease.

CONCLUSION

DECT could be of help in case of controversial and not defined imaging findings , but the relative absolu value of the iodine map in evaluating the bowel wall trophism seemed to be reconsidered.

CLINICAL RELEVANCE/APPLICATION

Clinical relevance of this study is mainly pertinent on the DECT in evaluating the bowel wall enhancement in acute conditions

RC308-10 Abdominopelvic Imaging in the Emergency Department of Patients Treated with Immune Checkpoint Inhibitors: A Single Institute 9-Year Experience

Tuesday, Dec. 3 11:10AM - 11:20AM Room: S401CD

Participants
Ezgi Guler, MD, Cleveland, OH (*Presenter*) Nothing to Disclose
Sreeharsha Tirumani, MBBS, MD, Beachwood, OH (*Abstract Co-Author*) Nothing to Disclose
Daniel A. Smith, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Christopher Hoimes, DO, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Nikhil H. Ramaiya, MD, Shaker Heights, OH (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To evaluate abdominopelvic imaging findings of cancer patients treated with immune checkpoint inhibitors (ICIs) who presented to the emergency department (ED).

METHOD AND MATERIALS

A retrospective database search was performed to identify patients treated with ICIs who presented to the ED and underwent abdominopelvic imaging between January 2010 and November 2018. Images were reviewed to assess tumor burden and to detect immune-related adverse events (irAEs). Clinical indications for imaging and management were documented from medical record.

RESULTS

A hundred patients (62 men, median age: 63 years) with 138 abdominopelvic exams including 123 CT scans, 9 X-rays, 5 US, and 1 HIDA exams were identified. The most common cancer types included lung (40%), melanoma (17%), and kidney (12%). The date of ED visit occurred a median of 70 days after starting ICI (IQR 75-25 139-31). Common imaging indications included abdominal pain (72%), constipation (5%), and hematuria (5%). Forty-nine (35%) ED abdominopelvic scans showed worsening tumor burden at a median of 42 days (IQR 75-25 92-22) following initiation of ICIs. Twenty-five (18%) scans detected a cause of acute abdomen in patients treated with ICIs. In 5 (4%) exams, both an etiology of acute abdomen and worsening tumor burden were identified. Ten (10%) out of 100 patients demonstrated an irAE at a median of 74 days (IQR 75-25 284-42) following initial dose of ICI. irAEs detected on imaging included colitis/enteritis (6/10), pneumatosis coli (2/10), acute hepatitis (1/10), and acute acalculous cholecystitis (1/10). Steroid therapy was started in 2 cases following ICI discontinuation. The other most common causes of acute abdomen included gastrointestinal tract emergencies (10/100), and collections/abscesses (5/100).

CONCLUSION

Thirty-five percent of abdominopelvic imaging of patients on ICI therapy who presented to the ED demonstrated worsening tumor

Thirty-five percent of abdominopelvic imaging of patients on ICI therapy who presented to the ED demonstrated worsening tumor burden. Abdominopelvic irAEs were detected on imaging in 10% of patients and colitis/enteritis was the most common irAE.

CLINICAL RELEVANCE/APPLICATION

Abdominopelvic imaging at the ED detected the etiology of clinical presentation in 57% of patients treated with ICIs.

RC308-11 Clinical Use and Value of Renal Ultrasound for Suspected Urolithiasis in the Emergency Department

Tuesday, Dec. 3 11:20AM - 11:30AM Room: S401CD

Awards
Trainee Research Prize - Medical Student

Participants
Camilo Campo, Boston, MA (*Presenter*) Nothing to Disclose
Jennifer W. Uyeda, MD, Boston, MA (*Abstract Co-Author*) Consultant, Allena Pharmaceuticals, Inc
Aaron D. Sodickson, MD,PhD, Boston, MA (*Abstract Co-Author*) Institutional research agreement, Siemens AG; Speaker, Siemens AG; Speaker, General Electric Company

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PURPOSE

Computed tomography (CT) has the highest sensitivity and specificity for urolithiasis in patients with acute flank pain. However, studies have suggested that ultrasound (US) should be the initial imaging test in the Emergency Department (ED) for acute flank pain. The purpose of this study is to assess the value of renal US in predicting follow-up imaging for patients with acute flank pain and to calculate the additional time required to obtain a renal US prior to CT.

METHOD AND MATERIALS

This was an IRB-approved, HIPAA-compliant retrospective study of all patients that underwent renal US in the ED from March 2018-March 2019 for acute flank pain. Data points collected were: presence of calculi and/or hydronephrosis on US, whether patients underwent follow-up imaging within 24 hours of US, presence of calculi and/or hydronephrosis on follow-up imaging, acute extra-renal findings, need for intervention, and history of urolithiasis. The time interval between US and follow-up CT was recorded based on the time that the tests were ordered.

RESULTS

271 patients underwent renal US in the ED for acute flank pain. 76 of 271 patients (28%) underwent follow-up imaging within 24 hours of initial US: 72 underwent CT abdomen/pelvis and 4 underwent magnetic resonance urogram (MR). Of the initial 271 US, 138 (51%) were positive for calculi and/or hydronephrosis on US. Of the 76 patients who underwent follow-up CT or MR, 40 (52%) had been positive for calculi and/or hydronephrosis on initial US and 36 (47%) had been negative on US. Of the 76 that underwent follow-up imaging, 10 had acute extra-renal findings, and 17 had subsequent intervention. For patients that underwent follow-up CT, the mean time interval between US and CT was 170 min.

CONCLUSION

Few cases of acute flank pain underwent follow-up imaging. Of these, approximately half had a positive US (54%) and half had a negative US (47%). Therefore, it is likely that clinical judgement plays a large role in predicting the need for follow-up imaging. We also found a larger time interval between US and follow-up CT for patients with positive versus negative US, which may reflect that patients with positive US were given the opportunity to pass the stones before follow-up imaging.

CLINICAL RELEVANCE/APPLICATION

Renal US is often the initial test done in the ED for acute flank pain. We evaluate how renal US predicts follow-up imaging and the additional time required to obtain a renal US prior to CT.

RC308-12 Imaging of Renal Emergencies

Tuesday, Dec. 3 11:30AM - 12:00PM Room: S401CD

Participants
John J. Hines JR, MD, Huntington, NY (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Identify acute and emergent conditions of the kidney, with emphasis on renal obstruction, infection and hemorrhage. 2) Discuss cross-sectional imaging findings typically found with acute kidney disease, with an emphasis on CT. 3) Explain how the radiologist can integrate imaging findings with clinical history in order to help guide management of the patient with acute kidney disease.

RC310

Renal Sonography 2019: Update and Controversies

Tuesday, Dec. 3 8:30AM - 10:00AM Room: E451A

GU US

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

FDA Discussions may include off-label uses.

Sub-Events

RC310A Sonography of Renal Masses: Pearls and Pitfalls

Participants
Michael D. Beland, MD, Providence, RI (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Optimize renal ultrasound technique to maximize detection of renal masses. 2) Describe the ultrasound imaging features of a wide variety of renal masses and mass-like conditions and the potential overlap between malignant and non-malignant lesions. 3) Recognize the limitations of ultrasound for renal mass detection and characterization.

RC310B Microbubbles: How to Get Started

Participants
Wui K. Chong, MD, Houston, TX (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Review principles of ultrasound contrast agents, regulatory requirements, administration and safety. 2) Learn how to set up a contrast enhanced renal ultrasound service, training and equipment. 3) Review RVUs billing and reimbursement for renal contrast enhanced ultrasound procedures.

Active Handout:Wui Kheong Chong

http://abstract.rsna.org/uploads/2019/19000117/Active RC310B.pdf

RC310C Genitourinary CEUS

Participants
Stefanie Weinstein, MD, San Francisco, CA (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Review the range of indications for performing CEUS in the genitourinary tract, including the evolving role of CEUS beyond characterization of cystic renal masses. 2) Discuss methods to optimize performance and avoid pitfalls.

ABSTRACT

N/A

RC310D Sonography of Renal Dysfunction

Participants
Jean-Michel Correas, MD, Paris, France (*Presenter*) Advisory Board, Koninklijke Philips NV Speaker, Bracco Group Investigator, Bracco Group Speaker, SuperSonic Imagine Speaker, General Electric Company

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RC311

Review of Pediatric Nuclear Medicine

Tuesday, Dec. 3 8:30AM - 10:00AM Room: S504CD

GI GU MK NM PD

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

LEARNING OBJECTIVES

1) Review of Pediatric Nuclear medicine, particularly for radiologists and nuclear medicine physicians who may not specialize in pediatric patients, and for resident and fellow trainees.

Sub-Events

RC311A Pediatric Gastrointestinal

Participants
Helen R. Nadel, MD, Palo Alto, CA (*Presenter*) Consultant, ICON plc

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LEARNING OBJECTIVES

1) Be able to list indications for GI scintigraphy in children. 2) Be able to describe scintigraphic patterns of disease on GI examinations in children.

RC311B Pediatric Genitourinary

Participants
Neha S. Kwatra, MBBS, MD, Boston, MA (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Describe pediatric renal diseases and understand the complementary role of scintigraphy and other imaging modalities. 2) Apply pediatric-specific imaging considerations. 3) Identify important normal variants/pitfalls in interpretation.

RC311C Pediatric Musculoskeletal

Participants
Susan E. Sharp, MD, Cincinnati, OH (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Be able to describe the utilization and performance of nuclear medicine imaging for musculoskeletal indications in pediatric patients. 2) Be able to identify musculoskeletal findings on Tc-99m-MDP and F-18-FDG scans.

RC311D Case Presentation/Panel Discussion

Participants
Stephan D. Voss, MD,PhD, Boston, MA (*Presenter*) Nothing to Disclose

RC317

Emerging Technologies: Prostate Cancer Imaging & Management - Update 2019

Tuesday, Dec. 3 8:30AM - 10:00AM Room: S505AB

GU MI MR NM

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

FDA Discussions may include off-label uses.

Participants
Peter L. Choyke, MD, Rockville, MD (*Moderator*) License agreement, Koninklijke Philips NV; Researcher, Koninklijke Philips NV; License agreement, ScanMed; License agreement, Rakuten Medical; Researcher, Rakuten Medical; Researcher, General Electric Company; Researcher, Progenics Pharmaceuticals, Inc; Researcher, Novartis AG; ; ; ; ;

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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 technolgies in prostate cancer imaging and management.

Sub-Events

RC317A Introduction to Imaging in Prostate Cancer

Participants
Peter L. Choyke, MD, Rockville, MD (*Presenter*) License agreement, Koninklijke Philips NV; Researcher, Koninklijke Philips NV; License agreement, ScanMed; License agreement, Rakuten Medical; Researcher, Rakuten Medical; Researcher, General Electric Company; Researcher, Progenics Pharmaceuticals, Inc; Researcher, Novartis AG; ; ; ; ;

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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 provide an overview regarding the major issues of imaging in prostate cancer including screening and detection, initial staging, biochemical recurrence and metastatic disease. Recent trends in the management of prostate cancer from active surveillance to first and second line androgen deprivation, radium and chemotherapy/immunotherapy will be briefly discussed. The role of imaging in prostate cancer is becoming much more central than it was a decade ago and this talk will set the stage for other talks in the session that will provide new details regarding novel imaging methods.

RC317B Next Generation Prostate MRI

Participants
Baris Turkbey, MD, Bethesda, MD (*Presenter*) Research support, Koninklijke Philips NV; Royalties, Invivo Corporation; Investigator, NVIDIA Corporation

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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*) Research Grant, Progenics Pharmaceuticals, Inc; Royalties, Progenics Pharmaceuticals, Inc

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LEARNING OBJECTIVES

1) To compare and contrast the imaging characteristics of present and emerging molecular imaging agents for prostate cancer. 2) To describe how emerging molecular imaging agents for prostate cancer are being integrated into clinical practice. 3) To focus on PET agents targeting the prostate-specific membrane antigen (PSMA) with respect to a new structured reporting system proposed to enhance clinical management.

ABSTRACT

n/a

RC317D 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

1) To describe the basic principles and techniques used in hyperpolarized carbon-13 MRI. 2) Understand the cellular metabolic reprogramming that occurs in prostate cancer. 3) Demonstrate the changes in pyruvate to lactate conversion that are observed in prostate cancer and differences with cancer aggressiveness and response to therapy.

RC317E Radionuclide Therapy for Prostate Cancer

Participants
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Printed on: 10/29/20

MSRO32

BOOST: Genitourinary-Anatomy and Treatment Planning (Interactive Session)

Tuesday, Dec. 3 10:30AM - 12:00PM Room: S103AB

GU OI RO

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

Participants
Rohit Mehra, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
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LEARNING OBJECTIVES

1) Learn current data on effectiveness of prostate MRI. 2) Understand inter-rater challenges with prostate MRI. 3) Gain awareness of how analytics can be used to improve quality of care.

GUS-TUA

Genitourinary Tuesday Poster Discussions

Tuesday, Dec. 3 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
Silvia D. Chang, MD, Vancouver, BC (*Moderator*) Nothing to Disclose

Sub-Events

GU212-SD-TUA1 Does an Additional Biopsy or Targeting with Contrast-Enhanced Ultrasound Positively Influence Disease Detection or Severity in the Renal Transplant?

Station #1

Participants
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PURPOSE

To determine if renal transplant (Tx) pathologic diagnosis significantly changes when 2 biopsy sites are chosen and if CEUS has value in targeting the second site.

METHOD AND MATERIALS

40 patients undergoing US guided renal Tx biopsy within 2 years of their Tx were recruited and consented for this IRB approved, sponsor funded study; 20 'surveillance' and 20 with 'for cause' indications. After routine diagnostic ultrasound, CEUS was performed with the aim of identifying cortical regions with subjectively altered flow. One biopsy was at the location deemed 'technically preferred' (primary) by the operator regardless of CEUS findings. An additional biopsy was performed at a second location, either targeted to an area in which CEUS findings differed from the primary site (targeted) or at a random location (secondary) if there was no different area of CEUS findings. Specimens were randomly labeled A or B; the pathologist blinded to the CEUS result and location of the biopsy. Location-specific CEUS assessments were recorded (none, mild, moderate, marked). Pathology results were compared, including total BANFF scores divided into acute and chronic categories.

RESULTS

There were no location-specific pathology differences that correlated with differences in CEUS assessments. Total BANFF score for 2 biopsies was significantly higher than for the primary biopsy alone in both acute ($p=0.02$) and chronic ($p<0.01$) disease. Comparison of the two biopsies yielded tissue with a discordant basic (normal vs abnormal) pathologic conclusion in 5/20 (25%) surveillance patients, but 0/20 (0%) in for cause biopsies. In discordant biopsies, were abnormal only in the primary location and 2/5 only in the secondary site. Major bleeding complications occurred in 3/40 (7.50%) patients; the historical major bleeding complication rate in our lab (6 years) is < 0.5%.

CONCLUSION

Obtaining renal Tx biopsies from two substantially different locations may provide clinically significant additional information. CEUS targeting was not useful. Major bleeding complications were much higher than typical for our institution; this may be due to the additional biopsy away from the "operator preferred" location.

CLINICAL RELEVANCE/APPLICATION

Obtaining biopsies from two substantially different locations in renal transplants may provide clinically significant additional information but should be considered with caution because it may result in higher complication rates.

GU214-SD-TUA3 Contrast-Enhanced MRI Findings in Adnexal Torsion: A Case-Control Study Based on Qualitative and Quantitative Evaluation

Station #3

Participants
Minako Suzuki, MD, Yokohama, Japan (*Presenter*) Nothing to Disclose
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Kazuya Matsunari, MD, Yokohama, Japan (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

To assess qualitative and quantitative findings of contrast-enhanced magnetic resonance imaging (MRI) that are useful in diagnosisg adnexal torsion.

METHOD AND MATERIALS

The case group was made up of 30 patients who were examined by contrast-enhanced MRI during April 2009 to December 2017 and for whom adnexal torsion was confirmed by surgery. The control group was made up of 31patients who were randomly selected from 353 patients who had contrast-enhanced MRI and surgery for ovarian tumors during the same period. Qualitative MRI findings reverled: characteristics of the tumor, cystic wall, characteristics of fallopian tubal swelling, T1WI and DWI high-intensity of the ovary and fallopian tube, contrast intensity of the ovary and fallipian tube, characteristics of ascites and uterine deviation. These findings were independently assessed by two radiologists. Quantitative MRI findings revealed the tumor size, cystic wall thickeness, and contrast intensity ratio of ovaries and fallopian tubes, which were measured by one radiologist.

RESULTS

Significant differences between the case and control groups were observed in the qualitative findings for nodular and twisted swelling of the fallopian tube, and weakness of the contrast enhancement of the ovary and the fallopian tube, high intensity on T1WI of the fallopian tube, in the quantitative findings for average of cystic wall thickeness, ovarian early increased ratio (EIR-o) <0.5, ovarian delayed increased ratio <0.8, and fallopian delayed increased ratio (DIR-t) <1.4.

CONCLUSION

These results identify several contrast-enhanced MRI findings that may be useful in diagnosing adnexal torsion: nodular and twisted tubal swelling, ovarian and tubal contrast enhancement weakening, high intensity on T1WI of the fallopian tube, and contrast enhancement ratio of the ovaries and fallopian tubes.

CLINICAL RELEVANCE/APPLICATION

This is a case-control study of contrast-enhanced MRI of adnexal torsion which revealed old useful knowledges and new quantitative useful findings.

GU247-SD-TUA5 Validation of the Use of Region of Interest (ROI) Measurements for Objective Assessment of Post-Contrast Enhancement of Renal Lesions on Magnetic Resonance Imaging (MRI)

Station #5

Participants
Ishaq S. Al-Salmi, MD, Ancaster, ON (*Abstract Co-Author*) Nothing to Disclose
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Faten Al-Douri, MBChB, Oakville, ON (*Abstract Co-Author*) Nothing to Disclose
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Michael N. Patlas, MD,FRCPC, Hamilton, ON (*Abstract Co-Author*) Speaker, Springer Nature
Abdullah Alabousi, MD, Burlington, ON (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

The aim of this study was to validate the use of region of interest (ROI) measurements in magnetic resonance imaging (MRI) to objectively assess for enhancement in suspected solid renal masses and to determine a minimum threshold value for true enhancement.

METHOD AND MATERIALS

104 consecutive patients who had renal MRI and subsequent biopsy or partial/radical nephrectomy between January 2015-December 2017 were included. Two body imaging fellows independently measured the mean ROI values of renal masses, normal renal parenchyma, the ipsilateral psoas muscle and external air on the pre- and post-contrast sequences. Pathology-proven renal cysts were used as controls. The absolute and percentage changes in the mean ROI values were calculated. The readers were blinded to the pathology results.

RESULTS

104 patients were included in this study (mean age of 65 years; 58 males and 46 females). 74 patients (71%) had a diagnosis of renal cell carcinoma (RCC). Pathology showed clear-cell RCC in 55%, papillary RCC in 22%, and other RCC subtypes in 23%. There were 30 non-RCC renal lesions (29%), including oncocytoma, renal papillary adenoma, and renal metastasis. The minimum percentage change in ROI values in the pre- versus post-contrast images for all pathology-proven RCCs was 23% (range: 23-437%). The percentage change for normal renal parenchyma ranged from 32-317%. The maximum percentage change in ROI values for 13 pathology proven renal cysts was 13%. There was excellent inter-observer agreement between the two readers [Cohen's Kappa (k) 0.84].

CONCLUSION

The percentage change in ROI values on MRI (signal intensity index) can be a helpful tool in the objective assessment of true enhancement of renal masses and can supplement subtraction images. The minimum threshold for enhancement of solid renal lesions in our study was 23%.

CLINICAL RELEVANCE/APPLICATION

The signal intensity index is an objective tool to assess for true enhancement of renal lesions on MRI, which is particularly helpful when the subtraction images are degraded by motion artifact.

GU248-SD-TUA6 Development and Validation of a Radiomics Nomogram for Preoperative Prediction of Extracapsular Extension in Prostate Cancer

Station #6

Participants
Shuai Ma, Beijing, China (*Presenter*) Nothing to Disclose
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PURPOSE

To develop and validate a radiomics nomogram for preoperative prediction of extracapsular extension (ECE) in patients with prostate cancer (PCa).

METHOD AND MATERIALS

Preoperative magnetic resonance imaging data from 238 patients with PCa was studied. Patients enrolled were randomized in a two-to-one ratio into training (n = 165) and validation (n = 73) cohorts. Radiomics features were extracted from T2-weighted images (T2WI). A radiomics signature was built via dimension reduction, feature selection based on the least absolute shrinkage and selection operator method. Finally, a radiomics nomogram comprised of radiomics signature, MR-reported ECE status, and independent clinicopathologic risk factors (i.e., location, maximum diameter and the apparent diffusion coefficient (ADC) values of the index lesion, MR-reported prostatic volume and prostate specific antigen (PSA) level) was constructed using multivariable logistic regression. Discrimination, calibration and clinical usefulness of this radiomics nomogram were subsequently assessed. The incremental role of biopsy results added to the nomogram was also explored by the net reclassification improvement (NRI) value assessment.

RESULTS

A radiomics signature consisting 22 selected radiomics features was significantly associated with pathologic ECE status ($P < .001$ for both training and validation cohorts). The radiomics nomogram comprising radiomics signature, lesion location, PSA level, and MR-reported ECE status demonstrated excellent performance concerning discrimination and calibration, with an area under the curve (AUC) of 0.874 and 0.846 in training and validation cohort, respectively. Clinical usefulness of this nomogram was confirmed with no need to incorporate additional invasive biopsy results.

CONCLUSION

The proposed radiomics nomogram demonstrated adequate discrimination and calibration for preoperative prediction of ECE status.

CLINICAL RELEVANCE/APPLICATION

The proposed radiomics nomogram demonstrated good discrimination and calibration for prediction pathologic ECE status, and was confirmed with no need to incorporate additional biopsy findings to facilitate the preoperative prediction of ECE in a noninvasive fashion, which outperformed subjective MR-reported ECE status by radiologists. It could define patient subsets benefiting most from radical prostatectomy approach, supporting the clinical decision-making.

UR184-ED-TUA7 Bosniak Classification v.2019: Pictorial Review and Update Summary

Station #7

Participants
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Ivan Pedrosa, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Satheesh Krishna, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Stuart G. Silverman, MD, Brookline, MA (*Abstract Co-Author*) Nothing to Disclose
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TEACHING POINTS

After viewing the exhibit, the learner will: 1. Understand the limitations of the current Bosniak Classification of cystic renal masses. 2. Understand the rationale for the Bosniak Classification v.2019 (in press [RADIOLOGY]). 3. Apply a more quantitative approach to characterization of cystic renal masses with CT and MRI. 4. Understand the need for future validation of the Bosniak Classification v.2019.

TABLE OF CONTENTS/OUTLINE

1) Background Discuss changes to management of cystic renal masses in clinical practice, including the expanded role of surveillance and emphasis on survival rather than pathological cancer diagnosis. Discuss limitations of the current Bosniak classification of cystic renal masses. 2) Bosniak v.2019 Objectives To 1) address data indicating renal cell carcinoma with predominant cystic change is overdiagnosed and overtreated, 2) reduce inter-reader variability, 3) improve precision of reported malignancy rates within each Bosniak class, and 4) minimize the number of benign masses undergoing unnecessary treatment by improving specificity (reducing procedural morbidity, loss of renal function, and cost). 3) Pictorial Review of Bosniak v.2019 Proposed updates and changes to the Bosniak classification will be presented with schematic and illustrative examples at CT and MRI.

UR185-ED-TUA8 The Construction of Structured Reporting Template for Renal Cancer

Station #8

Participants
Xiang Liu, Beijing , China (*Presenter*) Nothing to Disclose
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TEACHING POINTS

1.The application of CT examination to make a definite diagnosis before operation is of importance for patients' prognosis. 2. Structured reports(SR) were intended to provide standardized and complete structure for lesion description which were of great significance to the selection of surgical methods and prognosis evaluation. 3. To develope and implement a SR template to determine the grading of tumor and to accurately evaluate renal function for RCC patients.

TABLE OF CONTENTS/OUTLINE

1. The basic clinical evaluation and technical evaluation. 2. Image findings were comprised of 5 subsections. a) Design a framework for lesion evaluation; b) Evaluate tumor invasion concretely; c) Estimate renal vessels and show in key image screenshots; d) Assess lymph node and bone metastasis; e) Other significant imaging signs. 3. Automatically generated a reasonable imaging performance and diagnostic impression simultaneously.

Printed on: 10/29/20

GUS-TUB

Genitourinary Tuesday Poster Discussions

Tuesday, Dec. 3 12:45PM - 1:15PM Room: GU/UR Community, Learning Center

ER GU

AMA PRA Category 1 Credit ™: .50

FDA Discussions may include off-label uses.

Participants
Silvia D. Chang, MD, Vancouver, BC (*Moderator*) Nothing to Disclose

Sub-Events

GU215-SD-TUB1 Machine Learning-Based MRI Radiomics Signature for Preoperative Prediction of ISUP Nuclear Grade in Clear Cell Renal Cell Carcinoma

Station #1

Participants
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PURPOSE

This study aimed to preoperatively predict nuclear grade based on MRI radiomics signature with machine learning method.

METHOD AND MATERIALS

A total of 381 consecutive patients with pathologically comfirmed ccRCC in our Hospital were retrospectively evaluated. A set of 254 patients was used as the training cohort and the remaining 127 patients was set as the test cohort. For each patient, a total of 646 radiomics features were extracted from preoperative T2WI. Logistic regression model in conjunction with the Recursive Elimination Algorithm was used to determine the number of features based on the 3-fold cross-validation score. In order to get better classification results, we combined the logistic regression model based on clinicoradiological risk factors. The receiver-operating characteristic curve and the area under the curve (AUC) were used as evaluation index.

RESULTS

Out of 646 features, 613 radiomics features with excellent reproducibility (ICC equal to or higher than 0.75) were included in the further feature selection process. The logistic regression model using 8 selected features from T2WI showed a favorable effect of discriminating lower-grade ccRCC (ISUP 1 and 2) from higher-grade ccRCC (ISUP 3 and 4) in test cohort. The sensitivity, specificity and AUC were 57.1%, 91.5% and 0.73 (95%CI 0.649-0.809), respectively. Multiple logistic regression model showed that adding radiomics signature to clinicoradiological risk factors model resulted in a slightly improvement of predicting value with the AUC increasing from 0.74 (95%CI 0.655-0.814) to 0.78 (95%CI 0.701-0.851), but the statistical differences have not reached significance (DeLong test, P>0.05).

CONCLUSION

The machine learning-based MRI radiomics signature of T2WI can predict ISUP nuclear grade in patients with ccRCC with a satisfying performance. Prediction value of the combined model is comparable to that of radiomics signature of T2WI or clinicoradiological factor score.

CLINICAL RELEVANCE/APPLICATION

The machine learning-based MRI radiomics signature of T2WI can predict ISUP nuclear grade and is recommended in the initial evaluation of clear cell renal cell carcinoma.

GU216-SD-TUB2 Diagnostic Value of DCE-MR Imaging for Differentiating Malignant Adnexal Masses Compared with Contrast Enhanced T1-W1 with DWI

Station #2

Participants
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PURPOSE

To compare the diagnostic performance of DCE-MRI with delayed contrast enhanced(CE)-T1-weighted images(WI) with diffusion WI (DWI) for differentiating malignant adnexal tumors from benign tumors.

METHOD AND MATERIALS

This study included 99 consecutive patients with ovarian tumors who underwent preoperative imaging and surgery at our institution. Excluded were; pure cystic tumor, endometriotic cyst without solid portion, teratoma, and tumors with peritoneal dissemination or lymph node metastasis. MR images were analyzed by two radiologists; one specialized in gynaecological radiology (reader A) and a non-specialized (reader B). Three sets of images were evaluated: (Set 1) Conventional MRI including T1/T2WI and DWI with ADC map, (Set 2) Set 1 and delayed CE-T1WI, and (Set 3) Set 1 and DCE-MRI with dynamic curve. The reviewers evaluated the presence of tumor features, including thickened regular/irregular septa, vegetation, solid portion, low SI on T2 and DWI, enhancement effect at tumor wall and others in each cases. The criteria predictive benignity/malignancy were defined according to the previous reports. Finally, the reviewer decided lesion characteristic by three point scale (benign, indeterminate, malignant). Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy were calculated. Surgical pathologic findings were used as the reference standard.

RESULTS

Sensitivities for Set 1, 2 and 3 were 88%, 89.8%, and 89.8% respectively in reader A and specificities were 83.7%, 84%, and 74%. PPVs were 84.6%, 84.6%, and 77.2%. NPVs were 87.2%, 89.4, and 88.1%. Accuracies were 85.9%, 86.9%, and 81.8%. In reader B, sensitivities were 77.6%, 85.1%, and 89.7%, respectively. Specificities were 82.9%, 75%, and 71.7%. PPVs were 86.5%, 75.5%, and 67.3%. NPVs were 72.3%, 84.8, and 91.5%. Accuracies were 79.8%, 79.8%, and 78.8%. Intra-reader agreement was substantial agreement ($\kappa = 0.63$) in Set 1, moderate in Set 2 ($\kappa=0.57$) and in Set 3 ($\kappa=0.48$).

CONCLUSION

DCE-MR did not show superiority for differentiating malignant adnexal tumors from benign tumors compared to those with conventional MR, DWI and delayed CE-T1WI.

CLINICAL RELEVANCE/APPLICATION

Adnexal tumors can be correctly diagnosed using only conventional MR, DWI and delayed CE-T1WI without using DCE-MRI in almost about 80% of adnexal tumors.

GU217-SD-TUB3 Diagnostic Efficiency of Intravoxel Incoherent Motion Diffusion-Weighted Imaging (IVIM-DWI) in Staging of Diabetic Nephropathy

Station #3

Participants
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PURPOSE

To analyze the diagnostic efficiency of IVIM-DWI parameters of kidneys in various stages of DN.

METHOD AND MATERIALS

48 patients with DN were enrolled as the observation group,and 35 healthy volunteers as the control group.The eGFRs were calculated for all subjects ,and combined with laboratory examination of renal function parameters(UAER,Scr,BUN) for DN staging. IVIM-DWI(b=0,50,100,150,200, 400,600,800sec/mm²)and Diffusion weighted imaging(DWI,b=50,800 sec/mm²) sequence were obtained on a 3T scanner. A total of 12 regions of interest were drawn for each subject in the different renal cortex and medulla region .The average value of all results is taken to ensure consistency of measurement results.ADC map was automatically generated on the Siemens MRWP workstation after DWI sequence executed. IVIM-DWI parameters(ADC,D,f and D* values) were generated by using a prototype software body diffusion toolbox. Using the laboratory examination of renal function parameters as the criteria to distinguishing the stage of DN,the observation group were divided into three groups, I and II stage, III stage and IV stage, respectively.The renal cortex and medulla IVIM-DWI parameters and laboratory examination of renal function parameters were compared among the groups using the single-factor analysis of variance.ROC curve analysis was used to distinguish the diagnostic performance of IVIM-DWI parameters.A p value less than 0.05 was considered statistically significant for all analyses.

RESULTS

From the healthy control group to the DN IV stage group, the IVIM-DWI parameters of the renal cortex and medulla were gradually decreasing.The laboratory examination of renal function parameters and IVIM-DWI parameters were statistically different between the four groups($p<0.05$). After ROC analysis,the D values of the renal cortex was an optimal parameter for distinguishing healthy control group from observation group,the ADC values of the renal medulla was an optimal parameter for distinguishing healthy control group and the DN I stage group from other two groups, and the ADC values of the renal medulla was an optimal parameter for distinguishing DN IV stage group from other three groups.

CONCLUSION

The D values of the renal cortex and ADC values of the renal medulla have higher diagnostic efficiency in distinguishing the staging of DN.

CLINICAL RELEVANCE/APPLICATION

IVIM-DWI parameters can provide supplementary information for DN clinical staging.

GU249-SD-TUB4 A Radiomic Nomogram Based on Arterial Phase of CT for Differential Diagnosis of Ovarian Cancer and Ovarian Metastases

Station #4

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PURPOSE

To develop and validate a radiomic nomogram based on arterial phase of CT to discriminate the primary and metastatic ovarian tumors preoperatively.

METHOD AND MATERIALS

The institutional review board approved this study and the written informed consent was waived. A total of 110 ovarian cancer patients including 62 primary and 48 metastatic ovarian cancer patients in our institution were reviewed from January 2010 to December 2018. Of 110 ovarian cancer patients, 66 patients were allocated to establish testing model, and the remaining 34 patients were used as validation group. Radiomic features based on the arterial phase of CT were generated automatically by Artificial Intelligence Kit software (A.K. software; GE Healthcare, China). Feature reduction was conducted using the ANOVA+KW test, binary logistic regression analysis, and LASSO regression. A prediction model based on radiomic features was established by logistic linear regression and cross-validation. A nomogram was constructed integrated arterial phase of CT radiomic features, and clinical features, including the CEA and CA125.

RESULTS

Six features(Root mean squared, percentile10,percentile95,Inverse Difference Moment_AllDirection_offset4_SD,InverseDifferenceMoment_AllDirection_offset1_SD,Short Run High Grey Level Emphasis) were selected from the arterial phase of CT images using the LASSO model, following which, the logistic regression model was constructed. The model showed good calibration and discrimination in the training cohort, with an AUC of 0.781 (95% CI: 0.804-0.937), yield the sensitivity of 95.3% and specificity of 51.5%. In the validation cohort, AUC was 0.761 (95% CI: 0.745-0.966), yield the sensitivity was 73.7%, and specificity was 86.7%. A visualized differential nomogram based on the radiomic score, CEA and CA125 was established. The decision curve showed good consistency.

CONCLUSION

The radiomic features of arterial phase of CT may provide great value for differential primary and metastatic ovarian tumors. The visualized nomogram incorporated radiomic features of arterial phase of CT with clinical features may have good prospects for clinical application.

CLINICAL RELEVANCE/APPLICATION

Radiemic-based model on arterial phase of CT is capable of distinguishing ovarian cancer from ovarian metastases.

GU251-SD-TUB6 Nutcracker Syndrome: Diagnostic Accuracy of Jetting Sign and Expansion Ratio of Left Renal Vein in Multiphase CT

Station #6

Participants
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PURPOSE

To assess the diagnostic values of multiphase CT findings of nutcracker syndrome (NCS).

METHOD AND MATERIALS

Eighty six patients (M:F = 29:57, mean age 43.2 years, range 18-83 years) that presented with hematuria, showed left renal vein (LRV) compression between the aorta and SMA (aortomesenteric portion) on CT and further evaluated by renal venography (n = 25) or cystoscopy (n = 61) were included. Patients with renocaval pressure gradient >= 3mmHg on renal venography (n = 10) or showing bloody urine jetting from left ureteral orifice on cystoscopy (n = 8) are defined as Nutcracker group, and the rest of 68 patients are set as control group. The CT findings were analyzed with presence of jetting contrast flow from LRV to IVC (jetting sign), aortomesenteric distance, presense of collateral veins and expansion ratio of LRV diameter in the aortomesenteric portion on delayed phase compared to that of late arterial phase. Clinical findings including age, gender and body mass index were also

analyzed.

RESULTS

Jetting sign of LRV was found in 77.8% (14/18) of Nutcracker group and in 35.3% (24/68) of control group with the significant difference (P = 0.001). Between Nutcracker group and control group, aortomesenteric distance (P = 0.035), expansion ratio of LRV diameter on delayed phase (P = 0.019) and age (P < 0.001) differed significantly. Lower age (OR 0.95, 95% CI: 0.912-0.987, P = 0.009), presence of jetting sign (OR 4.99, 95% CI: 1.259-19.780, P = 0.022) and lower expansion ratio of LRV diameter on delayed phase (OR 0.29, 95% CI: 0.084-0.995, P = 0.049) are significant independent factors in multiple logistic regression. Presence of jetting sign shows area under the ROC curve (AUC) 0.712 with a sensitivity of 77.78% and a specificity of 64.71%. The expansion ratio of LRV diameter shows AUC 0.706 with a sensitivity of 83.33% and a specificity of 54.41% at cut-off value 1.7. Finally, AUC 0.874 was obtained with a sensitivity of 88.89% and a specificity of 77.94% for the diagnosis of Nutcracker group.

CONCLUSION

Jetting sign of LRV and expansion ratio of LRV diameter on delayed phase compared to that of late arterial phase can be useful in diagnosing NCS when Nutcracker feature is suspected on CT.

CLINICAL RELEVANCE/APPLICATION

We evaluated the morphology of contrast flow and diameter change of left renal vein at stenotic portion in two phases to predict Nutcracker syndrome.

UR186-ED-TUB7 Practical Guide to Enhancing Radiologist Role in the Diagnosis of Diseases: Case Studies in Genitourinary Imaging

Station #7

Participants
Kheng L. Lim, MD, Bala Cynwyd, PA (*Presenter*) Nothing to Disclose

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TEACHING POINTS

In an era of increasing healthcare provider accountability for patient outcomes, there are revived opportunities for radiologists to enhance their roles in achieving timely and accurate diagnosis of diseases. This exhibit highlights the value radiologists can bring to the table in the diagnosis and management of diseases. Case studies highlighting the process of rendering high-value diagnosis in acute emergency setting are presented. Lessons glimpsed from this analysis can provide a path for radiologists to sustain a meaningful role of being a 'doctor', and avoid burnout from ever increasing RVU-driven workload. Teaching points highlighting the fullest utilization of electronic medical record are presented.

TABLE OF CONTENTS/OUTLINE

Discussion of each genitourinary case follows the patient course through the healthcare system from presentation, initial clinical assessment (H&P), laboratory and radiologic workup, pathologic diagnosis, and final patient outcomes. Examples include: Acute presentation of flank pain, discussion of common etiologies, and differential diagnosis radiologists render on this case. Pyelonephritis, and discussion of spectrum of renal infection. Workup of palpable lump in the groin. Incidentally found renal mass during workup of back pain and its implications. Literature review of incidentaloma and nephrectomy rate.

UR187-ED-TUB8 Infiltrative Renal Lesions: Imaging Findings, Differential Considerations, and Mimickers

Station #8

Awards
Certificate of Merit
Identified for RadioGraphics

Participants
David Sweet, MD, Cleveland, OH (*Presenter*) Nothing to Disclose
Ryan Ward, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Steven C. Campbell, MD,PhD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Erick M. Remer, MD, Beachwood, OH (*Abstract Co-Author*) Travel support, Bracco Group

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remere1@ccf.org

TEACHING POINTS

1. Infiltrative renal lesions represent a discrete subset of renal tumors and inflammatory processes. 2. These lesions are characterized by replacement of or invasion into the renal parenchyma and often cause renal enlargement with preservation of the renal shape. 3. While nonspecific, these features, when combined with clinical history and laboratory data, can help suggest the correct diagnosis.

TABLE OF CONTENTS/OUTLINE

1. Expansile vs. Infiltrative Lesions - Imaging Features 2. Renal Cortical Tumors a. Atypical Renal Cell Carcinoma (RCC) b. Sarcomatoid and Rhabdoid Differentiation c. Tumor Thrombus 3. Renal Medullary Tumors a. Renal Medullary Carcinoma b. Collecting Duct Carcinoma 4. Renal Pelvis Tumors a. Urothelial Carcinoma (UCC) b. Metachronous UCC c. Squamous Cell Carcinoma 5. Lymphoproliferative Disorders a. Renal Lymphoma b. Renal Leukemia c. Renal Plasmacytoma 6. Renal Metastases a. Primary Lung Cancer b. Primary Breast Cancer c. Primary Thyroid Cancer d. Rare Primary Neoplasms 7. Pediatric Renal Tumors a. Wilms Tumor b. Mesonephric Blastoma c. Rhabdoid Tumor 8. Inflammatory Mimickers a. Acute Pyelonephritis b. Xanthrogranulomatous Pyelonephritis

MSCC33

Case-based Review of Nuclear Medicine: PET/CT Workshop-Abdomen/Pelvis & Pediatrics (In Conjunction with SNMMI) (Interactive Session)

Tuesday, Dec. 3 1:30PM - 3:00PM Room: E450B

CT GI GU NM PD

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

Participants
Medhat M. Osman, MD, Saint Louis, MO (*Moderator*) Speakers Bureau, Advanced Accelerator Applications SA

Sub-Events

MSCC33A Adult Abdomen/Pelvis

Participants
Don C. Yoo, MD, Lexington, MA (*Presenter*) Consultant, inviCRO, LLC
Terence Z. Wong, MD, PhD, Chapel Hill, NC (*Presenter*) Consultant, Lucerno Dynamics, LLC;

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LEARNING OBJECTIVES

1) Review challenging and instructive cases PET/CT scans in the abdomen and pelvis which will help with interpretation of PET/CT scans.

ABSTRACT

For oncologic studies, F18-FDG is an outstanding tracer with wide applications. However, there are many pitfalls which can make interpretation challenging. The purpose of this educational activity is to familiarize the audience with the normal biodistribution of FDG in the body and learn various pitfalls in the abdomen and pelvis that can occur when interpreting oncologic PET/CT scans.

MSCC33B Pediatrics

Participants
Helen R. Nadel, MD, Palo Alto, CA (*Presenter*) Consultant, ICON plc

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LEARNING OBJECTIVES

1) Be able to identify indications for pediatric PET /CT or PET/MRI imaging. 2) Be familiar with protocols used for pediatric PET/MRI.

MSRO34

BOOST: Genitourinary-Case-based Multidisciplinary Review (Interactive Session)

Tuesday, Dec. 3 3:00PM - 4:15PM Room: S103AB

GU OI RO

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

Participants
Nicole Curci, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Arvin K. George, MD, Ann Arbor , MI (*Presenter*) Research Consultant, TROD Medical
Stanley L. Liauw, MD, Chicago, IL (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Understand the utility of Prostate MRI in clinical decision-making in the following areas: A) Primary diagnosis, B) Active Surveillance for Prostate Cancer, C) Surgical Planning, D) Treatment Failure, E) Selection for focal therapy candidacy.

RC413

Pediatric Series: Gastrointestinal/Genitourinary

Tuesday, Dec. 3 3:00PM - 6:00PM Room: E353B

GI GU PD

AMA PRA Category 1 Credits ™: 2.75
ARRT Category A+ Credits: 3.25

FDA Discussions may include off-label uses.

Participants
Jonathan R. Dillman, MD, MSc, Cincinnati, OH (*Moderator*) Research Grant, Siemens AG; Research Grant, Guerbet SA; Travel support, Koninklijke Philips NV; Research Grant, Canon Medical Systems Corporation; Research Grant, Bracco Group
Ethan A. Smith, MD, Cincinnati, OH (*Moderator*) Nothing to Disclose
Brandon P. Brown, MD, Indianapolis, IN (*Moderator*) Nothing to Disclose
Sabah Servaes, MD, Philadelphia, PA (*Moderator*) Nothing to Disclose

Sub-Events

RC413-01 Pediatric Liver Malignancies

Tuesday, Dec. 3 3:00PM - 3:20PM Room: E353B

Participants
Gary R. Schooler, MD, Dallas, TX (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Identify clinical and imaging characteristics of the two most common primary pediatric hepatic malignancies: hepatoblastoma and hepatocellular carcinoma. 2) Apply an up-to-date imaging strategy for pediatric patients with hepatoblastoma and hepatocellular carcinoma.

RC413-02 Diagnosis of Pediatric Liver Diseases with Multiparametric MRI and Quantitative Magnetic Resonance Cholangiopancreatography (MRCP) Analysis

Tuesday, Dec. 3 3:20PM - 3:30PM Room: E353B

Participants
Lin Cheng, Oxford, United Kingdom (*Presenter*) Employee, Perspectum Diagnostics Ltd
Sofia Mouchti, Oxford, United Kingdom (*Abstract Co-Author*) Employee, Perspectum Diagnostics Ltd
Ged Ridgway, Oxford, United Kingdom (*Abstract Co-Author*) Employee, Perspectum Diagnostics Ltd; Stockholder, Perspectum Diagnostics Ltd
Marc H. Goldfinger, Msc, PhD, Oxford, United Kingdom (*Abstract Co-Author*) Researcher, Perspectum Diagnostics Ltd
Carlos D. Ferreira, Oxford, United Kingdom (*Abstract Co-Author*) Shareholder, Perspectum Diagnostics Ltd; Employee, Perspectum Diagnostics Ltd
Andrea Borghetto, Oxford, United Kingdom (*Abstract Co-Author*) Employee, Perspectum Diagnostics Ltd
Andrea Dennis, Oxford, United Kingdom (*Abstract Co-Author*) Employee, Perspectum Diagnostics Ltd
Matt Kelly, PhD, Oxford, United Kingdom (*Abstract Co-Author*) Employee, Perspectum Diagnostics Ltd
Kamil Janowski, Warsaw, Poland (*Abstract Co-Author*) Nothing to Disclose
Elzbieta Jurkiewicz, MD, Warsaw, Poland (*Abstract Co-Author*) Nothing to Disclose
MacIej Pronicki, Warsaw, Poland (*Abstract Co-Author*) Nothing to Disclose
Ma?Gorzata Wozniak, Warsaw , Poland (*Abstract Co-Author*) Nothing to Disclose
Sylwia Chelstowska, Warsaw, Poland (*Abstract Co-Author*) Nothing to Disclose
Wieslawa Grajkowska, Warsaw, Poland (*Abstract Co-Author*) Nothing to Disclose
Stefan Neubauer, Oxford, United Kingdom (*Abstract Co-Author*) Shareholder, Perspectum Diagnostics Ltd Non-Executive Director, Perspectum Diagnostics Ltd
David Debrota, MD, Zionsville , IN (*Abstract Co-Author*) Vice President, Perspectum Diagnostics Ltd
Michael Brady, Oxford, United Kingdom (*Abstract Co-Author*) Founder and Chairman, Perspectum Diagnostics Ltd Founder and Chairman, Volpara Health Technologies Limited Founder, ScreenPoint Medical BV Chairman, Acuitas Medical Ltd Chairman, IRISS Medical Chairman, Colwiz
Rajarshi Banerjee, MD,DPhil, Oxford, United Kingdom (*Abstract Co-Author*) CEO, Perspectum Diagnostics Ltd
Piotr Socha, Warsaw, Poland (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

Non-invasive objective diagnostic methods are urgently needed in paediatric liver diseases, such as autoimmune hepatitis (AIH) and primary sclerosing cholangitis (PSC). Iron-corrected T1 (cT1) generated from a multiparametric MRI method *LiverMultiScan*TM (LMS) has been shown to correlate with biopsy-assessed inflammation and fibrosis in adults [1]. The biliary tree can be analysed by a novel quantitative MRCP method, *MRCP+*, quantifying biliary tree volume, local duct diameters, and dilated/strictured regions. Here, we investigate whether biomarkers from LMS and MRCP+ can differentiate AIH, PSC and healthy controls in the paediatric setting.

METHOD AND MATERIALS

In this prospective study, 49 paediatric patients (6-18 yrs.; AIH: n=41; PSC/AIH overlap syndrome: n=8) and 20 healthy age-matched controls underwent LMS and T2w MRCP imaging on 1.5T Siemens Avanto-fit. cT1(median, interquartile range), T2*, fat fraction, etc. were generated from LMS, and 20 biliary system metrics were generated from MRCP+; in total 25 variables were fit to logistic regression models to discriminate healthy, AIH and PSC patients. Stepwise logistic regression was used to select optimal combinations of variables to stratify individuals by disease. ROC analysis was performed for the selected predictors and their combinations.

RESULTS

Median cT1 and the sum of dilation severity are the optimal predictors for classifying healthy from disease group (p=0.015 and 0.013, respectively), and their combination yields the strongest predictor (AUC=0.86). Four individual predictors: fat fraction, median cT1, number of ducts with candidate strictures, and length percentage of strictured or dilated ducts, can significantly differentiate AIH from non-AIH (p=0.038, 0.003, 0.024 and 0.023, respectively); ROC curves indicate that their combination is the strongest predictor for AIH (AUC=0.83). The number of ducts with candidate strictures is the strongest predictor for discriminating PSC (p=0.003) and yields AUC of 0.85, which shows MRCP+ has the potential to objectively differentiate PSC from non-PSC.

CONCLUSION

LiverMultiScan and quantitative MRCP have the potential to aid radiologists with the assessment of paediatric liver diseases including AIH and PSC.

CLINICAL RELEVANCE/APPLICATION

A novel non-invasive method using multiparametric MRI and quantitative MRCP (*MRCP+*) can predict healthy/AIH/PSC objectively, thus aid clinicians with the diagnosis of paediatric liver diseases.

RC413-03 Assessment of Normal Values of GSI Spectroscopy in Children's Liver Based on Fixed-time Contrast Medium Injection

Tuesday, Dec. 3 3:30PM - 3:40PM Room: E353B

Participants
Chunxiang Wang, Tianjin, China (*Presenter*) Nothing to Disclose
Nan Yang, Tianjin , China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Objective: Spectral CT can provide meaningful multi-parameter diagnostic information for clinic. However, the normal values of liver energy spectrum analysis in children are still unclear. In this study, the normal range of liver energy spectrum analysis in children with enhanced GSI was assessed by fixed-time injection of iodine contrast agent based on their body weight.

METHOD AND MATERIALS

MATERIALS: Thirty children with body mass greater than 20 kg and non-hepatic lesions underwent abdominal CT enhancement from January to February 2019 were selected. All children underwent abdominal CT enhancement using the Revolution GSI model. All patients were given iodine contrast medium of 300 mg I/ml at 1.5 ml/kg and fixed contrast medium injection time of 24 seconds. (Table 1)Portal vein phase was selected for evaluation, and the delay time was fixed at 56 seconds after injection. The values of 70 KeV, iodine water value(mg/ml), water iodine value(mg/ml)and Effective-Z atomic number of 8 segments of liver were measured by Couinaud liver segmentation method(Fig.1). All data were tested by single sample T test, and the 70 KeV, iodine water value, iodine water value, Effective-Z atomic sequence value and body weight of each segment were displayed by scatter plot.

RESULTS

Results: The body weight of 30 samples ranged from 20.1 kg to 65.0 kg, with an average of 29.60 + 12.26 kg. Single sample T test showed no significant changes in liver energy spectrum 70 keV, iodine water value, water iodine value and Effective-Z atomic number of children with different body weight (Table 2). The scatter plot showed that the 70 keV value of each liver segment increased with the increase of body weight, while the trend lines of iodine water value, water iodine value and atomic sequence value showed a steady trend(Fig.2).

CONCLUSION

CONCLUSION: The normal CT value of children's liver parenchyma obtained by traditional enhanced examination is not reliable, but the normal values of iodine water, water iodine and Effective-Z atomic number of children's liver obtained by fixed time injection of iodine contrast agent can be trusted.

CLINICAL RELEVANCE/APPLICATION

CLINICAL RELEVANCE/APPLICATION:The determination of normal values of multi-parameters of children's liver energy spectrum CT can reflect the characteristics and functional status of children's liver more comprehensively, so as to obtain more accurate and comprehensive diagnosis.

RC413-04 CT and MR Imaging of Pancreatic Trauma in Children

Tuesday, Dec. 3 3:40PM - 3:50PM Room: E353B

Participants
Ala Y. Ibrahim, Toronto, ON (*Presenter*) Nothing to Disclose
Paul Wales, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Michael R. Aquino, MD, MS, Toronto, ON (*Abstract Co-Author*) Co-author, Reed Elsevier
Govind B. Chavhan, MD, Toronto, ON (*Abstract Co-Author*) Speaker, Bayer AG

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PURPOSE

To evaluate the type and grade of pancreatic injury in children on CT and correlate it with management and outcome. To evaluate MRI findings of pancreatic trauma and correlate it with CT grades of pancreatic injury.

METHOD AND MATERIALS

Retrospective review of children with pancreatic injury over 16 years period was performed to note mechanism of injury, injury severity score(ISS), associated abdominal injuries, management and interventions performed, and outcome. All CT and MR images were re-reviewed by two radiologists and pancreatic injuries were classified according to the American Association for the Surgery of Trauma (AAST)

RESULTS

Of 3,265 children presented with trauma during the study period, only 28 (0.86%) children (M:F 19:9; mean age 7.14 yrs; age range1-15yrs) had pancreatic injury. 27 had CT of the abdomen with 26 of them performed on the day of trauma. According to AAST, there were 5 (19%) grade I, 9 (33%) grade II, 8 (30%) grade III, and 3 (11%) grade IV. No pancreatic parenchymal injury was identified in 2 (7%) patients with isolated fluid around the pancreas and mesentery. Associated injuries were seen in 93% cases. MRI was performed in 10 children on day 0-330 (median 41 day) of trauma. Pancreatic duct injury was seen on 5/10 and pseudocyst on 4/10. Signal intensity difference in pancreatic parenchyma (SIDPP) and caliber difference in duct (CDD) proximal and distal to the injury site was seen in 5/10 children, 2/10 showed only SIDPP, 1/10 showed only CDD and 1/10 showed atrophy of body and tail with ductal dilatation. Two patients died because of multiorgan injuries, 9 patients (mainly with grade III and IV injuries)underwent surgery and/or ERCP and 16 patients (mostly grade I&II)were treated conservatively. AAST grading of pancreatic injury on CT correlated with type of management (p=0.0001).

CONCLUSION

CT grading of injury correlates with management and guides intervention and/or surgery versus conservative treatment. MRI is useful for assessing ductal injury and secondary changes in pancreatic parenchyma and the PD, and it should be performed when the status of the PD is not clear on CT

CLINICAL RELEVANCE/APPLICATION

CT grading of pediatric pancreatic injury is crucial as it correlates with subsequent management. MRI is useful for assessing ductal injury and secondary changes in pancreatic parenchyma.

RC413-05 DTI of the Kidney in Children: Comparison between Normal Kidneys and Those with Ureteropelvic Junction (UPJ) Obstruction

Tuesday, Dec. 3 3:50PM - 4:00PM Room: E353B

Participants
Suraj D. Serai, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Juan Calle Toro, MD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
J. C. Edgar, PhD, Philadelphia, PA (*Abstract Co-Author*) Nothing to Disclose
Hansel J. Otero, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose

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PURPOSE

To compare renal diffusion tensor imaging (DTI) parameters in patients with or without ureteropelvic junction (UPJ) obstruction.

METHOD AND MATERIALS

Patients that underwent functional MR urography (MRU) with renal DTI were retrospectively selected. Kidneys deemed normal on T2-weighted images and functional parameters (i.e. time to peak, calyceal transit time and renal transit time) were used as control kidneyss and compared to kidneys with morphologic findings of UPJ obstruction and renal transit time >490 seconds. DTI included a 20-direction DTI with b-values of b=0 s/mm2 and b=400 s/mm2. Diffusion Toolkit and TrackVis were used for analysis and segmentation. TrackVis was used to draw regions of interest (ROI) covering the entire volume of the renal parenchyma, excluding the collecting system. Fibers were reconstructed using a deterministic fiber tracking algorithm. Whole kidney ROI based analysis was performed to obtain cortico-medullary measurements (Fractional anisotropy (FA), ADC and track length) for each kidney. T-tests compared means with statistical significance defined at $p<0.05$.

RESULTS

118 normal kidneys from 102 patients (mean age 8.0 ± 5.8 years; 58 males and 44 females) were compared to 18 kidneys from 16 patients (10.4 ± 6.8 years; 9 males and 7 females) with UPJ Obstruction. Mean FA values were significantly lower (0.31 ± 0.07; n=18) in kidneys with UPJ obstruction than normal kidneys (0.40 ± 0.08; n=118) ($p<0.001$). ADC was marginally significantly different ($p= 0.01$) and track length was not significantly different ($p= 0.24$).

CONCLUSION

DTI derived fractional anisotropy (FA) appears to discriminate between normal kidneys and those with UPJ obstruction, in the future, FA could potentially be used to monitor renal damage in patients with UPJ obstruction obviating the need for contrast administration and thus shortening exam length.

CLINICAL RELEVANCE/APPLICATION

DTI of the kidney is feasible in a clinical setting and can provide complementary functional information in patients with UPJ obstruction.

RC413-06 Imaging Features and Clinical Decision-making in Pediatric Focal Nodular Hyperplasia

Tuesday, Dec. 3 4:00PM - 4:10PM Room: E353B

Participants
Greg Chambers, MBBS, MSc, Paris, France (*Presenter*) Nothing to Disclose
Angelo Zarfati, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Cecile Cellier, Rouen, France (*Abstract Co-Author*) Nothing to Disclose
Catherine Adamsbaum, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Sophie Branchereau, Paris, France (*Abstract Co-Author*) Nothing to Disclose
Stephanie Franchi-Abella, MD, Le Kremlin-Bicetre, France (*Abstract Co-Author*) Nothing to Disclose

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g.chambers@nhs.net

PURPOSE

Describe imaging features of pediatric focal nodular hyperplasia (pFNH) in a large cohort and propose clinical, radiological and surgical management

METHOD AND MATERIALS

Imaging of 87 children with 105 pFNH lesions from 1977-2018 were evaluated by 2 radiologists for features such as size, number, echogenicity/density/intensity, presence of central scar and enhancement pattern. All patients referred from 1996 were assessed for symptoms, risk factors, initial management, follow up and outcome. Results were used to form management guidelines for future patients.

RESULTS

87 patients (70% female) with 105 lesions were analysed. 8 patients (9.2%) had multiple pFNH. Size ranged from 1-13.7cm. Ultrasound (US) imaging was available for 82 patients, CT in 32 patients and MRI in 44 patients. pFNH are iso-/hyperechoic on US (68/82) with arterial Doppler flow in 75% (36/48). Contrast US shows typical enhancement in 86% (6/7). On CT, pFNH are iso-/hypodense (30/32) pre-contrast with typical enhancement in 79.5% (31/39). On MRI, pFNH are iso-/hypointense on T1 (37/44), iso-/hyperintense on T2 (42/44), hyperintense on diffusion (23/28) and show typical enhancement in 71.8% (28/39). 50 patients were referred after 1996: 74% females, mean age 8.9 years old with 46% symptomatic. Mean length of follow-up was 5.2 years. Mean long axis diameter pFNH lesion at diagnosis was 5.9cm. 74% of patients underwent watchful waiting and 26% surgical resection. Of the watchful waiting patients 25 (67.5%) had lesional growth, 6 (16.2%) showed stability and 6 (16.2%) showed lesional decrease. 9 (24.3%) of the observed patients eventually had surgery. 92% of patients were asymptomatic at the end of follow-up with no significant difference in the surgical and observational groups.

CONCLUSION

pFNH is a rare tumour which can be large, multiple, atypical on imaging and a weaker predisposition for females than in adults. Atypical cases require histological confirmation to exclude differential diagnoses such as adenoma. We propose a conservative approach to treatment given that surgery has risks and complications. Surgery should be considered first line in patients presenting with compressive abdominal symptoms.

CLINICAL RELEVANCE/APPLICATION

These results offer a clinico-radiological strategy for the diagnosis and management of these rare pediatric liver tumours, which will help clinicians triage their patients towards wathcful wating, radiological intervention or surgery.

RC413-07 CEUS of Pediatric Liver Masses

Tuesday, Dec. 3 4:10PM - 4:30PM Room: E353B

Participants
Judy H. Squires, MD, Pittsburgh, PA (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Learn basic principles for performing contrast-enhanced ultrasounds for focal liver lesion evaluation. 2) Identify imaging characteristics of common focal liver lesions, including how to distinguish benign from malignant lesions.

RC413-08 Imaging of Pediatric Pancreatitis

Tuesday, Dec. 3 4:40PM - 5:00PM Room: E353B

Participants
Sudha A. Anupindi, MD, Philadelphia, PA (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Define the current terminology of subtypes of pancreatitis in children. 2) Describe the current and emerging imaging techniques for pediatric pancreatitis. 3) Examine the common congenital anomalies which lead topancreatitis.

RC413-09 Imaging Diagnosis and Differential Diagnosis of Pancreatoblastoma (PB) and Solid Pseudopapillary Tumors (SPTs) of Children

Tuesday, Dec. 3 5:00PM - 5:10PM Room: E353B

Participants
Zhaoxia Yang, Shanghai , China (*Presenter*) Nothing to Disclose
Ying Gong, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose
Zhongwei Qiao, Shanghai, China (*Abstract Co-Author*) Nothing to Disclose

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879760449@qq.com

PURPOSE

To determine if characteristic features on computed tomographic and (or) magnetic resonance imaging can differentiate pancreatoblastoma(PB) and solid pseudopapillary tumours (SPTs) of the pancreas in children.

METHOD AND MATERIALS

The clinical and imaging data of 34 children with pancreatoblastoma(PB) and solid pseudopapillary tumours (SPTs) that were confirmed by surgeries were retrospectively analyzed,including 20 cases of SPTs and 14 cases of PB. The size, margin, calcification, hemorrhage, proportion of solid component, intratumoral vessels, encapsulation of the tumor, dilatation of pancreatic duct, peripancreatic vessel invasion, distance metastasis status, and the apparent diffusion coefficient(ADC) values of the two groups were analyzed and key diagnostic points were identified. Statistical analysis was performed using the $\chi 2$ test and the Student's t test.

RESULTS

All children with SPTs were more than 5 years old which was significant older than children with PB(p=0.000);There was no significant sex differential between SPTs and PB(p=0.148). Mean maxisimum tumour size in PB was signifcantly larger than SPTs (p=0.001). PB presented with more calcification(p=0.002), intratumoral vessels(p=0.000), vascular invasion(p=0.000) and distant metastasis(p=0.003) comparison with SPTs, while SPTs were more prone to hemorrhage(p=0.033) and had a higher mean ADC value(p=0.019). There were no significant statistical differentiation in tumor capsule(p=0.442), dilatation of pancreatic duct(p=1.000), and cystic degeneration area over than 50% of tumor volume(p=0.719) between two groups of tumors.

CONCLUSION

CT and (or) MRI is helpful in the differential diagnosis of pancreatoblastoma(PB) and solid pseudopapillary tumors (SPTs) of pancreas in children.Pancreatoblastomas were usually presented as large tumors with calcification,intratumoral vessel,vascular invasion and distant metastasis comparison with SPTs,while SPTs had a tendency to intratumoral hemorrhage and higher ADC values.

CLINICAL RELEVANCE/APPLICATION

SPT is the most common pancreatic tumor in children; And pancreatoblastoma(PB) is considered the most common malignant tumor in children in the first decade. Differential diagnosis of these two tumors is very important for clinical because of different prognosis. Our result demonstrated that CT and (or) MRI is helpful in the differential diagnosis of PB and SPTs of the pancreas in children.

RC413-10 Study on Normal Range of GSI Energy Spectrum Analysis of Children's Pancreas Based on Contrast Agent Fixed-Time Injection Method

Tuesday, Dec. 3 5:10PM - 5:20PM Room: E353B

Participants
Sipei Xing, Tianjin , China (*Presenter*) Nothing to Disclose
Nan Yang, Tianjin , China (*Abstract Co-Author*) Nothing to Disclose
Chunxiang Wang, Tianjin, China (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

This study used a fixed-time injection of iodine contrast agent based on the body mass of the child to evaluate the normal range of the analysis of the pancreatic energy spectrum of the children in the GSI spectrum enhancement examination.

METHOD AND MATERIALS

Thirty children with a body mass greater than 20 kg and a non-pancreatic lesion with abdominal CT enhancement were selected from 2019.1 to 2019.2. All patients underwent GSI spectroscopy CT enhancement examination using GE revolution CT. Four scan protocols (four groups) were scanned according to body weight (Table 1), and a uniform contrast protocol was used: 300 mgI was given according to the weight of the child per ml Iodine contrast agent 1.5ml/kg, and use 24s fixed contrast injection time method. All patients underwent an image evaluation of the portal vein phase. The phase delay time was 56s after the contrast agent injection. The ROI of the head, body and tail of the pancreas was selected (Fig. 1), and the four energy spectrum analysis values of 70KeV, iodine water value, water iodine value and atomic number were measured. The single sample statistics were drawn using SPSS software. (Table 2).

RESULTS

This indicates that the four energy spectrum analysis values of 70KeV, iodine water value, water iodine value and atomic number obtained are relatively fixed in children with pancreatic energy spectrum GSI enhanced CT examination using fixed-time injection of iodine contrast agent.

CONCLUSION

Contrast fixed injection time method according to different body weight to give different doses of iodine contrast agent, can ensure that children of different body weight under the contrast agent program and relatively fixed weight of iodine contrast agent, iodine contrast agent dose absorbed by human tissue Not affected by weight. Under the scanning scheme and the contrast agent scheme, the iodine dose is relatively constant, and is not affected by body weight, and the energy spectrum analysis value is relatively fixed, and the result has credibility under the scheme.

CLINICAL RELEVANCE/APPLICATION

Therefore, under this method, the energy spectrum analysis value can be used as a reference value for the normal energy spectrum analysis of the GSI enhanced CT examination of the pancreatic energy spectrum for the clinician to perform functional and component diagnosis based on the numerical value.

RC413-11 Quantified Terminal Ileal Motility during MR Enterography as a Biomarker of Crohn's Disease Activity in a Pediatric Population: A Retrospective Study

Tuesday, Dec. 3 5:20PM - 5:30PM Room: E353B

Participants
Alex Menys, London, United Kingdom (*Presenter*) Director, Motilent Ltd; Shareholder, Motilent Ltd
Lucia Cococcioni, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Shankar Kumar, BSC,MBBS, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Stuart A. Taylor, MBBS, Great Missenden, United Kingdom (*Abstract Co-Author*) Research Consultant, Robarts Clinical Trials, Inc; Shareholder, Motilent
Fevronia Kiparissi, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Tom A. Watson, MBChB, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

A relationship between small bowel motility and inflammatory activity in Crohn's Disease is now well described in adults against endoscopic and histopathological measures of activity. This retrospective study explores this relationship between terminal ileal (TI) motility in children against a symptomatic endpoint.

METHOD AND MATERIALS

A review of a pediatric hospitals imaging database was performed to identify subjects with good quality MRE studies and a clinical appointment ±1mo to determine a clinical score for disease activity (PGA, a 4 point score 1 = no disease to 4 = severe). 68 subjects were identified (mean age 13.2, range 6 to 19) with dynamic 'cine' imaging through the terminal ileum. The dynamic imaging was processed, blind to any clinical data, with a previously validated motility assessment algorithm (GIQuant®, Motilent, London, UK). A consultant radiologist delineated the TI on each subject within 5cm of the ileocecal valve and the motility score derived. The TI was used as an repeatably identifiable reference to enable comparison between subjects. The TI motility score was correlated against the symptom score and the cohort split into clinically active disease PGA >1 and non-active = 1. The mean difference between groups was assessed with U-Test.

RESULTS

The median TI motility was 0.2 (range 0 to 0.6) and the median PGA symptom score was 1 (range 1 to 4). The correlation between the two measures was R = -0.32, P = 0.011. The mean motility score of those with active disease was 0.18 , compared to 0.26 for those without active disease, a statistically significant difference of 0.08, P = 0.003.

CONCLUSION

Subjects with reduced terminal ileal motility appeared to have a higher symptom load. These findings broadly support results in adult populations and comparison with an endoscopic or histopathological endpoint at the TI represents an important next step.

CLINICAL RELEVANCE/APPLICATION

MRI is non-invasive, safe and widely available option for monitoring Crohn's Disease activity making it an ideal test for subjects destined to undergo scanning for the rest of their lives. Biological therapy is now widely used in children to control inflammation. These drugs are very expensive. A rapid and objective biomarker of disease response like motility, espeically one that does not require gadolinium, is imporant to driving efficient spending in IBD.

RC413-12 Contrast-Enhanced Ultrasound in Pediatric Crohn's Patients: Comparative Study with MRI

Tuesday, Dec. 3 5:30PM - 5:40PM Room: E353B

Participants
Jesse K. Sandberg, MD, Palo Alto, CA (*Presenter*) Nothing to Disclose
Kiran Mudambi, MD, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
Dorsey Bass, Stanford, CA (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

Current standard of practice for evaluating bowel inflammation in Crohn's disease (CD) includes magnetic resonance imaging (MRI). Despite MRI having a high sensitivity/specificity for detecting bowel wall inflammation; it requires oral contrast, long scan times, high costs and sedation in younger patients. Alternatively, contrast enhanced ultrasound (CEUS) provides quick evaluation of bowel at bedside without the need for sedation. The purpose of our study is to compare CEUS to MRI for evaluation of bowel inflammation in Crohn's disease in pediatric patients.

METHOD AND MATERIALS

Between April 2018 and January 2019, 20 patients, 11 females and 9 males (mean 14.2yr [8mo-20.7yr]) with biopsy proven CD, underwent contrast enhanced MRI (GE Discovery) and CEUS. Greyscale US (Philips, GE or Siemens machine, 9-18L probes) was performed to identify thickened bowel loops, followed by injection of Lumason contrast (Bracco Imaging). CEUS was interpreted by a single radiologist with 15 years experience while the MRIs were interpreted by numerous pediatric radiologists. Enhancement, mucosal disruption, mucosal/submucosal wall thickness, and pericolonic inflammation were noted. Concordance between MRI and CEUS was assessed retrospectively.

RESULTS

CEUS sensitivity to detect bowel inflammation when seen on MRI was 100%. Enhancement concordance was 85% (17/20). The 3 discordant biopsy proven CD cases showed no enhancement or wall thickening on MRI but had thickened enhancing bowel loops on CEUS. Wall thickness was not statistically significant between MRI and CEUS (p=0.25), confidence in accurately measuring mucosal/submucosal layers was possible only with US. Mucosal disruption was more often seen with US (n=10) than MRI (n=2). Pericolonic inflammation was found equally (n=13).

CONCLUSION

In this small sample of pediatric patients, CEUS was superior to MRI in detecting bowel inflammation in CD patients. Bowel US involves using high frequency linear US probes providing detailed evaluation and visualization of bowel wall layers. MRI remains essential for initial diagnosis of CD as CEUS has a limited field of view. Thus, CEUS may have great potential for follow-up.

CLINICAL RELEVANCE/APPLICATION

Contrast enhanced ultrasound has the potential to enhance our ability to detect bowel inflammation and avoid inherent limitations of MRI.

RC413-13 Abdominal Imaging in Children with Failing Fontan Circuits

Tuesday, Dec. 3 5:40PM - 6:00PM Room: E353B

Participants
Govind B. Chavhan, MD, Toronto, ON (*Presenter*) Speaker, Bayer AG

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LEARNING OBJECTIVES

1) To explain hemodynamic disturbances associated with elevated systemic venous pressure in children with Fontan surgery. 2) To discuss abdominal complications in children with failing Fontan circuit. 3) To discuss role of imaging and strategies to optimally image these complications.

SSJ10

Science Session with Keynote: Genitourinary (Quantitative Prostate MRI)

Tuesday, Dec. 3 3:00PM - 4:00PM Room: S502AB

BQ GU MR

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

FDA Discussions may include off-label uses.

Participants
Hebert Alberto Vargas, MD, Cambridge, United Kingdom (*Moderator*) Nothing to Disclose
Antonio C. Westphalen, MD, Medina, WA (*Moderator*) Nothing to Disclose

Sub-Events

SSJ10-01 Genitourinary Keynote Speaker: Update on Quantitative Prostate MRI - Challenges and Opportunities for Translation Into Clinical Practice

Tuesday, Dec. 3 3:00PM - 3:10PM Room: S502AB

Participants
Nicola Schieda, MD, Ottawa, ON (*Presenter*) Nothing to Disclose

SSJ10-02 Application of a Novel High-Resolution, Accelerated Quantitative T2 Mapping Sequence at 3T for the Detection of Prostate Cancer

Tuesday, Dec. 3 3:10PM - 3:20PM Room: S502AB

Participants
Andreas Bucher, MD, Frankfurt am Main , Germany (*Presenter*) Travel support, Guerbet SA;
Benjamin Kaltenbach, MD, Kelkheim, Germany (*Abstract Co-Author*) Nothing to Disclose
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Boris Bodelle, MD, Frankfurt am Main, Germany (*Abstract Co-Author*) Research support, General Electric Company; Research support, Siemens AG

PURPOSE

Quantitative measurements of the prostate have been shown to produce reliable differentiation of malignant prostate lesions in the peripheral zone in several small scale studies with previous generation T2 mapping sequences. We tested the reliability of a novel, fast, high-resolution T2 mapping prototype sequence with parallel imaging and model-based reconstruction (T2M) in the detection of malignant prostate lesions.

METHOD AND MATERIALS

A total of 46 multiparametric MRI datasets for suspected prostate cancer (pCA) at 3T were included. All examinations included T2M in addition to a standard multiparametric prostate protocol. Confirmed pCA were present in 22 cases. Quantitative T2 mapping was acquired axially (0.7x0.7x3.0 mm3, 16 echoes with delta TE 10.8 ms, TR 5000 ms). Region-of-interest measurements (ROI) were performed on the T2 maps in 3 slices for healthy prostate tissue of the peripheral and transitional zone (apex, midbase, base) with a minimum area of 10 mm2. Confirmed malignant lesions were traced in a separate ROI on the most representative slice. Average and minimum values of T2M relaxation time (T2) were recorded per ROI.

RESULTS

Diagnostic image quality was obtained in all patients. Average acquisition time for T2M was 4:37 mins. Mean T2 was 153.7±45.1 ms for healthy tissue in the peripheral zone, 96.2±22.7 ms in the transitional zone. Mean T2 was significantly reduced for pCA in the peripheral zone (71.6±13.3 ms, p=0.001). Differences of mean T2 of pCA and average tissue of the transitional zone were suffcient to differentiate between tumor infiltration and average healthy tissue of the transitional zone (p=0.001). Minimal values of T2 showed good differentiation between healthy tissue and pCA (healthy: 99.4±19.9 ms, malignant: 52.0±10.6 ms; p=0.001).

CONCLUSION

Quantitative measurements from T2 mapping sequences provide good differentiation between healthy and malignant prostate tissue and are feasible in an expanded standard porstate protocol at high-resolution in acceptable acquisition time.

CLINICAL RELEVANCE/APPLICATION

Accelerated T2 mapping sequences could be a feasible addition to standard multiparametric prostate MRI for detection of prostate cancer.

SSJ10-03 Efficacy of Quantitative Texture Parameters of 3T Multiparametric MRI for the Differentiation of Transition Zone Prostate Cancer Lesions from Benign Prostatic Hyperplasia Nodules with

Wholemount Histopathology as Reference

Tuesday, Dec. 3 3:20PM - 3:30PM Room: S502AB

Participants
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PURPOSE

To investigate the performance of different quantitative texture parameters of 3T multiparametric magnetic resonance imaging (3TmpMRI) for the differentiation of transition zone (TZ) prostate cancer (PCa) lesions from benign prostatic hyperplasia (BPH) nodules with wholemount histopathology as reference standard.

METHOD AND MATERIALS

This IRB approved, HIPAA compliant case-control study, included 77 patients. Regions of interest (ROI) for true positive TZ PCa lesions as well as the BPH nodules were contoured on 3TmpMRI axial T2-weighted images (T2WI), apparent diffusion coefficient (ADC) map of the diffusion weighted images (DWI) and dynamic contrast enhancement (DCE) MRI and the quantitative image analysis was performed. We generated 10 parameters including normalized T2WI signal intensity (SI) (calculated as mean T2WI signal intensity/ROI of obturator muscle), the shape of the histogram of T2WI SI (skewness and kurtosis), ADC minimum, ADC maximum, ADC skewness, ADC kurtosis, Ktrans (influx volume transfer coefficient), kep (efflux reflux rate constant) and Ve (the fractional volume of extracellular extravascular space). The quantitative parameters were compared between the TZ PCa and BPH nodules using paired sample t-test in SPSSv24. P-value<0.05 was considered as significant. The performance of the significant parameters were assessed using AUC for the ROC curves.

RESULTS

Mean patient age was 62.9±7.6 years with mean prostate specific antigen (PSA) 7.6±8.3 ng/ml. Compared to the BPH nodules, TZ PCa lesions had significantly higher T2WI SI (p=0.004), ADC skewness (p<0.001), Kep (p-value=0.026) and significantly lower ADC minimum (p<0.001) and ADC maximum (p=0.001). T2WI skewness, T2WI kurtosis, ADC kurtosis, Ktrans and Ve were not significantly different between cancerous and benign lesions (p>0.05). The highest AUC for the differentiation of TZ PCa from BPH was resulted from ADC skewness (0.998) followed by ADC minimum (0.891), ADC maximum (0.790), T2WI SI (0.625) and Kep (0.403) (figure 1).

CONCLUSION

3T mpMRI quantitative texture parameters, with higher performance of the parameters generated based on ADC maps, can be of significant value for the differentiation of TZ PCa from BPH nodules.

CLINICAL RELEVANCE/APPLICATION

Differentiation of transition zone prostate cancer from benign prostatic hyperplasia on 3T mpMRI can be difficult due to overlapping features, however mpMRI quantitative parameters may increase the performance.

SSJ10-04 PI-RADS-Based 3D Prostate Cancer Detection Using Residual Convolutional Neural Networks

Tuesday, Dec. 3 3:30PM - 3:40PM Room: S502AB

Participants
Helen Xu, Toronto, ON (*Presenter*) Researcher, Ezra
Alon Hazan, Toronto, ON (*Abstract Co-Author*) Researcher, IBM Corporation; Researcher, Ezra; Spouse, Regulatory Affairs Manager, Venus Concept
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PURPOSE

Multi-parametric magnetic resonance imaging (mp-MRI) is playing an increasing role in prostate cancer assessment. Automated cancer localization as part of clinical decision support system can reduce inter-observer variability and time spent on image interpretation. This study evaluates the performance of a residual convolutional neural network (ResCNN) in the identification of potential areas of prostate cancer.

METHOD AND MATERIALS

A total of 337 cancer patients from the PROSTATEx dataset were analyzed in this study. Three radiologists segmented lesions that were PI-RADS v2 category three or higher using T2-weighted, ADC, and high b-value images. A 2D patch-based ResCNN was trained based on segmentations from the most senior radiologist. Volumetric predictions were generated using an adaptive threshold that controls the number of false positives. Sensitivity was measured by comparing network predictions to biopsy locations with clinically significant cancer using a distance criterion of 10 mm or less.

RESULTS

The network's sensitivity for detecting clinically significant cancer was 97% for all PI-RADS categories, whereas radiologists' sensitivities were 79±0.06%, 94±0.04%, and 99±0.02% for category 3, 4, and 5 lesions, respectively. The trade-offs for an increased network sensitivity were lesion volume overestimation (radiologists: 1.5cc, network: 3.2cc) and an increased number of false positives (PI-RADS 3: 29%, PI-RADS 4,5: 2%).

CONCLUSION

The proposed ResCNN was able to obtain similar sensitivity for detecting clinically significant cancer as the radiologists. This demonstrates the network's potential to assist radiologists in prostate cancer detection, especially for PI-RADS 3 lesions where the presence of clinically significant cancer is equivocal (sensitivity: network 97% vs radiologists 79%).

CLINICAL RELEVANCE/APPLICATION

We have demonstrated that a residual convolutional neural network trained on PI-RADS v2 protocol has the potential to assist radiologists in detecting clinically significant prostate cancers.

SSJ10-05 Radiomic Features from Prostate Bi-Parametric MRI Differentiate MRI-Invisible Lesions from Non-Tumor Region in the Peripheral Zone: A Preliminary Multi-Site Study

Tuesday, Dec. 3 3:40PM - 3:50PM Room: S502AB

Participants
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PURPOSE

Approximately 12% of biopsy-confirmed prostate cancer (PCa) lesions cannot be detected on MRI, which are referred to as 'MRI-invisible' lesions (PI-RADS < 3 and Gleason Grade Group (GGG) >= 1). Radiomics derived from prostate multi-parametric MRI (mpMRI) have been shown to complement imaging in characterizing PCa. In this work, we explore radiomics from bi-parametric MRI (bpMRI) including T2-weighted MRI (T2WI) and apparent diffusion coefficient (ADC) maps to differentiate MRI-invisible lesions from non-tumor prostate tissue in the peripheral zone (PZ).

METHOD AND MATERIALS

In this study, a set of N = 100 PCa patients was included from 4 different institutions. Of these, 64 patients (N1) underwent 3T mpMRI prior to radical prostatectomy (RP) and 36 patients (N2) underwent 3T mpMRI with no abnormal signs followed by systematic biopsy that was negative. For N1, delineation of lesion regions of interest (ROIs) on bpMRI were obtained by mapping ROIs from corresponding RP surgical specimens and verified by an experienced radiologist. N = 39 visible lesions (VL) and N=25 invisible lesions (IL) were identified by the radiologist. Patients from N2 were used to obtain non-tumor (NR) ROIs within the PZ on T2WI and ADC maps. Training set (D1) consists of 15 NR, 15 IL and 18 VL, and the testing set (D2) consists of 21 NR, 10 IL and 21 VL. In D1, we identified stable radiomic features (test-retest and cross-site stability) that distinguished NR and IL, as well as NR and VL (to ensure their association with PCa). A logistic regression model (CL) was trained to separate NR and PCa lesions (IL + VL) in D1 and was then validated on D2 in terms of receiver operating characteristic (ROC).

RESULTS

Radiomic features including Co-occurrence of Local Anisotropic Gradient Orientations (CoLIAGe), Haralick features from T2WI; CoLIAGe and Laws features from ADC maps were found to distinguish NR and IL, VL. The area under the ROC curve (AUC) of CL on D2 is 0.93 (NR vs lesions), 0.97 (NR vs IL) and 0.91 (NR vs VL).

CONCLUSION

Radiomic features derived from prostate bpMRI were able to differentiate MRI-invisible lesions from non-tumor regions within the PZ.

CLINICAL RELEVANCE/APPLICATION

Radiomic based approaches might allow for non-invasive identification of PI-RADS invisible tumors and improve the lesion detection sensitivity of prostate MRI.

SSJ10-06 A Machine Learning-Assisted Decision Support Model with MRI Can Better Spare the Extended Pelvic Lymph Node Dissection at Cost of Less Missing in Prostate Cancer

Tuesday, Dec. 3 3:50PM - 4:00PM Room: S502AB

Participants
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PURPOSE

To develop a machine learning (ML)-assisted model for identifying the candidates for extended pelvic lymph node dissection (ePLND) in prostate cancer by integrating clinical, biopsy and precisely defined MRI findings.

METHOD AND MATERIALS

248 patients treated with radical prostatectomy and ePLND or PLND were included. ML-based models were developed from 18 integrated features using a logistic regression (LR), support vector machine (SVM) and random forests (RFs) algorithm, respectively. The models were compared to a MSKCC nomogram using the receiver operating characteristic-derived area under the curve (AUC), calibration plot and decision-curve analysis (DCA).

RESULTS

Total 59/248 (23.8%) lymph node invasion (LNIs) were identified at surgery. After cross validation, the predictive accuracy of these ML-based predictors yielded similar AUCs (RFs: 0.906; 95% confidence interval [CI], 0.856-0.928; SVM: 0.891; 95% CI, 0.840-0.917; LR+: 0.886; 95% CI, 0.834-0.913), while higher than MSKCC nomogram (0.816, 95% CI, 0.762-0.862). The calibration of MSKCC tended to underestimate LNI risk across the entire range of predicted probabilities compared to RFs and SVM. The DCA demonstrated three ML-based models significantly improved risk prediction at risk threshold <= 80% compared to MSKCC. If ePLNDs missed was controlled < 3%, RFs resulted in higher positive predictive value (55/107 [51.4%] vs 56/139 [40.3%]), similar negative predictive value (137/141 [97.2%] vs 106/109 [97.2%]), and higher No. of ePLNDs spared (141/248 [56.9%] vs 109/248 [43.9]) compared to MSKCC.

CONCLUSION

Our ML-based model below 15% cutoff, superior to MSKCC nomogram, allows to 57% ePLNDs spared at the cost of missing < 3% LNIs.

CLINICAL RELEVANCE/APPLICATION

Preoperative identification of LNI is critical for appropriate treatment selection and planning.As precisely defining nodal stage is to allow surgeons to define which patients may benefit from ePLND or PLND during radical prostatectomy and which patients may safely avoid it.

Printed on: 10/29/20

SSJ11

Genitourinary (Evidence-Based Genitourinary Imaging)

Tuesday, Dec. 3 3:00PM - 4:00PM Room: S503AB

GU

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

Participants
Douglas S. Katz, MD, Mineola, NY (*Moderator*) Nothing to Disclose
Mariano Volpacchio, MD, Buenos Aires, Argentina (*Moderator*) Nothing to Disclose

Sub-Events

SSJ11-01 What is the Value of Surveying the Kidneys during Pelvic Ultrasound Examinations? A Clinical Audit of 1000 Patients

Tuesday, Dec. 3 3:00PM - 3:10PM Room: S503AB

Participants
Sheila Oh, MBBCh, Hamilton, New Zealand (*Presenter*) Nothing to Disclose
Orlaith Brennan, Hamilton, New Zealand (*Abstract Co-Author*) Nothing to Disclose
Martin Necas, Hamilton, New Zealand (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Pelvic ultrasounds are commonly performed for various clinical indications in female patients presenting to the hospital. A survey of the kidneys is routinely included as part of the examination, but there is limited justification for their inclusion in the assessment of every female presenting for a pelvic ultrasound1-4. There may be reasonable clinical rationale to extend the examination to survey the kidneys in select patients, i.e. large pelvic masses or lower abdominal pain necessitating review of the kidneys. However, most pelvic ultrasounds are performed for different reasons including heavy/irregular bleeding and characterisation of ovaries for polycystic morphology which provide no clinical justification for routine survey of kidneys. The prevalence of incidental renal findings in female patients presenting specifically for pelvic sonography is currently unknown. We aim to determine the incidence, spectrum and severity of renal findings in patients presenting for pelvic ultrasounds and clinical outcomes upon their discovery.

METHOD AND MATERIALS

A retrospective sequential audit of pelvic ultrasound examinations in 1000 non-pregnant female patients presenting to Waikato DHB Ultrasound service (Waikato Hospital & Thames Hospital) between 1 January 2017 and 14 July 2017. Examinations were identified using a sequential search of our PACS system. Ultrasound reports and outcomes were analysed. Renal findings were separated into clinically significant criteria (e.g.Bosniak 2F-4 cyst, new angiomyolipoma(AML), renal cell carcinoma(RCC) or new urolithiasis); and insignificant criteria (e.g.simple cyst, stable AML or known urolithiasis). Clinical outcomes of patients with significant renal findings were determined by reviewing patients' clinical records for one-year following the ultrasound.

RESULTS

A total of 1999 kidneys were examined from 1000 female patients (Mean age=43) who underwent pelvic ultrasound examination;1 patient had previous nephrectomy. No significant renal findings were found in 96% of pelvic ultrasound examinations. Of the 46 significant renal findings, 91% were clinically inconsequential. Only 4 patients had incidental findings of high clinical priority requiring specialist treatment; 2 patients were symptomatic from obstructive urolithiasis and 2 patients harboured asymptomatic RCC. Overall incidence of incidental renal findings of high clinical priority in asymptomatic patients was 2 in 1000 patients.

CONCLUSION

Prevalence of significant incidental renal findings was 4.6% but the vast majority (91%) were clinically inconsequential. Prevalence of incidental renal findings of high clinical priority was only 4 in 1000(0.4%); two were symptomatic. Indiscriminate uncritical screening of kidneys in women presenting for pelvic ultrasound is not evidence-based and represents a low-yield examination with extremely low rate of incidental findings of clinical significance.

SSJ11-02 Intrapatient Analysis of Effect of Oral and Intravenous Contrast Material on CT Diagnosis of Acute Pelvic Pathologies

Tuesday, Dec. 3 3:10PM - 3:20PM Room: S503AB

Participants
Tugce Agirlar Trabzonlu, MD, Chicago, IL (*Presenter*) Grant, Siemens AG
Kevin R. Kalisz, MD, Chicago, IL (*Abstract Co-Author*) Nothing to Disclose
Kamal Subedi, MBBS, Kathmandu, Nepal (*Abstract Co-Author*) Nothing to Disclose
Sonia Lee, MD, Irvine, CA (*Abstract Co-Author*) Nothing to Disclose
Mohammad Helmy, MD, Anaheim, CA (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

Ultrasound is the initial modality to evaluate acute pelvic pathologies. However, when symptoms are poorly localized, patients can be evaluated by CT. Our objective was to compare the performance of computed tomography (CT) without and with oral and intravenous (iv) contrast for the diagnosis of acute pelvic pathologies in the same patients by using dual energy CT (DECT) contrast-enhanced and virtual non-contrast (VNC) images.

METHOD AND MATERIALS

In this retrospective analysis, we reviewed DECT studies with oral and IV contrast obtained for abdominal pain. We included patients with a radiological diagnosis of acute pelvic pathologies and control cases without evidence of acute pelvic pathology scanned between October 2018 and March 2019. In the first session, the virtual non-contrast scans were randomized and analyzed. In the second session, true contrast enhanced images were randomized and analyzed. Findings of acute pelvic pathologies and diagnostic certainty in percentage were noted. Diagnostic performance of VNC images were compared with contrast enhanced CT studies. Sensitivity, specificity and accuracy were calculated. Fischer's exact test and Wilcoxon signed-rank test were used for statistical analysis.

RESULTS

Cohort included 46 patients with 92 sets of CT images (patients with acute pelvic pathologies n=27, control cases n=19). Pelvic pathologies included: tubo-ovarian abscess/ hydrosalphinx (n=13), ovarian cyst rupture (n=8), hemorrhage within an ovarian cyst (n=2), large ovarian cyst (n=3), dermoid cyst rupture (n=1). Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of VNC images were 70.4% (95% CI= 49.8-86.3%), 94.7% (95% CI= 74.0-99.9%), 95% (95% CI= 73.5-99.2%), 69.2% (CI= 55.5-80.3%) and 80.4% (95% CI= 66.1-90.6%), respectively. Mean diagnostic certainty rate was significantly higher in true enhanced group when compared to VNC group (81.6% vs 100%, p=0.001).

CONCLUSION

When compared to contrast enhanced CT imaging, unenhanced images missed 30% of cases with acute pelvic pathologies. Also with contrast enhanced CT diagnostic certainty rate was significantly higher.

CLINICAL RELEVANCE/APPLICATION

The use of oral and intravenous contrast remains necessary in patients with suspected acute pelvic pathologies.

SSJ11-03 Suggestion on New Computed Tomography Criteria to Differentiate Pheochromocytoma from Adrenal Adenoma

Tuesday, Dec. 3 3:20PM - 3:30PM Room: S503AB

Participants
Sohi Kang I, MD,MD, Seoul, Korea, Republic Of (*Presenter*) Nothing to Disclose
Sung Yoon Park, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To retrospectively investigate performance of new radiologic criteria to differentiate pheochromocytoma from adrenal adenoma using adrenal protocol computed tomography (CT).

METHOD AND MATERIALS

Consecutive 199 patients who underwent adrenal CT and surgically proven pheochromocytoma (n= 66) or adenoma (n= 133) were included. Patients were alternatively allocated to model development (n= 100) and validation (n= 99) groups, according to the order of surgical date. Two independent radiologists analyzed two CT criteria for pheochromocytoma. Conventional criteria were as follows: (a) lesion attenuation on unenhanced CT >10 Hounsfield unit (HU); (b) absolute percentage washout (APW) <60%; AND (c) relative percentage washout (APW) <40%. New criteria were as follows: (a) conventional criteria; OR (b) one of followings; (i) lesion attenuation on UCT >=40 HU; (ii) 1-min enhanced CT >=160 HU; or (iii) intralesional cystic degeneration seen on both 1-min and 15-min enhanced CT. Area under the curve (AUC) and inter-reader agreement were assessed.

RESULTS

Proportion of pheochromocytoma was similar between development and validation groups (26.0% versus 37.4%; p= 0.210). AUC of new criteria was consistently greater than that of conventional criteria for differentiating pheochromocytoma from adenoma (reader 1, 0.895 versus 0.755 for development group and 0.840 versus 0.724 for validation group; reader 2, 0.902 versus 0.799 for development group and 0.845 versus 0.724 for validation group) (p< 0.05 for all comparisons). Inter-reader agreement was excellent in interpreting any criteria (weighted kappa >0.800).

CONCLUSION

New radiologic criteria using adrenal protocol CT seem to improve diagnostic performance reliably in differentiating pheochromocytoma from adrenal adenoma.

CLINICAL RELEVANCE/APPLICATION

Conventional CT criteria have some overlaps in quantitative image finidngs between adrenal adenoma and pheochromocytoma. Thus, some of pheochromocytoma can be considered as adenoma radiologically. The present new criteria seem to allow more accurate prediction of pheochromocytoma by using adrenal protocol CT.

SSJ11-04 Establishing Normative Kidney Sizes for a Large Developing Country's Adult Population Using Big Data: A Study of 30,000 Ultrasound Scans Yields a Potential Gender and Age-Related Difference

Tuesday, Dec. 3 3:30PM - 3:40PM Room: S503AB

Participants
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Salil Gupta, BEng, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Harsh Mahajan, MD,MBBS, New Delhi, India (*Abstract Co-Author*) Director, Mahajan Imaging Pvt Ltd; Research collaboration, General Electric Company; Research collaboration, Koninklijke Philips NV; Research collaboration, Qure.ai; Research collaboration, Predible Health

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PURPOSE

There are no large-scale population level studies describing kidney size in normal adult population from this geography. Currently, radiologists rely on data from other countries or on limited data from small-scale studies specific to this geography. We studied kidney sizes of 30,000 patients with normal kidneys and compare our findings to currently established normal values.

METHOD AND MATERIALS

65,000 text reports of abdomen ultrasound scans done for patients presenting to 4 radiology clinics between June 2016 and December 2018 were extracted and anonymised. 35,064 reports were removed from the database since they either had some abnormality in the kidney (as determined by a filter-based text search mechanism) or were of paediatric population. Kidney sizes (length and breadth) were present in all 29,936 reports (48.6% females) and cortical thickness measurement was present in 1,624 reports (46.1% females). The sizes and cortical thickness for both kidneys were extracted using keyword-based mechanisms and summary statistics calculated.

RESULTS

The average age of females was 49.8 years and males was 52 years. The average length of the kidney was 10 cm (right) and 10.1 cm (left) in females and 10.3 cm (right) and 10.4 cm (left) in males. Average cortical thickness in females was 1.1 cm (left), 1.2 cm (right) and in males was 1.3 cm (left), 1.4 cm (right). However, the regression plots of kidney length vs. age, showed inflection points in females (38.2 y (right), 39.3 y (left)) to occur earlier when compared to that of males (43.2 y (right), 42.2 y (left)). This observed difference in inflection points might support the idea that kidney atrophy begins earlier in females than males. Additionally as compared to standard textbook kidney sizes and previous literature from this geography, our study values were slightly higher - study from 2014 reported sizes in males to be 9.7 cm (right) and 9.8 cm (left), and females to be 9.5 cm (right) and 9.7 cm (left).

CONCLUSION

The use of data-mining techniques can enable study of large datasets which currently reside unstudied in institutions across the world, giving insight into defining normative values across age-groups, populations and regions.

CLINICAL RELEVANCE/APPLICATION

Practising radiologists and clinicians can use age- and gender-specific normal sizes to improve their reporting and guide more appropriate clinical management.

SSJ11-05 Adherence to Appropriate Imaging Management per Published Guidelines for Incidental Adnexal Masses at a Level 1 Trauma Center

Tuesday, Dec. 3 3:40PM - 3:50PM Room: S503AB

Participants
Sagar V. Desai, BS, Mountain Top, PA (*Presenter*) Nothing to Disclose
Adrian W. Ong, West Reading, PA (*Abstract Co-Author*) Nothing to Disclose
Adam Sigal, West Reading, PA (*Abstract Co-Author*) Nothing to Disclose
Joaquin Ramos, West Reading, PA (*Abstract Co-Author*) Nothing to Disclose
Michael A. Enea, Easton, PA (*Abstract Co-Author*) Nothing to Disclose
Alison Muller, West Reading, PA (*Abstract Co-Author*) Nothing to Disclose
Brent J. Wagner, MD, West Reading, PA (*Abstract Co-Author*) Nothing to Disclose

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sagarde@pcom.edu

PURPOSE

Evidence-based guidelines have been published to standardize management of incidental findings; however, there has been limited investigation of the adherence rates to these guidelines. We evaluate the appropriateness of radiologists' recommendations for follow-up imaging of incidentally discovered adnexal masses using published guidelines as the reference standard.

METHOD AND MATERIALS

Computerized tomography (CT) reports within the trauma registry were searched for 'ovary', 'ovarian' and 'adnexal'. 157 reports were used for this pilot study. 3 investigators independently assessed CT reports and generated recommendations for follow-up imaging as per American College of Radiology (ACR) guidelines. Discrepancies were reviewed among investigators for a consensus decision. Dictated reports were compared to published recommendations to assess for appropriate management, inadequate management, or over-management.

RESULTS

61 (39%) reports were excluded as they contained pertinent negative verbiage, expected physiologic findings, inadequate characterization or repeat examinations, leaving 96 for further analysis. 62 (65% [95% CI 56, 75]) had appropriate management, while 25 (26%) had inadequate management and 9 (9%) over-management. Of the inadequately managed reports, 11 had no recommendation provided when follow-up was indicated and 14 did not include a time interval when prompt follow-up imaging was

indicated. There was a significant association between appropriate management and age (<=50 years, 42/47 [89.4%] vs >50 years, 20/49 [51.9%], p<0.0001) and mass size (<=3 cm, 34/44 [77.2%] vs > 3cm, 28/52 [53.8%], p=0.01).

CONCLUSION

Adherence of radiologists to the ACR recommendations for adnexal masses was suboptimal; of note, we find that patient age > 50 years and mass size > 3 cm were associated with poorer adherence. A larger study is needed to validate these findings; however, these findings suggest a need to implement educational initiatives to promote the appropriate management of incidental adnexal findings.

CLINICAL RELEVANCE/APPLICATION

Proper management of incidental adnexal masses balances the goal for early detection of ovarian malignancy against unnecessary imaging of low-risk lesions.

SSJ11-06 Towards Reducing Overutilization of Prostate mpMRI: Using PSA Density to Predict Negative and Indeterminate MRI Scans

Tuesday, Dec. 3 3:50PM - 4:00PM Room: S503AB

Participants
Dominik A. Deniffel, MD, Toronto, ON (*Presenter*) Nothing to Disclose
Yucheng Zhang, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Emmanuel Salinas SR, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Raj Satkunasivam, Houston, TX (*Abstract Co-Author*) Nothing to Disclose
Farzad Khalvati, PhD,MSc, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Masoom A. Haider, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To assess the applicability of a prediction model based on clinical parameters to reduce the number of negative and indeterminate multiparametric MRI (mpMRI) scans in patients at risk for prostate cancer (PCa).

METHOD AND MATERIALS

In this retrospective research ethics board approved study, we evaluated 865 patients with no prior PCa diagnosis who underwent prostate mpMRI, classified according to PI-RADS v2.0. The following clinical risk factors were collected: age, prostate volume, PSA, PSA density (PSAd). Lesions reported as PI-RADS >= 4 were considered as suspicious for clinically significant (cs) PCa. The patient cohort was randomly split into training (n=605) and validation cohorts (n=260) for all analyses. We used univariate and multivariate logistic regression, and area under receiver operator characteristic (ROC) curve (AUC) to predict PI-RADS >= 4 findings. The optimal decision threshold to confidently rule out a PI-RADS >= 4 disease was determined in the training cohort and applied to the validation cohort. In total, 116 patients underwent biopsy following MRI, revealing 11 csPCas (>= Gleason Grade Group 2).

RESULTS

In univariate analysis, all variables were significant predictors of PI-RADS scores >= 4 (p<0.05). In multivariate analysis, only age, prostate volume, and PSAd were independent predictors of PI-RADS scores >= 4 (p<0.0001). PSAd (AUC=0.74) outperformed other single parameters in diagnostic accuracy (age: AUC=0.55, p<0.01; prostate volume: AUC=0.65, p<0.05; PSA: AUC=0.60, p<0.01) and yielded no significant difference compared to the multivariate model (AUC=0.73). At a PSAd cut-off value of 0.078 ng/ml2 sensitivity, specificity, positive and negative likelihood ratio were 93.62%, 28.64%, 1.31 and 0.22, respectively. This decision threshold would result in the omission of 25% (64/260) of mpMRI scans in the validation cohort, missing 6% of PI-RADS >= 4 findings (3/47). The number of subsequent biopsies could thus be reduced by a maximum of 33% (12/36), whilst missing only one csPCa.

CONCLUSION

In patients at risk for PCa, applying a PSAd cut-off level of 0.078 ng/ml2 would result in 25% fewer mpMRIs being performed while missing a minimal number of csPCas. Further prospective validation is required.

CLINICAL RELEVANCE/APPLICATION

We present a triage strategy for patients at risk for prostate cancer based on PSAd, which safely avoids a large proportion of prostate mpMRI scans with negative or indeterminate findings.

RC407

Chronic Pelvic Pain: Added Value of MRI in Endometriosis, Fibroids, and Pelvic Floor Relaxation

Tuesday, Dec. 3 4:30PM - 6:00PM Room: N226

GU MR

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

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. 10) Understand the pathophysiology of endometriosis. 11) Recognize MRI finding of endometriosis. 12) Avoid the pitfalls of endometriosis imaging. 13) Review common surgical interventions for stress urinary incontinence and pelvic organ prolapse. 14) Describe the MRI technique for imaging synthetic material in the pelvic floor. 15) Recognize normal and abnormal MRI appearances of synthetic materials used in pelvic floor dysfunction.

Sub-Events

RC407A Overview: Why is this Subject Important?

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

RC407B Endometriosis and Adenomyosis: MR Imaging Pearls and Pitfalls

Participants
Elizabeth A. Sadowski, MD, Madison, WI (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the pathophysiology of endometriosis. 2) Recognize MRI finding of endometriosis. 3) Avoid the pitfalls of endometriosis imaging.

RC407C Leiomyomas: Pre- and Post-procedural Imaging-More Than a Roadmap

Participants
Yuliya Lakhman, MD, New York, NY (*Presenter*) Nothing to Disclose

RC407D Slings and Meshes: Guide to MR Imaging of Pelvic Floor Following Surgical Repair

Participants
Gaurav Khatri, MD, Irving, TX (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review common surgical interventions for stress urinary incontinence and pelvic organ prolapse. 2) Describe the MRI technique for imaging synthetic material in the pelvic floor. 3) Recognize normal and abnormal MRI appearances of synthetic materials used in pelvic floor dysfunction.

Active Handout:Gaurav Khatri

http://abstract.rsna.org/uploads/2019/18000692/Active RC407D.pdf

Printed on: 10/29/20

RC410

Advances in Gynecologic Ultrasound

Tuesday, Dec. 3 4:30PM - 6:00PM Room: N227B

GU US

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

Sub-Events

RC410A Uterus and Endometrium: A Primer with Pearls to Perfect Your US Performance

Participants
Loretta M. Strachowski, MD, San Francisco, CA (*Presenter*) Royalties, Reed Elsevier; Speaker, World Class CME

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lori.strachowski@ucsf.edu

LEARNING OBJECTIVES

1) Recognize the varied appearance of the endometrium throughout a woman's life. 2) Improve sonographic visualization of the endometrium utilizing 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. 5) Understand the controversies of endometrial thickness cutoffs in postmenopausal bleeding. 6) Appreciate the limitations of US in evaluating myomas, adenomyosis and Mullerian duct anomalies.

RC410B Sonography of GYN Emergencies: Pearls and Pitfalls

Participants
Roya Sohaey, MD, Portland, OR (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Recognize the varied imaging features of adnexal torsion including the limitations of Doppler for this diagnosis. 2) Understand the importance of 3D ultrasound and scanning technique in evaluating the patient with acute heavy bleeding. 3) Appreciate the limitations of ultrasound when evaluating complications from surgery and advanced oncologic disorders which may present with acute symptoms.

ABSTRACT

Ultrasound is often the first 'go to' modality when women present with acute gynecologic symptoms. A case-based symptoms approach will be used to discuss sonographic findings in women presenting with acute pain, heavy bleeding, and post-operative complications. In addition to classic diagnostic findings, atypical findings of common diagnoses will be shown(i.e. isolated fallopian tube torsion). Scanning techniques as well as imaging pearls and pitfalls will be stressed in order to help the participant make an accurate diagnosis using primarily ultrasound.

RC410C Ovarian Cysts and Masses

Participants
Deborah Levine, MD, Boston, MA (*Presenter*) Editor with royalties, Reed Elsevier; Editor with royalties, Wolters Kluwer nv;

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dlevine@bidmc.harvard.edu

LEARNING OBJECTIVES

1) Review updated recommendations for suggesting follow-up of adnexal cysts. 2) Improve knowledge of the malignant potential of various sonographic findings. 3) Integrate these findings into daily practice with goal of reducing recommendations for follow-up of benign adnexal cysts and reducing excess surgery for benign masses while improving triage to gynecology-oncology in women with suspicious adnexal masses.

RC410D 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) Describe 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 couseling and surgical planning. Transvaginal ultrasound after bowel preparation is the best imaging modality as the first-line technique to evaluate patients suspected of endometriosis. The bowel preparation is relatively simple and 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.

Printed on: 10/29/20

ED006-WE

Genitourinary Wednesday Case of the Day

Wednesday, Dec. 4 7:00AM - 11:59PM Room: Case of Day, Learning Center

AMA PRA Category 1 Credit ™: .50

Participants
Lori Mankowski Gettle, MD , Madison, WI (*Presenter*) Nothing to Disclose
Maitraya K. Patel, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Adam Kinzel, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Ely R. Felker, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose
Michael Bergquist, MD, Madison, WI (*Abstract Co-Author*) Nothing to Disclose
Kathryn L. McGillen, MD, Hershey, PA (*Abstract Co-Author*) Nothing to Disclose
Sparsh Gola, MD, Hershey, PA (*Abstract Co-Author*) Nothing to Disclose
Christine M. Peterson, MD, Hummelstown, PA (*Abstract Co-Author*) Nothing to Disclose
Christine O. Menias, MD, Chicago, IL (*Abstract Co-Author*) Royalties, Reed Elsevier
Kenneth S. Zurcher, MD, Phoenix, AZ (*Abstract Co-Author*) Nothing to Disclose
Andrew Soroka, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Alex Li, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Carolina E. Reveron-Arias, MD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Payal P. Gupta, MD, Woburn, MA (*Abstract Co-Author*) Nothing to Disclose
Hoon Ji, MD, PhD, Boston, MA (*Abstract Co-Author*) Nothing to Disclose
Nagaraj-Setty Holalkere, MD, Boston, MA (*Abstract Co-Author*) Founder and CEO, Imaginglink Inc
Kumaresan Sandrasegaran, MD, Phoenix, AZ (*Abstract Co-Author*) Nothing to Disclose
Akira Kawashima, MD, PhD, Scottsdale, AZ (*Abstract Co-Author*) Nothing to Disclose
Lejla Aganovic, MD, La Jolla, CA (*Abstract Co-Author*) Nothing to Disclose
Matthew A. Zarka, MD, Scottsdale, AZ (*Presenter*) Nothing to Disclose

TEACHING POINTS

1) Recognize imaging findings seen in disorders of the genitourinary systems. 2) Develop differential diagnosis based on the clinical information and imaging findings. 3) Explain the clinical importance of the diagnosis.

SPDL40

Body Imaging Case Challenge (Case-based Competition)

Wednesday, Dec. 4 7:15AM - 8:15AM Room: E451B

CH GI GU

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

Participants
Sayf A. Al-Katib, MD, Royal Oak, MI (*Presenter*) Nothing to Disclose
Monisha Shetty, MD, Royal Oak, MI (*Presenter*) Nothing to Disclose

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Sayf.Al-Katib@beaumont.edu

Special Information

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

LEARNING OBJECTIVES

1) Engage in a friendly, fast-paced, interactive body imaging unknown case competition. 2) Review presentation and imaging pearls of uncommon diagnoses of the chest, abdomen and pelvis. 3) Monitor individual and team performance in real-time by answering a spectrum of questions types using the RSNA Diagnosis Live platform. 4) Analyze personal results of the competition by way of a self-assessment report sent via email.

RC507

PI-RADS Hands-on Workshop (Interactive Session)

Wednesday, Dec. 4 8:00AM - 10:00AM Room: E450A

GU MR

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

Participants
Jelle O. Barentsz, MD, PhD, Nijmegen, Netherlands (*Moderator*) Nothing to Disclose
Jelle O. Barentsz, MD, PhD, Nijmegen, Netherlands (*Coordinator*) Nothing to Disclose
Baris Turkbey, MD, Bethesda, MD (*Presenter*) Research support, Koninklijke Philips NV; Royalties, Invivo Corporation; Investigator, NVIDIA Corporation
Roel D. Mus, MD, Nijmegen, Netherlands (*Presenter*) Nothing to Disclose
Antonio C. Westphalen, MD, Medina, WA (*Presenter*) Nothing to Disclose
Daniel J. Margolis, MD, New York, NY (*Presenter*) Consultant, Blue Earth Diagnostics Ltd
Geert M. Villeirs, MD, PhD, Gent, Belgium (*Presenter*) Nothing to Disclose
Joseph J. Busch, MD, Chattanooga, TN (*Presenter*) Nothing to Disclose
Prasad R. Shankar, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Leonardo K. Bittencourt, MD, PhD, Rio de Janeiro, Brazil (*Presenter*) Nothing to Disclose
Vibeke B. Logager, MD, Herlev, Denmark (*Presenter*) Nothing to Disclose
Silvia D. Chang, MD, Vancouver, BC (*Presenter*) Nothing to Disclose
William J. Weadock, MD, Ann Arbor, MI (*Presenter*) Owner, Weadock Software, LLC

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Special Information

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

LEARNING OBJECTIVES

1) Understand and how to use the PI-RADS v2.1 Category Assessment to detect and localize significant prostate cancer for both peripheral and transitional zone. 2) Recognize benign pathology like prostatitis and BPH and to differentiate these from significant prostate cancers.

ABSTRACT

You need to bring your own laptops or tablets, as in this 'Hands-on Workshop' you will review multi-parametric MRI cases with various prostatic pathology using your own laptop or tablet. Though a Cloud-connection (RadPix) your device will serve as a dedicated prostate-MRI workstation through which you can analyse 20 cases. This activity is best done on a laptop or tablet. Although phones and small tablets will work, their small size limits optimal image viewing. Focus will be on the overall assessment of PI-RADS v2.1 category. You will be interactively teached how to score the probability of the presence of a significant prostate in patients with elevated PSA or other suspicion to have prostate cancer. All 20 cases are from daily practice, and have various levels of difficulty. They include easy and difficult significant cancers, inflammation, BPH, and most common pitfalls. Internationally renowned teachers will guide you during your PI-RADS v2.1 scoring process. You will be able to ask them all question you have on prostate mp-MRI, from acquisition to diagnosis to MR-biopsy. Prior to this course you need to download a digital course book at http://bit.ly/prostate2019. This digital pdf-course book includes all the cases and will guide you during the course through the various cases.

Active Handout:Roel Dirk Mus

http://abstract.rsna.org/uploads/2019/16002001/Active RC507.pdf

Printed on: 10/29/20

MSCP41

Case-based Review of Pediatric Radiology (Interactive Session)

Wednesday, Dec. 4 8:30AM - 10:00AM Room: E450B

GI GU NR PD VA

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

Participants
Edward Y. Lee, MD, Boston, MA (*Director*) Nothing to Disclose

LEARNING OBJECTIVES

1) Review clinical presentations of congenital and acquired pediatric disorders. 2) Discuss optimal imaging techniques for assessing various pediatric disorders. 3) Learn characteristic imaging findings of congenital and acquired pediatric disorders.

Sub-Events

MSCP41A Pediatric Brain Disorders

Participants
Noor A. Al Khori, MD, Doha, Qatar (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

nalkhori@sidra.org

LEARNING OBJECTIVES

1) Review imaging features of a few disorders. 2) Review relevant clinical features, pathophys, and associations. 3) Review the role of various imaging modalities in diagnosis and management.

MSCP41B Pediatric Vascular Disorders

Participants
Jared R. Green, MD, Chicago, IL (*Presenter*) Nothing to Disclose

ABSTRACT

During this interactive session, vascular anomalies cases will be presented allowing the learners to recognize the imaging findings and to understand the importance of performing US and MR for diagnosis. Key points will be discussed to avoid misdiagnosis.

MSCP41C Pediatric Abdominal Disorders

Participants
Grace S. Phillips, MD, Seattle, WA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To describe the imaging appearance of various pediatric abdominal tumors and tumor-like conditions. 2) To discuss an appropriate imaging algorithm for pediatric abdominal masses. 3) To highlight specific imaging and patient characteristics that help to narrow the differential diagnosis.

ABSTRACT

During this interactive session, pediatric abdominal disorder cases will be presented allowing the learners to recognize and describe the imaging features of various diagnostic entities. Key points will be discussed to avoid misdiagnosis.

MSCP41D Pediatric Pelvic Disorders

Participants
Domen Plut, MD, Ljubljana, Slovenia (*Presenter*) Nothing to Disclose

ABSTRACT

During this case-driven, interactive session, pediatric pelvic disorders will be presented allowing the participants to recognize and describe the imaging features of various diagnostic entities.

RC510

Ultrasound in the First Trimester of Pregnancy

Wednesday, Dec. 4 8:30AM - 10:00AM Room: S401CD

GU OB US

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

LEARNING OBJECTIVES

1) Describe the typical appearances of a tubal ectopic pregnancy. 2) List findings that suggest an interstitial ectopic pregnancy. 3) Differentiate a spontaneous abortion in progress from a cervical ectopic pregnancy. 4) Recommend the appropriate follow up for early pregnancies of unknown location (PUL) identified on transvaginal sonography. 5) Differentiate with certainty a failed pregnancy from a pregnancy suspicious for but not diagnostic of failed pregnancy based on the sonographer finding. 6) Diagnose ectopic pregnancy and identify its location. 7) Recognize normal fetal anatomy in the first trimester and differentiate the normal fetus from an abnormal fetus. 8) Predict the sex of the developing fetus during the first trimester and understand the importance of sex determination in some conditions. 9) Recognize 'must know' major anomalies evident in first trimester. 10) Understand the role of first trimester sex designation. 11) Evaluate first trimester assessment of multiple pregnancies.

Sub-Events

RC510A Ectopic Pregnancy

Participants
Mindy M. Horrow, MD, Philadelphia, PA (*Presenter*) Spouse, Employee, Merck & Co, Inc

For information about this presentation, contact:

horrowm@einstein.edu

LEARNING OBJECTIVES

1) Describe the typical appearances of a tubal ectopic pregnancy. 2) List findings that suggest an interstitial ectopic pregnancy. 3) Differentiate a spontaneous abortion in progress from a cervical ectopic pregnancy.

RC510B Abnormal Early Intrauterine Pregnancies

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

For information about this presentation, contact:

cbenson@bwh.harvard.edu

LEARNING OBJECTIVES

1) Recommend the appropriate follow up for early pregnancies of unknown location (PUL) identified on transvaginal sonography. 2) Differentiate with certainty a failed pregnancy from a pregnancy suspicious for but not diagnostic of failed pregnancy based on the sonographer finding. 3) Diagnose ectopic pregnancy and identify its location. 4) Recognize normal fetal anatomy in the first trimester and differentiate the normal fetus from an abnormal fetus. 5) Predict the sex of the developing fetus during the first trimester and understand the importance of sex determination in some conditions.

ABSTRACT

During this session, findings in early pregnancy on transvaginal ultrasound will be discussed including pregnancies of unknown location (PUL), intrauterine pregnancies of uncertain viability (IPUV), and ectopic pregnancy. Criteria for definitive diagnosis of failed pregnancy will be reviewed, as will sonographic findings suspicious for but not diagnostic of failed pregnancy. Diagnosis of ectopic pregnancy will be discussed, including sonographic findings and determination of the location of the ectopic pregnancy. In addition, sonographic evaluation of the fetus during the first trimester will be presented with attention to the early diagnosis of some fetal malformation and the importance of sex determination for some conditions.

Active Handout:Carol Beer Benson

http://abstract.rsna.org/uploads/2019/18000742/Active RC510B.pdf

RC510C First Trimester Anomalies, Sex, and Other Things

Participants
Kalesha Hack, MD, FRCPC, Toronto, ON (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

kalesha.hack@sunnybrook.ca

LEARNING OBJECTIVES

1) Recognize 'must know' major anomalies evident in first trimester. 2) Understand the role of first trimester sex designation. 3) Evaluate first trimester assessment of multiple pregnancies.

ABSTRACT

This refresher course will review the major anomalies which must be recognized in the later half of first trimester. We will also discuss the role of assessment of external genitalia in first trimester and what key features should be documented in the assessment in twin gestation.

Printed on: 10/29/20

RC514

Interventional Series: Reproductive Health Interventions

Wednesday, Dec. 4 8:30AM - 12:00PM Room: S105AB

GU IR

AMA PRA Category 1 Credits ™: 3.25
ARRT Category A+ Credits: 3.75

FDA Discussions may include off-label uses.

Participants
Paul J. Rochon, MD, Aurora, CO (*Moderator*) Speaker, Penumbra, Inc; Speakers Bureau, C. R. Bard, Inc; Speaker, Cook Group Incorporated; Advisory Board, Medtronic plc ; Speaker, Medtronic plc
Theresa M. Caridi, MD, Washington, DC (*Moderator*) Medical Advisory Board, Boston Scientific Corporation; Consultant, Boston Scientific Corporation ; Medical Advisory Board, Embolx, Inc; Consultant, Embolx, Inc; Research Grant, Embolx, Inc; Shareholder, Embolx, Inc; Speakers Bureau, Terumo Corporation; Medical Advisory Board, Varian Medical Systems, Inc;

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Theresa.m.caridi@gunet.georgetown.edu

Sub-Events

RC514-01 Prostate Embolization: Technical Considerations

Wednesday, Dec. 4 8:30AM - 8:45AM Room: S105AB

Participants
Jafar Golzarian, MD, Minneapolis, MN (*Presenter*) Officer, EmboMedics Inc; Consultant, Boston Scientific Corporation; Consultant, Medtronic plc; Consultant, Guerbet SA;

For information about this presentation, contact:

golzarian@umn.edu

LEARNING OBJECTIVES

1) Discuss about complex anatomy and collateral pathway. 2) Review tips and tricks accessing prostate artery. 3) Discuss best use of embolic materials.

RC514-02 Prostate Embolization: Outcomes

Wednesday, Dec. 4 8:45AM - 9:00AM Room: S105AB

Participants
Jafar Golzarian, MD, Minneapolis, MN (*Presenter*) Officer, EmboMedics Inc; Consultant, Boston Scientific Corporation; Consultant, Medtronic plc; Consultant, Guerbet SA;

LEARNING OBJECTIVES

1) Understand indications and contraindications to prostatic artery embolization. 2) Understand the selection of patients who are ideally suited for prostatic artery embolization. 3) Become familiar with embolic materials used in PAE. 4) Identify and anticipate complications related to PAE. 5) Understand and interpret the existing literature on PAE and how this would translate into setting expectations for the procedure in a clinical setting. 6) Become familiar with the basic techniques of PAE.

RC514-03 Benign Prostate Hyperplasia: Advantages of MR Angiography (MRA)-Guided Prostate Artery Embolization (PAE)

Wednesday, Dec. 4 9:00AM - 9:10AM Room: S105AB

Participants
Thomas J. Vogl, MD, PhD, Frankfurt , Germany (*Presenter*) Nothing to Disclose
Annette Zinn I, Frankfurt, Germany (*Abstract Co-Author*) Nothing to Disclose
Elsayed M. Elhawash, BMedSc,MS, Frankfurt am Main , Germany (*Abstract Co-Author*) Nothing to Disclose
Nagy N. Naguib, MD, MSc, Frankurt, Germany (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To evaluate advantages of MR angiography (MRA)-guided prostate artery embolization (PAE) and to correlate preinterventional MRI findings and analysis of the prostatic artery (PA) with clinical outcomes, intervention time and radiation exposure.

METHOD AND MATERIALS

This study includes 32 patients (mean: 64±7.62; range 47-80). Clinical success was evaluated through the International Prostate Symptom Score (IPSS) and Quality of Life (QoL) before and after PAE. To identify PA origin, MRA reconstruction with maximum intensity projection (MIP) and three-dimensional reconstruction was performed. Mean intervention time was 95.88 minutes, mean fluoroscopy time was 30.2 minutes, mean dose area product was 29,365.21 µGym² and mean entrance dose was 1,614.01 mGy.

RESULTS

The retrospectively evaluated data documented a clinical success in 72.7% of patients with a highly significant reduction in IPSS ($p<0.0001$; mean 9.67 points). Analysis of PA origin via MRA was sufficient in 30 patients (90.1%) and a significant reduction of the intervention time ($p=0.030$) and the dose area product was detected.

CONCLUSION

MRA-guided PAE is a feasible and safe treatment option and significantly improves the IPSS and QoL scores. It reduces procedure time and radiation exposure for patients and interventional radiologists.

CLINICAL RELEVANCE/APPLICATION

MRA guidance in PAE is feasible and reduces procedure time and radiation exposure

RC514-04 Uterine Fibroid Embolization: Techniques

Wednesday, Dec. 4 9:10AM - 9:25AM Room: S105AB

Participants
Theresa M. Caridi, MD, Washington, DC (*Presenter*) Medical Advisory Board, Boston Scientific Corporation; Consultant, Boston Scientific Corporation ; Medical Advisory Board, Embolx, Inc; Consultant, Embolx, Inc; Research Grant, Embolx, Inc; Shareholder, Embolx, Inc; Speakers Bureau, Terumo Corporation; Medical Advisory Board, Varian Medical Systems, Inc;

LEARNING OBJECTIVES

1) Familiarize the audience with the techniques of Uterine Fibroid Embolization. 2) Learn indications/contraindications for the procedure. 3) Understand procedural techniques ad outcomes/complications. 4) Understand periprocedural care.

RC514-05 Magnetic Resonance-Guided Focused Ultrasound Surgery (MRgFUS) Ablate Adenomyosis Combined with Gonadotropin-Releasing Hormone Agonist: A Clinical Study

Wednesday, Dec. 4 9:25AM - 9:35AM Room: S105AB

Participants
Yaoqu Huang, MD, Foshan, China (*Presenter*) Nothing to Disclose

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PURPOSE

To investigate the clinical efficacy of magnetic resonance-guided focused ultrasound surgery (MRgFUS) ablation for adenomyosis after gonadotropin-releasing hormone agonist (GnRH-a) pretreatment.

METHOD AND MATERIALS

From May 2017 to April 2018, twenty patients with symptomatic adenomyosis were underwent MRgFUS treatment. Before MRgFUS ablation, all patients were pretreated with GnRH-a. After ablation, the short-term clinical efficacy were assessed.

RESULTS

After GnRH-a therapy, the average volumes of the uterus and adenomyosis were reduced 48.3% and 47.9%, respectively, and the average signal intensity(SI) ratio of adenomyotic lesions decreased by 29.2%. After MRgFUS ablation, contrast-enhanced MRI showed an average nonperfused volume (NPV) ratio of 82.4±11.5%. Nine patients (45.0%) had 15 class A or B complications according to the Society of Interventional Radiology. Three months after MRgFUS treatment, the volumes of the uterus and adenomyosis were reduced by 20.4% and 36.9%, respectively, compared with baseline. Compared with baseline, the dysmenorrhea scores and PBAC scores significantly decreased at 3 months and 6 months after MRgFUS treatment.

CONCLUSION

MRgFUS ablation is feasible, safe and effective for patients with adenomyosis. GnRH-a pretreatment can significantly decrease the SI and volume of adenomyotic lesions and may create favorable conditions for subsequent MRgFUS ablation.

CLINICAL RELEVANCE/APPLICATION

GnRH-a pretreatment can create favorable conditions for subsequent MRgFUS treatment, it is recommended that MRgFUS combined with GnRH-a as a recommended protocol for adenomyosis ablation.

RC514-06 Uterine Fibroid Embolization: Outcomes

Wednesday, Dec. 4 9:35AM - 9:50AM Room: S105AB

Participants
Theresa M. Caridi, MD, Washington, DC (*Presenter*) Medical Advisory Board, Boston Scientific Corporation; Consultant, Boston Scientific Corporation ; Medical Advisory Board, Embolx, Inc; Consultant, Embolx, Inc; Research Grant, Embolx, Inc; Shareholder, Embolx, Inc; Speakers Bureau, Terumo Corporation; Medical Advisory Board, Varian Medical Systems, Inc;

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Theresa.m.caridi@gunet.georgetown.edu

LEARNING OBJECTIVES

1) Define the expected technical and clinical outcomes for UFE; what percentages we provide to our patients. 2) Distinguish urban myths versus actual challenges in UFE on topics such as expected fertility and outcomes for various fibroid locations. 3) Understand the most recent data regarding UFE outcomes and comparison to surgical treatments for fibroids. 4) Identify areas for further UFE outcomes investigation.

RC514-07 The Treatment of Submucosal Uterine Fibroids by Using Magnetic Resonance-Guided Focused Ultrasound Surgery (MRgFUS): The Evaluation of Efficacy and Safety in 3-Year Prospective Study

Wednesday, Dec. 4 9:50AM - 10:00AM Room: S105AB

Participants
Flavia Cobianchi Bellisari, MD, Laquila , Italy (*Presenter*) Nothing to Disclose
Sonia Iafrate, Laquila, Italy (*Abstract Co-Author*) Nothing to Disclose
Ilaria Capretti, Laquila, Italy (*Abstract Co-Author*) Nothing to Disclose
Ester Cannizzaro, MD, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose
Federica de Matteis, Laquila , Italy (*Abstract Co-Author*) Nothing to Disclose
Francesco Arrigoni, L'Aquila , Italy (*Abstract Co-Author*) Nothing to Disclose
Margherita Di Luzio, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose
Sara Mascaretti, Laquila , Italy (*Abstract Co-Author*) Nothing to Disclose
Carlo Masciocchi, MD, L'Aquila, Italy (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

This study aimed to evaluate clinical efficacy and safety of Magnetic Resonance-guided Focused Ultrasound (MRgFUS) in the treatment of sub-mucosal uterine fibroids in a 3-year prospective study

METHOD AND MATERIALS

Twenty patients affected by sub-mucosal uterine fibroids were treated by MRgFUS (age range 23-54 years), from December 2013 to January 2016. The patients were studied with MRI and classified according to the FIGO staging system. Non-perfused volumes (NPVs) were measured immediately after MRgFUS to calculate the treated area on the c.e. T1-weighed sequences (MRI). The Uterine Fibroid Symptoms and Quality of Life Questionnaire (UFS-QOL) was used to assess the patients' Symptom Severity Scores (SSS) before and after 3 year post-treatment

RESULTS

After MRgFUS treatment, a mean NPV extension of 90,5 % was observed. At follow-up studies up to 3-year, 9 out of 20 patients showed progressive reduction of the uterine volume with regularization of the uterine wall, 11 out of 20 patients showed significant reduction of fibroid volume (about 87%). Each patient was treated during one session. All the patients reported improvement in the UFS-QOL symptoms severity score, when compared with the pre-treatment score. No severe adverse events were observed

CONCLUSION

The results obtained from this study showed that MRgFUS could be safely and effectively used to ablate sub-mucosal uterine fibroids and to improve clinical symptomatology and morphology of uterus

CLINICAL RELEVANCE/APPLICATION

Efficacy and safety of MRgFUS

RC514-08 Treatment of Type 2 and 3 Uterine Fibroids with MR-Guided Focused Ultrasound Surgery: Study of 248 Fibroids

Wednesday, Dec. 4 10:00AM - 10:10AM Room: S105AB

Participants
Ritu M. Kakkar, MBBS, DMRD, Mumbai, India (*Abstract Co-Author*) Nothing to Disclose
Shrinivas B. Desai, MD, Mumbai, India (*Presenter*) Nothing to Disclose

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PURPOSE

To evaluate the role of Magnetic Resonance guided Focussed Ultrasound Surgery (MRgFUS) in treatment of type 2 and 3 uterine fibroids by evaluating post treatment non perfused volume .To evaluate difference in treatment energies and duration of treatment as compared to type 1 fibroids

METHOD AND MATERIALS

248 symptomatic fibroids enhancing type 2 and 3 (T2 iso and hyperintense) uterine fibroids in 104 Indian women , were selected for study after approval from ethics committee following .Pre treatment baseline MRI with contrast was performed and fbroids were classified on basis of T2 signal intensity .Fibroids were classified as Type 1 - hypointense to muscle ,Type 2 - isointense to muscle and type 3- hyperintense to muscle .Treatment was performed on a 1.5-T whole-body system (Signa; GE Healthcare) in the ExAblate 2000 (InSightec) device, using nominal spot protocol .The mean energies ranged between 3500-4200J,while the duration of treatment was 3.5 to 4 hours .Pretreatment fibroid volumes and post treatment non perfused volumes were calculated.

RESULTS

The mean volume of fibroids before treatment was 127 cc with SD, 71.22 cc.The post treatment contrast enhanced images showed

that the volume of fibroid that was nonperfused was 92.21 cc (mean) with SD of 44.12 cc. The average percentage NPV of the total fibroid volume was 72.44 % with a SD of 5.60%.The mean energies used in the treatment ranged between 3500-4200 J ,which is 15 -16 % higher than type 1 fibroids 2000-3000J .The average duration of treatment was 3.5 -4 hours ,1.4 times higher than type 1 fibroids.78%patients has no significant adverse effects.Skin burn with blisters were seen 2%patients .Post treatment leg pain was seen 10% patients immediaterly after treatment

CONCLUSION

MRgFUS is a non invasive technology providing good treatment and volume reduction in patients with T2 iso and hyperintense fibroids ,with acceptable adverse effect profile inspite of higher energies used

CLINICAL RELEVANCE/APPLICATION

MRgFUS can be considered treatment of T2 iso and hyperintense fibroids and can used as an alternative to Uterine artery embolization and in patients not willing for surgery

RC514-09 High-intensity Focused Ultrasound in the Treatment of Uterine Fibroids

Wednesday, Dec. 4 10:10AM - 10:25AM Room: S105AB

Participants
Alexander H. Lam, MD, Orange, CA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Become aware of the indications/contraindications for HIFU, procedural steps, outcomes/complications, and periprocedural care.

ABSTRACT

The purpose of this lecture is to discuss High Intensity Focused Ultrasound (HIFU) in the treatment of uterine fibroids.

RC514-10 Pelvic Congestion Syndrome

Wednesday, Dec. 4 10:25AM - 10:40AM Room: S105AB

Participants
Gloria M. Salazar, MD, Boston, MA (*Presenter*) Consultant, Medtronic plc

For information about this presentation, contact:

gmsalazar@partners.org

LEARNING OBJECTIVES

1) Describe different categories of Pelvic Venous Disorders. 2) Identify relevant venous anatomy for proper clinical evaluation. 3) Establish proper clinical evaluation of patients. 4) Define treatment strategies optimized for different patients' clinical presentation. 5) Understand different interventional treatments and their potential complications.

ABSTRACT

Pelvic Venous Disorders include descriptors of different conditions associated with pelvic venous hypertension resulting in chronic pelvic pain. It could be associated with ovarian vein reflux and/or venous compression syndromes. In some patients, it is associated with internal iliac vein reflux and varicose veins of the legs, as well as May-Thurner Syndrome. The management of chronic pelvic pain is best achieved with a multidisciplinary approach that involves gynecology, pain management, physical therapy, psychological therapy, and interventional radiology. We will review the literature supporting the diagnosis & treatment of these conditions, highlight the differential diagnosis and other therapies that are often required and describe the technical approaches to ovarian vein embolization, internal iliac vein embolization and left internal iliac stenting.

RC514-11 Contraceptive Implant Migration and Removal

Wednesday, Dec. 4 10:55AM - 11:10AM Room: S105AB

Participants
Paul J. Rochon, MD, Aurora, CO (*Presenter*) Speaker, Penumbra, Inc; Speakers Bureau, C. R. Bard, Inc; Speaker, Cook Group Incorporated; Advisory Board, Medtronic plc ; Speaker, Medtronic plc

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LEARNING OBJECTIVES

1) To recognize the risks and complications associated with contraceptive implant placement and removal. 2) To apply image guided techniques for complex removal of contraceptive implants.

RC514-12 Post-partum Hemorrhage

Wednesday, Dec. 4 11:10AM - 11:25AM Room: S105AB

Participants
Matthew A. Brown, MD, Aurora, CO (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Learners should be able to understand the role of embolization alongside standard obstetrical therapy for post-partum

1) Learners should be able to understand the role of embolization alongside standard obstetrical therapy for post partum hemorrhage (PPH). 2) Learners should be able to understand the technique and embolic materials used for treatment of PPH.

RC514-13 Uterine Artery Embolization for Abnormal Uterine Bleeding in the Setting of Retained Products of Conception

Wednesday, Dec. 4 11:25AM - 11:35AM Room: S105AB

Participants
Kaitlin A. Carrato, MD, Washington, DC (*Presenter*) Nothing to Disclose
James B. Spies, MD, Washington, DC (*Abstract Co-Author*) Nothing to Disclose
Theresa M. Caridi, MD, Washington, DC (*Abstract Co-Author*) Medical Advisory Board, Boston Scientific Corporation; Consultant, Boston Scientific Corporation ; Medical Advisory Board, Embolx, Inc; Consultant, Embolx, Inc; Research Grant, Embolx, Inc; Shareholder, Embolx, Inc; Speakers Bureau, Terumo Corporation; Medical Advisory Board, Varian Medical Systems, Inc;

PURPOSE

Retained products of conception (RPOC) can cause significant abnormal uterine bleeding after delivery or abortion, which can be difficult to distinguish from a uterine arteriovenous malformation (AVM) as both show hypervascularity on imaging. There is limited data regarding the efficacy and outcomes of uterine artery embolization (UAE) as a treatment option for RPOC without subsequent intervention. The purpose of this study is to report the outcomes of patients treated with UAE for RPOC.

METHOD AND MATERIALS

A single-center retrospective review was performed of 5 patients from October 2012 to August 2018 who underwent UAE for suspected RPOC versus uterine AVM and were ultimately found on angiogram to have RPOC. Outcomes included technical success, cessation of bleeding, complications and need for subsequent procedures.

RESULTS

Of the 5 patients with abnormal uterine bleeding, 2 had vaginal delivery, 2 had spontaneous abortions and 1 had a D&C. All 5 had transvaginal ultrasound diagnoses, 2 with RPOC vs. AVM and 3 with RPOC. Two patients had subsequent pelvic MRI, one of which was diagnosed with AVM and the other with AVM vs. RPOC. All 5 patients underwent uterine artery angiogram with diagnosis of hypervascular RPOC (no AVM present) followed by UAE with immediate technical success. None of the patients had abnormal uterine bleeding post-procedure. None of the patients required further procedures, although one patient underwent a planned D&C for removal of RPOC following UAE. No complications were reported.

CONCLUSION

The diagnosis of uterine RPOC versus AVM can be difficult with noninvasive imaging alone and definitive uterine artery angiogram may be needed before instrumentation is considered. Furthermore, in this series of patients at a single US institution, UAE has been a safe and effective standalone treatment option for patients with abnormal uterine bleeding related to RPOC.

CLINICAL RELEVANCE/APPLICATION

Retained products of conception have detrimental consequences such as abnormal uterine bleeding. This study reports clinical outcomes from a US institution's experience with UAE for treatment of RPOC.

RC514-14 Investigation of the Relationship between Magnetic Resonance Imaging Performance and Outcome of Uterine Artery Embolization in Patients with Adenomyosis

Wednesday, Dec. 4 11:35AM - 11:45AM Room: S105AB

Participants
Siqi Hu, Guangzhou , China (*Presenter*) Nothing to Disclose
Wenbo Guo, PhD, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Rui Zheng, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Dan Zeng, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Tingting Wan, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the safety and effectiveness of uterine artery embolization (UAE) applied to adenomyosis in short-term (6 months) follow-up. And to investigate the relationship between magnetic resonance imaging (MRI) performance and outcome of UAE in patients with adenomyosis.

METHOD AND MATERIALS

Between 2009-2016, 73 patients with adenomyosis who underwent bilateral UAE were retrospectively analyzed. These patients were divided into three groups according to the distribution and characteristics of T1WI and T2WI signal intensity (SI) of adenomyosis lesions on MRI. Type I: high SI on both T2WI and T1WI; Type II: high SI only on T2WI; Type III: no high SI on neither T2WI or T1WI (SI equal to that of rectus abdominis). Followed-up review lasted 12 months after UAE. Improvements in dysmenorrhea and menorrhagia were evaluated based on the symptom relief criteria.

RESULTS

The proportion of type 1, 2, 3 in preoperative MRI were 31.5% (n=23), 50.7% (n=37), 17.8% (n=13). Sixty-one of the 73 patients with dysmenorrhea (83.6%) reported improvement, fifty-seven of the 73 patients with menorrhagia (78.1%) reported improvement after UAE in 12 months. The effective rate of dysmenorrhea for type I, II, III were 73.9%(17/23),89.2%(33/37),84.6%(11/13) (p=0.62), respectively. The effective rate of menorrhagia for type I, II, III were 69.6%(16/23),78.4%(29/37),92.3%(12/13) (p=0.16).

CONCLUSION

Patients with adenomyosis who underwent UAE showed a favorable short-term control of dysmenorrhea and menorrhagia. But there was no statistically significant on prognosis between three types on MRI.

CLINICAL RELEVANCE/APPLICATION

To investigate whether the different preoperative MRI findings in patients with adenomyosis can predict the prognosis of UAE

RC514-15 Gender Differences in Peripheral Vascular Disease

Wednesday, Dec. 4 11:45AM - 12:00PM Room: S105AB

Participants
Kristofer M. Schramm, MD, Aurora, CO (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To describe trends in female vascular disease. 2) To review barriers to female access to care and treatment of vascular disease. 3) To establish differences in outcomes in open and endovascular repair of female vascular disease.

RC520

MR Image Guidance Radiotherapy

Wednesday, Dec. 4 8:30AM - 10:00AM Room: E353A

GI GU MR RO

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

FDA Discussions may include off-label uses.

Participants
Kathryn J. Fowler, MD, San Diego, CA (*Moderator*) Consultant, 12 Sigma Technologies; Researcher, Nuance Communications, Inc; Contractor, Midamerica Transplant Services; ;

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LEARNING OBJECTIVES

1) Review MR imaging staging for gynecological cancers. 2) Discuss acquisition parameters and recommended sequences for evaluation. 3) Evaluate techniques for evaluating treatment response. 4) Emerging techniques. 5) Recognize the role of MR guided SBRT for borderline resectable and locally advanced pancreas tumors. 6) Recognize the role of MR guided SBRT for intra-abdominal oligometastatic tumors. 7) Identify adaptive workflow strategies to increase physician utilization and clinic efficiency. 8) Identify why MRI-guided radiation therapy has the potential to improve treatment outcomes in the management of pelvic malignancies. 9) Differentiate between rules for safe dose escalation during non-adaptive stereotactic body radiation therapy (SBRT) versus adaptive MRI-guided SBRT. 10) Develop an MRI-guided adaptive treatment flow for the management of cervical cancer. 11) recognize the unique challenges of implementing MRI-guided radiation therapy workflows. 12) develop procedures for safe and efficient delivery of online adaptive radiation therapy. 13) understand the common sources of dosimetric errors in MRI-guided radiation therapy.

Sub-Events

RC520A MR Imaging Requirements for Gastrointestinal/Gynecological Tumors

Participants
Rebecca Rakow-Penner, MD, PhD, San Diego, CA (*Presenter*) Research Grant, General Electric Company

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LEARNING OBJECTIVES

1) Review MR imaging staging for gynecological cancers. 2) Discuss acquisition parameters and recommended sequences for evaluation. 3) Evaluate techniques for evaluating treatment response. 4) Emerging techniques.

RC520B Role of MR-guided RT for Abdominal Tumors

Participants
Hyun Kim, MD, Saint Louis, MO (*Presenter*) Research Grant and Speakers Bureau, Varian Medical Systems, Inc; Research Grant and Speakers Bureau, ViewRay, Inc

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LEARNING OBJECTIVES

1) Recognize the role of MR guided SBRT for borderline resectable and locally advanced pancreas tumors. 2) Recognize the role of MR guided SBRT for intra-abdominal oligometastatic tumors. 3) Identify adaptive workflow strategies to increase physician utilization and clinic efficiency.

RC520C Role of MR-guided RT for Pelvic Tumors

Participants
Lorraine Portelance, MD, Miami, FL (*Presenter*) Advisory Committee, Sirtex Medical Ltd; Advisory Board, BTG International Ltd; Moderator, ViewRay, Inc

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LEARNING OBJECTIVES

1) Identify why MRI-guided radiation therapy has the potential to improve treatment outcomes in the management of pelvic malignancies. 2) Differentiate between rules for safe dose escalation during non-adaptive stereotactic body radiation therapy

(SBRT) versus adaptive MRI-guided SBRT. 3) Develop an MRI-guided adaptive treatment flow for the management of cervical cancer.

RC520D Practical Aspects and Workflow for MR-guided Radiotherapy

Participants
Olga Green, PhD, St. Louis, MO (*Presenter*) Speaker, ViewRay, Inc

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LEARNING OBJECTIVES

1) recognize the unique challenges of implementing MRI-guided radiation therapy workflows. 2) develop procedures for safe and efficient delivery of online adaptive radiation therapy. 3) understand the common sources of dosimetric errors in MRI-guided radiation therapy.

Printed on: 10/29/20

SSK10

Genitourinary (PI-RADS v2.0 and v2.1)

Wednesday, Dec. 4 10:30AM - 12:00PM Room: N227B

GU

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

FDA Discussions may include off-label uses.

Participants
Varaha Tammisetti, MD, Houston, TX (*Moderator*) Nothing to Disclose
Sadhna Verma, MD, Cincinnati, OH (*Moderator*) Nothing to Disclose
Nicola Schieda, MD, Ottawa, ON (*Moderator*) Nothing to Disclose

Sub-Events

SSK10-01 PIRADS Score 2 Misses Significant Prostate Cancer Foci on MRI

Wednesday, Dec. 4 10:30AM - 10:40AM Room: N227B

Participants
Katja Bogner, Nuremberg, Germany (*Presenter*) Nothing to Disclose
Karl Engelhard, MD, Nuremberg, Germany (*Abstract Co-Author*) Nothing to Disclose
Florian Schneider, Nurnberg, Germany (*Abstract Co-Author*) Nothing to Disclose
Sajad Hamel, Nuremberg, Germany (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To evaluate cancer suspected areas in multiparametric MRI (mpMRI) of the prostate which were classified as PIRADS 2 lesions using scientifically proved MRI criteria of cancer by an experienced reporting investigator

METHOD AND MATERIALS

In 2012-2017 328 out of 929 patients with suspicion of prostate cancer that underwent mpMRI were categorized as PIRADS 2 by a radiologist with more than 7 years' experience, 198 of them underwent an 18-core TRUS guided biopsy added by 3 additional samples of the MRI suspected areas. Since 2015 suspicious lesions were evaluated with respect to well-known tumor criteria in literature. In 2012-2014 suspicious lesions were retrospectively categorized as PIRADS 2. In 61 of 198 patients with PIRADS 2 score suspicious lesions were found (study group).The negative predictive value (NPV) of PIRADS 2 was assessed.Chi-square-test was performed to evaluate a possible difference between the number of significant carcinomas in patients with suspicious lesions and in men with PIRADS score 2 criteria alone.

RESULTS

In the study population cancer was found in 13 of 61 men (21%), significant cancer (Gleason score > 6 or Gleason score 6 with PSA > 10 ng/ml or tumor areas in both prostate lobes) in 10 patients (16%). 11 of 13 cancer foci showed a good correlation between the suspected areas in MRI and the biopsy sides. In the control group 25 carcinomas were detected (18%), 16 of them significant (12%). PIRADS score 2 showed a NPV for significant carcinomas of 87 % in the whole population, 84% in the study group and 88% in the control group. The number of significant carcinomas detected in the study population was not significant higher than in the control group.

CONCLUSION

PIRADS scoring provides accurate reproducible reports in interpreting prostate MRI, especially in unexperienced investigators. Reported weaknesses of the PIRADS system are the straight recommendations of interpreting the different zones of the prostate with priority to first and second line sequences in diagnosis weighting. Including proved tumor criteria in MRI as early contrast enhancing foci in the transitional zone or low signal intensity areas in the peripheral zone on T2-weighted images tends to indicate prostate carcinoma beside PIRADS criteria.

CLINICAL RELEVANCE/APPLICATION

PIRADS 2 lesions could comprise significant prostate cancer foci and should require further diagnostic assessment with additionally scientific proven tumor MRI criteria.

SSK10-02 Factors that Predict Clinically Significant Prostate Cancer Among Prostate Imaging Reporting and Data System (PI-RADSv2) Category 3 Lesions Using Histopathology as a Reference

Wednesday, Dec. 4 10:40AM - 10:50AM Room: N227B

Participants
Voraparee Suvannarerg, MD, Bangkok, Thailand (*Presenter*) Nothing to Disclose
Melina Hosseiny, MD, Los Angeles, CA (*Abstract Co-Author*) Nothing to Disclose

Sohrab Afshari Mirak, 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*) Consultant, Johnson & Johnson; Consultant, Bayer AG; Consultant, Merck & Co, Inc; Consultant, Amgen Inc; Consultant, Profound Medical Inc

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PURPOSE

This study aimed to identify clinical and magnetic resonance imaging (MRI) factors that predict clinically significant prostate cancer (CSC) in patients with Prostate Imaging Reporting and Data System version 2 (PI-RADSv2) category 3 lesions using histopathology as a reference.

METHOD AND MATERIALS

This retrospective study included 339 consecutive PI-RADSv2 category 3 lesions that were identified by multiparametric prostate 3T MRI during the January 2009 to December 2018 study period. Transitional and peripheral zone lesions were also included. Histopathologic diagnosis was determined via radical prostatectomy in 232 lesions (68.4%), and by MRI-guided biopsy in 107 lesions (31.6%). CSC was defined as a Gleason score equal to or greater than 3+4. Imaging parameters, quantitative measurement, and PI-RADSv2 category were analyzed by an experienced board-certified radiologist. Univariate and multivariate logistic regression analyses were performed to identify factors significantly associated with CSC.

RESULTS

Of the 339 included lesions, 124 (36.6%) were CSC, and 215 (63.4%) were benign or non-CSC. Univariate analysis showed prostate volume ($p=0.005$), prostate specific antigen density ($p=0.049$), UCLA score ($p<0.001$), mean apparent diffusion coefficient (ADC) ($p<0.001$), ADC ratio ($p<0.001$), Ktrans ($p=0.012$), base, mid, and apex levels ($p<0.001$), and index lesions ($p<0.001$) to be significantly associated with CSC. Multivariate analysis revealed prostate volume (logistic regression coefficient [Coef.]=-0.032, 95% confidence interval [CI]: -0.05 to -0.02, $p<0.001$), ADC ratio (Coef.=1.478, 95% CI: 0.83-2.13, $p<0.001$), apex location (Coef.=1.731, 95% CI: 0.57-2.89, $p=0.003$), and index lesions (Coef.=1.755, 95% CI: 1.14-2.37, $p<0.001$) to be independent predictors of CSC. These findings were used to develop a nomogram for assessing the probability of CSC among PI-RADSv2 category 3 lesions as shown in Figure 1.

CONCLUSION

Prostate volume, ADC ratio, apex level, and index lesions were identified as the MRI parameters and quantitative measurement factors that independently predict CSC in PI-RADSv2 category 3 lesions.

CLINICAL RELEVANCE/APPLICATION

MRI parameters and quantitative measurement factors can predict the probability of CSC in PI-RADSv2 category 3 lesions.

SSK10-03 Patients Assigned to PI-RADS Category 4 and Subsequent Targeted Negative Biopsy: How To Deal With?

Wednesday, Dec. 4 10:50AM - 11:00AM Room: N227B

Participants
Lars Schimmoeller, MD, Dusseldorf, Germany (*Presenter*) Nothing to Disclose
Tim Ullrich, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Nina Laqua, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Andreas Hiester, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Christian Arsov, MD, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
Gerald Antoch, MD, Dusseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose

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Lars.schimmoeller@med.uni-duesseldorf.de

PURPOSE

To comprehensively characterize patients assigned to MRI category PI-RADS 4 and guide clinical management in the case of negative biopsy.

METHOD AND MATERIALS

This prospectively enrolled, single center cohort study includes 931 consecutive patients after mp-MRI (T2WI,DWI,DCE) at 3T for prostate cancer detection. 193 patients with PI-RADS assessment category 4 and subsequent targeted MRI/US fusion-guided plus systematic 12-core TRUS-guided biopsy as reference standard were finally analyzed. The primary endpoint was prostate cancer (PCa) detection of MRI-subgroups in PI-RADS 4 cases (S1-S3: highly likely clinically significant PCA, overlaying prostatitis, or overlaying stromal hyperplasia). Secondary endpoints were analyses of clinical data and detection of targeted biopsy cores.

RESULTS

PCa detection rate was 62% (119/193) including 48% clinically significant PCa (csPCa; Gleason score >=3+4=7). 95% of the index lesions of MRI-subgroup S1 had PCa, whereas lesions of subgroup S3 had csPCa only in 4%. 7% of the patients targeted biopsy cores missed the csPCa index lesion. PSA density (PSAD) was significantly higher in PCa patients.

CONCLUSION

Small csPCa can reliably be detected with mp-MRI by experienced readers, but can be missed by targeted biopsy alone. Re-biopsy of PI-RADS-4-lesions within subgroup S1 is recommended after negative targeted biopsy. Negatively biopsied PI-RADS-4-lesions within subgroup S3 can be followed-up without early re-biopsy. In uncertain cases PSAD should be considered for biopsy decision.

CLINICAL RELEVANCE/APPLICATION

Re-biopsy of PI-RADS-4-lesions with negative primary biopsy might be adjusted to lesion location, image appearance and PSAD. No all patients need timely re-biopsy.

SSK10-04 Dirty Peripheral Zone in Patients with Suspicious Prostate Cancer: Evaluation with PI-RADS v2 Followed by MRI-Guided Biopsy

Wednesday, Dec. 4 11:00AM - 11:10AM Room: N227B

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PURPOSE

Interpretation of dirty peripheral zone (PZ) using PI-RADS v2 is a challenge because of unclear criteria in the term between 'indistinct' in diffusion-weighted imaging (DWI) score 2 and 'focal' in DWI scores 3-5. We aimed to investigate the detection rates of prostate cancer (PCa) in dirty PZ (dirty group) and to identify any differences between dirty and non-dirty control groups.

METHOD AND MATERIALS

266 patients (dirty group = 139; control group = 127) with suspicious PCa were enrolled in this retrospective study. All patients underwent prebiopsy 3-T MRI and subsequent MRI-guided targeted biopsy and concurrent systemic biopsy. Dirty PZ was defined as >= three lesions of wedge-shaped, ill-defined or linear hypointensity in the PZ on apparent diffusion coefficient (ADC) maps. Biopsy-based definition of clinically significant cancer (CSC) was Gleason score >= 3 + 4. Detection rates of all PCa and CSC were compared between the two groups. Inter-reader agreement for PI-RADS v2 scoring was evaluated.

RESULTS

In 266 patients, detection rates of all PCa were 41.7% for dirty group and 50.4% for control group, respectively (P = 0.157); dirty group had significant lower detection rates of CSC than control group (19.4% versus 33.1%, P = 0.011). In all 326 target lesions (dirty group = 176; control group = 150), detection rates of all PCa were 43.8% for dirty group and 50.7% for control group, respectively (P= 0.222); dirty group had significantly lower detection rates of CSC than control group (21% versus 34.7%, P = 0.0063). Regarding remote lesions from target lesions based on systemic biopsy, detection rates of all PCa and CSC in dirty group versus control group were 18.7% versus 32.8% (P = 0.027) and 26.9% versus 19.1% (P = 0.731), respectively. For PI-RADS v2 score >= 4 or not, a substantial inter-reader agreement was seen for control group (κ = 0.723), while a poor inter-reader agreement was seen for dirty group (κ = 0.063).

CONCLUSION

In patients with suspicious PCa, dirty PZ appears to contain approximately 20% CSCs, with fewer detection rates of CSCs than non-dirty PZ. Furthermore, dirty PZ reveals a poor inter-reader agreement for PI-RADS v2 scoring.

CLINICAL RELEVANCE/APPLICATION

When performing a MRI-guided targeted biopsy, we need a cautious approach for dirty PZ because it may harbor approximately 20% CSCs. However, dirty PZ demonstrates fewer detection rates of CSCs compared with non-dirty PZ.

SSK10-05 Does the PI-RADS Prostate MRI Definition of Sextant Regions Adequately Correspond with Transrectal Ultrasound to Direct Non-Fusion TRUS Biopsy of Suspicious MRI Masses?

Wednesday, Dec. 4 11:10AM - 11:20AM Room: N227B

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PURPOSE

To determine if prostate sextant anatomical nomenclature is consistent between multiparametric MRI (MP-MRI) and transrectal ultrasound (TRUS) biopsy.

METHOD AND MATERIALS

50 patients (age 60.9±7.2 years, prostate volume 52±29cm^3, prostate specific antigen 8.0±4.2 ng/mL) underwent MR-TRUS fusion biopsy. Standard 12-core sextant biopsies were also performed purely under TRUS guidance and the biopsy core locations relative to the MP-MRI were recorded. A radiologist sectioned each MP-MRI into base, mid-gland and apex regions as defined by the Prostate Imaging Reporting and Data System version 2 (PI-RADS). Each TRUS-guided biopsy core location was compared to 3D reconstructions of the MP-MRI sextant regions to determine the length of the biopsy core located within each sector.

RESULTS

590 biopsy cores were analyzed. Only 47% (92/197) of TRUS-cores targeting the base sampled any of the MP-MRI defined base, which was significantly less than TRUS-cores targeting the mid-gland (97%, 192/199) and apical (94%, 182/194) regions (p<0.001). Sampling percentages were not significantly different between right and left-sided TRUS-biopsies of base (p=0.07), mid-

gland (p=0.7) and apical regions (p=0.6). Of the 47% of TRUS-cores targeting the base that did touch the MP-MRI defined base, only 26%±18% of the total core length was within the base region-significantly less than mean total core lengths of mid-gland (59%±24%) and apical (57%±28%) TRUS-targeted cores within their corresponding MP-MRI regions (p<0.001). A subgroup analysis of TRUS-cores targeting the base of prostate revealed fewer TRUS-cores sampling the MP-MRI defined base for prostates with volume greater than 45cm³ (n=24) compared to smaller prostates (n=26): 23%±24% versus 67%±25%, respectively (p<0.001).

CONCLUSION

The PI-RADS MP-MRI definitions of apex, mid-gland and especially base do not match standard TRUS-biopsy, particularly in the base of larger prostates. Results from this study could be used to define more TRUS relevant PI-RADS definitions of prostate sectors on MP-MRI.

CLINICAL RELEVANCE/APPLICATION

These results have implications for TRUS-guided biopsy of MP-MRI prostate lesions without software fusion assistance ("cognitive fusion"), as it may lead to inaccurate targeting.

SSK10-06 Does Compliance with PIRADSv2 Technical Requirements Guarantee Image Quality or Adequacy in Prostate mpMRI Reads? A Multi-Institution Multi-Reader Study

Wednesday, Dec. 4 11:20AM - 11:30AM Room: N227B

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PURPOSE

To determine whether compliance with PIRADSv2 technical requirements is related to perceived image quality during prostate mpMRI read outs.

METHOD AND MATERIALS

62 prostate MRI examinations including T2W and DWI from 62 different institutions acquired within the last 12 months that were consecutively referred to our center were included. 6 readers assessed images as adequate or inadequate for use in PCa detection and assessment in addition to ranking image quality on a 1-5 scale. PIRADSv2 technical requirements were synthesized into sets of 7 and 10 rules for T2W and DWI, respectively. Image compliance was assessed using DICOM metadata. Statistical analysis of survey results and image compliance was performed based on reader quality scoring (Kendall Rank Tau-b) and reader adequate scoring (Wilcoxon test for association) for T2 and DWI quality assessment.

RESULTS

52/62 (83%) T2 and 38/62 (61%) DW images were rated to be adequate by a majority of readers. Reader adequacy scores showed no significant association to any rules or combination of rules. For T2 quality, 10/62 (16%) scored as high quality (score >3) by a majority of readers and 18 studies met all 7 T2 rules. There was a weak correlation (tau-b=0.22) between compliance with PIRADSv2 technical standards and image quality for T2 which was significant(p-value=0.01). Studies following all PI-RADSv2 T2 rules achieved a higher average quality score (median avg score = 3.58 for 7/7 vs. median avg score = 3 for <7/7, p=0.012). There was no significant association for individual T2 rules. For DWI quality, 6/62 (9%) scored as high quality by a majority of readers and 4 studies met all 10 DWI rules. Analysis of DWI quality scores found no relationship with PIRADSv2 compliance.

CONCLUSION

Many prostate mpMRI images are of inadequate quality for clinical use and very few images are of high quality. This is especially true for DWI. Adherence to PIRADSv2 technical requirements doesn't necessarily increase the likelihood of having a qualitatively adequate T2W or DWI for clinical use.

CLINICAL RELEVANCE/APPLICATION

High quality MRIs are needed for PCa screening and accurate targeting in MRI guided biopsies. The PIRADSv2 Minimum Technical Standards are not a sufficient threshold to ensure quality.

SSK10-07 Head-to-Head Comparison of PI-RADS 2 versus PI-RADS 2.1: Moderate Agreement and Slight Changes in Scoring and Cancer Localization

Wednesday, Dec. 4 11:30AM - 11:40AM Room: N227B

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PURPOSE

Our goal was to evaluate the novel scoring system in an intra-lesion comparison to the previous version 2 with respect to scoring variability, cancer detection and usage of the new prostate segments.

METHOD AND MATERIALS

3.0 T-MRI Datasets of 200 patients with MRI/TRUS biopsy (10-core systematic and targeted biopsies) were evaluated in a blinded / randomized setting. Lesions were marked and PI-RADS 2 and PI-RADS 2.1 assessment categories were assigned by one of three experienced radiologists (>5 years of reporting prostate MRI), with at least 6 months between the reading sessions. Tumor location and histopathology results were correlated and detection rates of clinically significant PCa (csPCa; >=Gleason 3+4) were tabulated against the scores for both versions.

RESULTS

214 lesions were identified and compared, 135 (63.1%) in the peripheral zone (PZ), 79 (36.9%) in the transition zone (TZ). There was no significant difference in the median PI-RADS 2 vs. 2.1 score (Wilcoxon signed rank PZ: p=0.8 and TZ: p=0.681). Distribution of PI-RADS-scores and csPCa detection rates for PI-RADS 2 vs 2.1 were: 1: 6 vs. 18 (16.7%/11.1%), 2: 51 vs. 31 (7.8%/12.9%), 3: 28 vs. 35 (17.9%/14.7%), 4: 60 vs. 59 (47.5%/44.1%), 5: 69 vs. 71 (62.3%/62.0%). Cohen's kappa for PI-RADS 2 vs. 2.1 was 0.568 and Cohen's weighted kappa was 0.78. Separated by zones detection rates were (PZ, PI-RADS 2/2.1) 1: 33.3%/22.2%, 2: 10.0%/16.7%, 3: 16.7%/14.3%, 4: 47.2%/47.1% and 5: 65.0%/63.4% and (TZ, PI-RADS 2/2.1) 1: 0.0%/0.0%, 2: 6.5%/10.5%, 3: 20.0%/15.4%, 4: 50.0%/25.0% and 5: 58.6%/60.0%. ROC analysis of the significant cancer detection accuracy revealed an AUC of 0.718 (CI 95% 0.631-0.0.805, PI-RADS 2) and 0.702 (0.613-0.791, PI-RADS 2.1) for peripheral zone lesions and 0.806 (0.706-0.907, PI-RADS 2) and 0.803 (0.702-0.904, PI-RADS 2.1) for transition zone cancers (p>0.05 for both comparisons). The new segments (Left/Right Base PZm) were marked in 5/135 (3.7%) of the PZ lesions.

CONCLUSION

Comparing PI-RADS 2 vs. 2.1 showed slight changes in the overall scoring with more pronounced changes in the lower scores and moderate to good intra-reader agreement between the two versions. ROC-performance remained stable at a high level for both PZ and TZ and the newly added segments are used in few instances.

CLINICAL RELEVANCE/APPLICATION

PI-RADS 2.1 introduces slight changes which should not prevent an immediate application of the new version.

SSK10-08 Diagnosis of Transition Zone Prostate Cancer: Comparison of the Prostate Imaging Reporting and Data System (PI-RADS) Version 2 and Version 2.1

Wednesday, Dec. 4 11:40AM - 11:50AM Room: N227B

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PURPOSE

To address limitations in the Prostate Imaging Reporting and Data System version 2 (PI-RADS v2), including interreader reproducibility and ambiguous assessment criteria for T2-weighted imaging of the transition zone (TZ), the PI-RADS Steering Committee developed an updated version (PI.RADS v2.1) in 2019. This study aimed to compare the diagnostic performance of PI-

RADS v2 and v2.1 for detecting TZ prostate cancer (TZPC) on multiparametric prostate MRI (mpMRI).

METHOD AND MATERIALS

This retrospective study received institutional review board approval. The participants comprised 58 patients with suspected TZPC who were undergoing MRI-ultrasound fusion-guided prostate-targeted biopsy (MRGB: at least two cores per MRI-targeted lesion) for a suspected TZ lesion after 3-T mpMRI, including T2-weighted imaging and diffusion-weighted imaging. The standard of reference was MRGB-derived histopathology. A lesion with Gleason score (GS) >= 7 or with GS = 3 + 3 and tumor size >= 0.5 mL (maximum tumor diameter >= 8 mm) was considered as clinically significant PC (csPC). Two readers independently assigned each TZ lesion with a score of 1-5 for T2WI, a score of 1-5 for DWI, and the overall PI-RADS assessment category according to PI-RADS v2 and v2.1. Diagnostic performance including diagnostic sensitivity, diagnostic specificity, and area under the ROC curve (AUC) were compared between the two methods using the McNemar and Delong tests.

RESULTS

Of the 58 patients, 26 were diagnosed with csPC (GS=3+3, 9; GS=3+4, 9; GS=3+5, 1; GS=4+3, 4; GS=4+4, 3) and 32 with benign lesions. Sensitivity between both methods did not differ (100% vs. 92%, p=0.50). Specificity and accuracy were significantly higher for v2.1 than for v2 (56% vs. 25%, p=0.002 and 72% vs. 59%, p=0.039, respectively). AUC tended to be higher in v2.1 than in v2, but the difference was not significant (0.859 vs. 0.799, p=0.062). In particular, PI-RADS v2.1 led to 10 false-positive results of category 3 in PI-RADS v2 being identified as true-negative results of category 2 in PI-RADS v2.1.

CONCLUSION

These observations suggest that PI-RADS v2.1 appears preferable for evaluating TZ lesions in comparison with PI-RADS v2.

CLINICAL RELEVANCE/APPLICATION

PI-RADS v2.1 is suggested to be a more suitable method for detecting csPC in TZ before prostate biopsy. The revisions of PI-RADS have steadily achieved standardization of qualitative assessment using mpMRI for csPC in the TZ.

SSK10-09 Zoomed EPI versus Conventional EPI DWI in Prostate Imaging: Impact on PIRADS Scoring and Cancer Detection

Wednesday, Dec. 4 11:50AM - 12:00PM Room: N227B

Participants
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PURPOSE

Conventional echoplanar (EPI) diffusion-weighted imaging (DWI) is prone to susceptibility artifacts. One possible alternative is zoomed EPI DWI, which has already been shown to reduce distortion artifacts compared to conventional DWI. The aim of this study was to evaluate the impact of zoomed EPI DWI on prostate cancer detection and lesion classification in multiparametric prostate MRI.

METHOD AND MATERIALS

Seventy-two patients (mean age 65 y, age range 46 - 84 y) with suspected prostate cancer who underwent prostate MRI at 3T were included in this retrospective study. Besides T2-weighted and dynamic contrast-enhanced (DCE) sequences, each exam included both conventional EPI DWI and zoomed EPI DWI. All patients had micro-enema before prostate MRI. Lesions were classified according to PIRADS v2. All 72 patients had prostate biopsy (combined systematic prostate biopsy and TRUS-guided prostate biopsy) and 14/72 patients also underwent prostatectomy. The sensitivity and specificity of mpMRI with conventional EPI (mpMRIc) or zoomed EPI DWI mpMRIz) were evaluated and compared using receiver operating characteristic (ROC) analysis, with the histopathological workup as the standard of reference.

RESULTS

75 lesions (in 52 patients) were identified on mpMRI (PIRADS 3 or higher). 32/75 lesions (42.7%) were located in the peripheral zone. Based on mpMRIc, 43/75 lesions (57.3%) were classified as PIRADS 3, 21/75 (28.0%) as PIRADS 4 and 11/75 (14,7%) as PIRADS 5. Based on mpMRIz, 52/75 lesions (69.3%) were rated as PIRADS 3, 14/75 (18.7%) as PIRADS 4 and 9/75 (12.0%) as PIRADS 5. No lesions were detected in 20 patients; in this case, the PIRADS score was set to 2. mpMRIc had a lesion-based sensitivity of 77.8% and a specificity of 93.7%, while mpMRIz DWI had a sensitivity of 55.6% and specificity of 95.2%. The accuracy of mpMRIz was significantly lower when compared to mpMRIc (p = 0.0064).

CONCLUSION

The accuracy of mpMRI with conventional EPI DWI for prostate cancer detection is superior to the accuracy of mpMRI with zoomed EPI DWI. Zoomed EPI DWI cannot be currently recommended for routine clinical prostate examinations.

CLINICAL RELEVANCE/APPLICATION

Our study shows that diffusion restriction in prostate cancer is less pronounced on zoomed EPI DWI when compared to conventional EPI DWI with identical b-values, leading to lower PIRADS scores and lower diagnostic accuracy.

SSK11

Genitourinary (Functional Renal Imaging and Contrast Issues)

Wednesday, Dec. 4 10:30AM - 12:00PM Room: N226

GU

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

FDA Discussions may include off-label uses.

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Sub-Events

SSK11-01 The Effect of Iodinated Contrast Medium Volume on Post-Contrast Acute Kidney Injury after Contrast-Enhanced CT in 3,450 Patients

Wednesday, Dec. 4 10:30AM - 10:40AM Room: N226

Participants
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PURPOSE

Iodinated contrast medium (CM) is still considered a risk factor for post-contrast acute kidney injury (PC-AKI), particularly in patients with chronic kidney disease and diabetes. However, the impact of the volume of intravenously administered CM has not been evaluated in a large population. The purpose of this work was to determine the association between CM-volume and the incidence of PC-AKI in patients who underwent contrast-enhanced computed tomography (CECT).

METHOD AND MATERIALS

This retrospective study included all patients who underwent CECT between May 2017 and November 2018 in a large academic medical center. All patients with at least one serum creatinine (SCr) value within 7 days before, and at least one SCr value within 24-96 hours after CECT were included. The primary outcome was PC-AKI, defined as >50% or >0.3mg/dL increase in SCr 24-96 hours after CECT. Patient demographics, the 35 most relevant diagnoses (coded according to The International Classification of Diseases 10), SCr, eGFR, and administered CM volume were extracted systematically searching the hospital electronic medical record system using a structured query language (SQL). Univariable and multivariable logistic regression analyses were performed.

RESULTS

In total, 3,450 patients were included. PC-AKI occurred in 207 patients (6.0%). Administered median CM volume was 98 mL (84-124, interquartile) in non PC-AKI, and 100 mL (85-130, interquartile) in PC-AKI. Univariable analyses showed that CM-volume normalized for weight (calculated as iodine dose/body weight) was not associated with PC-AKI (p=0.172). CM volume normalized for eGFR (calculated as iodine dose/eGFR) was associated with PC-AKI (OR 1.12 {1.03-1.21}, P=0.005). Similarly, diabetes mellitus (DM), atrial fibrillation (AF), and history of cerebral infarction were associated with PC-AKI in univariable analyses (all P<0.05). In multivariable models adjusted for age, gender and race, independent associations were found for DM, AF, and history of cerebral infarction (all P<0.05), while CM-volume normalized for eGFR was not independently associated with AKI (P>0.05).

CONCLUSION

In our retrospective cohort of 3,450 patients referred for CECT, the administered CM volume was not independently associated with PC-AKI.

CLINICAL RELEVANCE/APPLICATION

Our study suggests that typical volume of intravenously administered iodinated CM does not have an independent effect on the development of PC-AKI in patients referred for CECT.

SSK11-02 Development of Imaging Biomarkers of Contrast-Induced Nephropathy Using Contrast-Enhanced Ultrasound: An Animal Study

Wednesday, Dec. 4 10:40AM - 10:50AM Room: N226

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PURPOSE

To investigate imaging biomarkers of contrast induced nephropathy (CIN) using contrast enhanced ultrasound (CEUS)

METHOD AND MATERIALS

CIN model was made by administering indomethacin (10mg/kg), L-NAME (15mg/kg), and iopamidol (1ml/kg) in Spargue-Dawley male rats. After 24 hours, CEUS was performed in CIN rats (n=6) and control rats (n=6) with 12-5 MHz linear probe. Rats were injected with 0.6 ml of Sonovue (Bracco, Milano, Italy) via tail vein using infusion pump at a rate of 300 ml/hr and CEUS was recorded for 5 minutes from contrast agent injection. Image analysis was performed using dedicated software (QLAB, Philips Medical Systems) and peak enhancement (PE), time to peak enhancement (TTP), and acceleration time (AT) was measured and compared between two groups. After CEUS, the rats were sacrificed and blood and kidney tissue were harvested. Blood urea nitrogen (BUN) and creatinine (Cr) were measured to confirm the development of CIN. Cell apoptosis markers was assessed in kidney tissue. Morphological changes of tubular cells were evaluated by transmission electron microscopy (TEM). Statistical analysis was performed using Mann-whitney test and $P<0.05$ was considered as statistically significant.

RESULTS

BUN and Cr was significantly elevated in CIN model (BUN/Cr, 157±41/1.6±0.5 mg/dL) compared to control (15.5±3.3/0.3±0.0 mg/dL, $P<0.001$). Apoptotic maker (Bax/Bcl-2 level) was significantly higher in CIN model compared to control group ($P<0.01$). More cells were stained with cleaved caspase-3 immunohistochemical staining, suggesting more apoptotic cells in CIN model kidney tissue. On TEM, vacuole formation and mitochondrial expansion phenomenon was detected in CIN group. In terms of CEUS parameters, PE was significantly higher in control group (median, 15.9 dB; interquartile range[IQR], 3.6) than CIN group (13.1 dB; IQR, 5.1, $P=0.043$). TTP was significantly shorter in control group (6.9 sec; IQR, 4.0) compared to CIN group (11.8 sec; IQR, 3.9, $P=0.008$). AT was also significantly shorter in control group (2.3 sec; IQR, 1.2) than CIN group (4.2 sec; IQR, 1.9, $P=0.003$).

CONCLUSION

CEUS parameters including PE, TTP and AT can be used as an imaging biomarker of CIN. In the case of CIN, PE was decreased and both TTP and AT was prolonged.

CLINICAL RELEVANCE/APPLICATION

CEUS parameters can be used as a biomarker for the understanding pathophysiology of CIN and the development of prevention strategies of CIN.

SSK11-03 Chemical Exchange Saturation Transfer (CEST) and Magnetization Transfer (MT) Magnetic Resonance Imaging Helps Detect Metabolic and Structural Characteristics in an Animal Model of Renal Fibrosis

Wednesday, Dec. 4 10:50AM - 11:00AM Room: N226

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PURPOSE

To investigate the value of combined chemical exchange saturation transfer (CEST) and conventional magnetization transfer imaging (MT) in detecting the metabolic and structural characteristics of renal fibrosis in rats with unilateral ureteral obstruction (UUO).

METHOD AND MATERIALS

This prospective study was approved by the Institutional Laboratory Animal Ethics Committee. Thirty-five Sprague-Dawley rats underwent UUO surgery (n = 25) or sham surgery (n = 10). The obstructed and contralateral kidneys were evaluated on days 1, 3, 5 and 7 after surgery as cross-sectional or longitudinal study. After routine MRI, CEST and MT examinations, 18F-fluorodeoxyglucose (FDG) positron emission tomography (PET) was acquired to detect glucose metabolism. Fibrosis was subsequently measured by histologic and Western blot analysis. Pearson correlation analysis was used to compare correlations between asymmetrical magnetization transfer ratio at 1.2 ppm (MTRasym(1.2ppm)) and maximum standard uptake values (SUVmax), and between magnetization transfer ratio (MTR) and a-smooth muscle actin (a-SMA).

RESULTS

MTRasym(1.2ppm) and MTR of the UUO renal cortex and medulla on day 3 and day 7 were significantly different from those of the contralateral kidneys (all $P < .05$). MTRasym(1.2ppm) and MTR of the UUO renal cortex and medulla on day 7 were significantly different from those of the sham-operated kidneys (all $P < .05$). MTRasym(1.2ppm) of UUO kidneys medulla was fairly negative correlated with SUVmax ($r = -0.350$, $P = .021$), and MTR of UUO kidneys medulla was strongly negative correlated with a-SMA ($r = -0.744$, $P < .001$).

CONCLUSION

CEST and MT could provide molecular level metabolic and structural information for comprehensive assessment of renal fibrosis in UUO rats.

CLINICAL RELEVANCE/APPLICATION

In rat models of renal fibrosis, MTRasym(1.2ppm) correlated with SUVmax, and MTR correlated with a-SMA. Extrapolation of these finding from animal models to human subjects suggested that combined chemical exchange saturation transfer (CEST) and conventional magnetization transfer (MT) might potentially provide methods for diagnosis and characterization of renal fibrosis in patients with chronic kidney disease.

SSK11-04 Diagnostic Efficiency of Magnetization Transfer (MT) Technique in Staging of Diabetic Nephropathy

Wednesday, Dec. 4 11:00AM - 11:10AM Room: N226

Awards
Trainee Research Prize - Medical Student

Participants
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PURPOSE

To analyze the diagnostic efficiency of magnetization transfer (MT) technique in staging of diabetic nephropathy (DN).

METHOD AND MATERIALS

48 patients with DN were enrolled as the observation group in this study, and 35 healthy volunteers as the control group. Patients with DN were staged to I-IV according to eGFRs as well as renal function parameters (UAER,Scr,BUN) as a reference standard. All subjects underwent examination on a 3.0T MRI scanner (MAGNETOM Skyra, Siemens Healthcare, Erlangen, Germany) with an 18-channel body phased-array surface coil. A 3D fast low angle shot (FLASH) sequence was scanned for two times to acquire MT data, first time with a MT saturation pulse (MTon) and second time without (MToff). For MT quantification, the magnetization transfer rate (MTR) was calculated using following equation: MTR =(MToff-MTon)×100/MToff. MTR value was measured on the MT map of each subject using the region of interest method. Multiple regions of interest are drawn and averaged in the medullitary region of the upper kidney, renal hilum, and lower pole. The difference of MTR and laboratory examination in each stage were compared using one-way AVNON. The sensitivity and specificity of MTR value in the diagnosis of diabetic nephropathy at different stages were analyzed by ROC curve.

RESULTS

The MTR value of the cortex and medulla were gradually increasing with increase of DN stage ($p<0.05$). After ROC analysis, the MTR values of the renal cortex and medulla had a great preformance for distinguishing healthy control group from observation group, as well as in distinguishing DN VI stage group from other three groups with the area under the curve (AUC) of 0.988 and the sensitivity and specificity of 100.0% and 97.0%. The diagnostic efficiency of MTR values in renal cortex had no difference with AUC of 0.975 with the sensitivity and specificity of 94.1% and 95.4% (Delong's test, Z = 1.696, P = 0.090).

CONCLUSION

The MTR values of the renal cortex medulla have higher diagnostic efficiency in distinguishing the staging of DN, especially in identifying patients with severe diabetic nephropathy.

CLINICAL RELEVANCE/APPLICATION

MT can provide supplementary information for clinical staging about DN.

SSK11-05 Functional MR Imaging Evaluation of Renal Allograft: Role of Blood Oxygen Level Dependent (BOLD) MRI and Diffusion-Weighted (DW) MRI

Wednesday, Dec. 4 11:10AM - 11:20AM Room: N226

Participants
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PURPOSE

To study the role of Blood Oxygen Level Dependent [BOLD] MRI and Diffusion weighted [DW] MRI in evaluation of Renal Allografts and their ability to differentiate normal allografts, acute allograft dysfunction [AAD] and chronic allograft dysfunction[CAD] and also to understand the correlation between R2* & ADC values and clinical / biopsy parameters.

METHOD AND MATERIALS

This prospective case-control study included 50 post renal transplant patients. Patients were segregated into three different categories - Normal allograft, AAD and CAD, based on pre-determined clinical criteria. BOLD MRI and DW MRI studies were

performed. Mean R2* and ADC values were analysed by Pearson correlation and were compared across groups using Kruskal Wallis test. All tests were performed with a two-tailed type-I error rate of P <0.05. A P< 0.05 was considered statistically significant. ROC curves were drawn to evaluate the feasibility of differentiation.

RESULTS

Out of 50 patients, 23 had normal allografts, 16 had acute graft dysfunction and 11 had chronic graft dysfunction. Mean R2* values in cortex and medulla were 24 ± 2 and 26 ±2 in the normal allograft group,18 ± 2 and 15 ± 2 in the AAD group and 41± 4 and 40 ± 5 in the CAD group. Mean ADC values in patients in the cortex and medulla were 2.38 ±0.08 and 2.37 ±0.10 in the normal allograft group, 1.99± 0.11 and 1.92 ±0.16 in the AAD group and 1.69±0.13 and 1.67 ±0.11 in the CAD group. The higher the percentage of interstitial edema and tubular atrophy(as in acute dysfunction), lower are the R2* and ADC values. The higher the percentage of interstitial fibrosis and tubular atrophy(as in chronic graft dysfunction), lower the ADC value and higher the R2* value. R2* values were significantly reduced in cortex and medulla (p value < 0.001) in AAD group.

CONCLUSION

BOLD MRI-based R2* and DW MRI-based ADC values in renal cortex and medulla significantly correlate with renal functions and biopsy findings and are likely to be useful in detection of allograft dysfunction and in differentiation of normal allograft from AAD. The role in differentiation of AAD and CAD was not found to be significant.

CLINICAL RELEVANCE/APPLICATION

BOLD MRI and DW MRI techniques are fast, non-invasive and does not require contrast injection. These functional MRI parameters [R2*and ADC] are therefore likely to emerge as useful additional imaging options for prompt diagnosis of allograft dysfunction in post renal transplant patients.

SSK11-06 Evaluation of Fourier Decomposition MRI for the Assessment of Perfusion Properties of the Human Kidney: Initial Results

Wednesday, Dec. 4 11:20AM - 11:30AM Room: N226

Participants
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PURPOSE

To evaluate Fourier decomposition MRI (FD) in comparison to arterial spin labeling (ASL) for the assessment of renal perfusion properties in healthy subjects and patients with unilateral renal artery stenosis (RAS) (80-90%).

METHOD AND MATERIALS

Fifteen healthy volunteers (mean age 33.0±10.1 years) and five patients with unilateral RAS (mean age 58.4±16.2 years) were examined on a 1.5 T whole-body MR-scanner (Magnetom Avanto, Siemens Healthineers AG) with a non-contrast enhanced dynamic 2D-TrueFISP sequence (TR/TE 2.06/0.89 ms, acquisition time 180 ms/image, 250 images) and FAIR-TrueFisp ASL sequnece (TR/TE 4.0/2.0 ms, TI 1200 ms, 30 averages) in coronal direction. The acquisition time for FD was 1.30 min and ASL 4.16 min, respectively. No ECG or respiratory triggering was used. Image registration algorithm (fMRLung 3.0, Siemens Corporate Research) was performed to compensate the spatial variation of the renal structure. Perfusion parameter maps were calculated for FD and ASL. Perfusion values were determined over the whole organs. Renal perfusion determined by FD and ASL was calculated for healthy subjects and separated for each kidney of the RAS patients. All results were compared using the student t-test.

RESULTS

The average renal perfusion of healthy volunteers was for the right kidney FD 275,4±137,2 ml/100ml/min, ASL 277,2±159,9 ml/100ml/min and for the left kidney FD 278,1±158,1 ml/100ml/min, ASL 319,4±157,2 ml/100ml/min, respectively. There was no significant difference in renal perfusion measured by FD or ASL in healthy volunteers (p>0.05). However, significant difference in side separate renal perfusion could be measured as well by FD as by ASL of patients with unilateral RAS (p<0.05).

CONCLUSION

FD seems to be an appropriate method for rapid measurement of the renal perfusion. Due to the fast acquisition time, the perfusion measurement by FD can easily be attached to any clinical protocol. Renal perfusion measured by FD shows comparable results to the already established ASL method. Alterations of renal perfusion, as unilateral RAS, further can be detected by the new FD method. Further studies are required to determine the clinical value of FD for functional renal imaging.

CLINICAL RELEVANCE/APPLICATION

FD is novel promising approach for rapid assessment of renal perfusion and might improve functional renal MR imaging in future.

SSK11-07 Assessment of Obstructive Renal Injury with Magnetic Resonance Arterial Spin Labeling: An Experimental Study in a Rat of Unilateral Ureteral Obstruction

Wednesday, Dec. 4 11:30AM - 11:40AM Room: N226

Participants
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PURPOSE

To investigate the potential of magnetic resonance arterial spin labeling (ASL) in assessment of obstructive renal injury in 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 left kidney of 40 rats. Eight rats from the model group (n=40) were scanned at each of the five time points (on days 1, 2, 3, 4, 5 after UUO) and then sacrificed for histological examination. Contralateral kidneys were examined as controls. Another eight rats were examined before the onset of UUO to get the baseline data. Hematoxylin-eosin, Masson and a-smooth muscle actin (a -SMA) staining assays were performed. For quantification of renal blood flow (RBF) from a 3.0T scanner, a combination of flow-alternating inversion-recovery (FAIR) labeling scheme and EPI readout was carried out with following parameters for both global (control) and slice-selective (label) inversion: TR/TE: 3000/35ms; TI: 1200ms; FOV: 60×60mm2; matrix: 76×58; slice thickness: 4mm; NSA: 10. RBF were analyzed and correlated with the histopathological results.

RESULTS

Histopathologic examination revealed renal fibrosis of obstructive renal injury on the side with UUO. RBF with ASL of the obstructive lateral kidney decreased gradually with the prolongation of obstruction. Mean RBF with ASL of the left kidney with days 1, 2, 3, 4, 5 after the UUO were 187.33±31.03, 174.83±24.01, 111.54±30.03, 91.44±29.93, 86.19±22.93 ml/100g/min, respectively, while the baseline data was 292.36±16.54 ml/100g/min. The RBF with day 1 after UUO significantly decreased in comparison to the control ($p < 0.01$). The expression of a-SMA in renal interstitial tissue increased gradually after UUO. RBF with ASL of the obstructive lateral kidney was negatively correlated with the positive expression of a -SMA ($r = -0.72$, $p<0.01$).

CONCLUSION

In this model, obstructive renal injury in the early phase was detected with magnetic resonance ASL; the degree of renal fibrosis was correlated with the degree of decrease in RBF.

CLINICAL RELEVANCE/APPLICATION

ASL may be a new kind of noninvasive technique to show the change of RBF in the process of obstructive renal injury and even other diseases, reflecting pathophysiological changes in early stage.

SSK11-08 Non-invasive Measurements of Circadian Variations in Renal Blood Flow Linked to Urinary Output Parameters

Wednesday, Dec. 4 11:40AM - 11:50AM Room: N226

Participants
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PURPOSE

In humans, numerous processes are influenced by a circadian rhythm. This also applies to the kidneys and recent years has seen a growing interest in this field. The novel MRI tehchniques Phase contrast (PC), Arterial Spin Labelling (ASL) and Blood Oxygen Level Dependent (BOLD) have made it possible to study renal perfusion and oxygenation non-invasively giving a number of advantages such as no risk for contrast induced conditions and short-time repeatability. In this study we studied total and regional renal perfusion and regional renal oxygenation over 24 hours linked to urinary output parameters in healthy volunteers.

METHOD AND MATERIALS

Sixteen healthy volunteers (8 female), mean age 23 years were repeatedly scanned at 3T using a scan protocol including PC, ASL and BOLD sequences every fourth hour for 24 hours. Subjects received a urinary catheter to measure urine output parameters (urine production, excretion of Na+, K+, protein, creatinine and urea) during the study. In each subject, both kidneys were analyzed regarding total renal blood flow, regional (cortex, outer and inner medulla) perfusion and regional oxygenation.

RESULTS

Significant circadian variations were found for total renal blood flow measured by PC MRI with increased flow from noon to midnight and thereafter decreasing flow to the morning hours. For regional renal perfusion measured by ASL no significant circadian variations could be seen although a similar pattern as for total renal blood flow was seen for cortical perfusion. For oxygenation by BOLD, no significant circadian variations could be seen. For urinary parameters significant circadian variations could be seen for urine production, excretion of Na+, K+, Creatinine and Urea, all of them showing decreasing values during the night hours. Urinary protein excretion also showed decreasing values during the night but this was not found to be statistically significant.

CONCLUSION

In this study we were able to detect circadian variations in total renal blood flow using non-invasive PC MRI. The circadian renal blood flow pattern correlated well to the circadian pattern of a number of urinary parameters also measured. For regional renal perfusion and oxygenation, no significant circadian variations could be detected.

CLINICAL RELEVANCE/APPLICATION

Knowledge of circadian variations of renal blood flow could be important for future studies/clinical applications dealing with renal blood flow alterations.

SSK11-09 Optimizing Renal CT Angiography Using 80kV and Iterative Reconstruction: Reducing Radiation Dose and Reducing Contrast Agent with Improving Image Quality

Wednesday, Dec. 4 11:50AM - 12:00PM Room: N226

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PURPOSE

To explore the application of using 80 kV and iterative reconstruction in reducing radiation dose and reducing contrast agent with improving image quality to optimize renal CT angiography.

METHOD AND MATERIALS

Seventy patients for renal CT angiography were prospectively collected and randomly divided into group A and group B. Group A used 120kV tube voltage and 600mgI/kg contrast agent, and was reconstructed with 40%ASIR. Group B used 80kV tube voltage and 350mgI/kg contrast agent, and was reconstructed with ASIR-V from 40% to 100% with 10% interval. The CT values and standard deviation (SD) of right renal artery, left renal artery were measured to calculate the signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) for renal arteries. The image quality was subjectively scored by two experienced radiologists blindly using a 5-point system. The effective dose (ED) and total contrast agent was calculated.

RESULTS

There was no significant difference in population characteristics between the two groups ($p>0.05$). Group B had significantly lower contrast agent (21.74±3.08g) (reduced by 43.0%) and effective radiation dose(2.10±0.20mSv) (reduced by 67.1%) than those in group A (38.11±3.74g and 6.39±1.76mSv) ($p<0.001$). The CT values of renal arteries in group B with any reconstructions were slightly higher than those in group A, but the difference was not statistically significant ($P>0.05$). Compared with 40%ASIR reconstruction in group A, the SD values of renal arteries with 60%ASIR-V to 100%ASIR-V in group B were significantly lower ($p<0.001$), and the SNR values with 60%ASIR-V to 100%ASIR-V and the CNR values with 70%ASIR-V to 100%ASIR-V in group B were significantly higher($P < 0.001$). The subjective scores on image quality by two radiologists had excellent agreement (Kappa>0.75,$P<0.05$), and subjective scores with 50%ASIR-V to 100%ASIR-V in group B were significantly higher than 40%ASIR in group A, and 70%ASIR-V provided the highest subjective score.

CONCLUSION

In renal CT angiography, using 80 kV and iterative reconstruction can improve image quality and significantly reduce radiation dose and contrast agent at the same time.

CLINICAL RELEVANCE/APPLICATION

Using 80kV and iterative reconstruction can provide better image quality and lower radiation dose and contrast agent for renal CT angiography, which help to optimize the scanning protocol of renal CT angiography.

SSK20

Radiation Oncology (Genitourinary)

Wednesday, Dec. 4 10:30AM - 12:00PM Room: S102CD

GU RO

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

FDA Discussions may include off-label uses.

Participants
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Sub-Events

SSK20-01 A PSMA-PET-Radiomics Signature Model for Characterization of Gleason Score in Patients with Prostate Cancer

Wednesday, Dec. 4 10:30AM - 10:40AM Room: S102CD

Participants
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PURPOSE

To evaluate the performance of PSMA-PET-radiomics modelling for non-invasive characterization of Gleason score (GS).

METHOD AND MATERIALS

Twenty prostate cancer (PCa) patients, who underwent [68Ga]-PSMA-PET/CT followed by radical prostatectomy, were prospectively enrolled. Two PCa segmentations were performed: the PCa manually contoured by experts (GTV-Exp) and the coregistered histopathological PCa (GTV-Histo). 133 PET image features (IF) were computed. The study involved: (i) the comparison of IF derived from PCa and non-PCa ; (ii) the comparison of IF derived from both segmentations (GTV-Histo vs GTV-Exp); (iiii) the evaluation of the IF correlations with GS and (iv) the development of a radiomics signature model for GS characterization. Comparisons were analysed in terms of two-tailed Mann-Whitney U test for non-pairwise testing (i) and Spearman's correlation test (ii and iii). The incorporation of features into multivariable models (iv) was performed using logistic regression. Model development involved imbalance-adjusted bootstrap resampling in the following processes: IF selection, prediction performance estimation and computation of model coefficients.

RESULTS

Most IF discriminated significantly between PCa and non-PCa tissue: 76% for GTV-Histo and 81% for GTV-Exp. 82% of the IF derived from GTV-Expert showed significant strong correlation (r>0.8) with respect to the IF derived from GTV-Histo. For GTV-Exp, the best performance in GS characterization was observed for the IF short-zones-high-gray-level emphasis-after-quantization-resampling (QSZHGE) with area-unde-the-curve (AUC) of 0.91. In addition, a radiomics signature (5 IF) discriminated between GS 7 and >=8 (AUC=0.93 and sensitivity=0.90). Preliminary validation with an internal cohort of 20 additional patients (GTV_Exp_val) confirmed the results.

CONCLUSION

From our results it could be proved the feasibility of model development based on PSMA-PET radiomics for GS characterization.

CLINICAL RELEVANCE/APPLICATION

GS characterization has an impact on clinical decision making as it defines intermediate- and high-risk PCa patients which influences for example the duration of androgen deprivation therapy during radiation therap. Because of the fact that GS before primary therapy is based on biopsy tissue, a model derived from PSMA-PET radiomics could serve as an alternative for non-invasive GS characterization in the future.

SSK20-02 Pre-Treatment Quantitative Multi-Parametric MRI Can Predict the Biochemical Outcome of Prostate Cancer Patients Undergoing Radiotherapy

Wednesday, Dec. 4 10:40AM - 10:50AM Room: S102CD

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PURPOSE

Up to one-third of men treated with radiation therapy (RT) for prostate cancer may experience biochemical failure, often identified beyond 5 years of follow-up. An earlier diagnosis of recurrent prostate cancer can better inform prognosis and treatment. This study evaluates whether quantitative multiparametric MRI (mpMRI) can be used to predict the biochemical outcome of prostate cancer (PCa) patients.

METHOD AND MATERIALS

Fifty-one patients with biopsy confirmed PCa underwent prostate mpMRI on 3T Philips MR scanner prior to RT with a median dose of 78 Gy. 51% had concurrent hormonal therapy for a median of 16.5 months. The index lesion was outlined by a radiologist and quantitative ADC, T2 and DCE parameters (Tofts model) were measured. The biochemical failure based on Phoenix criteria was associated with these values.

RESULTS

After a median follow-up of 65 months, 6 patients had biochemical failure, and 3 had distant metastasis. ADC had an area under the ROC curve of 0.71 for predicting RT outcome with significantly (*t*-test) lower ADC (0.78±0.17 vs 0.96±0.26 µm2/ms, p=0.04) found in patients showing biochemical failure. Ideal ADC cutoff point (Youdens index) was 0.96 µm2/ms which had a sensitivity of 47% and specificity of 100% for biochemical failure. Kaplan-Meier analysis showed that lower ADC values predicted for significantly lower freedom from biochemical failure (p=0.03, no failures out of 20 men if ADC >=0.96 µm2/ms; 7 of 31 with failures if ADC <0.96 µm2/ms). Quantitative T2 and DCE parameters were not associated with biochemical outcome.

CONCLUSION

This study demonstrates that quantitative mpMRI, and specifically ADC values, are associated with biochemical outcome in patients with PCa treated with RT. Lower ADC values were associated with biochemical failure.

CLINICAL RELEVANCE/APPLICATION

Quantitative MRI, specifically ADC values can predict biochemical outcomes in PCa patients undergoing RT, with lower ADC values associated with biochemical failure. mpMRI may improve risk stratification and help determine optimal treatment.

SSK20-03 Integrated Gene Expression Score in Circulating Tumor Cells to Predict Treatment Response in Muscle-Invasive Bladder Cancer

Wednesday, Dec. 4 10:50AM - 11:00AM Room: S102CD

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PURPOSE

Muscle-invasive bladder cancer (MIBC) is often treated with radical cystectomy, but select pts can be treated with bladder-sparing trimodality therapy (TMT) with comparable long-term survival. There is an urgent need for reliable biomarkers to optimize treatment selection and detect disease recurrence early. Circulating tumor cells (CTCs) in the blood have potential as non-invasive, serial "liquid biopsies" to predict and monitor therapeutic response. The purpose of this study is to develop a CTC gene expression score (CTC-GES) to monitor response to TMT using microfluidic CTC isolation coupled with droplet digital PCR.

METHOD AND MATERIALS

Candidate genes were identified by differential expression analysis comparing RNA-seq data from MIBC (TCGA; n=67) to normal bladder (GTEX; n=11) and leukocytes (n=20). Primer/probe sets for each gene were validated using bladder cancer cell lines (RT4: luminal, HT-1376: basal) spiked into healthy blood. Blood is being collected from a discovery cohort of MIBC pts undergoing TMT (n = 11 to date, median age 73 yr) at several time points (baseline, on-treatment, two-month follow-up). CTCs were isolated using

the microfluidic CTC-iChip and the CTC-GES was computed as log(?(positive droplets/mL blood)+1).

RESULTS

Eight candidate genes (PPARG, UPK1A, UPK2, KRT14, EGFR, KRT19, TMEM129, DSG2) were analytically validated and comprised the CTC-GES. The assay lower limit of detection was 3 CTCs per 10 mL blood. The assay predicted recurrences >2 months prior to clinical detection. At a median follow-up of 20.3 weeks for the 5 pts to date with all time points collected, development of metastatic disease was associated with an increase in CTC-GES from baseline to on-treatment (n = 3), whereas a decline in CTC-GES was seen in 2 pts with no evidence of disease (average ΔGESmet = +2.61 vs. ΔGESNED = -0.43; p=0.048).

CONCLUSION

We have developed a novel CTC gene expression score for MIBC pts undergoing TMT. Our preliminary data suggests this biomarker can predict cancer recurrence more than two months prior to clinical detection. In contrast to circulating tumor DNA, CTC-GES does not require interpatient customization based on prior knowledge of specific mutations.

CLINICAL RELEVANCE/APPLICATION

With continued refinement and substantiation, the CTC-GES has potential as a universal biomarker in MIBC to predict early failures after TMT and enable treatment modification/intensification at a lower disease burden.

SSK20-04 Radium 223 Therapy in Hormone Refractory Metastatic Prostate Cancer: Clinical and Quality of Life Outcomes

Wednesday, Dec. 4 11:00AM - 11:10AM Room: S102CD

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PURPOSE

Radium 223 (Ra 223) has been shown to improve survival in hormone refractory metastatic prostate cancer. However, the optimal duration of therapy and its true benefit in improving quality of life is not clear in patients who have already undergone extensive systemic therapy. We present the outcomes from a single community institution with mature follow-up.

METHOD AND MATERIALS

Fifty four patients with refractory metastatic prostate cancer were treated between August 2013 and April 2019. The median age of the patients was 76 years (range 49-100). The median number of chemotherapy regimens used proir to starting Ra 223 was 3 (range 1-7). The treatment plan was to use 6 monthly injections of Ra 223 at a dose of 1.49 microcuries.kg. The patients were followed regularly in both radiation oncology and medical oncology clinics to assess pain control, quality of life and overall survival.

RESULTS

The median follow-up was 18 months (range 1-48). The median survival time was 8.3 months (range 1-48). Twenty six (48%) of the patient completed all planned 6 monthly injections. The median survival for the patient who completed all 6 cycles of therapy was 16 months (range 7-48) as compared to 5.2 months (range 1-22) who received less than planned 6 cycles ($p<0.01$). Adequate pain relief was noted in 70% and improved ambulation was observed in 64% of cases, in patients who finished all planned therapy. Disease progression was the cause of early stoppage of Ra 223 therapy in 86% of cases. Fatigue was the most common symptom at the end of therapy in 72% of cases.

CONCLUSION

Only half of the patients who receive Ra 223 completed all planned 6 monthly injections. Improved survival, adequate pain relief and better ambulation was seen in patients who completed planned therapy. Earlier use of therapy may result in better treatment outcome as compared to delayed use in this patient population.

CLINICAL RELEVANCE/APPLICATION

Completion of all planned six cycles is necessary to have an improved survival, pain relief and quality of life in hormone refractory metastatic patients receiving Ra 223 therapy.

SSK20-05 Patterns of Failure by Gallium-68 PSMA PET For Biochemically Recurrent Hormone Sensitive Prostate Cancer Following Prostatectomy and Salvage Radiotherapy

Wednesday, Dec. 4 11:10AM - 11:20AM Room: S102CD

Participants
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PURPOSE

Disease localization for patients who develop biochemical failure post radical prostatectomy (RP) and salvage radiotherapy (SRT) is critical for optimizing subsequent management strategies. The role of Gallium-68 PSMA PET is not established in this setting after SRT.

METHOD AND MATERIALS

We analyzed 70 non-castrate men with 71 total Gallium-PSMA PET scans obtained on a prospective imaging trial (NCT03204123) for PSA recurrence after prior RP+SRT. Men with known metastasis or castrate resistance were excluded. A PSMA scan was called positive if at least one avid site was interpreted as at least 'possibly' metastatic. For patterns of failure analyses, pelvic lymph nodes (PLN) included common iliac, internal/external iliac, obturator, perirectal and presacral.

RESULTS

Post RP, most had pT3/4 disease (73%), 26% had extracapsular extension, 30% had positive margins and 23% were pN1. Median time from RP to SRT was 1.6 years (IQR 0.6, 4.1). SRT fields included the prostate bed only (56%), prostate bed and PLN (41%) or unknown (3%) delivered to a median total prostate bed dose of 72 Gy (range 58-81). PSMA scans were performed a median of 4.4 years (interquartile range 2.3, 8.8) post SRT when median PSA was 1.1 ng/mL (IQR 0.4, 2.8). Overall, 51 scans (72%) were positive; positivity rates by pre-PSMA PSA levels of <0.5 (n=26), 0.5-2 (n=23) and >2 ng/mL (n=22) were 69%, 61% and 86%, respectively. Patterns of failure were heterogeneous (Figure). 9 scans (13%) had concern for prostate bed recurrence; with respect to SRT, 5 recurrences (7%) were in field, 3 (4%) were marginal and 2 (2%) were out of field. 27 scans (38%) had concern for PLN relapse, of these, SRT fields had included PLN in 9 (33%). Incidence of PLN relapse was not significantly lower (p=0.2) in men who received SRT to the pelvic nodes. 29 scans (41%) had at least one distant avid site. 20 (28%) had at least one PSMA avid site biopsied, of which 80% were positive.

CONCLUSION

There is predictive value in the use of PSMA PET for men with PSA recurrence after RP and SRT. Patterns of failure are heterogeneous but relapse in the irradiated prostate bed is rare. PSMA may be an important tool to identify men who remain salvageable post SRT.

CLINICAL RELEVANCE/APPLICATION

68Ga-PSMA PET identifies recurrence in the majority of men with PSA recurrence post prostatectomy and salvage radiotherapy and information regarding sites of residual disease would be critical for guiding further personalized treatment interventions.

SSK20-06 Assessment of Patterns of Failure with Gallium-68 PSMA PET for Early Biochemically Recurrent Prostate Cancer following Primary Prostate Radiotherapy

Wednesday, Dec. 4 11:20AM - 11:30AM Room: S102CD

Participants
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PURPOSE

There is a lack of information regarding the value of PSMA PET scans for disease evaluation after definitive prostate radiotherapy (RT). Improved detection following RT will offer opportunities for targeted treatment and may improve disease-free survival outcomes.

METHOD AND MATERIALS

We analyzed 28 non-metastatic patients who underwent Gallium-68 PSMA PET scans after definitive prostate RT. All were enrolled

on an IRB-approved prospective imaging trial. Patients' initial PSA level was low (14%), intermediate (46%), and high (40%) and 4 (14%) had N1 disease. Definitive RT approaches were conventional EBRT (43%), brachytherapy-based regimens (46%), and hypo-fractionated EBRT (11%). Post RT, all had at least 2 consecutive PSA rises and 17 (60%) had nadir+2 relapse. A PSMA scan was considered positive if at least one avid site was noted as at least possibly metastatic. Pelvic lymph nodes (PLN) included common iliac, internal/external iliac, obturator, perirectal, and presacral. 22 (78%) had an available pelvic MRI for comparison to PSMA PET. Median time from RT to PSMA PET was 6 years.

RESULTS

Prior to PSMA PET, 4 (14%), 4 (14%) and 21 (75%) had PSA ranging between 0.5-1, 1-2, and >2 ng/mL, respectively. For these PSA ranges, the incidence of a positive PSMA scan was n=1 (25%), n=4 (100%), and n=18 (86%), respectively. Among the 23 patients with positive PSMA, local prostate/SV failure, PLN failure, and distant failure rates were n=14 (50%), n=7 (25%), and n=12 (48%), respectively. We observed prostate only, PLN only, and distant only failure in 8 (35%), 1 (4%), and 5 (22%) patients. 9 patients were initially treated with RT to the pelvis and only 1 (11%) of these patients failed in a PLN. Pelvic MRI revealed nodal recurrence in only 3 men (14%) but local recurrence in 11 men (50%). Discordant PSMA and MRI findings were noted in 22 (41%) cases. Based on PSMA results, 15 underwent further treatment, which included salvage RT to sites of PSMA avid disease (n=8).

CONCLUSION

PSMA PET provides information beyond other diagnostic studies routinely obtained for restaging. While MRI remains valuable for detecting intraprostatic relapses, PSMA was advantageous for detecting PLN and distant failures.

CLINICAL RELEVANCE/APPLICATION

PSMA PET identifies radiographic recurrence (mostly PLN) among patients whose PSAs demonstrate consistent rise after primary radiotherapy but prior to reaching nadir+2 biochemical relapse.

SSK20-07 SBRT Re-Irradiation Therapy for Locally Recurrent Prostate Cancer after External-Beam Radiation Therapy

Wednesday, Dec. 4 11:30AM - 11:40AM Room: S102CD

Participants
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PURPOSE

The aim of this study is to evaluate the toxicity of re-irradiation with stereotactic body radiotherapy (SBRT) in pts with recurrent prostate cancer after external beam radiotherapy (EBRT) in order to assess the potential risk predictors of rectal and urinary toxicity.

METHOD AND MATERIALS

From Apr 2011 to Feb 2019, SBRT was delivered to 11 pts for isolated local recurrence of prostate cancer. 10 pts were high risk while a patient was an intermediate risk. The pts were previously treated with 3DCRT to a median dose of 76,6Gy (68-78Gy). After a median time of 40 mos (13-84 mos), the pts had recurrences confirmed by multiparametric MRI and 18Ffluorocoline PET-CT. Median PSA at the time of SBRT was 4,38 (2.5-9.9). The prescribed dose was 30 Gy in 3fx to 80% isodose in 9 pts and 30Gy in 6fx to 80% isodose in 2 pts. The PTV delineation was performed on CT-MRI fusion to limit normal tissue toxicity. The VMAT treatment was delivered by 6MV Linac. CBCT was employed to control patient set-up before each fraction. Toxicity was evaluated according to CTCAE v.4.0 and the treatment response was assessed by PSA. Dose to rectum and bladder (Dmax of EBRT+SBRT plans) were evaluated using DVH converted into NTD2Gy (a/ß ratio=3Gy for rectum and a/ß ratio=5Gy for bladder) to determine factors that predict toxicity.

RESULTS

Median follow-up was 8 mos (range 1-18). LC, defined by PSA returned to zero, was achieved in all treated pts. Two pts (18%) had a biochemical failure due to metastatic progression without local recurrence. 4 pts (36%) showed grade<=2 urinary toxicity and no grade>2 acute gastrointestinal or late toxicities were reported. Dmax was predictive for toxicity of bladder (98 Gy) and rectum (130 Gy).

CONCLUSION

SBRT re-irradiation of prostatic recurrences after EBRT showed favorable results in terms of LC. In our experience only two relapses occurs outside of prostate gland. Acute and late toxicity was mild. In our study a threshold Dmax (98Gy) for bladder may be related to a greater probability of low toxicity and confirms data already published in literature (Dmax=130 Gy) for rectum. The results need to be confirmed with more pts and longer follow up.

CLINICAL RELEVANCE/APPLICATION

Prostate re-irradiation with SBRT

SSK20-08 Constraining Rectal Dose to Attain Higher Dose Coverage to Prostate Volumes in Robotic SBRT Using Perirectal Hydrogel Spacer for Low- and Intermediate-Risk Prostate Cancer

Wednesday, Dec. 4 11:40AM - 11:50AM Room: S102CD

Participants

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PURPOSE

Avoiding or minimizing acute and delayed rectal toxicities is a critical objective for safe dose-escalation in prostate SBRT. This retrospective study aims at examining if there is a dosimetric benefit in using perirectal hydrogel spacers for patients eligible for SBRT treatment per PACE Trial for low- and intermediate-risk prostate cancer.

METHOD AND MATERIALS

The study included 16 prostate cancer patients, 8 were planned with perirectal hydrogel spacer and the other 8 with no spacer. CT and T2-weighted MRI (when available) scans were used with SBRT plans optimized with the Volo Optimizer in a PrecisionTM TPS (2.0) utilizing MLC-based delivery on a CyberKnife M6 system. CTVs include prostate and 1.5-2.0 cm proximal seminal vesicles under the intermediate-risk prostate cancer scenario. PTV margins were 3-5 mm per PACE protocol with 36.25 Gy to PTVs and 40 Gy to prostate volumes and a mandatory rectum constraint V36 <= 1.0 cc. Comparisons are made for the volume overlaps between rectum and PTV, dose coverage to the prostate (V40) and PTV (V36.25), and absolute prostate sub-volumes receiving < 40 Gy. In addition, to examine if placing the spacer may lead to consistent rectal dose reduction, rectum DVH profiles are compared by requiring both V40 >= 95% for prostate and V36.25 >= 95% for PTV and no overriding priority for rectum V36 <= 1.0 cc.

RESULTS

In planning under the intermediate-risk case scenario, the mean rectum overlap with PTV was 2.0 cc (range 0.8 to 3.9 cc) in the no-spacer group, and 0.2 cc (range 0.0 to 0.4 cc) in the spacer group. The mean prostate V40 is 93.2% (range: 78.4% to 99.3%), the mean PTV V36.25 is 94.3% (range: 90.7% to 97.4%), and the mean prostate sub-volume receiving <40 Gy is 3.8 cc (range: 0.3 to 10.7 cc) in the no-spacer group; The mean prostate V40 is 98.9% (range: 96.6% to 100%), the PTV mean V36.25 is 97.5% (range: 94.9% to 99.9%) and the mean prostate sub-volume receiving <40 Gy is 0.8 cc (range: 0.0 to 2.3 cc) in the spacer group. By requiring both prostate V40 >= 95% and PTV V36.25 >= 95%, the mean rectum V36 is 1.5 cc (range: 0.2 to 2.8 cc), the mean V18.125, V29, V32.625 and V36.25 are 31.0%, 11.0%, 6.3% and 1.9% in the no-spacer group; and the mean rectum V36 is 0.5 cc (range: 0.0 to 1.0 cc), the mean DVHs values are 35.9%, 8.6%, 3.7% and 0.6% in the spacer group. Similar trends were observed for planning the low-risk prostate cancer scenario.

CONCLUSION

Significantly lower rectum overlaps with PTV are achieved by using perirectal hydrogel spacer. Preliminary results reveal a promising way to consistently lower the dose to the rectum while attaining higher specified dose coverage to the prostate volumes for low- and intermediate-risk prostate cancer.

CLINICAL RELEVANCE/APPLICATION

This study provides a first report on the dosimetric benefits of consistent rectal dose reduction while safely escalating dose to the clinical target volumes by using perirectal hydrogel spacer for prostate cancer patients eligible for SBRT under the international randomized PACE trial for treating low- and intermediate-risk prostate cancer.

SSK20-09 TraceIT: A Prospective Pilot Study Evaluating the Role of a Temporary Intravesical Fiducial Marker for Bladder Cancer Image-Guided Radiation Therapy

Wednesday, Dec. 4 11:50AM - 12:00PM Room: S102CD

Participants
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PURPOSE

Daily anatomic variability of the bladder and challenging visualization of the bladder tumor bed limits the ability to offer image-guided radiotherapy (RT) for patients with muscle-invasive bladder cancer (MIBC). We hypothesized that TraceIT, an injectable biocompatible hydrogel, could offer a safe and feasible temporary bladder wall fiducial marker to guide RT planning and daily image guidance on cone-beam CT (CBCT) in patients undergoing definitive RT.

METHOD AND MATERIALS

We enrolled 12 patients in an IRB-approved prospective observational cohort study from 2017-2018. Eligibility included MIBC planned to receive definitive RT or chemoRT over at least 4 weeks of daily treatment. TraceIT hydrogel was injected around the circumference of the tumor bed during pre-treatment and/or midcourse transurethral resection of the bladder tumor. The primary endpoint was fiducial marker localization to assess interfraction motion on daily CBCTs. Van Herk (VH) margin equation was used to determine the planning target volume margin optimized for the clinical target volume receiving at least 95%-prescription dose in 90% of patients. Toxicities were measured by CTCAE v4.

RESULTS

12 MIBC patients underwent RT to a median total dose of 64.4 Gy [37.5-66.6]. Median TraceIT volume was 0.5cc [0.3-0.75] per site for a total of 4 [4-6] sites per patient with a total volume of 2cc [2-3]. All patients demonstrated 100% visibility of TraceIT on the initial simulation CT-scan and day 1 CBCT. Average visualization of TraceIT after the initial and boost phase of RT was 91.5% [40-100] and 82.5% [0-100%], respectively. For the initial phase, alignment to fiducials over bone anatomy allowed for reduced VH margins (0.95cm vs 1.57cm). This was due to decreased total systematic error from 0.64cm (bone) to 0.23cm (fiducial) (p=0.005). For the boost phase, the VH margin was similar between fiducial and bone alignment (1.06cm vs 0.95cm). No grade >=1 toxicity was observed related to TraceIT.

CONCLUSION

TraceIT serves as a feasible intravesical fiducial that can aid in target delineation for RT planning and daily image-guidance, which may allow for increasingly conformal margins to reduce toxicity and improve tumor control via dose escalation.

CLINICAL RELEVANCE/APPLICATION

For bladder cancer radiotherapy, TraceIT is a feasible intravesical fiducial marker for tumor bed visualization and image-guidance, allowing for reduced margins with the goal of decreased toxicity.

Printed on: 10/29/20

GUS-WEA

Genitourinary Wednesday Poster Discussions

Wednesday, Dec. 4 12:15PM - 12:45PM Room: GU/UR Community, Learning Center

GI MR GU

AMA PRA Category 1 Credit ™: .50

FDA Discussions may include off-label uses.

Participants
Michael T. Corwin, MD, Sacramento, CA (*Moderator*) Nothing to Disclose

Sub-Events

GU218-SD-WEA1 Evaluating New England Journal of Medicine Minor Diagnostic Criteria for Diagnosing Early Trimester Pregnancy Failure: A Single Institution Experience

Station #1

Participants
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Tara A. Morgan, MD, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose
Liina Poder, MD, Mill Valley, CA (*Abstract Co-Author*) Nothing to Disclose
Priyanka Jha, MBBS, San Francisco, CA (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

The major criteria presented by Doubilet et al. help diagnose early pregnancy loss. The role of proposed minor criteria in predicting early pregnancy loss has not been studied. In this study, we aim to evaluate whether one minor criterion or a combination of several minor criteria may help definitively diagnose early pregnancy loss.

METHOD AND MATERIALS

In this IRB approved retrospective study, 1107 1st trimester ultrasounds were obtained. Definitively viable or non-viable pregnancies, ectopic pregnancies, pregnancy of unknown location, elective abortion, imaging lost to follow-up, and possible early intrauterine pregnancies (gestational sac (GS) < 10 mm) were excluded. Pregnancies of uncertain viability requiring follow-up as evidenced by GS without cardiac motion (with or without embryo) were included. Pregnancy outcomes were documented using follow-up imaging, ß-HCG levels and clinic notes. Each criterion was assessed independently by 2 readers with 5 and 10 years of US experience and blinded to the outcome. Odds ratio, positive predictive value and specificity were calculated for each criterion in predicting pregnancy outcomes. Combination of minor criteria leading to subsequent failure was assessed.

RESULTS

A total of 142 ultrasounds were included in the study. Among those, 49 pregnancies continued as normal pregnancies while 93 cases failed on follow-up. For reader 1, the odds ratio, specificity and PPV were 3.13, 63% and 77% for 'crown-rump length less than 7 mm' criterion while values were 1.02, 71% and 66% for 'absence of embryo after 6 weeks from last menstrual period' criterion. All other minor criteria had specificities and PPV of 100%. For reader 2, the odds ratio, specificity and PPV were 2.49, 65% and 76%, and 1.13, 69% and 67% for aforementioned criteria. All other minor criteria had specificities and PPV of 100%.

CONCLUSION

Minor criteria based on mean sac diameter, appropriately timed follow-up imaging studies, empty amnion and enlarged yolk sac have 100% specificity and 100% PPV to diagnose 1st trimester pregnancy loss. Minor criteria based on crown-rump length and last menstrual period alone do not have a high specificity to definitively diagnose early pregnancy loss.

CLINICAL RELEVANCE/APPLICATION

Minor diagnostic criteria can be used to definitively diagnose nonviable pregnancy in the 1st trimester and will result in more timely, appropriate and cost-effective care for the patients.

GU219-SD-WEA2 Quantitation of Bladder Cancer for Prediction of Muscle-Invasion in Comparison with VI-RADS Categorization

Station #2

Participants
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PURPOSE

To investigate methods of quantitative bladder cancer assessment in prediction of muscle-invasion, and to compare their diagnostic

performance to that of a qualitative method, represented by Vesical Imaging-Reporting and Data System (VI-RADS).

METHOD AND MATERIALS

Among the patients who underwent transurethral resection of bladder tumors or radical cystectomy from January 2018-March 2019, 72 preprocedural or preoperative 3-T MRIs were retrospectively analyzed. Two radiologists independently assigned VI-RADS categories, and quantified the followings for single index lesion of each patient, on axial T2-weighted, diffusion-weighted (b = 1000 s/mm2) and contrast-enhanced T1-weighted images: curvilinear length of tumor base, greatest tumor dimension, and their ratio. Inter-reader agreement was assessed with κ and intraclass correlation coefficients (ICCs). Multivariable logistic regression analysis was done to find meaningful indicators of muscle-invasion. Diagnostic performance of markers was compared to one another with receiver operating characteristic (ROC) curve analysis. Optimal cut-off point was suggested by Youden index J.

RESULTS

Inter-reader agreement was substantial (κ 0.76-0.80) for VI-RADS categorization and base-dimension ratio (ICC 0.67-0.74), and almost perfect for tumor base length and tumor dimension (ICC 0.86-0.98). Tumor base length (odds ratio [OR] 2.43-2.62) and VI-RADS categorization (OR 7.40-8.03) were independently associated with muscle-invasion ($p < 0.01$). Area under the ROC curves, optimal cut-off points, and sensitivity/specificity at the corresponding points were, 0.924, 2.7 cm, and 0.88/0.81 for tumor base length on diffusion weighted images, and 0.932, score 3, and 0.78/0.91 for VI-RADS categorization, respectively.

CONCLUSION

Curvilinear tumor base length may be a highly reproducible quantitative method, with comparable diagnostic performance in prediction of muscle-invasive bladder cancer to VI-RADS categorization.

CLINICAL RELEVANCE/APPLICATION

Comparing to qualitative assessment of bladder cancer characterized by high specificity, this simple and intuitive quantitative mean may provide additional sensitivity in prediction of muscle-invasion.

GU252-SD-WEA4 Necessity of Differentiating Small (<10 mm) and Large (>= 10mm) PI-RADS 4 Lesions

Station #4

Participants
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Byung Kwan Park, MD, Seoul, Korea, Republic Of (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

Prostate Imaging Reporting and Data System version 2 (PI-RADSv2) provides reasonable performance in detecting significant cancers. However, it is unclear about whether all PI-RADS 4 lesions show the same cancer detection rate (CDR) regardless of tumor size. This study is designed to compare the CDRs of small (<10 mm) and large (>= 10 mm) PI-RADS 4 lesions.

METHOD AND MATERIALS

After magnetic resonance imaging (MRI) was performed in 684 men, a radiologist interpreted the MR images and detected 281 index lesions categorized as PI-RADS 4 in 281 men. Transrectal ultrasound-guided target and/or systematic biopsy was performed. PI-RADS4 lesions were divided in to small and large groups depending on size of 10 mm. Overall and significant CDRs were compared between the groups. A significant cancer was defined as one with Gleason score (GS) >= 7 or tumor volume >= 0.5 ml. Tumor volumes were roughly calculated as $\pi r^3 4/3$(π=3.14 and r=a half of tumor size) and were compared between the groups. Standard reference was a biopsy examination. Fisher's exact and Mann-Whitney tests were used for statistical analysis.

RESULTS

The overall CDRs of small and large groups were 39.0% (53/136) and 59.3% (86/145), respectively (p=0.0008). The median tumor volumes of cancer-proven small and large groups were 0.18 ml (0.01-0.38 ml) and 0.70 ml (0.52-1.44 ml), respectively (p<0.0001). Using GS or tumor volume, the significant CDRs of these groups were 26.5 % (36/136) and 59.3% (86/145), respectively (p<0.0001) and using GS alone, 26.5% (36/136) and 39.3% (57/145), respectively (p=0.0232).

CONCLUSION

PI-RADS 4 lesions should be sub-divided based on the size of 10 mm because of different significant CDRs.

CLINICAL RELEVANCE/APPLICATION

Men with a large (>=10 mm) PI-RADS4 cancer are not candidates of active surveillance, but of definitive treatment regardless of Gleason score because this tumor should be considered significant cancer due to the tumor volume greater than 0.5 ml.

GU253-SD-WEA5 Evaluation of Renal Allograft Injury Using MRI Texture Analysis

Station #5

Participants
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PURPOSE

To explore the value of MRI texture analysis in evaluating renal allograft injury.

METHOD AND MATERIALS

66 patients who underwent allograft renal transplantation between November 2013 and December 2016 were included in this study. All the patients were divided into three groups according to the estimated glomerular filtration rate (eGFR): normal renal allograft function (nRAF, eGFR >= 60 ml/min/1.73 m2, n = 15), mild to moderate renal allograft injury (mRAI, 30 <= eGFR < 60 ml/min/1.73 m2, n = 18), and severe renal allograft injury (sRAI, eGFR < 30 ml/min/1.73 m2, n = 33) group. Texture features of renal allograft based on T2WI, SWI, and BOLD MRI were extracted. Multiple dimensionality reduction for MRI texture features were performed, and

the texture features based on T2WI, SWI, and BOLD MRI with absolute correlation coefficient of eGFR greater than or equal to 0.3 ($P < 0.05$) and also with the highest Z value for Boruta algorithm were selected. The differences in the texture features among the three groups and the diagnostic performance of the texture features in differentiating the three groups was assessed.

RESULTS

After Multiple dimensionality reduction, T2WI_Perc.50%, SWI_Perc.01%, BOLD_S(4,4)Contrast, and BOLD_S(5,5)Correlat were selected. There were significant differences in T2WI_Perc.50%, SWI_Perc.01%, BOLD_S(4,4)Contrast, and BOLD_S(5,5)Correlat between the nRAF group and the sRAI group (all $P < 0.05$). T2WI_Perc.50% in the mRAI group was significantly lower than that in the nRAF group ($P = 0.001$). BOLD_S(4,4)Contrast in the sRAI group was significantly lower than that in the mRAI group ($P = 0.032$). T2WI_Perc.50%, SWI_Perc.01%, and BOLD_S(5,5)Correlat showed equal capacities for differentiating the nRAF group with the mRAI group (AUC: 0.785, 0.720, and 0.700). T2WI_Perc.50%, SWI_Perc.01%, BOLD_S(4,4)Contrast, and BOLD_S(5,5)Correlat showed equal capacities for differentiating the nRAF group with the sRAI group (AUC: 0.687, 0.733, 0.784, and 0.737). BOLD_S(4,4)Contrast showed the ability to differentiate the mRAI group with the sRAI group (AUC: 0.667).

CONCLUSION

There is a correlation between MRI texture features and renal allograft function, and MRI texture analysis can provide valuable information for evaluating renal allograft injury.

CLINICAL RELEVANCE/APPLICATION

MRI texture analysis can demostrate renal allograft injury indirectly and is recommended as a non-invasive tool for monitoring renal allograft function in clinic.

GU254-SD-WEA6 The Diagnostic Evaluation of PI-RADS V2 based on Simplified Biparametric MRI for Prostate Cancer

Station #6

Participants
Jie Bao, Suzhou, China (*Presenter*) Nothing to Disclose
Xi-ming Wang, Suzhou, China (*Abstract Co-Author*) Nothing to Disclose
Chun-hong Hu, Suzhou , China (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

This study compare the performance of the PI-RADS scores obtained by using biparameter MRI and multi-parameter MRI for clinically significant PCa, respectively.

METHOD AND MATERIALS

MpMRI was performed for 333 patients with suspicious lesions on a 3T MR scanner including high-spatial-resolution structural imaging. For bpMRI, two radiologists scored only the cross-sectional T2W image and DWI for all cases in strict accordance with the PI-RADS V2 scoring standard. The patients with suspicious tumors PI-RADS V2 assessment category of>=3 were selected for MRI-TRUS targeted biopsy. The other patients with PI-RADS V2 assessment category of 1and 2 were selected for TRUS biopsy. The receiver operating characteristic curves were obtained by PI-RADS V2 scores based on bpMRI and mpMRI sequences.

RESULTS

A cohort of 333 patients was performed including 162 PCa and 171 non-PCa. bpMRI detected PCa in 131 patients and clinically significant PCa in 126 patients. The AUC of PI-RADS V2 score based on bpMRI and mpMRI for the diagnosis of PCa was 0.869 and 0.889, respectively (P=0.0638). The accuracy of bpMRI in the diagnosis of benign and malignant prostate diseases is 81.68% (272/333), the sensitivity is 80.86% (131/162), the specificity is 82.46% (141/171). The accuracy of mpMRI score in the diagnosis of benign and malignant prostate lesions was 84.98% (283/333), the sensitivity was 85.18% (138/162), the specificity was 84.80% (145/171). The AUC of PI-RADS V2 score based on bpMRI and mpMRI for the diagnosis of clinically significant prostate cancer was 0.879 and 0.890, respectively (P=0.1685). The diagnostic accuracy of bpMRI for clinically significant prostate cancer was 84.38% (281/333), the sensitivity was 92.42%(122/132), the specificity was 79.10%(159/201); The diagnostic accuracy of mpMRI was 85.59%(285/333), the sensitivity was 93.94% (124/132), the specificity was 80.10% (161/201).

CONCLUSION

BpMRI can effectively detect clinical significant prostate cancer; the diagnosis performance of bpMRI is similar to that of mpMRI for detecting prostate cancer. As a result, using bpMRI method can significantly shorten the acquisition and interpretation time and avoid the potential risk of DCE injection of contrast agent.

CLINICAL RELEVANCE/APPLICATION

This study compare the performance of the PI-RADS scores obtained by using biparameter MRI and multi-parameter MRI for clinically significant PCa, respectively.

UR188-ED-WEA7 Metastasis or Recurrence of RCC: How, When, and Where

Station #7

Participants
Xin Li, MD,PhD, Wuhan, China (*Presenter*) Nothing to Disclose
Cen Chen, Wuhan , China (*Abstract Co-Author*) Nothing to Disclose
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Ping Han, MD, Wuhan, China (*Abstract Co-Author*) Nothing to Disclose

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TEACHING POINTS

The purpose of this exhibit is: To review the pathway of metastasis or recurrence of RCC To discuss the time of RCC metastasis and post-treatment follow-up criteria Use cases to explain the common and uncommon place of RCC metastasis and its imaging features.

TABLE OF CONTENTS/OUTLINE

Outline How- The pathway of Metastasis or Recurrence of RCC When- Time of Metastasis or Recurrence Post-Treatment Follow-Up Criteria Where- Common and uncommon place and Imaging features

UR189-ED-WEA8 Leading the Way with PI-RADS and MRI-Directed Biopsy Pathway for the Diagnosis of Prostate Cancer

Station #8

Awards

Certificate of Merit

Participants
Alina D. Dragan, MRCS,FRCR, Watford, United Kingdom (*Presenter*) Nothing to Disclose
Heminder K. Sokhi, MRCS, FRCR, Harrow, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Anwar R. Padhani, MD,FRCR, Northwood, United Kingdom (*Abstract Co-Author*) Advisory Board, Siemens AG; Speakers Bureau, Siemens AG; Speakers Bureau, sanofi-aventis Group; Speakers Bureau, Johnson & Johnson; Speakers Bureau, Astellas Group

TEACHING POINTS

Appreciate the benefits of performing PI-RADS compliant MRI prostate before biopsy in patients suspected of prostate cancer who would be candidates for treatment pre-agree strategies for follow-up of patients that do not undergo immediate biopsy after a negative MRI, with clear criteria for re-investigation weigh and tailor the options for management of the PIRADS 3 category, considering the care priorities and clinical risk profiles understand the biopsy options for PIRADS 4-5 depending on the clinical management priorities become familiar with key international recommendations on MRI use before biopsy in biopsy-naive men and in repeat biopsy men.

TABLE OF CONTENTS/OUTLINE

Introduction Overview of PI-RADS v2.1 and MRI-directed biopsy pathway Review evidence for management options for negative scans (PI-RADS 1-2 categories) Present and explore the management options for PI-RADS 3 lesions Review the evidence and discuss targeted vs focal saturation vs systematic biopsies for patients with PIRADS 4-5 lesions Present international recommendations on MRI use before biopsy, comparing European and US guidelines

Printed on: 10/29/20

GUS-WEB

Genitourinary Wednesday Poster Discussions

Wednesday, Dec. 4 12:45PM - 1:15PM Room: GU/UR Community, Learning Center

GU

AMA PRA Category 1 Credit ™: .50

Participants

Michael T. Corwin, MD, Sacramento, CA (*Moderator*) Nothing to Disclose

Sub-Events

GU221-SD-WEB1 Assessment of Diagnostic Performance of Two Pelvic Organ Prolapse Grading Systems in MR Defecography

Station #1

Participants
Yini Liu, Guangzhou , China (*Abstract Co-Author*) Nothing to Disclose
Wuteng Cao, Guangzhou, China (*Presenter*) Nothing to Disclose
Jianping Qiu, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
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Dan Liang, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
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Zheng-Jun Liu, MD, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose
Zhiyang Zhou, PhD, Guangzhou, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To evaluate the diagnostic performance of currently commonly used MRD grading systems of rule of II and rule III for POP.

METHOD AND MATERIALS

63 volunteers with an average age of 33.5 ± 2.5 years and 30 patients with an average age of 47.5±14.1 years and who had MRD for POP symptoms for more than one year were recruited from 2012 to 2017. Magnetic resonance imaging was performed with a GE Optima 360 1.5T optical fiber magnetic resonance scanner. Measurements of the height of the urethrovesical junction (UVjnct), uterovaginal junction (UCjnct) and anal rectal junction (ARJ) at the perpendicular distance to the PCL were taken on R, L and D phase. The Bonferroni method was used for intra-group comparison. ROC curves for diagnosing POP were drawn. Diagnostic performance was compared between grade of II and grade of III systems. Grade of III criteria are organ reference points UVjnct, UCjnct and ARJ prolapse <3 cm (I), 3 to 6 cm (II), >6 cm below the PCL (III) for POP in the anterior, middle and posterior compartments. Grade of II criteria are ARJ prolapses 3 to 5 cm (I), >5 cm (II) below the PCL for the posterior compartment.

RESULTS

UVjnct and UCjnct lines were positive in the R, L and D phases. Its value increased from R to L, and decreased from R to D. ARJ line were positive in L phase and negative in the R and D phases. Its value increased from the negative to positive from R to L, meaning it moved from below to above the PCL. The absolute value increased from R to D phase, meaning it moved further away below the PCL. ROC for diagnosing POP showed UVjnct AUC of 0.894 for anterior compartment POP, UCjnct AUC of 0.897 for middle compartment, and ARJ AUC of 0.807 for posterior compartment. In grade of III system, in posterior compartment, 1.6%, 44.4%% and 54% of healthy volunteers were normal, grade I and grade II POP respectively; 100% of symptomatic patients were grade II POP. In grade of II system, in posterior compartment, 31.2%, 42.9%, and 11.1% of healthy volunteers were normal, grade I and grade II POP respectively; 53.3% and 46.7% of symptomatic patients were grade I and grade II POP.

CONCLUSION

For the anterior and the middle compartments grade of III system has good diagnostic performance for POP. For the posterior compartment, the rule of II is superior than the rule of III criteria.

CLINICAL RELEVANCE/APPLICATION

Rule of II is superior than rule of III in diagnosing posteriro pelvic organ prolapse in the posteriro compartment.

GU222-SD-WEB2 Dynamic MRI in Assessment of Female Urinary Incontinence

Station #2

Participants
Neveen S. Shaker, MBBCh, MSc, Tanta, Egypt (*Presenter*) Nothing to Disclose
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PURPOSE

To assess the merit of static & cine MRI in evaluation of SUI in females aiming to understand normal pelvic floor function-structure relationship

METHOD AND MATERIALS

This study had institutional review board approval& informed consent obtained from all participants. There were 77 women:37 continent control women & 40 patients, who were divided into 3 groups according to their ALPP. Static T2-weighted turbo spin-echo images, STIR and FATSAT images were used in evaluating structural derangements. Functional dynamic T2 WIs were used in detecting functional abnormalities &recording measurements of supporting structures. Findings of MRI were analyzed to determine the predominant defect & correlate with findings in ALPP

RESULTS

The 40 cases of study group were sub-divided into: Group A(<60cm H2O): 5 cases, Group B(60-90cm H2O): 20 cases &Group C (>90cm H2O): 15 cases. In the patient group, the mean urethral thickness was 4.43±0.58 mm, in control group it was 4.89±0.65mm. The mean urethral thickness in group A was 3.70±0.49mm with statistical significance between group A & control group. No statistical significance could be detected in between control & cases groups as regard urethral length. In patient groups, level II endopelvic fascia defect in 13 cases (32.5%). Significant statistical difference between control & patients groups as regard urethral supporting system. Group B took the upper hand in structural defects on static sequences as 7cases (35%)show level III endo pelvic fascial defect & 10 cases (50%) with multi factorial defect in static sequences , while no structural defects in group A cases. 18 cases(45%) in patent group show bladder neck funneling with significant statistically difference between control & pateint groups. urethral hypermobility presented in 31 cases (77.5%) of pateint group with statistical significance in between control & pateint groups. 8 cases (90%)in group B show UH. The mean width of levator hiatus in pateint group was 5.37±1.78cm &4.32±1.33cm in control group with Statistically significant inbetween. WLH was the maximum at group C as it ranges from 3.50-9cm with mean width 5.75±1.5cm

CONCLUSION

Combined static & dynamic MRI of patients with SUI allow identification of certain structural abnormalities and predict the predominant factor so the therapeutic approach could be a pathology-based rather than symptom-based.

CLINICAL RELEVANCE/APPLICATION

static&cine MRI allow identification of pelvic floor structural abnormalities & predict the predominant factor.

GU223-SD-WEB3 Magnetic Resonance Imaging of Endometrial Stromal Nodule

Station #3

Participants
Yuequan Shi, Fuzhou , China (*Abstract Co-Author*) Nothing to Disclose
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Kaiwu Lin, Fuzhou, China (*Abstract Co-Author*) Nothing to Disclose
Lilan She, FuZhou, China (*Presenter*) Nothing to Disclose

PURPOSE

Endometrial stromal nodules are a rare benign uterine stromal tumor. ESN patients have a good prognosis and can be treated by local resection of the tumor to retain reproductive function. It's important to accurate diagnosis before surgery for reproductive needs Women. Previous reports have mostly described the pathological features of ESN , characteristic magnetic resonance imaging of this tumor has not been described. In this report, we describe and summarize the imaging of 5 ESN and explore the correlation between MR imaging and pathological findings

METHOD AND MATERIALS

Five patients aged 43-60 years (mean 48 years) were treated with L.5-T superconducting magnetic resonance pelvic MRI. Axial, sagittal and coronal T2WI images, axial T1WI and DWI images were acquired to analyze lesion size, location, growth pattern, signal intensity, internal structure, presence of hemorrhage and necrosis, and invasion of surrounding structures. The intensity is compared to the myometrial and endometrial signal intensity. Find the correlation between these radiological findings and pathological findings

RESULTS

All ESN were single and located in the myometrium,which showed cystic changes with clear boundaries. On T1WI, the mass signal is similar to the myometrial. On T2WI, a discontinuous low signal band was observed at the edge of the tumor. The solid part was higher than the myometrium, slightly lower than the endometrial and the cystic part was higher than the myometrium. On DWI, the solid part is higher than the myometrium, and the cystic part is low. An enhanced scan showed that the enhancement around the mass was consistent with the myometrium

CONCLUSION

ESNs are mainly endometrioid cells which are dense and visible mitotic figures, MRI shows a clear lumps of borders similar to endometrial signals. On DWI lesions are higher than the myometrium, similar to malignant lesions, which can be distinguished from other benign uterine masses. The distribution of myometrial fiber bundles in the lesions is consistent with the low-signal band in the lesions. The margins of the masses and the large blood vessels in the septum are the tissue basis for the dynamic enhancement of the endometrium. These may be ESN's characteristic performance

CLINICAL RELEVANCE/APPLICATION

Magnetic resonance imaging of endometrial stromal nodules is associated with pathology, and imaging features are likely to provide accurate preoperative diagnosis of the disease.

GU255-SD-WEB4 Use of 3D Arterial Spin Labeling to Evaluate Renal Perfusion in Patients with Chronic Kidney Disease

Station #4

Participants
Shuohui Yang, MD, Shanghai, China (*Presenter*) Nothing to Disclose

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PURPOSE

To evaluate the effectiveness of 3D pulsed arterial spin labeling (PASL) and 3D pseudo-continuous spin labeling (pCASL) in assessment of renal blood flow (RBF) in both the renal cortex and medulla of chronic kidney disease (CKD) patients and healthy volunteers.

METHOD AND MATERIALS

CKD patients Stage 1(S1) to Stage 4 (S4) (n = 4, 9, 11 and 7 , total n = 31) and healthy volunteers (n = 10) underwent MRI on a 3T MR scanner (Skyra) using a dedicated 18-channel body coil and an integrated spine coil. Prototype sequences of PASL and pCASL with 3D motion correction were used to generate perfusion maps. Image quality of both PASL and pCASL images were scored. RBF of the renal cortex and medulla were measured on three central slices of every RBF map. RBF values were compared between CKD patients and volunteers and between CKD patients at different stages. Pearson correlation test was used to evaluate correlations between RBF at the renal cortex and medulla and estimated glomerular filtration rate (eGFR) and between at the renal cortex and medulla and serum creatinine level (SCr) for CKD patients.

RESULTS

The image quality scores (median [P25, P27]) were significantly higher with pCASL (CKD: 2[1, 3], volunteers: 3[2, 3]) than those with PASL (CKD: 1[0, 1], volunteers: 1[1.5, 2.75]) for both CKD patients ($P < 0.001$) and volunteers ($P = 0.005$). Thus, only the pCASL RBF maps were used for further analyses. RBF values in the cortex were significantly higher than those in the medulla for both CKD patients ($P < 0.001$) and volunteers ($P < 0.001$). RBF values in both the cortex and medulla of CKD patients of S2 to S4 were significantly lower than those of volunteers. RBF values in CKD S1 and S2 patients were significantly higher than those of S3 and S4 patients in both the cortex ($P < 0.05$) and medulla ($P < 0.05$). A significant positive correlation between RBF and eGFR was demonstrated in both the cortex and the medulla of CKD patients (cortex: $r = 0.822$, $P = 0.000$; medulla: $r = 0.790$, $P = 0.000$). A significant negative correlation was found between RBF and SCr (cortex: $r = -0.712$, $P = 0.000$; medulla: $r = -0.653$, $P = 0.000$).

CONCLUSION

pCASL can be used as a non-invasive and non-contrast MRI technique to assess renal perfusion for CKD patients.

CLINICAL RELEVANCE/APPLICATION

A non-invasive, non-contrast, convenient and high reproducible ASL technology to evaluate the RBF is essential for establishing accurate CKD staging and appropriate treatment.

GU256-SD-WEB5 Zoomed EPI versus Conventional EPI DWI in Prostate Imaging: Impact on PIRADS Scoring and Cancer Detection

Station #5

Participants
Ivan Platzek, MD, Dresden, Germany (*Presenter*) Nothing to Disclose
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PURPOSE

Conventional echoplanar (EPI) diffusion-weighted imaging (DWI) is prone to susceptibility artifacts. One possible alternative is zoomed EPI DWI, which has already been shown to reduce distortion artifacts compared to conventional DWI. The aim of this study was to evaluate the impact of zoomed EPI DWI on prostate cancer detection and lesion classification in multiparametric prostate MRI.

METHOD AND MATERIALS

Seventy-two patients (mean age 65 y, age range 46 - 84 y) with suspected prostate cancer who underwent prostate MRI at 3T were included in this retrospective study. Besides T2-weighted and dynamic contrast-enhanced (DCE) sequences, each exam included both conventional EPI DWI and zoomed EPI DWI. All patients had micro-enema before prostate MRI. Lesions were classified according to PIRADS v2. All 72 patients had prostate biopsy (combined systematic prostate biopsy and TRUS-guided prostate biopsy) and 14/72 patients also underwent prostatectomy. The sensitivity and specificity of mpMRI with conventional EPI (mpMRIc) or zoomed EPI DWI mpMRIz) were evaluated and compared using receiver operating characteristic (ROC) analysis, with the histopathological workup as the standard of reference.

RESULTS

75 lesions (in 52 patients) were identified on mpMRI (PIRADS 3 or higher). 32/75 lesions (42.7%) were located in the peripheral zone. Based on mpMRIc, 43/75 lesions (57.3%) were classified as PIRADS 3, 21/75 (28.0%) as PIRADS 4 and 11/75 (14,7%) as PIRADS 5. Based on mpMRIz, 52/75 lesions (69.3%) were rated as PIRADS 3, 14/75 (18.7%) as PIRADS 4 and 9/75 (12.0%) as PIRADS 5. No lesions were detected in 20 patients; in this case, the PIRADS score was set to 2. mpMRIc had a lesion-based sensitivity of 77.8% and a specificity of 93.7%, while mpMRIz DWI had a sensitivity of 55.6% and specificity of 95.2%. The accuracy of mpMRIz was significantly lower when compared to mpMRIc ($p = 0.0064$).

CONCLUSION

The accuracy of mpMRI with conventional EPI DWI for prostate cancer detection is superior to the accuracy of mpMRI with zoomed EPI DWI. Zoomed EPI DWI cannot be currently recommended for routine clinical prostate examinations.

CLINICAL RELEVANCE/APPLICATION

Our study shows that diffusion restriction in prostate cancer is less pronounced on zoomed EPI DWI when compared to conventional EPI DWI with identical b-values, leading to lower PIRADS scores and lower diagnostic accuracy.

GU257-SD-WEB6 Co-Trained Convolutional Neural Networks Analysis for Assessment of the Diagnostic Accuracy of Biparametric Magnetic Resonance Imaging of the Prostate

Station #6

Awards

Trainee Research Prize - Resident

Participants
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PURPOSE

The study aimed to apply convolutional neural networks (CNNs) to biparametric magnetic resonance imaging (MRI) and to evaluate the diagnostic values of the prediction model generated from training CNNs in prostate cancer.

METHOD AND MATERIALS

This study evaluated 56 patients with prostate cancer (PCa) and 58 benign prostatic hyperplasia (BPH).A total of 116 PCa and 148 BPH lesions were devided into a training set and a test set. Prediction models of prostate MRI were developed through a novel called CNN40bottleneck based on four different improved methods --bottlenecks, batch normalization, global average and pooling, namely, CNN40bottleneck_gap, CNN40bottleneck_nobn, and CNN40bottleneck_nogap framework. T2 weighted images and ADC images are used as training data in the post-network part. Accuracy, sensitivity, specificity and areas under the receiver operating curve (AUC) were calculated to compare the diagnostic performance of CNNs models based on T2WI, ADC and the combination of T2WI and ADC (T2WI-ADC).

RESULTS

The six models trained with T2WI had significantly higher AUCs (0.862, 0.844, 0.854, 0.813, 0.821, 0.854) than those with ADC (0.724, 0.695, 0.702, 0.715, 0.668, 0.765) in distinguishing between PCa and BPH. When A deep CNN40bottleneck model, the product resulting from jointly combining T2WI with ADC, was adopted, the differential diagnostic efficiency (0.934) was significantly improved. It was remarkably obvious that CNN40bottleneck possessed simliar diagnostic performance and accuracy with ReNet and Inception , but the CNN40bottleneck framework took less training time (T2WI:5391.54s, 3574.32s, 5450.79s; ADC: 4141.76s, 2842.54s, 4220.37s) and needed fewer parameters (16.80MB, 16.50MB, 17.40MB) than the latter two(T2WI:6416.36s, 61241.32s, 10675.32s; ADC: 5085.01s, 21646.21s, 51315.27s; Parameters: 40.70MB, 180.00MB, 315.00MB).

CONCLUSION

The Co-trained deep CNNs framework based on MRI can effectively differentiate PCa from BPH. In adition, combining both T2WI and ADC (biparametric MRI) in the CNN40bottleneck framework can provide increased diagnostic accuracy. Compared with ResNet and Inception, CNN40bottleneck is a better choice for its advantage of taking less training time and needing fewer parameters.

CLINICAL RELEVANCE/APPLICATION

Prediction models of prostate MRI were developed through a novel called CNN40bottleneck and combined mutimodal imformation from both ADC and T2W images of an mp-MRI sequence.

UR190-ED-WEB7 VIRADS: Not Just Another "RAD's" - Why the Radiologist Should Know and Use It

Station #7

Awards

Certificate of Merit

Participants
Dyandra Moreira de Araujo, Sao Paulo, Brazil (*Presenter*) Nothing to Disclose
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Abdalla Y. Skaf, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
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TEACHING POINTS

•Bladder cancer (BC) is the most common urinary tract neoplasm, and one of the most expensive to manage. The correct staging is directly associated with prognosis and treatment planning. •Magnetic resonance imaging (MRI) has an important role on staging BC, due to its high spatial resolution and soft tissue contrast, differentiating tumor from normal muscle layer.•VI-RADS (Vesical Imaging Reporting and Data System) was developed using multiparametric resonance imaging (mpMRI), creating a systematic approach to define the risk of muscle invasion. MpMRI also allows differentiation between benign pathologies and post-treatment changes from BC.•Using the conventional T2 sequence and functional sequences such as diffusion and dynamic contrast enhanced images, VIRADS proposes a score using the appearance of BC in each sequence to define the probability of invasive disease, helping the radiologist to increase accuracy on staging.

TABLE OF CONTENTS/OUTLINE

• Basic concepts of BC and impact of adequate staging.• Limitations of conventional MRI and computed tomography alone on tumor staging.• Presentation of VIRADS.• Illustration of several cases highlighting the importance of functional sequences on staging, and in differentiate tumor from benign pathologies/changes after treatment.

UR191-ED-WEB8 Don't Get Fooled: Read Like a Musculoskeletal Radiologist - Key Benign Lesions for Abdominal Imagers

Station #8

Participants
Akriti Khanna, MD, Cleveland, OH (*Presenter*) Nothing to Disclose
Ryan Ward, MD, Cleveland, OH (*Abstract Co-Author*) Nothing to Disclose
Andrei S. Purysko, MD, Westlake, OH (*Abstract Co-Author*) Nothing to Disclose
Michael C. Forney, MD, South Euclid, OH (*Abstract Co-Author*) Nothing to Disclose

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TEACHING POINTS

By viewing this exhibit, the participant will: Realize that there are variety of incidental bone and soft tissue findings that can be detected on abdominal and pelvic MRI studies. Understand benign musculoskeletal entities that can be detected on abdominal/pelvic MRI studies that may be confused for aggressive pathology. Comprehend the differences between musculoskeletal MRI protocols and abdominal/pelvic MRI protocols to better navigate incidental musculoskeletal findings. Review example cases with emphasis on key imaging findings for each entity.

TABLE OF CONTENTS/OUTLINE

Incidence of bone and soft tissue findings on abdominal and pelvic MRI. Commonly encountered benign MSK pathology, classified in a meaningful way Compare and contrast abdominal/pelvic MRI and MSK MRI protocols Example cases within each category with key imaging findings Conclusion; how this knowledge positively impacts patient management.

Printed on: 10/29/20

VSIO41

Interventional Oncology Series: Renal Ablation/Embolization

Wednesday, Dec. 4 1:00PM - 3:00PM Room: S405AB

GU IR OI RO

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

FDA Discussions may include off-label uses.

Participants
Stephen J. Hunt, MD,PhD, Philadelphia, PA (*Moderator*) Consultant, Amgen Inc; Research Consultant, BTG International Ltd; Speakers Bureau, Galil Medical Ltd; Research Grant, BTG International Ltd; Research Grant, Geurbet SA
Debra A. Gervais, MD, Boston, MA (*Moderator*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Provide an overview of the current interventional oncology therapies utilized in the management of primary and metastic renal malignancies, their mechanisms of action, their indications for use, their published outcomes, and their modality specific complications. 2) Be able to provide examples of future interventional oncology therapies for renal malignancy currently in development.

ABSTRACT

This course provides an overview of interventional oncology techniques for the management of primary and metastatic renal malignancies. Treatment modalities that will be discussed include radiofrequency ablation, microwave ablation, cryoablation, embolization, and combined modalities. After participating in this course, participants will be able to provide an overview of the current interventional oncology therapies utilized in the management of primary and metastic renal malignancies, their mechanisms of action, their indications for use, their published outcomes, and their modality specific complications. Participants will also be able to provide examples of furture interventional oncology therapies for renal malignancy currently in development.

Sub-Events

VSIO41-01 Historical Overview of Renal Ablation

Wednesday, Dec. 4 1:00PM - 1:15PM Room: S405AB

Participants
Susan Shamimi-Noori, MD, Philadelphia, PA (*Presenter*) Consultant, Sirtex Medical Ltd; Consultant, Boston Scientific Corporation

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LEARNING OBJECTIVES

1) To understand how ablation technology has evolved, particularly in relation to treatment of renal lesions.

VSIO41-02 RF Ablation of Renal Masses

Wednesday, Dec. 4 1:15PM - 1:30PM Room: S405AB

Participants
Stephen J. Hunt, MD,PhD, Philadelphia, PA (*Presenter*) Consultant, Amgen Inc; Research Consultant, BTG International Ltd; Speakers Bureau, Galil Medical Ltd; Research Grant, BTG International Ltd; Research Grant, Geurbet SA

LEARNING OBJECTIVES

1) To understand the basic mechanism of radiofrequency ablation. 2) To identify the advantages and disadvantages of RF ablation in the kidney compared with other modalities. 3) To know when to use RF for treatment of RCC and how to perform the procedure safely.

VSIO41-03 MWA of Renal Masses

Wednesday, Dec. 4 1:30PM - 1:45PM Room: S405AB

Participants
John J. Schmitz, MD, Rochester, MN (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Be able to articulate the basic principles behind microwave ablation. 2) Be able to identify strengths and potential shortcomings of microwave ablation in the kidney. 3) Understand how microwave ablation of renal masses fits into the larger picture of treatment

options available.

VSIO41-04 Safety and Oncologic Efficacy of Cryoablation in Small Renal Masses (SRMs) Using an Innovative Liquid Nitrogen-Based Device

Wednesday, Dec. 4 1:45PM - 1:55PM Room: S405AB

Participants
Tamar Gaspar, MD, Haifa, Israel (*Abstract Co-Author*) Nothing to Disclose
Ilya Volovik, MD, Haifa, Israel (*Presenter*) Nothing to Disclose
Simona Croitoru, Haifa, Israel (*Abstract Co-Author*) Nothing to Disclose
Karina Dorfman, MD, Haifa, Israel (*Abstract Co-Author*) Nothing to Disclose
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Zaher Bahouth, MD, Haifa, Israel (*Abstract Co-Author*) Nothing to Disclose
Robert Sachner, MD, Haifa, Israel (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

We assessed safety, efficacy, and oncologic outcomes of the new innovative Liquid Nitrogen device in patients with early-stage (T1a) SRMs.

METHOD AND MATERIALS

74 patients (mean age: 69y; 68% males) with 78 lesions (mean: 2.35 cm) smaller than 4 cm, were included; Mean R.E.N.A.L score was 6.53; 16% were endophytic. Percutaneous cryoablation using ProSense™ (10G/13G; IceCure Medical Ltd, Caesarea, Israel) was performed in all patients under CT guidance with sedation/light general anesthesia. It's extremely low temperatures (-1960C) produces larger lethal zone per needle. All procedures were done in two cycles of freezing with intervening passive thaw. Patients underwent imaging and clinical surveillance every 3 months during first year and annually thereafter. Oncologic success was indicated by a reduction in lesion size and lack of enhancement on follow-up CT or MRI. Safety was determined by monitoring Creatinine (Cr) and Hemoglobin (Hb) levels.

RESULTS

Ablation was oncologically successful in all 78 lesions. Average freezing cycles was 22 minutes. Average procedure time was 50.5 min. 45 lesions were followed in 42 patients for more than 12 months (mean: 18.2 m). 3 treatment failures occurred (6.6%): of them, one is a candidate for repeat procedure. One serious event was noted; a late-onset ipsilateral hydronephrosis in a patient treated for a complex medial lower pole lesion (1.2%). Mean Cr and Hb levels remained unchanged in all patients.

CONCLUSION

Cryoablation of SRMs with an innovative Liquid Nitrogen cryogenic device is feasible and safe procedure, with similar oncologic results as nephron spearing surgery and with low rate of serious adverse events.

CLINICAL RELEVANCE/APPLICATION

Cryoablation of SRMs with a new Nitrogen cryogenic device is feasible and safe procedure with low rate of serious adverse events.

VSIO41-05 Cryoablation of Renal Masses

Wednesday, Dec. 4 1:55PM - 2:10PM Room: S405AB

Participants
Andrew J. Gunn, MD, Vestavia Hills, AL (*Presenter*) Consultant, BTG International Ltd; Speakers Bureau, BTG International Ltd; Research support, Penumbra Inc

LEARNING OBJECTIVES

1) Explain the technology underlying cryoablation. 2) List the advantages of cryoablation for renal masses. 3) List the disadvantages of cryoablation for renal masses. 4) Develop a safe approach in using cryoablation for renal masses.

VSIO41-06 Outcomes for Ablation versus Resection of Small Renal Masses

Wednesday, Dec. 4 2:10PM - 2:25PM Room: S405AB

Participants
Nima Kokabi, MD, Atlanta, GA (*Presenter*) Research support, Sirtex Medical Ltd

LEARNING OBJECTIVES

1. Learn the most up-to-date guidelines regarding managment of small renal masses. 2. Learn the contemporary evidence regarding oncologic outcome of treating small renal masses with thermal ablation. 3. Learn the contemporary evidence regarding oncologic outcome of treating small renal masses with partial nephrectomy.

VSIO41-07 Is There a Role for Combination Arterial Embolotherapy and Ablation for Renal Tumors?

Wednesday, Dec. 4 2:25PM - 2:40PM Room: S405AB

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

VSIO41-08 Treatment Approach for Renal Cell Carcinoma Metastases

Wednesday, Dec. 4 2:40PM - 2:55PM Room: S405AB

Participants
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 & Johnson Consultant, Thermedical, Inc

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LEARNING OBJECTIVES

1) Description of the clinical situations for patients with metastatic renal cell carcinoma that are appropriate for consideration of interventional oncology intervention. 2) Understand how interventional oncology has a role in the treatment of patients with metastatic renal cell carcinoma.

VSIO41-09 Panel Discussion

Wednesday, Dec. 4 2:55PM - 3:00PM Room: S405AB

SSM12

Genitourinary (Bi-Parametric versus Multi-Parametric Prostate MRI)

Wednesday, Dec. 4 3:00PM - 4:00PM Room: N229

GU MR

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

FDA Discussions may include off-label uses.

Participants
Valeria Panebianco, MD, Rome, Italy (*Moderator*) Nothing to Disclose
Temel Tirkes, MD, Indianapolis, IN (*Moderator*) Nothing to Disclose

Sub-Events

SSM12-01 The Added Value of Dynamic Contrast Enhanced Sequences for Detection of Clinically Significant Prostate Cancer: Results from the PROMIS Study

Wednesday, Dec. 4 3:00PM - 3:10PM Room: N229

Participants
Ahmed El-Shater Bosaily, PhD,MSc,MBBCh, London, United Kingdom (*Presenter*) Nothing to Disclose
Elena Frangou, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Hashim Ahmed, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Mark Emberton, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Richard Kaplan, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Louise Brown, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose
Alex P. Kirkham, MBChB, MD, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

Multiparametric MRI(MP-MRI) is now a well-established tool in the prostate cancer diagnostic pathway. Recently, the optimal combination of sequences has come into question with opposing views on the added value of dynamic contrast enhanced sequences (DCE). The main phase of the PROMIS (Prostate MRI Imaging Study) trial was adapted to provide a prospective analysis of the incremental value of diffusion (DWI) and DCE sequences in detection of significant cancer.

METHOD AND MATERIALS

497 biopsy naïve men underwent standardized MP-MRIs using T2, DWI (including a dedicated long b sequence) and DCE, followed by a detailed transperineal prostate mapping biopsy covering the whole prostate in 0.5cm intervals. In one sitting, the radiologist assigned a Likert score of 1-5 for the presence of significant tumour, in sequence, for the T2 images, then T2+DWI images , and finally T2+DWI+DCE images. For the primary analysis, a score of >/= 3 was considered positive for clinically significant cancer. Each combination was assessed against the primary PROMIS outcome measure of significance (>/= Gleason 4+3 tumour or >/=6mm maximum cancer core length) on biopsy.

RESULTS

The addition of DCE to T2+DWI resulted in a sensitivity of 95% vs 94%, specificity of 38% vs 37%, positive predictive value of 51% vs 51% and negative predictive value of 90% vs 91% respectively. Marginally more patients could avoid biopsy (score of 2/5 or less) with DCE (123/497 vs 121/497 patients). There was some evidence that contrast reduced the number of equivocal scores: 36% of positive patients were classified as equivocal (3/5) with addition of DCE compared to 42% on T2+DWI alone. The proportion of equivocal (3/5) and positive (4-5/5) cases showing significant tumour were similar (20% and 69 % with DCE, 23% and 71% with T2+DWI alone). None of these differences were statistically significant. No dominant Gleason pattern 4 disease or higher was missed with T2+DWI+DCE, compared to a single case with T2+DWI.

CONCLUSION

DCE did not significantly improve sensitivity or specificity. One dominant Gleason 4 tumour was missed using T2+DWI and none missed with DCE. Though not statistically significant, fewer cases were scored equivocal with the addition of DCE.

CLINICAL RELEVANCE/APPLICATION

The addition of DCE to T2+DWI in a prospective, multi centre study of prostate MRI did not result in convincing improvements in accuracy or a reduction in the number of men recommended for biopsy.

SSM12-02 Comparison of Biparametric and Multiparametric MRI in the Diagnosis of Prostate Cancer

Wednesday, Dec. 4 3:10PM - 3:20PM Room: N229

Participants
Lili Xu, Beijing, China (*Presenter*) Nothing to Disclose

Gu Mu Yang Zhang, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Zhengyu Jin, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Hao Sun, MD, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To compare the diagnostic accuracy of biparametric MRI (bpMRI) and multiparametric MRI (mpMRI) for prostate cancer (PCa) and clinically significant prostate cancer (csPCa), and to explore the application value of dynamic contrast-enhanced (DCE) MRI in prostate imaging.

METHOD AND MATERIALS

This study retrospectively enrolled 235 patients with suspected PCa in our hospital from 2016 to 2017. The lesions were scored according to the Prostate Imaging Reporting and Data System version 2 (PI-RADS V2). The bpMRI and mpMRI scores were recorded to plot the receiver operating characteristic curve (ROC). Area under the curve (AUC), accuracy, sensitivity, specificity, negative predictive value (NPV), and positive predictive value (PPV) for each method were calculated and compared. The patients were further stratified according to bpMRI scores for the application value of DCE MRI.

RESULTS

The AUC values of bpMRI and mpMRI for PCa were comparable (0.790 and 0.791, respectively). The accuracy, sensitivity, specificity, PPV and NPV of bpMRI for PCa were 76.2%, 79.5%, 72.6%, 75.8%, and 76.6%; and the values for mpMRI were 77.4%, 84.4%, 69.9%, 75.2%, and 80.6%, respectively. For the diagnosis of csPCa, the AUC values of bpMRI and mpMRI were similar (0.781 and 0.779, respectively). The accuracy, sensitivity, specificity, PPV and NPV of bpMRI for csPCa were 74.0%, 83.8%, 66.9%, 64.8%, and 85.0%; and 73.6%, 87.9%, 63.2%, 63.2%, and 87.8% for mpMRI. For patients with bpMRI score >= 3, the difference in DCE between PCa and non-PCa, and between csPCa and non-csPCa were both statistically significant (both P = 0.001). Further stratification analysis showed that for patients with bpMRI score = 4, DCE had statistically significant difference between PCa and non-PCa, and between csPCa and non-csPCa (P = 0.003, and P < 0.001, respectively).

CONCLUSION

The diagnostic accuracy of bpMRI is comparable with that of mpMRI in the detection of PCa and identification of csPCa. DCE is helpful in further identifying PCa and csPCa lesions in patients with bpMRI >= 3, especially bpMRI = 4, which may be conductive to achieve more accurate PCa risk stratification.

CLINICAL RELEVANCE/APPLICATION

For patients with suspected PCa, DCE may improve the tumor detection and aggressiveness classification. Rather than omitting DCE, we think further comprehensive studies are required for prostate MRI.

SSM12-03 Comparison of Bi-Parametric MRI Based Artificial Intelligence and Multi-Parametric MRI in Detection of Intraprostatic Lesions: A Multi-Reader Study

Wednesday, Dec. 4 3:20PM - 3:30PM Room: N229

Participants
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Ronald M. Summers, MD,PhD, Bethesda, MD (*Abstract Co-Author*) Royalties, iCAD, Inc; Royalties, Koninklijke Philips NV; Royalties, ScanMed, LLC; Royalties, Ping An Insurance Company of China, Ltd; Research support, Ping An Insurance Company of China, Ltd; Research support, NVIDIA Corporation; ; ; ;
Baris Turkbey, MD, Bethesda, MD (*Abstract Co-Author*) Research support, Koninklijke Philips NV; Royalties, Invivo Corporation; Investigator, NVIDIA Corporation

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PURPOSE

To compare a bi-parametric magnetic resonance imaging (bMRI) based artificial intelligence (AI) system which provides proposed regions of interests (ROI) overlaid on T2 weighted (T2W) with multi-parametric MRI (mpMRI) using PI-RADSv2 guided interpretation.

METHOD AND MATERIALS

Case and control patients were collected from 5 institutions and 9 radiologists from 9 different institutions participated as readers: 3 highly, 3 moderately, 3 less-experienced in reading prostate MRI. Patients were consecutive at each institution and underwent 3T mpMRI (T2W, ADC map, b-1500, DCE MRI). Case patients had subsequent radical prostatectomy with pathology mapping available, control patients had negative MRI and negative systematic biopsy. Two interpretation arms were executed with readers blinded to pathology: an mpMRI-alone arm utilizing PI-RADSv2 guidelines, then after 4-week washout, a first-reader AI-assisted arm. Lesion detection sensitivity was calculated for whole prostate. Per-lesion specificity was calculated on the AI-assisted arm on a per-ROI level.

RESULTS

153 case and 84 control patients were included across 5 institutions. For mpMRI-alone interpretation, lesion-based sensitivity was 62.2%, 63%, 65.3% and 58.2% for overall, high, moderate and low-experienced readers, respectively. For bMRI based AI system assisted interpretation, lesion-based sensitivity was 66.5%, 67.8%, 71.7% and 59.9% for overall, high, moderate and low-experienced readers, respectively. At threshold of PI-RADS >=3, specificity of AI assisted bMRI were 81.1%, 86.3%, 70.2% and 86.8% for overall, high, moderate and low-experienced readers, respectively.

CONCLUSION

AI-assisted bi-parametric MRI reads demonstrated higher sensitivities compared to multiparametric MRI reads at all experience categories for radiologists.

CLINICAL RELEVANCE/APPLICATION

AI-assisted MRI reads can standardize and improve prostate MRI reporting.

SSM12-04 Value of Dynamic Contrast Enhanced (DCE) MR Imaging for Patients in PI-RADS 4 Category

Wednesday, Dec. 4 3:30PM - 3:40PM Room: N229

Participants
Tim Ullrich, Duesseldorf, Germany (*Abstract Co-Author*) Nothing to Disclose
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Farid Ziayee, Dusseldorf, Germany (*Presenter*) Nothing to Disclose
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PURPOSE

To assess the impact of dynamic contrast-enhanced imaging (DCE) in mp-MRI on prostate cancer (PCa) detection in a large patient cohort assigned to PI-RADS category 4.

METHOD AND MATERIALS

This prospective, single center cohort study includes 193 consecutive patients with PI-RADS assessment category 4 after mp-MRI (T2WI, DWI, DCE) at 3T with combined targeted plus systematic biopsy as reference standard. Prostate cancer detection with DCE and without inclusion of DCE upgraded lesions was compared.

RESULTS

Overall PCa detection rate in PI-RADS-4-patients was 62% (119/193) with DCE and 52% (101/193) without inclusion of DCE upgraded lesions; 48% (92/193) had clinically significant PCa (csPCa; Gleason score >=3+4=7) and 40% (78/193) without use of DCE. 38 of the 193 patients (20%) had peripheral lesions upgraded from PI-RADS category 3 to an overall PI-RADS category 4 due to focal positive DCE findings. Of these 38 patients 18 had PCa including 14 with a csPCa. Thus, 15% (18/119) of the patients with any prostate cancer and 15% (14/92) of the patients with csPCa were detected only based on additional DCE information.

CONCLUSION

DCE allows detection of a significant number of mostly csPCa in PI-RADS-4-patients and thus improves detection rates. The current PI-RADS decision rules regarding upgrading PI-RADS-3-lesions to overall category 4 due to positive DCE imaging are useful for PCa detection.

CLINICAL RELEVANCE/APPLICATION

Patients assigned to PI-RADS category 3 benefit from DCE for primary (early) tumor detection.

SSM12-05 Comparison of Standard Multiparametric and Unenhanced Biparametric MRI in Men with Elevated Prostate-Specific Antigen

Wednesday, Dec. 4 3:40PM - 3:50PM Room: N229

Participants
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Giorgio Maria Agazzi, Brescia, Italy (*Abstract Co-Author*) Nothing to Disclose
Marzia Acquasanta, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Priyan Tantrige, London, United Kingdom (*Abstract Co-Author*) Nothing to Disclose

Chiara A. Mattiuz, MD, Milan, Italy (*Abstract Co-Author*) Nothing to Disclose
Francesco Sardanelli, MD, San Donato Milanese, Italy (*Abstract Co-Author*) Speakers Bureau, Bracco Group Advisory Board, Bracco Group Research Grant, Bayer AG Advisory Board, General Electric Company Reserach Grant, General Electric Company Speakers Bureau, Siemens AG Reserach Grant, Real Imaging Ltd
Marina Codari, MENG,PhD, San Donato Milanese, Italy (*Abstract Co-Author*) Nothing to Disclose
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PURPOSE

Multiparametric MRI (mpMRI) for prostate cancer (PCa) is usually composed of diffusion-weighted (DW), T2W and dynamic contrast enhancement (DCE) sequences. We compared biparametric MRI (bpMRI) composed of T2W and DW against mpMRI in patients with elevated prostate-specific antigen (PSA).

METHOD AND MATERIALS

1.5-T prostate MR was performed in 431 men (61.5+/-8.3 years) with PSA>4.0 ng/mL and included in a retrospective analysis. bpMRI and mpMRI were independently assessed in separate sessions >1 month apart in a random order by 2 readers with 5 (R1) and 3 years (R2) experience, using the PI-RADS2 criteria. Histopathology or >=2 years of follow-up served as a reference standard. PI-RADS score 3 was the threshold for a positive exam. Sensitivity and specificity were calculated with their 95% confidence interval (CI); McNemar and Cohen's K statistics were also used.

RESULTS

Population consisted in 195/431 (45,3%) histopathologically proven PCa, with 62/195 (31.8%) high-grade- (GS>=7b) and 133/195 (68.2%) low-grade-PCa. PCa could be excluded by histopathology in 58/431 (13.5%) patients and by follow-up in 178/431 (41.3%) patients. For bpMRI, sensitivity was 164/195 (84%, 95%CI 79-89%) for R1 and 156/195 (80%, 95%CI 74-86%) for R2; specificity was 182/236 (77%, 95%CI 72-82%) for R1 and 175/236 (74%, 95%CI 68-80%) for R2. For mpMRI, the sensitivity was 168/195 (86%, 95%CI 81-91%) for R1 and 160/195 (82%, 95%CI 77-87%) for R2; the specificity was 184/236 (78%, 95%CI 73-83%) for R1 and 177/236 (75%, 95%CI 69-81%) for R2. Omitting the DCE sequences (namely, using bpMRI) changed the PIRADS2 scores in 25/431 (5.8%) patients for R1 and in 35/431 (8.1%) patients for R2, when compared to mpMRI. PI-RADS score 3 increased by 5.3% for R1 and 7.4% for R2. bpMRI resulted in 4 more false negatives, compared to mpMRI, for both R1 and R2 and all of these were low-grade PCa. No high-grade PCa was missed with bpMRI. Not significant differences in accuracy were observed with both approaches by each readers (p>0.08). Interobserver agreement was substantial for both bpMRI (κ=0.802) and mpMRI (κ=0.787).

CONCLUSION

Diagnostic performance of bpMRI and mpMRI were similar, with no change in the detection of high-grade PCa

CLINICAL RELEVANCE/APPLICATION

bpMRI for PCa's detection could eliminate the adverse events and the retention of gadolinium, shorten time and reduce costs, possibly resulting in increased accessibility of MRI for men with elevated PSA

SSM12-06 Comparison of Measured Ultra-High b-Value ADC to Quantitative DCE for Enhancing Bi-Parametric (T2w and DWI) MRI Assessment of Clinically Significant Prostate Cancer

Wednesday, Dec. 4 3:50PM - 4:00PM Room: N229

Participants
Anoshirwan A. Tavakoli, MD, Heidelberg, Germany (*Presenter*) Nothing to Disclose
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David Bonekamp, MD, PhD, Heidelberg, Germany (*Abstract Co-Author*) Speaker, Profound Medical Inc

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PURPOSE

To compare the added diagnostic value of measured ultra-high b-value (UHB) - derived apparent diffusion coefficient (ADC) to quantitative normalized DCE assessment for the enhancement of bi-parametric (T2w and ADC) MRI for the prediction of clinically significant prostate cancer (sPC).

METHOD AND MATERIALS

73 consecutive patients (67.2±7.7 years, PSA 10.7±18.1 ng/dl) underwent prostate MRI at 3T (Magnetom Prisma) with EPI-DWI images acquired at b=50/500/1000/1500 s/mm2 as well as at b=100/500/1000/2250/3000/4000 s/mm2. Extended systematic and targeted MRI/TRUS fusion biopsies based on prospective clinical reads were matched to a second, retrospective blinded read and MR lesions segmented manually. ADC, UHB-ADC100,4000, early arterial DCE lesion contrast to surrounding parenchyma (nDCE) and T2w intensity normalized to pectineus muscle (nT2w) were extracted from each lesion. Three logistic regression models were created for prediction of sPC defined as Gleason Grade Group (GGG) >= 2: Model A (nT2w, ADC), model B (nT2w, ADC, nDCE) and model C (nT2w, ADC, UHB-ADC). For evaluation of the models AUC was calculated from ROC curves and Chi-square analysis of deviance or Vuong's test were used to compare the models.

RESULTS

In 73 patients 55 MRI-detected retrospectively validated MR-lesions revealed no cancer in 23 lesions (42%), GGG=1 in 10 lesions (18%), GGG=2 in 12 lesions (22%), GGG=3 in 4 lesions (7%), GGG=4 in 4 lesions (7%) and GGG=5 in 2 lesions (4%). Model A yielded

an AUC of 0.810 (sensitivity 80%, specificity 73%), model B yielded an AUC of 0.840 (sensitivity 80%, specificity 79%) and model C yielded an AUC of 0.806 (sensitivity 80%, specificity 73%), indicating a slightly higher AUC for model B when compared to model A and C (p=0.04 and p=0.13) and a comparable AUC between model A and C (p=0.76).

CONCLUSION

Measured UHB-ADC achieved no improvement in predictive performance over bi-parametric assessment with ADC and T2w, whereas added quantitative normalized DCE did improve predictive performance.

CLINICAL RELEVANCE/APPLICATION

Measured UHB-ADC does not provide a contrast-free alternative to DCE for the enhancement of bi-parametric prostate MRI.

Printed on: 10/29/20

ED006-TH

Genitourinary Thursday Case of the Day

Thursday, Dec. 5 7:00AM - 11:59PM Room: Case of Day, Learning Center

AMA PRA Category 1 Credit ™: .50

Participants
Lori Mankowski Gettle, MD , Madison, WI (*Presenter*) Nothing to Disclose
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Matthew A. Zarka, MD, Scottsdale, AZ (*Presenter*) Nothing to Disclose

TEACHING POINTS

1) Recognize imaging findings seen in disorders of the genitourinary systems. 2) Develop differential diagnosis based on the clinical information and imaging findings. 3) Explain the clinical importance of the diagnosis.

Printed on: 10/29/20

RC607

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

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

GU

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

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

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Special Information

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

LEARNING OBJECTIVES

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

ABSTRACT

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

RC624

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

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

CH GI GU MK NR

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

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

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laurabancroftmd@gmail.com

Special Information

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

LEARNING OBJECTIVES

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

Sub-Events

RC624A Thoracic

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

RC624B Neuroradiology

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

RC624C Genitourinary

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

RC624D Gastrointestinal

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

RC624E Musculoskeletal

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

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RC650

Fallopian Tube Catheterization (Hands-on)

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

GU OB IR

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

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

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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 history and evolution of interventions in the fallopian tubes, including tubal recanalization and tubal occlusion. 3) Learn safe techniques for fallopian tube recanalization for promoting fertility. 4) Discuss the outcomes regarding pregnancy rate and complications. 5) Appreciate ways to improve referrals from the fertility specialists and expand your practice. 6) Understand the importance of hysterosalpingography in the evaluation of the infertile couple.

ABSTRACT

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

MSES52

Essentials of Genitourinary Imaging

Thursday, Dec. 5 10:30AM - 12:00PM Room: E450A

GU

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

Sub-Events

MSES52A Ultrasound Evaluation of Scrotal Emergencies

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

For information about this presentation, contact:

leslie.scoutt@yale.edu

LEARNING OBJECTIVES

1) Discuss technique and ultrasound findings of testicular torsion. 2) Describe the ultrasound appearance of acute epididymitis with or without orchitis as well as other less common scrotal infections. 3) Discuss the role of ultrasound in the evaluation of patients with testicular trauma.

ABSTRACT

Ultrasound is commonly used to evaluate patients presenting with acute scrotal pain with a primary goal of differentiating between testicular torsion and epididymitis.as clincial presentation is often non-specific. Accurate diagnosis is key as testicukar torsion is a surgical emergency and epididymitis is treated conservatively with antibiotics. This presentation will discuss how to differentiate these two entities as well as common mimics. In addition, the role of ultrasound in the evaluation of patients with acute trauma will be discussed. The role of ultrasound in the detection of unsuspected neoplasms in patients presenting with acute scrotal pain will be emphasized.

MSES52B Gynecologic Emergencies

Participants
Robin B. Levenson, MD, Boston, MA (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Discuss the utility of pelvic ultrasound for non-pregnant, premenopausal women in the acute setting. 2) Describe imaging findings of various gynecologic emergencies, including adnexal torsion, complex cysts, pelvic inflammatory disease, fibroid-related. 3) Identify pearls and pitfalls in diagnosis.

ABSTRACT

Premenopausal women with acute pelvic pain can represent a diagnostic challenge in the emergency setting; the differential diagnosis includes multiple clinical conditions with signs and symptoms that overlap. Symptoms may be nonspecific and the differential diagnosis broad, including both gynecological and nongynecological entities (gastrointestinal, genitourinary, etc). Imaging plays an important role not only in diagnosis, but in differentiation between urgent surgical and nonsurgical conditions. Radiologist awareness of imaging findings in gynecologic emergencies is key for appropriate diagnosis and to help guide management.

MSES52C Acute and Emergency Conditions of First Trimester Pregnancy

Participants
Mariam Moshiri, MD, Bellevue, WA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

moshiri@uw.edu

LEARNING OBJECTIVES

1) Learn about various emergent medical conditions that occur commonly in the first trimester of pregnancy. 2) Learn current recommendation for imaging of such conditions based on ACR criteria as well as published data. 3) Learn current recommendations for imaging of trauma in pregnancy.

ABSTRACT

Imaging of known or suspected acute abdominal and pelvic conditions during pregnancy can be problematic, due to controversies in selection of a preferred imaging modality. We will discuss current imaging recommendations for acute abdominal and pelvic medical conditions during the first trimester of pregnancy such as appendicitis, ureteral calculus, ovarian torsion, acute bowel disease, etc. Trauma to the mother and fetus are also addressed emergently, and may require special considerations in the utilization of specific imaging modalities.

MSES52D Participants

Cystic Renal Masses

Gary M. Israel, MD, Madison, CT (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

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LEARNING OBJECTIVES

1) To review a method of characterizing cystic renal masses and to understand the nuances of using CT and MRI in cystic renal mass evaluation.

ABSTRACT

Cystic renal masses, are common, often incidental findings, with a range of etiologies spanning from simple cysts to renal cell carcinomas. CT and MRI have proven useful in primarily evaluating these masses, and has also proven useful in problem solving when US is not definitive in diagnosis. Evaluation of renal cyst is based on the thickness and enhancement characteritics of the wall of the cyst, the presence, number, thickness, and enhancement of any septa present within the cyst, the presence and amount of calcification within the wall or septa, and the presence or absence of any enhancing soft tissue components. While many renal cysts can be diagnosed as benign or malignant, evaluation of some cysts is not straight foward and require follow up imaging to demonstrate stability over time. We will focus on those renal cysts which prove to be difficult to diagnose at imaging and demonstrate the nuances of this evaluation.

Printed on: 10/29/20

SSQ09

Genitourinary (Imaging of Pregnancy)

Thursday, Dec. 5 10:30AM - 12:00PM Room: E351

GU MR OB

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

Participants
Jeanne M. Horowitz, MD, Chicago, IL (*Moderator*) Nothing to Disclose
Jin Yamamura, MD, Hamburg, Germany (*Moderator*) Nothing to Disclose
Priyanka Jha, MBBS, San Francisco, CA (*Moderator*) Nothing to Disclose

Sub-Events

SSQ09-01 The Placenta Accreta Spectrum (PAS) and MRI: Preliminary Findings in High-Risk Pregnancies and Associated Need for Cesarean Hysterectomy

Thursday, Dec. 5 10:30AM - 10:40AM Room: E351

Participants
Ambereen A. Khan, MD, Dallas, TX (*Presenter*) Nothing to Disclose
Haley R. Clark, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Quyen N. Do, PhD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Yin Xi, PhD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose
Diane M. Twickler, MD, Dallas, TX (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To evaluate MR findings described in PAS and identify those significantly associated with PAS severe enough to result in cesarean hysterectomy. Interobserver agreement was also assessed.

METHOD AND MATERIALS

We performed an IRB approved retrospective review of 56 pregnancies, from our 2006-2019 MR database referred for clinically suspected PAS. After randomization, single shot fast spin echo, balanced steady state free precession and T1-weighted sequences were independently evaluated by two reviewers, one expert and one with 4 years MR experience, after review of 10 test training cases. Evaluation of 11 variables was performed, including bladder-serosal interface interruption, bridging vessels, placental texture near the scar, presence of complete or low-lying previa, radiology impression of presence or absence of invasion and degree, bulge characteristics, dark linear bands or lacunae, and cervical varices. To assess readers agreement, simple kappa and prevalence adjusted bias adjusted kappa(PABAK) were used. Univariate logistic regressions were used to assess the association with cesarean hysterectomy.

RESULTS

From the study, 6 of 11 characteristics assessed by the expert were significantly associated($p<0.05$) with the outcome of hysterectomy:interrupted bladder-serosal interface(0.007), serosal bridging vessels(0.005), radiologist prediction of invasion degree(0.002) and presence(0.02), inhomogeneous texture near scar(0.003) and low-lying or placenta previa(0.0005). Dark linear band quantification, cervical varices size, lacunae and bulge presence or size were not significant. The reader agreement was fair to moderate according to PABAK. Simple Kappa was constantly underestimated due to unbalance in the dataset.

CONCLUSION

An expert reader was significantly predictive of presence and degree of invasion with MRI in women whose placental invasion was severe enough to result in cesarean hysterectomy. Other significant findings included bridging vessels, bladder serosal interruption, low-lying or complete previa, and inhomogeneous texture near scar. However, in this small series, interobserver agreement was only fair to moderate, suggesting the need for better-defined variables assessed with more MRI cases and larger training datasets.

CLINICAL RELEVANCE/APPLICATION

Several MR findings were associated with PAS severe enough to result in cesarean hysterectomy, but interobserver agreement between radiologists remains less than optimal.

SSQ09-02 MRI Diagnosis of Placenta Accreta Spectrum Disorder

Thursday, Dec. 5 10:40AM - 10:50AM Room: E351

Participants
Sherelle L. Laifer-Narin, MD, Englewood, NJ (*Presenter*) Nothing to Disclose
Mirella Mourad, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose
Fady Khoury Collado, MD, New York , NY (*Abstract Co-Author*) Nothing to Disclose
Leslie Moroz, New York, NY (*Abstract Co-Author*) Nothing to Disclose

Chia-Ling Nhan-Chang, MD, New York, NY (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To evaluate the accuracy of magnetic resonance imaging in diagnosing abnormal placentation.

METHOD AND MATERIALS

A retrospective review of placental MRI exams from December 2004 to January 2019 was performed. MRI reports were reviewed for suspicion of abnormal placentation. Criteria suggesting pathology included the presence of dark intraplacental bands, heterogeneous signal intensity, thick nodular contour along the urinary bladder surface, uterine bulging into the bladder, and loss of the myometrial margin with attention paid to parametrial regions. MRI was considered positive even if only one of these criteria were present. Comparison was made with findings at either delivery, operation, and pathology reports.

RESULTS

478 MRI exams were reviewed. 279 exams were negative both on MRI and delivery/pathology. 13 exams interpreted as normal on MRI underwent hysterectomy with pathology demonstrating placenta accreta. 148 exams were interpreted as positive for abnormal placentation, and were diagnosed as accreta, increta, or percreta on delivery/pathology. 38 cases interpreted as positive on MRI had normal placental delivery and pathology. MR diagnosis of abnormal placentation had a sensitivity of 92%, specificity of 88%, PPV of 80%, NPV of 96%, and an accuracy of 89%.

CONCLUSION

Placental adhesive spectrum disorder is a significant cause of maternal morbidity and mortality. Detailed imaging provides important information critical for the management of patients with this disorder. Prenatal MRI has a high degree of accuracy for the diagnosis of placenta adhesive spectrum disorder, specifically the myoinvasive forms. MRI provides detailed topographic information and is a critical component in the workup of patients at high risk for this condition.

CLINICAL RELEVANCE/APPLICATION

Advance knowledge of the diagnosis of abnormal placentation allows for predelivery operative planning and management. With this information, a multidisciplinary approach to this potentially catastrophic condition can be put into place to prevent significant morbidity and mortality.

SSQ09-03 Abnormal Fetal Placental Vasculature on MRI of Patients at High Risk for Placenta Accreta Spectrum Disorders: Analysis of 130 Cases

Thursday, Dec. 5 10:50AM - 11:00AM Room: E351

Participants
Charis Bourgioti, MD, Athens, Greece (*Presenter*) Nothing to Disclose
Anastasia Konstantinidou, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Konstantina Zafeiropoulou, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Chara Tzavara, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Stavros Fotopoulos, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
George Daskalakis, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Maria Evangelia Nikolaidou, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Marianna Theodora, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose
Lia A. Moulopoulos, MD, Athens, Greece (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To investigate the association of abnormal intraplacental (fetal) vessels on MRI of patients with placenta accreta spectrum (PAS) disorders with extent of invasiveness and poor clinical outcome

METHOD AND MATERIALS

Between 3/2016-2/2019, 130 high-risk gravid patients for abnormal placentation were referred for dedicated prenatal MRI (mean age:34.7 years, mean gestational age: 32.5 weeks); all patients underwent C-section within 6 weeks from MRI. Intraoperative/pathological findings confirmed the presence of PAS in 101/130 patients (percreta: n=58, creta/increta: n=43). 48/101 patients with PAS underwent hysterectomy, whereas in 44/101 patients, bladder repair was performed. All MRIs were reviewed by consensus by two expert radiologists after completion of the study for the presence of at least one long (>2cm), intraplacental flow void structure originating from the chorionic plate, crossing the placental parenchyma and reaching the basal plate, with paucity of branching along its course (stripped fetal vessel). Presence of stripped fetal vessels and their caliper were statistically tested for any association with degree of invasiveness and peripartum events including intraoperative blood loss, operation time, and need for hysterectomy or bladder repair.

RESULTS

There was a significant association ($p<0.001$) between presence of stripped fetal vessels with number of prior C-sections, presence of placenta percreta, hysterectomy and bladder repair treatment. Subjects with stripped fetal vessels on MRI, had significantly greater blood loss (1514.2.8vs382.8ml, $p<0.001$) and increased delivery times (145.2vs60.3min, $p<0.001$). The diameter of stripped fetal vessels was greater in patients with >=2 prior C-sections (5.2vs4.3mm,$p<0.001$), placenta percreta (5.3vs3.6mm,$p<0.001$), major bladder repair (6.4vs3.6mm,$p<0.001$) and caesarian hysterectomy (5.5vs3.5mm,$p<0.001$); additionally, stripped fetal vessel diameter was positively and significantly associated with intraoperative blood loss and duration of delivery.

CONCLUSION

The presence and extent of abnormal fetal intraplacental vasculature seems to be related with PAS invasiveness and adverse

The presence and extent of abnormal fetal intraplacental vasculature seems to be related with PAS invasiveness and adverse peripartum events.

CLINICAL RELEVANCE/APPLICATION

Accurate prenatal identification of aggressive forms of PAS may optimize treatment planning, improving patients' clinical outcome.

SSQ09-04 Apparent Diffusion Coefficient Differences in Twins of Monochorionic Diamniotic Pregnancy Complicated by Twin-To-Twin Transfusion Syndrome

Thursday, Dec. 5 11:00AM - 11:10AM Room: E351

Participants
Michael Aertsen, MD, Leuven, Belgium (*Presenter*) Nothing to Disclose
Isabel Couck, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Frederik De Keyzer, Leuven , Belgium (*Abstract Co-Author*) Nothing to Disclose
Steven Dymarkowski, MD, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose
Liesbeth Lewi, MD, Leuven, Belgium (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

michael.aertsen@uzleuven.be

PURPOSE

To evaluate the difference in apparent diffusion coefficient (ADC) of the placental parenchyma between donor and receptor of monochorionic diamniotic (MCDA) pregnancies complicated by twin-to-twin transfusion syndrome (TTTS) and compare those values with a control group of uncomplicated MCDA pairs.

METHOD AND MATERIALS

Prospective monocentric cohort study. Magnetic resonance (MR) was performed prior to surgery in TTTS and electively planned around 20 weeks (w) of gestation age (GA) for the uncomplicated MCDA cohort. Regions of interest (ROIs) for ADC calculations were placed at the cord insertion of each twin or as close as possible in velamentous insertion. Another ROI was drawn at the border of the placenta away from the presumed vascular equator. Intrapair ADC differences for the different ROIs (central (c) and peripheral (p), resp.) were compared between donor and recipient (Wilcoxon-signed rank test). GA at time of MR and intertwin ADC differences were compared between TTTS and MCDA twins (Mann-Whitney test).

RESULTS

71 pregnancies were included in the analysis. Median GA at the time of MRI was 21 w (range 18-27) in the uncomplicated (N=47) and 21 w (range 18 - 29) in the TTTS cohort (N=24) (p=.9). Intrapair ADC differences for the different placental regions and the difference in mean ADC (=(cADC + pADC)/2) of both regions in TTTS are summarized in the table. Between TTTS and MCDA cohorts, central ADC measurements in the donor (168 x10^-5 mm^2/s; 159 - 182 x10^-5 mm^2/s) and smallest twin (179 x10^-5 mm^2/s; 166-197 x10^-5 mm^2/s), respectively, differed significantly (p=.02), whereas no differences were observed between the receptor and larger twin (p=.6). cADC difference between the donor and receptor in TTTS were also larger than those in uncomplicated MCDA pregnancies (p=0.04).

CONCLUSION

In TTTS, central ADC measurements are helpful to differentiate receptor and donor insertion compared to peripheral ADC calculations. Furthermore, from an ADC point of view, the receptor seems to exhibit normal values, with the donor behaving significantly different.

CLINICAL RELEVANCE/APPLICATION

Diffusion weighted imaging has demonstrated differences in pregnancies with abnormal placental function. We want to analyze the added value of ADC measurements in TTTS twins prior to surgery.

SSQ09-05 The Value of MRI in Predicting Intraoperative Massive Hemorrhage during Hysteroscopic Treatment of Cesarean Scar Pregnancy

Thursday, Dec. 5 11:10AM - 11:20AM Room: E351

Participants
Piaoe Zeng, Beijing, China (*Presenter*) Nothing to Disclose
Yan Zhou, Beijing, China (*Abstract Co-Author*) Nothing to Disclose
Jianyu Liu, Beijing, China (*Abstract Co-Author*) Nothing to Disclose

PURPOSE

To explore the value of MRI in predicting intraoperative massive hemorrhage during hysteroscopic treatment for cesarean scar pregnancy

METHOD AND MATERIALS

A retrospective analysis of 77 first trimester CSP patients who were diagnosed by MRI and confirmed by operation and pathology from January 20 to December 2018. According to the intraoperative blood loss, CSP patients were divided into two groups. The Inclusion criteria of intraoperative massive bleeding group: intraoperative blood loss >=200ml, by hysteroscopic treatment with or without preoperative bilateral uterine artery embolization or medication; The Inclusion criteria of non-massive bleeding group: intraoperative blood loss <200ml, by single hysteroscopic treatment without preoperative bilateral uterine artery embolization or medication. The clinical data and MRI features were compared between the two groups. The multivariate logistic regression analysis was used to analyze the risk factors of CSP intraoperative massive hemorrhage. The ROC curve was used to evaluate the efficacy and optimal threshold

RESULTS

Between the intraoperative massive hemorrhage group (11 cases) and non- massive hemorrhage group (66 cases), the gestational

between the intraoperative massive hemorrhage group (11 cases) and non-massive hemorrhage group (30 cases), the gestational age, the maximum diameter of the gestational sac, the depth of the gestational sac, and LUST were significantly different($p < 0.05$). There were no significant differences in age, number of cesarean delivery, interval between current CSP and last cesarean, number of abortions, preoperative ß-HCG, CSP types, gestational sac or uterine hemorrhage between the two groups ($P>0.05$). Multivariate logistic regression analysis showed that only the lower uterus scar thickness was significantly different ($P=0.034$,OR=2.757, 95% CI=1.082-7.028). The ROC curve analysis showed that the AUC of the gestational age, the maximum diameter of the gestational sac, the depth of the gestational sag and LUST were 75.0%, 82.1%, 85.9%, and 91.5%, respectively. The best predictor is the LUST and the optimal cutoff value is 2.2mm, the diagnostic sensitivity, specificity, and the Youden index are 90.9%, 74.2%, and 65.2%, respectively.

CONCLUSION

Preoperative MRI can accurately predict the risk of major bleeding during cesarean section scar pregnancy and guide treatment

CLINICAL RELEVANCE/APPLICATION

To inverstigate risk factors of intraoperative excessive haemorrhage during during hysteroscopic treatment of cesarean scar pregnancy, and to guide treatment.

SSQ09-06 Role of Placental Elastography for Prediction of Preeclampsia in Early Second Trimester

Thursday, Dec. 5 11:20AM - 11:30AM Room: E351

Participants
Rajkumar Meena, MBBS, New Delhi, India (*Presenter*) Nothing to Disclose
Amita Malik, MD, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose
Madhuvendra S. Narwaria, MBBS, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To evaluate the role of shear wave placental elastography (SWE) in pre-clampsia (PE) and to give a cut off value of elasticity that would help in prediction of pre-eclampsia in early second trimester (14-20 weeks of period of gestation).

METHOD AND MATERIALS

A total of 230 patients who presented in obstetric OPD between 14-20 weeks of gestation and were willing to have delivery in our instituition were enrolled in the study. After taking detailed obstetric history, gray scale obstetric ultrasound with doppler scan SWE was performed. Mean value of elasticity was taken in every patient; and data were analysed to give the best cut-off value that would determine the diagnosis of PE. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy for prediction of PE were calculated based on SWE measurements. Statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0. A p value of <0.05 was considered statistically significant.

RESULTS

There was a statically significant difference in the value of elasticity in normal patients and in those who developed PE. The study concluded cut-off value of 2.9667 kPa for prediction of pre-eclampsia, with a sensitivity of 92%, specificity of 91.71%, PPV of 57.5% and NPV of 98.9% in a statistically significant manner with p-value of <0.05.

CONCLUSION

Placental stiffness is higher in patients who develop pre-eclampsia during pregnancy. It can be quantitatively measured by shear wave elastography values for prediction of pre-eclampsia in early second trimester.

CLINICAL RELEVANCE/APPLICATION

Placental elastographic values were statistically significant and higher in the patients developing preeclampsia in later pregnancy. Shear wave elastography can help us to diagnose this life threatening condition in early second trimester before the clinical appearance of preeclampsia, and act to provide early treatment and antenatal care to reduce the devastating maternal as well as fetal outcomes.

SSQ09-07 Differences in Brain Development between Fetuses with Intrauterine Growth Restriction and Normally-Grown Group Assessed by Fetal MRI

Thursday, Dec. 5 11:30AM - 11:40AM Room: E351

Participants
Behnaz Moradi, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Mahboobeh Shirazi, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Nazanin Seyed Saadat, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Zohreh Alibeigi Nezhad, MD, Tehran , Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Hasan Hashemi, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Masoumeh Gity, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Hossein Ghanaati, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Mohammad Ali Kazemi, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Maryam Rahmani, MD, Tehran, Iran (islamic Rep. Of) (*Abstract Co-Author*) Nothing to Disclose
Ghazaleh Arabkheradmand, MS, Chicago, CA (*Abstract Co-Author*) Nothing to Disclose
Farzaneh Fattahi Masrour, MD, Hartford, CT (*Presenter*) Nothing to Disclose

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PURPOSE

To evaluate different features of brain development by Magnetic Resonance Imaging (MRI) in intrauterine growth restricted (IUGR) fetuses compared to normally-grown fetuses.

METHOD AND MATERIALS

3T MRI was performed in 42 IUGR and 28 nearly age-matched normally-grown fetuses using T2-weighted half Fourier acquisition single-shot turbo spin echo (HASTE). Cortical thickness was assessed in 4 brain regions (insula, frontal, occipital and temporal) and corrected by biparietal diameter/2. Also whole brain area (WBA) at the level of cavum septum pellucidum and area of 6 brain regions (frontal, temporal, occipital, cerebellum, midbrain and pons) were evaluated and corrected by WBA and compared between the two groups. Any cases with brain structural anomaly were excluded. All fetuses were followed until birth.

RESULTS

No significant differences were found about maternal characteristic and fetal gestational age between two groups. IUGR fetuses had significantly lower birth weight (2377 g vs 2965 g in control group). Brain signal was normal in all cases. The corrected thickness of cortex was significantly thinner in insula and temporal lobes in IUGR fetuses compared to control group (0.034 vs 0.043 and 0.036 vs 0.047 respectively, P value of < 0.05), but there was no significant different in frontal and occipital lobes. IUGR fetuses has significantly smaller WBA. The assessed corrected area of brain regions was not significantly different between groups except the corrected area of cerebellum which was smaller in normally-grown fetuses (0.147 vs 0.130, P value of < 0.05). During follow up, there was only one still birth in IUGR group.

CONCLUSION

IUGR fetuses had a significantly thinner Insular and temporal lobe cortex and smaller WBA. Among different brain regions, cerebellum was less affected by growth restriction.

CLINICAL RELEVANCE/APPLICATION

Growth restriction significantly affects brain development and the fetal MRI has a potential value to assess the various aspects of this effect.

SSQ09-08 Fetal Anterior Abdominal Wall Thickness (FAAWT): A Promising Parameter to Predict Fetal Macrosomia in Pregnancies with Gestational Diabetes

Thursday, Dec. 5 11:40AM - 11:50AM Room: E351

Participants
Ashish Bansal, MBBS, New Delhi, India (*Presenter*) Nothing to Disclose
Brijbhushan Thukral, New Delhi, India (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

To evaluate the correlation of fetal anterior abdominal wall thickness and other standard fetal biometric parameters between 36-39 weeks of gestation with neonatal birth weight in pregnancies with gestational diabetes.

METHOD AND MATERIALS

This is a prospective cohort study conducted in a tertiary care Centre with institutional ethics approval. One hundred singleton pregnancies with gestational diabetes mellitus (GDM) between 36-39 weeks of gestation were included after informed written consent. Exclusion criteria comprised of women with diseases known to affect fetal growth, uncertain gestational age, fetuses with congenital anomalies and intrauterine growth restriction. Standard fetal biometry parameters including Biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), femur length (FL) and estimated fetal weight (EFW) were measured. Fetal anterior abdominal wall thickness (FAAWT) was measured ultrasonographically in AC view. Actual neonatal birth weights were recorded. Birth weight >90th centile (INTERGROWTH-21st charts) was considered as a cut-off for macrosomia. Statistical analysis was done and 95% confidence level was considered significant for all tests.

RESULTS

16 out of 100 neonates were found to be macrosomic (16%). Third trimester mean FAAWT was significantly higher in macrosomic babies (6.36±0.5 mm) as compared to non-macrosomic babies (5.54±0.61 mm) (p-value <0.0001). A FAAWT >6 mm (ROC curve derived) provided sensitivity of 87.5% (95% CI 61.7-98.4), specificity of 75% (95% CI 64.4-83.8), PPV of 40% (95% CI 23.9-57.9) and NPV of 96.9% (95% CI 89.3-99.6) for prediction of macrosomia. While other standard fetal biometric parameters (BPD, HC, AC, FL and EFW) did not correlate well with actual birth weight in neonates with macrosomia in GDM patients, only FAAWT was found to have statistically significant correlation (correlation coefficient of 0.626, p-value 0.009).

CONCLUSION

The FAAWT was the only fetal sonographic parameter to have significant correlation with neonatal birth weight in macrosomic neonates of GDM mothers. We found a high sensitivity (87.5%), specificity (75%) and NPV (96.9%) which suggests that FAAWT <6 mm can quite confidently rule out macrosomia in pregnancies with GDM.

CLINICAL RELEVANCE/APPLICATION

FAAWT is a promising and easily measurable parameter to rule out fetal macrosomia in late third trimester in pregnancies with GDM, thus, allowing proper obstetric management .

SSQ09-09 Three-Dimensional Fetal MRI Visualization of Cerebellar White Matter Tracts

Thursday, Dec. 5 11:50AM - 12:00PM Room: E351

Participants
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PURPOSE

Cerebellar white matter connectivity plays a crucial role in affective, cognitive and motor processing. Prenatal diffusion tensor imaging (DTI) can non-invasively visualize major white-matter tracts of the fetal forebrain. We retrospectively assessed the success rate of visualizing the superior, middle and inferior cerebellar peduncle (SCP, MCP and ICP) as well as transverse pontine fibers (TPF) in the third trimester.

METHOD AND MATERIALS

Cases with DTI sequences (b-value of 700 s/mm², 16 gradient encoding directions) covering the cerebellum were retrospectively assessed. Deterministic tractography was performed using the Philips IntelliSpace software based on at least two regions of interest. A visibility score was calculated as the fraction of visible tracts divided by the amount of potentially visible tracts.

RESULTS

14 Fetal MRI were assessed (9 with 1.5T and 5 with 3T MRI) with 38.51±1.00 GW (mean±standard deviation) at 1.5 T and 35.80±1.20 at 3T. There was no significant difference (p=.66) between the scores of 1.5T (0.69±0.27) and 3T (0.74±0.17). SCP could be depicted in 71% of cases, MCP in 71%, ICP in 55% and TPF in 93%.

CONCLUSION

Prenatal tractography of cerebellar white matter tracts is feasible in the third trimester and shows excellent correlation with the respective anatomy. Fetal MR based DTI thus may improve the characterization of infratentorial malformations during the third trimester, when ultrasound is limited by acoustic shadowing at the skull base.

CLINICAL RELEVANCE/APPLICATION

Fetal MR tractography with diffusion tensor imaging can demonstrate cerebellar white matter tracts in the third trimester of pregnancy. This could improve the characterization of infratentorial malformations prenatally.

Printed on: 10/29/20

SSQ10

Genitourinary (Renal Masses: Artificial Intelligence, Machine Learning, and Texture)

Thursday, Dec. 5 10:30AM - 12:00PM Room: E352

AI GU

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

FDA Discussions may include off-label uses.

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Sub-Events

SSQ10-01 Radiomics Panels of CT-Based Shape and Texture Metrics Robustly Discriminate Benign from Malignant Renal Masses

Thursday, Dec. 5 10:30AM - 10:40AM Room: E352

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PURPOSE

Differentiating benign from malignant renal masses using enhancement alone can be difficult. Additional imaging metrics (e.g. tumor shape and texture) have been shown to improve discrimination. Using a radiomics framework utilizing machine learning to quantitatively analyze shape and texture features of renal tumors in three dimensions, we tested its ability to objectively and robustly distinguish between benign and malignant renal masses on imaging. We also assessed the necessity of shape metrics in the prediction model.

METHOD AND MATERIALS

Routine standard-of-care computed tomography (CT) images of 485 patients with 291 (60%) malignant and 194 (40%) benign masses diagnosed between 2010 and 2015 were segmented. Point coordinates of tumor contours in all axial slices were input into a MATLAB (MathWorks) algorithm. 33 shape metrics and 760 texture metrics were calculated per tumor. We used Random Forest (SAS HPFOREST) for algorithm development, and 10-fold cross validation to obtain robust classification accuracy. Area under the curve (AUC) was used to assess robust discrimination power based on predicted probability from each fold of testing data. Sensitivity analysis was conducted by eliminating data with different missing patterns. SAS 9.4 was used for all data analysis.

RESULTS

In the cohort of 4-phase studies (n = 283), an AUC of 0.65 in the independent testing subset was achieved by 33 shape metrics alone, whereas an AUC of 0.69 was achieved when adding 760 texture metrics. Sensitivity analysis conducted in different phases with complete data also demonstrated similar results. Shape metrics appeared in top 3% variable of importance (VOI), featuring most prominently in the corticomedullary phase, with the sagittal convex hull perimeter ratio (CHP) consistently being a high-performing shape metric across all phases.

CONCLUSION

Robust prediction accuracy by shape alone and high ranking of VOI from shape in the combined model signify that shape analysis should not be ignored or underestimated in distinguishing benign from malignant tumors. A future radiomics platform powered by machine learning should therefore combine both shape and texture metrics rather than utilize them in isolation from each other.

CLINICAL RELEVANCE/APPLICATION

Combining both shape and texture metrics on a radiomics platform utilizing machine learning facilitates the differentiation of benign from malignant renal tumors on routine standard-of-care imaging.

SSQ10-02 Machine Learning of Multi-Phase CT Texture Features to Differentiate Clear Cell Renal Cell Carcinoma from Oncocytic Renal Neoplasms

Thursday, Dec. 5 10:40AM - 10:50AM Room: E352

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PURPOSE

Among common subtypes of renal masses, differentiation of clear cell renal cell carcinoma (cc-RCC) from oncocytic neoplasms is limited at CT and MRI. This study evaluates the diagnostic accuracy of machine learning (ML) of multi-phase CT texture analysis (TA) features to differentiate cc-RCC from oncocytic tumors.

METHOD AND MATERIALS

With IRB approval, we compared 81 consecutive cc-RCC and 66 consecutive oncocytic tumors (25 chromophobe RCC and 41 oncocytomas) with multi-phase CT performed from 2012-2018. A radiologist manually segmented tumors and second order TA features were extracted from non-contrast enhanced CT(NECT), corticomedullary (CM) and nephrographic (NG) contrast-enhanced CT(CECT). TA features were inputted into a ML Bayesian optimization algorithm and tested using 10-fold randomly stratified cross-validation. The ML system uses Gaussian processes with a heuristic technique to propose models evaluated by a fitness score to achieve the highest accuracy.

RESULTS

There was no difference in age, gender or size of tumors ($p>0.05$). Comparing the three CT phases, NG phase CECT TA achieved the highest discriminatory ability. The optimized ML algorithm which achieved the highest accuracy of classification at NG phase CECT incorporated various texture features most importantly: skewness, mean and RNLU. The area under the ROC curve (standard error) with optimal sensitivity/specificity for diangosis of cc-RCC was: 0.822 (0.087) and 71.3/81.4%. Statistically significant texture features compared between groups differed from NECT to CM and NG phase CECT; however, combining the most important features between phases did not improve accuracy of classification compared to NG phase analysis alone.

CONCLUSION

Machine learning of nephrographic phase CECT second order texture features achieved moderate accuracy to differentiate between clear cell RCC and oncocytic (chromophobe RCC + renal oncocytoma) neoplasms and outperformed assessment at unenhanced CT, corticomedullary phase CECT and combined three phase assessment.

CLINICAL RELEVANCE/APPLICATION

Machine learning of nephrographic phase enhanced CT texture features may improve classification of solid renal masses, in particular, moderate accuracy was achieved for the difficult comparison of clear cell RCC to oncocytic tumors where conventional CT/MRI evaluation is limited.

SSQ10-03 Machine Learning Derived Decision Tree to Identify Renal Mass Histological Type Based on CT Texture Analysis

Thursday, Dec. 5 10:50AM - 11:00AM Room: E352

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PURPOSE

Many renal masses share overlapping imaging features on contrast enhanced CT. In addition, subjective assessment of imaging features suffer from not insignificant interoberver variability. We created a machine learning derived decision tree matrix to differentiate subtypes of renal masses based on extracted quantitative texture features from CT images.

METHOD AND MATERIALS

Multi-phase contrast enhanced CT (CECT) including Non contrast (NC), Corticomedullary (CM), nephrographic (N) and excretory (E) of 268 patients. 93 had papillary RCC (prcc), 105 clear cell RCC (crcc), 43 Oncocytoma (oc) and 27 lipid poor AML(AML) . The CT images were subject to filtration-histogram based CT Texture analysis (CTTA) using a commercially available research software (TexRAD Ltd, www.texrad.com, part of Feedback Plc, Cambridge, UK). Using the DICOM images, filtration step extracted texture features using different spatial scale filters corresponding to fine, medium and coarse texture scales followed by histogram quantification: Mean gray-level pixel intensity, Entropy, Standard-Deviation (SD), Mean of positive pixels (MPP), Kurtosis and Skewness were derived. CTTA data obtained from excretory phase images (n=208) were used to build a decision tree for

classification of subtypes using a recursive partitioning and regression tree algorithm in R, employing a 10-fold cross validation technique and a cost matrix favoring detection of crcc due to its relative poor prognosis.

RESULTS

The decision tree is shown in the attached figure various texture features assessed using various filters. The sensitivity for detecting AML, crcc, oc and prcc was 0.3, 0.76, 0.68 and 0.71; specificity 0.94, 0.81, 0.93 and 0.87 and Accuracy was 0.75, 0.70, 0.58 and 0.76

CONCLUSION

A machine learning derived decision tree classification algorithm can be applied on CT derived texture features to identify different histological subtypes of renal masses

CLINICAL RELEVANCE/APPLICATION

A machine learning derived decision tree classification of renal masses based on quantitatively derived textural features may be clinically relevant in triaging patients for conservative versus aggressive management.

SSQ10-04 CT Texture Predicts Metastatic RCC Response to Anti-Angiogenic Therapy

Thursday, Dec. 5 11:00AM - 11:10AM Room: E352

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PURPOSE

The objective of this study was to quantify initial changes in CT texture to predict progression-free survival (PFS) in patients with metastatic renal cell carcinoma (RCC) treated with anti-angiogenic therapy.

METHOD AND MATERIALS

For this retrospective post-hoc secondary analysis of a prospective phase III trial, adult patients with metastatic RCC treated with sunitinib were included (N=275). Up to 5 target lesions were segmented using freeform regions-of-interest on 2D axial images on the baseline and initial post-therapy CT studies using eMASS software (eMASS LLC, Hoover, AL), to derive change in tumor length and vascular tumor burden (VTB). The segmentations were then processed using TexRAD software (Feedback Medical Ltd., Cambridge, UK) which used a CT texture filtration-histogram technique. A total of 6 texture parameters were measured at 6 filtration levels for a total of 36 texture/filtration parameters. Initial changes in CT texture were associated with PFS using univariate Kaplan Meier survival analysis (log-rank test). Multivariate Cox-proportional analysis was used to assess the independence of CT texture from other imaging biomarkers.

RESULTS

Median PFS of the cohort was 1.1 years. An increase in CT texture at the fine to medium texture scales were associated with shorter PFS (fine: SD, p=0.001; Entropy, p<0.001; medium: Entropy, p=0.001). A multivariate Cox model indicated that a change in fine texture (SD: HR=1.4, 95%CI: 1.0-1.9, p=0.033), tumor length (HR=1.8, 95%CI: 1.1-2.7, p=0.010) and VTB (HR=3.1, 95%CI: 2.0-4.7, p<0.001) were independent predictors of PFS.

CONCLUSION

Quantitative changes in CT texture on initial post-therapy CT images are predictive of PFS and independent of changes in tumor length and vascular tumor burden in patients with metastatic RCC treated with anti-angiogenic therapy.

CLINICAL RELEVANCE/APPLICATION

Change in tumor texture on CT can be quantified with no additional radiation or patient cost and has the potential to serve as a predictive biomarker of response to targeted therapy in patients with metastatic RCC.

SSQ10-05 Automated Detection of Renal Ultrasound Abnormalities Using Deep Learning

Thursday, Dec. 5 11:10AM - 11:20AM Room: E352

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PURPOSE

To develop a deep learning model that detects abnormalities on renal ultrasound examinations, as well as the presence of cystic lesions.

METHOD AND MATERIALS

This IRB-approved, HIPAA-compliant single center retrospective study involved 2,240 renal ultrasound examinations comprising 108,257 images. Scans were performed on Siemens Acuson Sequoia, GE Logiq E9, Siemens Acuson S2000, and ATL HDI 5000. Each examination was labeled by a board-certified radiologist for normal vs. abnormal and for the presence of cystic lesions. 10% of examinations were held out as a separate test set, whose ground truth labels were by consensus of two out of three board-certified radiologists. Scanner types were equally distributed across training and test sets, as well as normal and abnormal classes. The number of images per exam was balanced between abnormal and normal classes. After image pre-processing and data augmentation, a basic DenseNet-121 was investigated as well as four models with refinements over the DenseNet base, including an instance-aggregation model, an embedding-aggregation model, an attention model, and an ensemble of the best three attention models. Next, the well-performing attention models were applied to the detection of renal cystic lesions. All models were optimized using Adam with default parameters, with tuning of learning rate and regularization performed on the validation set.

RESULTS

For binary classification of normal vs. abnormal, the basic Densenet-121 had an AUC of 0.61. Instance- and embedded-aggregation improved performance to AUC=0.69 and 0.81, respectively. The attention model (AUC=0.82) and the ensemble of attention models (AUC=0.84) performed best. For cystic lesion detection, high diagnostic accuracy was achieved using the attention model (AUC=0.91) and the ensemble of attention models (AUC=0.95).

CONCLUSION

Diagnostic performance of baseline models for classification tasks can be increased using aggregation and attention techniques. Attention models had the highest diagnostic performance for normal vs. abnormal renal ultrasound characterization and the detection of renal cystic lesions.

CLINICAL RELEVANCE/APPLICATION

Our model could potentially serve as a triage tool for patients undergoing renal ultrasound examinations. It could improve operational efficiency for radiologists by optimizing workflow, improving patient throughput, and providing a quicker time to diagnosis and treatment for the referring physician.

SSQ10-06 Deep Learning to Distinguish Benign from Malignant Renal Lesions Based on Routine MR Imaging

Thursday, Dec. 5 11:20AM - 11:30AM Room: E352

Awards
Trainee Research Prize - Fellow

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PURPOSE

With increasing incidence of renal mass, it is important to make a pre-treatment differentiation between benign renal mass and malignant tumor. We aimed to propose a deep learning model to distinguish benign renal tumors from renal cell carcinoma (RCC) using routine MR imaging by applying a residual convolutional neural network (ResNet).

METHOD AND MATERIALS

Preoperative MR images (T2-weighted and T1-post contrast sequences) of 467 renal lesions in a multicenter cohort with definitive pathology were divided into training, validation, and test sets (70:20:10 split). An ensemble model based on ResNet was created combining clinical variable, T1C and T2WI MR images using a bagging classifier to predict renal tumor pathology. Final model performance was compared with expert interpretation.

RESULTS

Among the 467 renal lesions, 367 were malignant and 100 were benign. The final ensemble model achieved a test accuracy of 87.2%, F1 score of 0.925, and precision recall AUC of 0.939. In comparison, expert 1 achieved an accuracy of 85.1% and F1 score of 0.914, and expert 2 achieved an accuracy of 87.5% and F1 score of 0.875.

CONCLUSION

Deep learning can non-invasively distinguish benign renal tumors from RCC using conventional MR imaging in a multi-institutional dataset with high accuracy compared to experts.

CLINICAL RELEVANCE/APPLICATION

With the wide use of imaging modalities, the detection of incidental renal tumors increases rapidly. There is a substantial number of patients with benign renal tumors who undergo unnecessary surgery with its concurrent risk and morbidity. Our deep learning model has the potential to noninvasively and accurately distinguish benign from malignant renal lesions and help guide clinical management.

SSQ10-07 T2WI Texture Analysis of Fat-Poor Angiomyolipoma and Other Renal Tumors: Histologic Subtype Classification

Thursday, Dec. 5 11:30AM - 11:40AM Room: E352

Participants
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PURPOSE

The purpose of this study was to explore the value of T2WI texture analysis in differentiation between fat-poor angiomyolipoma and renal cell carcinoma.

METHOD AND MATERIALS

T2WI Texture analysis was applied to analyze renal tumors, including 32 clear cell renal cell carcinomas (ccRCCs), 25 papillary RCCs(pRCCs), 27 chromophobe RCCs(cRCCs) and 20 fat-poor angiomyolipomas(fat-poor AMLs). All the tumors were removed by surgery and pathologically confirmed. These renal masses were divided into four groups: group A (fat-poor AMLs and RCCs), group B (fat-poor AMLs and ccRCCs), group C (fat-poor AMLs and pRCCs) and group D (fat-poor AMLs and cRCCs). Lesions were delineated on software named Radiomics Cloud Platform by two radiologists to extract the corresponding volume of interest (VOI) and then 93 features based on feature classes were generated. The average values of two radiologists were obtained and used as the final data. The difference features between fat-poor AMLs and RCCs were screened by Mann-Whitney U test in each group. Receiver operating characteristic (ROC) analysis was performed and area under the ROC curve (AUC) was calculated for features that were significantly different ($P < 0.01$). The corresponding optimal thresholds were determined and diagnostic effect was assessed.

RESULTS

Among the significantly different ($P < 0.01$) features(n=19, 22, 6 and 13 in group A, B, C and D respectively), minimum generated the largest AUC of 0.889±0.044(95% CI 0.812 - 0.942),0.881±0.049(95% CI 0.761 - 0.954),0.893±0.049(95% CI 0.765 - 0.965)and 0.894±0.048(95% CI 0.770 to 0.965) in group A, B, C and D respectively. The corresponding cut-off value of minimum was 189, 189, 176 and 138, which permitted the diagnosis of RCC, ccRCC, pRCC and cRCC with sensitivity of 90.48%, 90.62%, 92.00% and 88.89%, specificity of 80%, 80%, 80% and 80%, positive predictive value of 95.00%, 87.88%, 85.19% and 85.71%, negative predictive value of 66.67%, 84.21%, 88.89% and 84.21% and accuracy of 88.46%, 86.54%, 86,67% and 85.11% respectively.

CONCLUSION

T2WI texture analysis can effectively distinguish between fat-poor angiomyolipoma and common renal cell carcinoma. Minimum had the optimal diagnostic performance.

CLINICAL RELEVANCE/APPLICATION

Fat-poor AML, not showing visible fat, can mimic RCC, leading to unnecessary surgical resection. T2WI texture analysis can effectively differentiate between these two tumors, so patients may benefit.

SSQ10-08 Renal Cysts: Role of MRI-Based 3D Texture Features to Classify Renal Cystic Lesions According to the Bosniak Classification

Thursday, Dec. 5 11:40AM - 11:50AM Room: E352

Participants
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PURPOSE

Purpose: To determine the role of MRI texture features to differentiate Bosniak 2F from Bosniak 3-4 renal cysts given the known interobserver variation for Bosniak cyst classification in the clinic.

METHOD AND MATERIALS

This retrospective study was performed from January 2005 to September 2016. Patients with a complex renal cyst (Bosniak category 2F, 3 and 4) on MRI were selected. 176 patients were identified; only the highest category cyst was included per patient. Cysts were divided into two groups: 107 patients had Bosniak 2F cysts, and 69 had Bosniak 3 or 4 cysts. The standard of reference for group assignment was agreement on Bosniak classification between at least 2 of 3 independent expert reviewers; findings at histology or 4-year follow up. Each cyst was delineated 2x on the venous phase of the post contrast MRI in 3D using the inner core (Inner), and outer region that included both the lesion's inner core and its periphery (Total). The difference between these two regions defined the cyst's periphery (Border). Six histogram-derived texture features were computed for each of the three ROIs on the native and transformed images, resulting in 18 features per cyst. Univariate t-tests were computed on the two groups Accounting for Bonferroni correction for multiple comparisons, features with $p<(0.05/18)=0.0028$ were selected and univariate diagnostic models were built separately for each selected feature. 95% confidence intervals were estimated using 1000 bootstrap iterations.

RESULTS

11 features with $p<0.0028$ were found. Among them, the top three univariate diagnostic performances were variance, entropy, and uniformity. (95% confidence interval indicated in brackets) (please refer to the table included in the figure)

CONCLUSION

Texture analysis can differentiate Bosniak 2F from Bosniak 3-4 renal cysts with good accuracy, sensitivity, and specificity.

CLINICAL RELEVANCE/APPLICATION

The radiomics techniques are helpful to differentiate Bosniak 2F and Bosniak 3-4 status of the cyst given the known interobserver variation for Bosniak cyst classification.

SSQ10-09 Development and External Validation of Prediction Models for the Fuhrman Nuclear Grade of Clear Cell Renal Cell Carcinoma: A Comparison between CT- and MR-Based High-Dimensional Machine Learning Models

Thursday, Dec. 5 11:50AM - 12:00PM Room: E352

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PURPOSE

To compare the diagnostic performance between CT- and MR-based machine learning models in predicting the Fuhrman nuclear grade of clear cell renal cell carcinoma (ccRCC).

METHOD AND MATERIALS

Patients with pathologically proven ccRCC from 1 February 2009 to 31 December 2018 were included by this retrospective study for development dataset. Additional dataset from another institution and the Cancer Imaging Archive (TCIA) dataset, including both CT and MR imaging prior to surgery, were collected for external validation dataset. The features were extracted from precontrast phase (PCP), corticomedullary phase (CMP), nephrographic phase (NP) on CT, as well as fat-suppressed T2WI, T1WI, CMP and NP on MRI. The CatBoost was utilized to investigate machine learning models for the differentiation of low- from high-grade ccRCC. The performance of machine learning classifiers based on CT and MRI were compared.

RESULTS

A total of 416 patients with 419 pathologically proven ccRCCs were included for development dataset and ten pairs of dataset with both CT and MRI from another hospital and TCIA database were used for external validation. Thirty-nine, 41, 35 and 17 features were extracted from ctPCP, ctCMP, ctNP and ctALL images, and 34, 38, 37, 38 and 12 features derived from fat-suppressed T2WI, T1WI, mrCMP, mrNP and mrALL images, respectively. The classifier based on all-phase CT and all-sequence MR images achieved the best performance in differentiating low- from high-grade ccRCC with area under the ROC curve (AUC) of 0.82 and 0.73, respectively. In the external validation set, the classifier based on all-phase CT and all-sequence MR images also obtained the best performance in differentiating low- from high-grade ccRCC with AUC of 0.76 and 0.77, respectively. The comparison of the AUC for all-phase T-based vs all-sequence MR-based machine learning classifier showed no significantly different performance.

CONCLUSION

Both CT- and MR-based machine learning model are valuable noninvasive techniques in differentiating low- and high-Fuhrman nuclear grade ccRCC. MR-based machine learning model had comparable but no better performance than CT-based model.

CLINICAL RELEVANCE/APPLICATION

(dealing with preoperative ccRCC grading)'Both CT- and MR-based machine learning model can be used to preoperatively predict

(dealing with preoperative ccRCC grading) Both CT- and MR-based machine learning model can be used to preoperatively predict the Fuhrman nuclear grade of ccRCC and MR-based model had comparable but no better performance than CT-base model.'

Printed on: 10/29/20

GUS-THA

Genitourinary Thursday Poster Discussions

Thursday, Dec. 5 12:15PM - 12:45PM Room: GU/UR Community, Learning Center

NM GU

AMA PRA Category 1 Credit ™: .50

Participants

Mary C. Frates, MD, Boston, MA (*Moderator*) Nothing to Disclose

Sub-Events

GU224-SD-THA1 Cloverleaf-Sign: A New MRI Sign Predicting Significantly Longer Operation Time and Higher Bowel Resection Rate in Deep Infiltrating Endometriosis

Station #1

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PURPOSE

We observed on MRI repeated a 'conglomerate' including deep infiltrating endometriosis with constricting adhesions between at least three different organs. We called it a 'Cloverleaf-Sign' and investigated the value of it.

METHOD AND MATERIALS

103 patients operated 2015-2017 with preoperative 1,5 T and 3 T MRI with or without vaginal and rectal gel opacification blinded to intraoperative findings were analyzed by a specialized gynecologic radiologist and then compared to intraoperative findings by looking at the operation report, postoperative diagnosis and intraoperative images and videos. A conglomerate was defined as a DIE with constricting adhesions to at least three organs. Statistical analysis was performed with SPSS (Vers 25.0) with ANOVA and crosstables for specify and sensitivity (DIE and gel filling) and with Excel (t-test, correlation coefficients).

RESULTS

103 patients were analyzed. Mean age was 33,2 years (18-46), mean BMI was 23.0 (16.1-36.8) and the women had a mean of 1,4 previous surgery. 11.5% had no endometriosis, 32.6% had and rASF °I and° II, 55.9% °III and °IV. 46 patients (45%) had received rectal and vaginal gel opacification before scanning, 57 (55%) did not. A conglomerate = 'Cloverleaf-Sign' on MRI was discovered in 34 patients (15 in gel filling and 19 in non-filling group). The mean operation time in the conglomerate group was 261 minutes (45-570 min.) compared to 150 minutes (30-300 min.) in the non-conglomerate group (p=0.000175). The highest correlation was yield between MR-graphic conglomerate (cloverleaf-sign) and operation times equal or more than 300 minutes (correlation coefficient 0.50), intraoperative blood loss being also significantly higher in the conglomerate group (179 ml vs. 96 ml, p=0.0002). 41% (14/34) of all bowel resections (22% of patients) of our study population were proceeded in the patients with Cloverleaf-Sign on MRI, on the contrary in 13% (9/69) in patients without the Clover-leaf Sign. The results of the gel opacification MRI protocol are reported in a separate study.

CONCLUSION

A 'Cloverleaf' MRI sign predicts significantly longer lasting and more extent operations, the bowel resection rate being also higher.

CLINICAL RELEVANCE/APPLICATION

For surgeons crucial in planning the operation and informing the patient: A 'Cloverleaf' MRI sign predicts a longer lasting, challenging operation and a higher risk to a bowel resection.

GU226-SD-THA3 Geometrical Distortion on Diffusion-Weighted Imaging of Prostate: Comparison of Single-Shot Echo-Planar and Readout Segmentation of Long Variable Echo Train Techniques

Station #3

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PURPOSE

This study aimed to compare the image quality in two acquisition techniques of prostate diffusion weighted imaging (DWI): single-shot Echo-Planar Imaging (ssEPI) and Readout Segmentation of Long Variable Echo trains (RESOLVE)

METHOD AND MATERIALS

This HIPAA-compliant, IRB-approved study assessed data of 68 consecutive patients who underwent 3 Tesla prostate mpMRI (3T mpMRI) from January to March 2019. Non-cooperative patients and patients with a history of prior pelvic surgery or radiation therapy were excluded. Two radiologists blinded to the clinical information evaluated each MRI in consensus for qualitative scoring. A five-point Likert scale was used to assess the geometrical distortion on ssEPI and RESOLVE DWI as followed: 1= no perceptible artifact, 2= minimal susceptibility artifact, which did not interfere with diagnosis 3= mild susceptibility artifact, obscuring <50% of the peripheral zone, 4= moderate susceptibility artifact, obscuring >50% of the peripheral zone, and 5= severe susceptibility artifact, affecting the peripheral and transitional zones. The degree of rectal gas was also scored based on the largest transverse diameter in dynamic contrast-enhanced images using a five-point scale as followed: 1: collapsed rectal wall, 2: minimal gas (<1cm), 3: mild gas (1-2 cm), 4: moderate gas (2-3 cm) and 5: severe gas (>3 cm). Chi-square test and ordinal logistic regression were used for statistical analysis by means of SPSSv.16.

RESULTS

Mean scores were 1.54 and 1.37 for image distortion in ssEPI and RESOLVE techniques, respectively. A significant mild-to-moderate correlation was observed between rectal gas grading and geometrical distortion on both ssEPI and RESOLVE DWI (Rs: 0.39 and 0.45, respectively, P<0.001). The geometrical distortion was significantly less observed in RESOLVE compared to ssEPI, regardless of the gas grading (P<0.01) and when stratified based on rectal gas scoring (P<0.05). Geometrical distortion scores of 3 and 4 were observed in six and two patients in ssEPI, respectively, with all eight patients having scores < 3 on RESOLVE.

CONCLUSION

RESOLVE performed significantly better in producing images with less geometrical distortion compared to ssEPI in prostate DWI.

CLINICAL RELEVANCE/APPLICATION

Using RESOLVE for DWI acquisition may augment or replace ssEPI on 3TmpMRI with higher image quality and less geometrical distortion.

GU240-SD-THA4 A Retrospective Evaluation of the Impact of Fetal MR Imaging on Prognosis and Referral Patterns for Intrauterine Fetal Anomalies

Station #4

Participants
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PURPOSE

This study evaluates the impact of fetal MR imaging on patient referral patterns and prognosis in cases of prior ultrasound diagnoses of fetal anomalies. Prenatal evaluations after diagnosis by ultrasound are usually followed up with fetal MR and amniocentesis. Routine prenatal care also involves blood tests such as the triple screen. Thus, a case-by-case evaluation of the relative impact of each testing modality on fetal outcomes is valuable.

METHOD AND MATERIALS

This is a retrospective study of 43 pregnant women seen during a 4-year period. Electronic medical records were researched and results from ultrasound, fetal MR, blood tests and amniocentesis were collected. The percentage of patients who tested positive for fetal anomalies by fetal MR, amniocentesis and blood tests after an ultrasound diagnosis was calculated. Results of ultrasound and fetal MR were compared to find the impact of fetal MR in overall prognosis and to evaluate the findings from both imaging modalities for agreement.

RESULTS

The principal diagnoses made by fetal MR and ultrasound were in complete agreement in only 55% of cases. Overall, MR gave a better prognosis than ultrasound in 38% of the cases and in the remaining 62%, MR gave a similar prognosis as ultrasound. In 69% of cases, MR led to significant changes in pre and perinatal management thus highlighting the impact of fetal MR on patient care. None of the patients who got karyotyping (amniocentesis) and only 9.5% of patients who got pregnancy markers tested (from amniotic fluid and/or blood) had results positive for suspected fetal abnormalities. All UMass-internal patients and 79% of externally referred patients stayed at UMass until delivery, indicating that in most cases, UMass has served as a preferred site.

CONCLUSION

In this study, fetal MR imaging demonstrated positive outcomes in patient management, whereas karyotyping by amniocentesis and pregnancy marker tests did not contribute significant impact in prenatal diagnosis in most cases. The referral patterns and follow-up history showed that UMass was a patient-preferred site in managing pregnancies complicated by fetal anomalies.

CLINICAL RELEVANCE/APPLICATION

Fetal MR is a valuable resource for prenatal and perinatal management of congenital anomalies.

GU241-SD-THA5 Predicting CD8+ T Cell infiltration in Renal Cell Carcinoma Using CT Radiomic Signatures

Station #5

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PURPOSE

CD8+ T cell infiltration has been shown to predict treatment response with immune checkpoint inhibitors (ICIs). However, it is not tested routinely in clinical practice due to inherent issues with tissue-based markers including pathologic specimen requirement (biopsy), tumor heterogeneity and sampling variability. We investigate the association between computed tomography (CT) based radiomic metrics and CD8+ T cell infiltration in patients with clear-cell renal cell carcinoma (ccRCC).

METHOD AND MATERIALS

In this IRB approved, retrospective study, we evaluated 48 patients with pathologically confirmed localized ccRCC, and who had preoperative multiphase CT with available tumor tissue from June 2009-2018. Immunohistochemistry (IHC) of CD8 was performed. Of the 48 patients, 25 were CD8 positive (>80) and 23 negative (<80). Manually segmented whole lesions from the multiphase CT acquisitions were evaluated using a radiomics panel comprising of 1708 metrics derived from 9 texture methods. Radiomic signatures were created from voxel-wise data analysis and tumor segmentation in Synapse 3D. Least absolute shrinkage and selection operator (LASSO) was used to select radiomic features that predict infiltration. Area under the curve (AUC) based on predicted probability from 48 iterations of leave-one-out cross-validation (LOOCV) testing data was used to assess robust discrimination accuracy. SAS 9.4 was used for all data analysis.

RESULTS

The result from 48 iterations of LOOCV testing data showed an AUC of 0.9; 95% CI; 0.8-1 in discriminating patients with CD8-positive from CD8-negative infiltration. While we cannot rule out discovery by chance due to a small sample size, distribution of predicted probability using histogram showed almost complete separation between CD8-positive and CD8-negative around 0.5. Maximal correlation coefficient extracted from the grey-level difference map (GLDM) of the sagittal plane image of the precontrast phase and uniformity metric extracted from the GLDM of the 3D tumor volume in the nephrographic phase were the top ranking predictors in the variable of importance.

CONCLUSION

CT-based radiomic metrics of ccRCC could provide useful information regarding the density of CD8+ T cell infiltration.

CLINICAL RELEVANCE/APPLICATION

Predicting CD8+ T cell infiltration could allow us to accurately identify patients that would benefit from ICI therapy non-invasively.

GU242-SD-THA6 Laser Lithotripsy for Ureteral Calculus: Can CT Three-Dimensional Texture Analysis Technique Help Predict the Therapeutic Effects? An Article Accorded with the STARD

Station #6

Participants
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PURPOSE

To explore whether multi-parameter of three-dimensional texture analysis (3D-TA) in computed tomography (CT) can predict the therapeutic effects of laser lithotripsy(LL) for ureteral calculus before operation.

METHOD AND MATERIALS

Patients with ureteral calculus, diagnosed by Toshiba 640-slice CT and treated with LL from January 2016 to March 2019, were retrospectively and continuously collected in the third-level medical institution of national single-center. According to the intraoperative observations and postoperative reexamination results, the patients were divided into two different groups: crushed completely group and non-crushed completely group. The CT value of each target stone was measured, and 15 TA parameters was extracted by delineating the 3D regions of interest (ROI) in Mazda software. The receiver operating characteristic curve (ROC) was drawn to determine the optimal critical value of each parameter between the two groups based on Jordan index, and univariate and multivariate logistic regression analyses were used to determine the significant factors on the curative effects of LL.

RESULTS

156 suspected samples were analyzed, and 94 samples, with 102 stones, were finally identified as qualified subjects. On univariate analysis, the significant differences (*P*< 0.05) among 7 parameters were shown, including CT value, Volume, Variance3D, Skewness3D, Kurtosis3D, Z-RLNonUni, Z-GLevNonU. On multivariate analysis, perc.01 3D > 2062(*P*=0.03) and Z-Fraction> 0.45570(*P*=0.009) were significant independent predictors of LL success, and the odds ratios (OR) respectively were 24.204 and 60.329. In subgroup analysis based on the cutoff value of CT value (HU=960)of stones, the significance of Perc.01 3D(OR=44.154,95%CI(2.379,819.618),*P*=0.011)and Z-Fraction(OR=14.519,95%CI(2.088,100.953),*P*=0.007)were also stronger.

CONCLUSION

3D-CTTA and multi-parameter combination can be used as quantitative references to predict whether target stones could be completely crushed by LL for patients with ureteral calculus before operation.

CLINICAL RELEVANCE/APPLICATION

(dealing with ureteral calculus and laser lithotripsy)'3D-CTTA and multi-parameter combination can be recommended as quantitative references to predict whether target stones could be completely crushed by laser lithotripsy for patients with ureteral calculus before operation.'

UR192-ED-THA7 Suspected Renal Colic: Multispecialty Consensus Imaging and CT Dose Reduction Recommendations

Station #7

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TEACHING POINTS

1. CT is overused in acute flank pain imaging. 2. While CT is the most accurate imaging method to detect stones, it is not needed in all patient who present with suspected renal colic. 3. Recent patient-centric multispecialty (Radiology-ACR, Emergency Medicine-ACEP, Urology-AUA) consensus recommendations have been developed based on published evidence and have been operationalized using clinical vignettes. 4. Further, recent publications suggest that radiologists are not adequately reducing patient dose during flank pain CT.

TABLE OF CONTENTS/OUTLINE

1. Review of evidence for CT overuse and reduced exposure underuse.2. Description of multispecialty consensus panel guideline development. 3. Case-based Review of imaging recommendations. 4. Review methods to decrease CT dose during flank pain CT.

GUS-THB

Genitourinary Thursday Poster Discussions

Thursday, Dec. 5 12:45PM - 1:15PM Room: GU/UR Community, Learning Center

GU

AMA PRA Category 1 Credit ™: .50

FDA Discussions may include off-label uses.

Participants
Mary C. Frates, MD, Boston, MA (*Moderator*) Nothing to Disclose

Sub-Events

GU227-SD-THB1 Study of 3D Unenhanced MR Lymphography and Unipedal Direct Lymphangiography plus CT in Patients with Chyluria

Station #1

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PURPOSE

To explore abnormalities of lymphatics and thoracic duct(TD) in patients with Chyluria, using 3D Unenhanced magnetic resonance lymphography(MRL) and Unipedal Direct lymphangiography (DLG) plus CT.

METHOD AND MATERIALS

The study was conducted on 26 patients with Chyluria. The examinations were reviewed separately by two radiologists. Dilated renal lymphatics and other retroperitoneal lymphatics, dilation of TD , multiple tortuous dilated lymphatics around TD, were recorded in MRL. Abnormal distribution of contrast medium, lympho-urinary leakages, and retrograde flow were noted, and the range and distribution of lymphatic vessel lesions were recorded in DLG plus CT. Statistical analyses were performed.

RESULTS

MRL depicted lymphourinary leakage in 20 cases(76.9%):2 cases in bilateral kidneys,6 in left kidney, 10 in right kidney ,2 in bladder. DLG plus CT depicted the level of lymphourinary leakage:6 cases in bilateral kidneys,7 in left kidney, 10 in right kidney ,3 in bladder. The level of agreement between MRL and DLG plus CT is moderate (kappa=0.60 p<0.01). In 3 cases the cervical section of TD were not distributed by contrast medium at DLG plus CT, can all be observed in MRL.In 2 cases unilateral double renal pelvis and ureter were found by MRL, which were misdiagnosed in DLG plus CT.

CONCLUSION

MRL combined with DLG plus CT could provide more comprehensive assessment of TD and lymphourinary leakage.

CLINICAL RELEVANCE/APPLICATION

Surgical Treatment such as renal lymphatics stripping and ligation were performed in some patients based on the Lymphourinary leakage location indicated by DLG plus CT and MRL.

GU228-SD-THB2 Unenhanced Computed Tomography (CT) Findings as Predictors of Success of Conservative Management of Emphysematous Pyelonephritis (EPN)

Station #2

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PURPOSE

To study CT radiological findings predicting success of conservative treatment in cases of emphysematous pyelonephritis (EPN).

METHOD AND MATERIALS

Patients with EPN admitted from Jan 2000 to Dec 2018 were retrospectively analyzed. Pre-admission NCCT findings including presence of hydronephrosis, urinary obstruction, and grades of EPN (four grades according to the laterality of air locule distribution in renal pelvis, parenchyma and peinephric spaces) and air locule volume were investigated for success of the conservative treatment. Air locule volume was estimated by summation of air locules volume using the following formula (W x H x L x0.52). In all cases conservative treatment were initiated till availability of urine culture and antibiotic is changed accordingly. Persistence of symptoms for >3 days is considered failure of conservative treatment and patients were managed by renal drainage (PCN or JJ stent). Patients' age, sex, presenting symptoms, diabetes, type of urine culture organism, serum creatinine, hemoglobin, WBCs, platelets, albumin, platelet/ WBCs ratio,. Multivariate analysis for statistically significant variable was done using logistic regression analysis.

RESULTS

The study included 54 patients (12 males and 42 females) with mean age± SD of 48±10 years. The grades of EPN were grade I, II, III and IV in 20, 10, 20 and 4 patients, respectively. Conservative treatment was successful in 10 patients (18.5 %). In two cases urgent nephrectomy was done (stage III). In 42 cases, renal drainage was required (17 by JJ stent and 25 by PCN). In univariate analysis, air locule volume and presence of hydronephrosis were statistically significant variables associated with failure of conservative treatment (p= 0.002 and 0.04, respectively). Air locule volume of 54 cc has 70% sensitivity and 90 % specificity as a predictor of conservative treatment success (AUC= 0.82 and P=0.002). In multivariate analysis, Presence of hydronephrosis and air locule volume > 54 cc were associated with 5.5 and 12 folds risk of failure of conservative treatment with p value and OR (95% CI) were [0.04, 5.5 (1.03-9.5) and 0.007, 12.1 (1.96-7.6), respectively]

CONCLUSION

Conservative treatment should be considered in selected cases of EPN. Presence of hydronephrosis and large air locule volume >54 cc in preadmission CT were predictors of conservative treatment failure.

CLINICAL RELEVANCE/APPLICATION

Prediction of EPN outcome

GU229-SD-THB3 Uronephropathy in Erdheim-Chester Disease (ECD)

Station #3

Participants
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PURPOSE

To assess radiologic manifestations of urologic involvement in an ECD cohort and to investigate associations between imaging findings of uronephropathy and the BRAFV600E mutation.

METHOD AND MATERIALS

This prospective study included 62 ECD patients (47 men; mean age, 52) who gave informed consent. Abdominopelvic images (45 MRI, 17 CT) were reviewed by two expert radiologists. Imaging findings related to kidney, renal vasculature, ureter, and urinary bladder were recorded. ECD and BRAFV600E status were confirmed by histopathological and molecular analysis of samples. The association between BRAFV600E mutation and imaging findings was analyzed via Fisher's exact test.

RESULTS

Fourteen of 62 patients (23%) had no urologic imaging findings. Forty-one of 48 (85%) cases with renal involvement had perinephric histiocytic infiltration, also known as 'hairy kidney'. Twenty-three had hydronephrosis (17 bilateral), 15 showed hydroureter (10 bilateral), and 4 had cystomegaly. Ten had renal artery stenosis (3 bilateral), with 3 requiring renal artery stents. Two (3%) developed end-stage renal disease (ESRD) from urologic involvement and underwent renal transplantation. Three renal biopsies showed extracapsular infiltrate without parenchymal infiltration and characteristic xanthomatous changes. In patients with renal involvement, the mean estimated glomerular filtration rate was 89.5 mL/min, and the mean creatinine was 1.09 mg/dl. The BRAFV600E mutation was positive in 52% (32/59) of samples. Perinephric infiltration (p= 0.002) and hydronephrosis (p= 0.01) showed significant association with the BRAFV600E mutation. However, hydroureter (p= 1), renal artery stenosis (p= 0.11), and cystomegaly (p= 0.61) were not associated with mutation status.

CONCLUSION

ECD commonly manifests with urologic disease and may lead to renal dysfunction. Patients should be screened for urological

complications through laboratory and imaging studies. Significant associations exist between the most frequent urologic imaging findings and the BRAFV600E mutation.

CLINICAL RELEVANCE/APPLICATION

Due to high incidence of urologic involvement in ECD, knowledge of imaging features is crucial in clinical management. BRAF status could potentially stratify patients, by detecting high risk sub-group, for screening measures.

GU244-SD-THB5 IntraVoxel Incoherent Motion Imaging Detect Placental Microvascular Impairment in Fetal Growth Restriction: A Prenatal MR Study

Station #5

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PURPOSE

To investigate the potential of Intravoxel Incoherent Motion (IVIM) model in the study of placental microvascular and microstructural characteristics in Fetal Growth Restriction (FGR) pregnancies and in normal placentae.

METHOD AND MATERIALS

63 subjects including normal and FGR pregnancies were enrolled. Placental MR examinations were performed using a 1.5 T scanner, including a prototype Diffusion-Weighted Echo-Planar Imaging sequence with 10 different b values (0, 10, 30, 50, 75, 100, 150, 400, 700, 1000 s/mm2). Six ROIs were manually placed on each placenta on different areas of both Fetal and Maternal side. The mean values of fraction of perfusion fp, Pseudo-Diffusion Coefficient D* and Diffusion Coefficient D were obtained for normal and pathological placentae. Differences between ROIs f, D, D* mean values and IVIM parameters correlation with gestational age (GA) were investigated in both normal and FGR group.

RESULTS

IVIM parameters showed statistically significant differences in both normal and pathological groups. In both normal and FGR placentae fetal side ROIs are more perfused, especially in U-ROI, with general higher fp and D* values ($p<0.05$). In FGR group, there is a decreased microperfusion and diffusivity than normal placentae, with significant lower IVIM parameters fp, D and D* (fp: p=6*10-10; D: p=0,006; D*: p=0.01). In pathological placentae, D has a statistically significant negative correlation with GA in both maternal and fetal ROIs, depicting a decreased diffusivity trend with placental aging ($p<0.0001$).

CONCLUSION

DW imaging with IVIM model highlighted a lower perfusion and an impaired diffusivity in dysfunctional placental parenchyma of FGR pregnancies. Therefore, IVIM parameters have the potentiality to reflect microstructural and microvascular characteristics of placental impairment occuring in pregnancies complicated by fetal growth restriction.

CLINICAL RELEVANCE/APPLICATION

This prenatal MR study suggests that IVIM model could be a useful additional noninvasive tool in the in vivo detection of microperfusion impairment occurring in FGR placentae. Based on our experience, the use of placental MR with IVIM-DW imaging has clinical relevance since it allows to obtain further quantitative information on placental tissue in vivo, being helpful in the prenatal management of pregnancies complicated by FGR, even in early gestational ages.

GU245-SD-THB6 Size of Kidney Stones in Computed Tomography: Influence of Acquisition and Image Reconstruction Parameters

Station #6

Participants
Nils Grosse Hokamp, MD, Koln, Germany (*Presenter*) Speakers Bureau, Koninklijke Philips NV
Robert P. Reimer, Marburg, Germany (*Abstract Co-Author*) Nothing to Disclose
Martin Merkt, Cologne, Germany (*Abstract Co-Author*) Nothing to Disclose
Kristina Sonnabend, Cologne, Germany (*Abstract Co-Author*) Nothing to Disclose
Johannes Salem, Cologne, Germany (*Abstract Co-Author*) Nothing to Disclose
David C. Maintz, MD, Koln, Germany (*Abstract Co-Author*) Nothing to Disclose
Stefan Haneder, MD, Cologne, Germany (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

Computed tomography (CT), preferably conducted using low-dose techniques, is the imaging modality of choice in suspected urolithiasis. Information obtained from CT include presence, location and size of stones while the latter frequently determines need for treatment. While there appears consensus regarding size measurements conducted on axial plane, the influence of other factors possibly impairing accurate measurement including radiation dose, reconstruction algorithm (RA) and kernel is unknown.

METHOD AND MATERIALS

Fifty stones of different composition, shape, etc. were collected and imaged in a 3D-printed, semi-anthropomorphic phantom. Stone size was measured manually with a digital caliper (Man-M). Stones were then imaged with 2 and 10 mGy using a spectral detector CT. Images were reconstructed using filtered back projection, hybrid-iterative and model-based iterative RA (FBP, HIR, MBIR) with soft, routine and sharp kernels. All stones underwent semi-automatic, threshold-based segmentation and consecutive analysis using an in-house developed software allowing for automated computation of maximum diameter. Statistics were conducted using ANOVA ± correction for multiple comparisons.

RESULTS

Average stone size was 10.0±3.2 mm (4.3-20.6 mm). Overall, stone size as compared to manual measurements was overestimated in CT (8.6 vs 10.0 mm, p<=0.05); however, showed a good correlation (p<=0.05, R2=0.683). Radiation dose did not influence measurement error (p<=0.05), while MBIR tended to underestimate size (e.g. FBP/MBIR: 10.3/9.7mm, p<=0.05). Segmentations using sharp image kernels did show closest agreement with Man-M as compared to soft kernels (8.6 vs 9.7/10.2, both p<=0.05). Differences within single stones were as high as 40% (e.g. Man-M: 7.3 mm, largest/smallest CT-based: 6.8/11.5 mm).

CONCLUSION

CT-based measurements tend to overestimate stone size as compared to manual measurements. They can be conducted irrespective of radiation dose; however, reconstruction algorithms and kernels may have relevant impact on size measurements. Differences between manual and CT-based measurements can be minimized by utilization of model-based iterative reconstruction algorithms with a sharp kernel.

CLINICAL RELEVANCE/APPLICATION

If using CT-based measurements of kidney stone size for clinical decision making, image reconstruction parameters need to be considered as they may greatly influence stone size in CT.

UR194-ED-THB7 A Guide to Imaging in Pancreas and Kidney Transplants

Station #7

Awards

Certificate of Merit

Participants
Ashish P. Wasnik, MD, Ann Arbor, MI (*Presenter*) Nothing to Disclose
Amit Pandya, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
John D. Millet, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose
Rohit V. Anand, BA, Battle Creek , MI (*Abstract Co-Author*) Nothing to Disclose
Shadi F. Azar, MBBS, Milan, MI (*Abstract Co-Author*) Nothing to Disclose
Ronald O. Bude, MD, Ann Arbor, MI (*Abstract Co-Author*) Nothing to Disclose

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TEACHING POINTS

1. Review indications and surgical techniques of simultaneous pancreas-kidney (SPK) transplants and solitary renal transplants 2. Review multimodal imaging of normal pancreas and renal grafts as well as vascular and non-vascular complications that can help timely diagnosis and appropriate management. 3. Present structured templates in pancreas and renal transplants that can help communicate relevant findings related to the surgical team.

TABLE OF CONTENTS/OUTLINE

Overview of indications, surgical techniques in SPK transplant and independent renal transplant with schematic illustrations. Role of various imaging modalities in post-transplant evaluation. Review multimodal imaging in normal pancreas and renal transplant along with complications with representative examples, as follows. Pancreas Transplant complications.Vascular: arterial stenosis and occlusion, venous thrombosis, arteriovenous fistula. Parenchymal: inflammation, necrosis. Perigraft hematoma, abscess, pseudocyst. Renal Transplant complications. Vascular: arterial/ venous stenosis, thrombosis, pseudoaneurysm and arteriovenous fistula. Parenchymal: Rejection, infarcts, acute tubular necrosis, pyelonephritis, abscess, neoplasm. Perigraft hematoma/collection, urinoma, lymphocele. Present structured reporting template for pancreas and kidney transplant evaluation.

UR195-ED-THB8 MR Imaging of Penile Neoplasms: Not That Hard

Station #8

Participants
Satheesh Krishna, MD, Toronto, ON (*Presenter*) Nothing to Disclose
Ronaldo H. Baroni, MD, Sao Paulo, Brazil (*Abstract Co-Author*) Nothing to Disclose
Krishna Prasad Shanbhogue, MD, Jersey City, NJ (*Abstract Co-Author*) Nothing to Disclose
Girish Kulkarni, MD, Toronto, ON (*Abstract Co-Author*) Nothing to Disclose
Nicola Schieda, MD, Ottawa, ON (*Abstract Co-Author*) Nothing to Disclose

For information about this presentation, contact:

satheeshkrishna.jeyaraj@utoronto.ca

TEACHING POINTS

1. Understand treatment of penile neoplasms has radically evolved with organ-sparing surgeries and locoregional therapies. EUA 2018 guidelines recommend MRI when organ sparing surgery is considered. 2. Appreciate changes in TNM staging which is crucial for accurate MR interpretation to avoid overtreatment to avoid devastating physical and psychological consequences.

TABLE OF CONTENTS/OUTLINE

MRI correlates of normal anatomical structures and surgical planes Perfecting Penile MR - Optimal patient, coil and penile positioning

- 2D or 3D T2-weighted MRI? Is Gadolinium necessary? Diffusion weighted imaging which b-values to use? The concept of multi-parametric penile MRI. Intracavernosal prostaglandin injection - does it have added value? Nodal staging, is there a role for SPIO agents? Special emphasis on updated 8th TNM classification. What has changed since the 7th edition and how does it affect imaging? Examples of T1, T2, T3 and T4 cancers including challenging cases and tips and tricks Beyond T-staging: Extent of resection planning; Identification of Satellite nodules; Grading (G1 - G3) of tumor - How can quantitative ADC help avoid incorrect biopsy grading due to undersampling? Radiomics and future Imaging appearances post-surgery, radiotherapy, recurrence Miscellaneous neoplasms - metastases, sarcomas, glomus tumor and mimics

Printed on: 10/29/20

SPSH53

Hot Topic Session: Imaging of the Placenta-Where Do We Stand in 2019?

Thursday, Dec. 5 3:00PM - 4:00PM Room: S404AB

GU OB

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

Participants
Liina Poder, MD, Mill Valley, CA (*Moderator*) Nothing to Disclose

For information about this presentation, contact:

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LEARNING OBJECTIVES

1) Understanding the epidemiology and impact of Placenta Accreta Spectrum (PAS) disorders on maternal fetal health. 2) Understanding the current concepts of pathophysiology of Placenta Accreta Spectrum (PAS) disorders. 3) Understanding the role and impact of imaging in diagnosis and treatment of Placenta Accreta Spectrum (PAS) disorders. 4) Understanding current FIGO guidelines in diagnosis and treatment and most current consensus on Placenta Accreta Spectrum (PAS) disorders.

Sub-Events

SPSH53A Impact of PASD in Maternal Fetal Health: The Big Picture

Participants
Dana R. Gossett, MD, San Francisco, CA (*Presenter*) Consultant, Bayer AG

For information about this presentation, contact:

dana.gossett@ucsf.edu

LEARNING OBJECTIVES

1) Review clinical risk factors, clinical presentation, and morbidity associated with invasive placentation. 2) Present current evidence regarding timing and surgical technique for delivery with invasive placentation. 3) Review team structure and coordination with surgical, obstetric, anesthetic, and radiologic teams for optimal patient outcomes.

SPSH53B What We Know of Pathophysiology of PAS Disorder in 2019

Participants
Jonathan Hecht, MD, PhD, Boston, MA (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

JLHecht@BIDMC.Harvard.edu

LEARNING OBJECTIVES

1) Understanding the current concepts of pathophysiology of Placenta Accreta Spectrum (PAS) disorders. 2) Pathologic correlates of PAS imaging. 3) Potential biomarkers of PAS.

ABSTRACT

Pathophysiology of the placenta accreta spectrum (PAS) will be discussed with reference to defects of trophoblast biology that lead to excessive invasion of the myometrium, the role of abnormal decidualization at the endometrium-myometrial interface in pregnancy, and uterine remodeling in the setting of placenta previa and dehiscence of prior cesarean scar. Potential serum or imaging biomarkers of PAS will be discussed.

SPSH53C Current Status and International Consensus on Imaging of PAS Disorders

Participants
Priyanka Jha, MBBS, San Francisco, CA (*Presenter*) Nothing to Disclose
Charis Bourgioti, MD, Athens, Greece (*Presenter*) Nothing to Disclose

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LEARNING OBJECTIVES

1) Review current updates on US and MR imaging findings of PAS disorders. 2) Develop a checklist of observations for dedicated US evaluation once abnormality is detected. 3) Develop an approach for troubleshooting difficult and equivocal cases.

ABSTRACT

Placenta accreta spectrum disorders may account for a number of important adverse maternal events during the course of delivery; therefore, prenatal diagnosis of the presence and extent of myometrial invasion or placental extrauterine spread is critical for optimal management. Sonography is the frontline imaging modality for the evaluation of abnormal placenta; MRI performs equally well and can be used as a reliable alternative in cases of equivocal sonographic findings or for better topography in case of placental lateral extension. The aim of this presentation is to review current updates on the imaging of PAS disorders and comment on US and MRI indications, in an attempt to familiarize radiologists with the 'hot' topic of abnormal placentation.

SPSH53D Current Role and Impact of Interventional Radiology in PAS Disorders

Participants
Philippe A. Soyer, MD, PhD, Paris, France (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) To understand the role of interventional radiology in women with postpartum hemorrhage due to placenta accreta spectrum (PAS) disorders. 2) To know the different options provided by interventional radiology in PAS disorders. 3) To understand the advantages and limitations of each approach.

ABSTRACT

To date, embolization of pelvic arteries in women with postpartum hemorrhage due to PAS disorder is the treatment option for which highest degrees of evidence are available. However, other options have been tested, including prophylactic catheter placement, balloon occlusion of the internal iliac arteries and abdominal aorta balloon occlusion. This presentation will provide an overview of the currently reported interventional radiology procedures that are used for the treatment of postpartum hemorrhage due to PAS disorders and suggest recommendations based on current evidences.

Printed on: 10/29/20

RC707

Advances in Imaging of Small Incidental Renal Masses (Including Cancers): Implications for Management

Thursday, Dec. 5 4:30PM - 6:00PM Room: E353B

GU OI

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

Participants
Nicole M. Hindman, MD, New York, NY (*Presenter*) Nothing to Disclose
Matthew S. Davenport, MD, Ann Arbor, MI (*Presenter*) Royalties, Wolters Kluwer nv
Nicola Schieda, MD, Ottawa, ON (*Presenter*) Nothing to Disclose
Stuart G. Silverman, MD, Brookline, MA (*Presenter*) Nothing to Disclose

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Nicole.Hindman@nyulangone.org

LEARNING OBJECTIVES

1) Recommend appropriate management for the incidental renal mass using the latest guidelines. 2) Generate a comprehensive evaluation of indeterminate renal masses using a novel structured report. 3) Predict malignant subtypes of renal cancers (and differentiate from benign masses) using new developments in CT and MRI. 4) Manage small renal masses, including select renal cancers, with active surveillance based on imaging and biopsy.

RC710

Second and Third Trimester Obstetrical Ultrasound

Thursday, Dec. 5 4:30PM - 6:00PM Room: S103CD

GU OB US

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

LEARNING OBJECTIVES

1) Understand how measurements can be used in obstetrical ultrasound. 2) Know which measurements should be used routinely in obstetrical ultrasound. 3) Know how to determine gestational age and estimate fetal weight. 4) To diagnose placenta previa. 5) To diagnose vasa previa. 6) To diagnose morbidly adherent placenta. 6) Identify chorionicity and amnionicity in multiple gestations. 7) Detect complications of monochorionic placentation. 8 Identify those cases that need referral for prenatal intervention.

Sub-Events

RC710A OB Measurements

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

For information about this presentation, contact:

pdoubilet@gmail.com

LEARNING OBJECTIVES

1) Understand how measurements can be used in obstetrical ultrasound. 2) Know which measurements should be used routinely in obstetrical ultrasound. 3) Know how to determine gestational age and estimate fetal weight.

Active Handout:Peter Michael Doubilet

http://abstract.rsna.org/uploads/2019/18000732/Active RC710A.pdf

RC710B Pregnancy Support Structures: Placenta and Umbilical Cord

Participants
Paula J. Woodward, MD, Salt Lake City, UT (*Presenter*) Editor, Reed Elsevier

LEARNING OBJECTIVES

1) Distinguish low-lying placenta from placenta previa. 2) Confidently diagnose vasa previa. 3) Recognize findings in placenta accreta spectrum and their clinical implication.

ABSTRACT

The placenta and umbilical cord are quite literally the lifeline for the developing fetus. Abnormalities in either can adversely affect the pregnancy and pose a significant risk of morbidity or mortality to either the fetus or mother at the time of delivery.

RC710C Multiple Gestations

Participants
Anne M. Kennedy, MD, Salt Lake City, UT (*Presenter*) Author with royalties, Reed Elsevier

For information about this presentation, contact:

anne.kennedy@hsc.utah.edu

LEARNING OBJECTIVES

1) Identify chorionicity and amnionicity in multiple gestations. 2) Detect complications of monochorionic placentation. 3) Identify those cases that need referral for prenatal intervention.

Active Handout:Anne M. Kennedy

http://abstract.rsna.org/uploads/2019/18000734/Active RC710C.pdf

RC713

Read Cases with Experts

Thursday, Dec. 5 4:30PM - 6:00PM Room: E351

GU OB PD

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

Sub-Events

RC713A Fetal Neuro Cases

Participants
Beth M. Kline-Fath, MD, Cincinnati, OH (*Presenter*) Nothing to Disclose

For information about this presentation, contact:

beth.kline-fath@cchmc.org

LEARNING OBJECTIVES

1) To reinforce discriminating between normal and abnormal development. 2) To present pathologies with regard to the supratentorial and infratentorial brain to familiarize the audience with common and rare entities that are relevant to clinical practice. 3) To review a patterned approach and critical thinking skills necessary for correct diagnosis.

ABSTRACT

Cases of central nervous system fetal pathology will be presented. The fetal brain changes dramatically during gestation.

RC713B Fetal Lung Cases

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

For information about this presentation, contact:

armeholl@texaschildrens.org

LEARNING OBJECTIVES

Review fetal imaging cases that highlight a variety of pathologies which occur in the fetal chest. Apply an organized approach to evaluating and diagnosing fetal lung malformations. Recognize complications and improve awareness of fetal and postnatal therapies.

RC713C Fetal GI Cases

Participants
Teresa Victoria, MD,PhD, Philadelphia, PA (*Presenter*) Nothing to Disclose

RC829

Abdominal/Pelvic MRI in the Emergent Setting

Friday, Dec. 6 8:30AM - 10:00AM Room: E263

GI GU MR

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

Participants
John R. Leyendecker, MD, Dallas, TX (*Moderator*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the advantages and disadvantages of MRI in the acute setting for the diagnosis of acute genitourinary disorders. 2) Identify the diagnostic criteria for ovarian torsion and also predict ovarian viability with MRI. 3) Contrast the strengths of different MRI sequences for the diagnosis of pyelonephritis. 4) Apply a rapid, noncontrast MRI protocol for the imaging of acute abdominopelvic pain that is accurate for the diagnosis of acute genitourinary disorders. 5) Discuss clinical and imaging features of a spectrum of entities that present with acute female pelvic pain including complications of fibroids, pelvic inflammatory disease and complicated cysts. 6) Highlight the pathogenesis and pertinent MR imaging features of adnexal (ovarian and tubal) torsion. 7) Assess the relative advantages and disadvantages for MR vs. other imaging modalities for suspected appendicitis in adults. 8) Assess the ability of MR for making alternative diagnoses to acute appendicitis in the setting of non-traumatic abdominal pain. 9) Consider the implications for the potential increased use of MR in the ED for non-traumatic abdominal pain. 10) Identify patients who will benefit from MR enterography in the acute setting. 11) Protocol and perform MR enterography in the acute setting. 12) Identify and report acute findings of Crohn's disease on MR enterography. 13) Discuss the most common indications for abdominal or pelvic MRI in pediatric patients in the emergent setting. 14) Demonstrate and discuss the most frequently encountered MRI imaging manifestations of these conditions. 15) Review the most appropriate MRI protocols for evaluation of pediatric patients presenting to the Emergency Department with acute abdominal or pelvic pain. 16) Discuss available techniques for achieving patient cooperation and limiting exam time in pediatric patients. 17) Understand MRI safety concerns in the setting of pregnancy. 18) Understand indications for emergency MRI during pregnancy. 19) Implement an imaging protocol for emergency MRI during pregnancy. 20) Understand MRI appearance of common acute disease processes during pregnancy.

Sub-Events

RC829A MRI for Acute Genitourinary Disorders

Participants
Bobby T. Kalb, MD, Tucson, AZ (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand the advantages and disadvantages of MRI in the acute setting for the diagnosis of acute genitourinary disorders. 2) Identify the diagnostic criteria for ovarian torsion and also predict ovarian viability with MRI. 3) Contrast the strengths of different MRI sequences for the diagnosis of pyelonephritis. 4) Apply a rapid, noncontrast MRI protocol for the imaging of acute abdominopelvic pain that is accurate for the diagnosis of acute genitourinary disorders.

RC829B MRI for Acute Pelvic Pain in Women

Participants
Christine O. Menias, MD, Chicago, IL (*Presenter*) Royalties, Reed Elsevier

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menias.christine@mayo.edu

LEARNING OBJECTIVES

1) Discuss clinical and imaging features of a spectrum of entities that present with acute female pelvic pain including complications of fibroids, pelvic inflammatory disease and complicated cysts. 2) Highlight the pathogenesis and pertinent MR imaging features of adnexal (ovarian and tubal) torsion.

RC829C MRI for Acute Appendicitis and Differential Diagnosis

Participants
Perry J. Pickhardt, MD, Madison, WI (*Presenter*) Stockholder, SHINE Medical Technologies, Inc; Stockholder, Elucent Medical; Advisor, Bracco Group;

LEARNING OBJECTIVES

1) Assess the relative advantages and disadvantages for MR vs. other imaging modalities for suspected appendicitis in adults. 2) Assess the ability of MR for making alternative diagnoses to acute appendicitis in the setting of non-traumatic abdominal pain. 3) Consider the implications for the potential increased use of MR in the ED for non-traumatic abdominal pain.

RC829D MRI for Crohn's Disease in the Acute Setting

Participants

David J. Grand, MD, Barrington, RI (*Presenter*) Nothing to Disclose

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dgrand@lifespan.org

LEARNING OBJECTIVES

1) Identify patients who will benefit from MR enterography in the acute setting. 2) Protocol and perform MR enterography in the acute setting. 3) Identify and report acute findings of Crohn's disease on MR enterography.

RC829E MRI for Acute Pediatric Disorders

Participants
Sarah D. Bixby, MD, Boston, MA (*Presenter*) Nothing to Disclose

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sarah.bixby@childrens.harvard.edu

LEARNING OBJECTIVES

1) Discuss the most common indications for abdominal or pelvic MRI in pediatric patients in the emergent setting. 2) Demonstrate and discuss the most frequently encountered MRI imaging manifestations of these conditions. 3) Review the most appropriate MRI protocols for evaluation of pediatric patients presenting to the Emergency Department with acute abdominal or pelvic pain. 4) Discuss available techniques for achieving patient cooperation and limiting exam time in pediatric patients.

RC829F Emergency MRI During Pregnancy

Participants
Gaurav Khatri, MD, Irving, TX (*Presenter*) Nothing to Disclose

LEARNING OBJECTIVES

1) Understand MRI safety concerns in the setting of pregnancy. 2) Understand indications for emergency MRI during pregnancy. 3) Implement an imaging protocol for emergency MRI during pregnancy. 4) Understand MRI appearance of common acute disease processes during pregnancy.

Active Handout:Gaurav Khatri

http://abstract.rsna.org/uploads/2019/19001016/Active RC829F.pdf

Printed on: 10/29/20

RC852

Carotid and Renal Doppler (Hands-on)

Friday, Dec. 6 8:30AM - 10:00AM Room: E264

GU VA US

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

FDA Discussions may include off-label uses.

Participants
Gowthaman Gunabushanam, MD, New Haven, CT (*Presenter*) Nothing to Disclose
Shweta Bhatt, MD, Rochester, NY (*Presenter*) Nothing to Disclose
Wui K. Chong, MD, Houston, TX (*Presenter*) Nothing to Disclose
Corinne Deurdulian, MD, Encino, CA (*Presenter*) Speaker, Samsung Electronics Co, Ltd
Vikram S. Dogra, MD, Pittsford, NY (*Presenter*) Nothing to Disclose
Ulrike M. Hamper, MD, Baltimore, MD (*Presenter*) Nothing to Disclose
Davida Jones-Manns, Owings Mills, MD (*Presenter*) Nothing to Disclose
Mark E. Lockhart, MD, Birmingham, AL (*Presenter*) Author, Oxford University Press; Author, Reed Elsevier; Editor, John Wiley & Sons, Inc; Deputy Editor, Journal of Ultrasound in Medicine
Nira Beck-Razi, MD, Haifa, Israel (*Presenter*) Nothing to Disclose
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, Essex, CT (*Presenter*) Speaker, Koninklijke Philips NV
Ravinder Sidhu, MD, Rochester, NY (*Presenter*) Nothing to Disclose
Sadhna Verma, MD, Cincinnati, OH (*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 renal Doppler ultrasound. 3) Review qualitative and quantitative criteria for diagnosing abnormalities in carotid and renal ultrasound Doppler examinations.

ABSTRACT

This hands-on course will provide participants with a combination of didactic lectures and an extended 'live' scanning opportunity on normal human volunteers, as follows: Didactic lectures (30 minutes): Carotid Doppler ultrasound: scanning technique, diagnostic criteria and interesting teaching cases. Renal Doppler ultrasound: scanning technique, diagnostic criteria and interesting teaching cases. Mentored scanning (60 minutes): Following the didactic lectures, the participants will proceed to a scanning area with normal human volunteers and ultrasound machines from different manufacturers. Participants will be able to perform live scanning with direct assistance, 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 renal Doppler studies.

SST04

Genitourinary (Urographic Imaging)

Friday, Dec. 6 10:30AM - 12:00PM Room: E350

GU

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

FDA Discussions may include off-label uses.

Participants
Dean A. Nakamoto, MD, Beachwood, OH (*Moderator*) Research agreement, Canon Medical Systems Corporation; Research agreement, General Electric Company
John R. Leyendecker, MD, Dallas, TX (*Moderator*) Nothing to Disclose
Geoffrey E. Wile, MD, Nashville, TN (*Moderator*) Nothing to Disclose

Sub-Events

SST04-01 Evaluation of Asymptomatic Microscopic Hematuria by Renal Ultrasound to Detect Upper Tract Malignancy: A 20-Year Experience in a Community Hospital

Friday, Dec. 6 10:30AM - 10:40AM Room: E350

Participants
Matthew Smith, MD,PhD, la Crosse , WI (*Presenter*) Nothing to Disclose
Keaton Read, la Crosse , WI (*Abstract Co-Author*) Nothing to Disclose
Matthew Stegman, MD, la Crosse , WI (*Abstract Co-Author*) Nothing to Disclose
Neil J. Kroll, MD, la Crosse , WI (*Abstract Co-Author*) Nothing to Disclose
Marvin van Every, MD, La Crosse , WI (*Abstract Co-Author*) Nothing to Disclose

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PURPOSE

Asymptomatic microscopic hematuria (AMH) can be a sign of upper tract (UT) malignancy and requires evaluation. However, the preferred imaging modality of the UT is controversial. Our healthcare system is an integrated medical center with 30 regional clinics serving 21 counties over a tri-state region has routinely used renal ultrasound (RUS) for the initial evaluation of the UT in patients with AMH because of cost and performance. The purpose of this study was to evaluate the sensitivity of RUS for detecting UT malignancy in patients with AMH.

METHOD AND MATERIALS

An IRB approved, retrospective study was performed of all patients who received a renal ultrasound in our health system from January 1, 1997 to July 1, 2015. Patients were excluded if they had <3 years of follow-up, <18 years old, history of prior UT genitourinary cancer, catheter, inpatient status, pregnant status, gross hematuria (GH) or spotting, or if the health record did not contain sufficient detail to rule out GH. The initial RUS was considered positive if findings led to a diagnosis of UT malignancy. Regardless of the RUS results, health records were then reviewed to determine whether any UT cancer was subsequently diagnosed to assess for false negatives.

RESULTS

Of the 4871 patients who underwent a RUS during the study period, 2124 met eligibility criteria. The average follow-up was 11.6 years (range: 3-21.6, stdev: 4.9). Twelve (0.6%) patients were diagnosed with UT malignancy (9 renal cell carcinoma and 3 urothelial carcinomas) during their initial evaluation, all of whom had an initial RUS positive for malignancy for an overall sensitivity of 100% and negative predictive value of 100%. Four patients were diagnosed with UT malignancy >3 years after an initially negative RUS.

CONCLUSION

We have demonstrated that the sensitivity of RUS is adequate for detection of UT malignancy in patients with AMH, a low-risk population. This study represents a general population from a community outpatient setting with reliable long-term follow-up. Patients whose RUS and cystoscopy findings are negative for signs of malignancy can safely be advised to return for further evaluation if they develop GH, flank pain, or irritative voiding symptoms.

CLINICAL RELEVANCE/APPLICATION

Renal ultrasound is highly sensitive for detection of upper tract malignancies and can be used for initial screening in low-risk patients with asymptomatic microhematuria.

SST04-02 The Diagnostic Yield of CT Urography in the Workup of Hematuria with Negative Cystoscopy

Friday, Dec. 6 10:40AM - 10:50AM Room: E350

Participants

Jessica L. Common, MD, Hamilton, ON (*Presenter*) Nothing to Disclose
Milita Ramonas, MD, Burlington, ON (*Abstract Co-Author*) Nothing to Disclose
Abdullah Alabousi, MD, Burlington, ON (*Abstract Co-Author*) Nothing to Disclose

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jessica.common@medportal.ca

PURPOSE

Current American Urological Association (AUA) guidelines recommend risk-stratified cystoscopy in the workup of hematuria. However, due to insufficient evidence for risk-stratified upper urinary tract imaging, the AUA recommends multiphasic computed tomography urography (CTU) for all patients. The aims of this study are to determine the diagnostic yield of CTU in patients evaluated for hematuria with negative cystoscopy, and to identify those at highest risk of urinary tract malignancy, who would benefit most from upper urinary tract imaging.

METHOD AND MATERIALS

A retrospective study was conducted of patients who underwent CTU within 12 months of negative cystoscopy for workup of hematuria at our institution between January 2017-December 2017. Patients were grouped according to etiology of hematuria. Clinical diagnoses were correlated with patient characteristics, including age, sex, smoking history, and type of hematuria, as well as renal ultrasound (US) and CTU results. Diagnostic concordance of renal US and CTU was compared.

RESULTS

258 patients met the inclusion criteria. Of these, only 1 patient was diagnosed with an upper urinary tract malignancy. 6 other malignancies were diagnosed including 3 renal cell carcinomas (RCC), 2 prostate adenocarcinomas, and 1 metastatic gynecologic malignancy. All malignancies were diagnosed in patients over 50 years of age. 60 patients were diagnosed with urolithiasis, and 56 were diagnosed with benign prostatic hyperplasia (BPH). There was no etiology identified in 109 patients, including 21 of 30 patients age 50 years and under. Renal US was performed in 93 patients. Renal US was diagnostic and concordant with CTU in 56 patients. Renal US failed to detect the diagnosis identified on CTU in 18 cases, including 1 RCC, 7 urolithiasis, 7 BPH, and 3 other benign findings. Both renal US and CTU were non-diagnostic in 11 patients in whom the etiology of hematuria was identified on cystoscopy.

CONCLUSION

Renal US with or without computed tomography of the kidneys, ureters, and bladder (CT KUB) should be considered as an alternative to multiphasic CTU in the workup of hematuria in patients with negative cystoscopy.

CLINICAL RELEVANCE/APPLICATION

Risk-stratified upper tract imaging in the workup of hematuria may reduce radiation exposure with no significant effect on detection of upper urinary tract malignancy or other significant findings.

SST04-03 Multi-Vendor Performance for Determination of Renal Stone Composition: Comparison with Six Dual-Energy CT Scanners

Friday, Dec. 6 10:50AM - 11:00AM Room: E350

Participants
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PURPOSE

The aim of this in-vitro study was to compare the performance of six dual-energy CT (DECT) scanners in determination of stone composition

METHOD AND MATERIALS

A total of 71 urinary stones (size: 2 mm - 16 mm) of known chemical composition (51calcium, 4 struvite, 4 cystine and 12 urate) were placed in a custom-made cylindrical phantom. Consecutive scans with manufacturer-recommended protocols were performed on second-generation dsDECT (S1: SOMATOM Definition Flash, Siemens;100/Sn140kVp), third-generation dsDECT (S2: Force,Siemens;100/Sn150kVp), sfDECT (S3: Edge, Siemens;AuSn120kVp), first-generation rsDECT (S4: Discovery750HD, GE; 80/140kVp), second-generation rsDECT (S5: Revolution, GE; 80/140kVp) and dlDECT (S6: IQon, Philips; 120kVp). Data sets were analysed using effective atomic number (Zeff) and dual-energy ratio indices (DEI) of maximally available spectra (40/190keV for dsDECT and sfDECT, 40/140 keV for rsDECT and 40/200keV for dlDECT) and comparable spectra (40 keV/140 keV) all S1-S6 were computed. Agreement of Zeff and DEI among the scanners was assessed with inter-class coefficient test.

RESULTS

Both Zeff and DEI could differentiate between non-urate and urate stones. For all stone compositions, Zeff showed excellent agreement between scanners (ICC:0.90, 95% CI : 0.86- 0.93). DEI showed lower agreement compared to Zeff. Both, DEI computed by maximally separated spectra (40/140-200keV) and similar spectra (40/140keV for all) showed comparable agreement (ICC:0.63, 95 % CI:0.49-0.75 vs. ICC:0.62, 95 % CI:0.47-74).

CONCLUSION

Overall cross-vendor measurements for determination of stone composition were comparable with all DECT techniques. Zeff is a better quantitative measure than DEI for stone characterization.

CLINICAL RELEVANCE/APPLICATION

In a busy practice with multivendor setting it is important to cross validate the performance for stone composition to provide consistent results since patients can be scanned at different scanners.

SST04-04 Automated Radiomic Analysis of Ureteral Stones Using ER Renal Stone CT Images Predicts Likelihood of Spontaneous Passage

Friday, Dec. 6 11:00AM - 11:10AM Room: E350

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PURPOSE

To quantify the ability of automated radiomic analysis of CT images to predict the likelihood of spontaneous passage of symptomatic renal stones, and to compare the results with the performance of manual measurements.

METHOD AND MATERIALS

This IRB-approved, HIPAA-compliant, retrospective study included symptomatic patients undergoing emergency renal stone CT who had one stone in the kidney or ureters; patients with bladder stones were excluded. Spontaneous passage (or not) was documented based on review of clinical records, patient report, follow-up CT scans, or the need for stone extraction during 6 months of follow-up. Radiologists-in-training manually measured axial and coronal stone dimensions. Automated quantitative stone analysis software computed stone length, width, height, maximum dimension, volume, and CT number, as well as morphologic parameters related to stone heterogeneity and roughness. Univariate logistic regression was used to define odds ratios (OR) of spontaneous passage and ROC analysis was used to assess the ability to predict stone passage. Independent variables identified using multivariable logistic regression were used to create models that incorporated parameters such as patient age and sex, stone volume and dimensions, and morphological features.

RESULTS

Of 195 patients, spontaneous passage was documented in 58% (114/195). Univariate analysis demonstrated numerous significant stone parameters (from the CT data) associated with stone passage ($p<0.001$), including OR (95% CI) of 10.1 (5.11, 19.9) for axial dimension < 4.6 mm and 9.40 (4.84, 18.2) for coronal dimension < 4.9 mm (manual measurements), and 11.14 (5.21, 23.8) for volume < 81 mm3 and 10.58 (5.37, 20.8) for mean curvature < -0.14 (automated measurements). Area under the ROC curve was 0.83 for manual measurements and increased to 0.88 when patient and morphological stone features were included.

CONCLUSION

Automated radiomic analysis quickly and reproducibly predicted stone passage better than manual radiologist measurements. Prospective clinical validation of the developed model is needed.

CLINICAL RELEVANCE/APPLICATION

Automated radiomic analysis of CT data can quickly provide reproducible objective data for guiding management of patients with acute ureterolithiasis.

SST04-05 Dose Independent Characterization of Renal Stones by Means of Spectral Detector Computed Tomography and Machine Learning

Friday, Dec. 6 11:10AM - 11:20AM Room: E350

Participants
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PURPOSE

To predict the main component of both, pure and compound kidney stones using dual energy computed tomography and machine

learning.

METHOD AND MATERIALS

200 kidney stones with a known composition as determined by infrared spectroscopy were examined using a non-anthropomorphic phantom on a spectral detector computed tomography scanner. Stones were of either pure (monocrystalline, n=116) or compound (dicrystalline, n=84) composition. Image acquisition was repeated twice using both, normal and low-dose protocols, respectively (ND/LD). Conventional images and low and high keV virtual monoenergetic images were reconstructed. Stones were semi-automatically segmented. Further analysis was conducted on a per-voxel basis. using a shallow neural network (SNN). ND data was imported in the SNN and split in training (70%), testing (15%) and validation-datasets (15%). LD data then was analyzed by the same network. Accuracy on a per-voxel and a per-stone basis was calculated.

RESULTS

Main components were: Whewellite (n=80), weddellite (n=21), Ca-phosphate (n=39), cysteine (n=20), struvite (n=13), uric acid (n=18) and xanthine stones (n=9). Stone size ranged from 3 - 18 mm. Overall diagnostic accuracy attained with test/training dataset for determining stone composition was 91.1%. On independently tested LD-acquisitions accuracy was 87.1-90.4%.

CONCLUSION

Even in compound stones, the main component can be reliably determined using dual energy CT and machine learning, irrespective of dose protocol.

CLINICAL RELEVANCE/APPLICATION

After transfer to patients, spectral detector CT and machine learning may enable a detalied analysis of renal stone composition and therefore a targeted therapy of different types.

SST04-06 Estimating Differential Renal Function in Patients with Upper Urinary Tract Stones Using Non-Enhanced Computed Tomography

Friday, Dec. 6 11:20AM - 11:30AM Room: E350

Participants
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PURPOSE

For chronic urinary tract stones patients, differential renal function (DRF) is a key indicator for assisting urologists in selecting treatment options (lithotripsy versus nephrectomy). The wide popularity and short acquisition time of unenhanced computed tomography (CT) make it a first-line examination method for imaging patients with ureteral stonesTherefore, this study aimed to determine whether Unenhanced CTimaging can estimate DRF in patients with chronic unilateral obstructive upper urinary tract stones.

METHOD AND MATERIALS

This was a retrospective study of 76 patients, and all patients underwent nonenhanced CT and nuclear renography (RG) at an interval of 4 to 6 weeks due to chronic unilateral obstructive urinary stones. Renal CT measurements (RCMs), consisting of residual parenchymal volume (RPV) and volumetric CT texture analysis parameters, were obtained using a semiautomated method. The percent RCM were calculated using the general format '100*(Left RCM/[Left RCM+Right RCM])'. Then percent RCMs were evaluated for theircorrelation power to DRFderived from RG.

RESULTS

The strongest Pearson coefficient between percent RCM and DRF was reflected by RPV (r=0.957, P<0.001). Combinations of RPV and other parameters did not significantly improve the correlation compared with RPV alone (Pearson's r=0.957 versus r=0.957, 0.957, 0.887, 0.815, and 0.956, for combinations of Hounsfield unit, parenchymal voxel, skewness, kurtosis, and entropy, respectively; all P<0.001). Percent RPV was subsequently introduced into linear regression, and the equation y = -2.66+1.07*x (P < 0.001) was derived to calculate predicted DRF. No statistically difference was found between predicted DRF using the equation and observed DRF according to RG (P=0.959).

CONCLUSION

Unenhanced CT imaging can estimate DRF and may reduce unnecessary use of RG for most patients with chronic unilateral obstructive upper urinary tract stones.

CLINICAL RELEVANCE/APPLICATION

Unenhanced CT can be used as a convenient tool to predict DRF and RPV should be considered as part of routine CT reporting in patients with chronic unilateral obstructive upper urinary tract stones.

SST04-07 Computed Tomography Findings of Upper-Urinary-Tract Lesions in Immunoglobulin G4-Related Disease: Comparison with Urothelial Carcinoma

Friday, Dec. 6 11:30AM - 11:40AM Room: E350

Participants
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PURPOSE

Immunoglobulin G4-related disease (IgG4-RD) can sometimes involve the upper urinary tract and mimic urothelial carcinoma

clinically. There have been indeed quite a few reports mentioning that unnecessary radical nephroureterectomy was performed to those patients. The purpose of this study was to investigate computed tomography (CT) findings of IgG4-RD lesions involving the upper urinary tract and to compare them with those of urothelial carcinomas.

METHOD AND MATERIALS

Pretreatment CT images of 13 consecutive patients of IgG4-RD with urinary tract lesions and 80 consecutive patients with urothelial carcinoma were retrospectively evaluated by two board-certified radiologists. Clinical information of each group was obtained by chart review.

RESULTS

Upper-urinary-tract findings between two groups is summarized in the table. Bilaterality ($P < 0.0001$), symmetry ($P < 0.0001$), extramural growth pattern ($P < 0.0001$), longer lesions($P = 0.04$) and gradual dynamic enhancement pattern ($P < 0.001$) were statistically more frequent in IgG4-RD patients compared to urothelial carcinoma patients. Concerning extra-urinary-tract findings, following findings were significantly common among IgG4-RD patients; paraaortic fat stranding ($P = 0.03$), presacral fat stranding ($P < 0.001$), and fat stranding of pelvic walls ($P < 0.001$). Aortic lesions were significantly more frequent in IgG4-RD patients ($P < 0.001$), on the other hand kidney lesions was seen in only one patient of IgG4-RD and patients with urothelial carcinoma tended to present with direct tumoral invasion to renal parenchyma, although there was no significant difference. There was no significant difference on frequency of hydronephrosis and coexisting pancreatic lesions between each group.

CONCLUSION

Compared to urothelial carcinoma, bilateral, symmetric, and longer involvement, extramural growth pattern, ill-defined margin, gradual enhancement pattern in dynamic CT are suggestive findings of IgG4-RD urinary tract lesions. IgG4-RD can also manifest as ipsilateral asymmetric lesion, which could overlap with those of urothelial carcinoma. Extra-urinary-tract findings such as fat stranding in paraaorta, presacral or pelvic wall area are also useful findings in differentiating IgG4-RD lesions from urothelial carcinoma.

CLINICAL RELEVANCE/APPLICATION

CT is useful in differentiating urinary tract lesions of IgG4-RD from urothelial carcinoma and can prevent unnecessary ureteronephrectomy.

SST04-08 The Feasibility of Compressed Sensing With and Without Breath-Holding on Magnetic Resonance Urography: A Comparison with Conventional 3D Magnetic Resonance Urography Looking at Acquisition Time, Image Quality, and Diagnostic Performance

Friday, Dec. 6 11:40AM - 11:50AM Room: E350

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PURPOSE

To investigate the feasibility of prototypical 3D magnetic resonance urography (MRU) with a compressed sensing (CS) technique for patients with or without breath-holding (BH) capabilities.

METHOD AND MATERIALS

MRU was performed in 66 patients on a 3T system, including BH with CS, navigator-triggered (NT) CS, and conventional NT (cNT) protocols. The patients were divided into two groups, Group1 (the BH group, $n = 56$) and Group II (the compromised BH group, $n = 10$), according to the image quality of a BH-T1-weighted protocol. The quality of urinary tract sharpness and background suppression were scored with a scale of 1 to 5 (poor to good). Urinary tract lesions were detected on reconstructed maximum intensity projections, multiplanar reconstructions, and source images, and graded with the same scale. Comparative analyses of acquisition time and image quality were performed. Receiver operating characteristic (ROC) curve analysis was performed, and sensitivity, specificity, and the area under the ROC curve (AUC) were calculated to determine diagnostic performances.

RESULTS

BH-CS MRU showed reductions of 88.1% and 96.7% in acquisition times compared with NT-CS MRU and cNT MRU in Group1. The acquisition time was reduced by 71.2% for NT-CS MRU compared with cNT MRU in Group II. BH-CS MRU had the best urinary tract sharpness in Group 1, and NT-CS MRU had the least background signal in both groups (both $P < 0.05$). BH-CS MRU presented superior urinary tract sharpness and background suppression in Group1 than Group II (both $P < 0.05$). Group II had better urinary tract sharpness with NT-CS MRU and less background suppression with cNT MRU than Group1 (both $P < 0.05$). Diagnostic efficiencies of all protocols were comparable in Group1 (all $P > 0.05$), while the diagnostic efficiency of BH-CS MRU was significantly lower than the other two protocols in Group II (both $P < 0.05$).

CONCLUSION

BH-CS MRU showed great potential for urinary tract imaging with the shortest acquisition times and excellent image qualities in patients that can hold their breath. For patients that cannot hold their breath, NT-CS MRU would be helpful.

CLINICAL RELEVANCE/APPLICATION

Compressed sensing magnetic resonance urography (MRU) can shorten MR acquisition time with better image quality compared with

conventional MRU.

SST04-09 Validation of Vesical-Imaging Reporting and Data System (VI-RADS): A Single-Centre Retrospective Evaluation of Interobserver Agreement and Diagnostic Accuracy of Multiparametric MRI (mpMRI) in the Setting of Bladder Cancer

Friday, Dec. 6 11:50AM - 12:00PM Room: E350

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PURPOSE

Vesical Imaging-Reporting and Data System (VI-RADS) has been developed to standardize multiparametric MRI (mpMRI) approach to bladder cancer (BC). The aim of this study was to evaluate interobserver agreement and diagnostic accuracy of mpMRI with the use of VI-RADS to discriminate between non-muscle invasive bladder cancer (NMIBC) and muscle-invasive bladder cancer (MIBC).

METHOD AND MATERIALS

Between September 2017 and March 2019, 138 patients referred for suspected bladder cancer underwentmultiparametric MRI of the bladder (mpMRI) prior to transurethral resection of bladder tumor (TURBT). All mpMRI were reviewed by two radiologists, who scored each lesion according to VI-RADS. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated for each VI-RADS cutoff. Receiver operating characteristics curves were used to evaluate the performance of mpMRI. The k statistics was used to estimate inter-readeragreement.

RESULTS

One hundred twenty-six patients were included in the final analysis, 88 with NMIBC and 38 with MIBC. Sensitivity and specificity were 93% and 91% for reader 1 and 86% and 85% for reader 2 respectively when the cutoff VI-RADS > 2 was used to define MIBC. At the same cutoff, PPV and NPV were 81% and 97% for reader 1 and 75% and 94% for reader 2. When the cutoff VI-RADS > 3 was used, sensitivity and specificity were 84% and 95% for reader 1 and 79% and 91% for reader 2. Corresponding PPV and NPV were 85% and 92% for reader 1 and 79% and 92% for reader 2. Area under curve was 0.918 and 0.886 for reader 1and 2 respectively. Inter-reader agreement was good for the overall score (k =0.748).

CONCLUSION

VI-RADS is accurate in differentiating MIBC from NMIBC. The optimal cutoff is VI-RADS >2 to maximize sensitivity and NPV. Inter-reader agreement is overall good.

CLINICAL RELEVANCE/APPLICATION

Magnetic resonance imaging (MRI) scans for bladder cancer with the use of a standardized and validated score as the VI-RADS may help improve patient care.