EUROPEAN SOCIETY OF UROGENITAL RADIOLOGY

ESUR 06

Cairo-Egypt

September 8-11,2006

BOOK OF ABSTRACTS

Main Topic:

Genitourinary Tumors

Venue:

Grand Hyatt Hotel

Welcome To Egypt & ESUR 06…

Dear Friends,

We warmly welcome you to attend the 13th European Symposium on Urogenital Radiology, ESUR 2006...

The symposium will start by the Member's day on September 8th. The programme includes post graduate course, workshops, scientific papers and posters.

The main topic of the Symposium is Imaging of genitourinary tumors. Also, interesting topics on modern Urogenital Imaging will be presented.

The Organizing Committee is delighted to welcome you to the ESUR Cairo meeting in September 2006.

Tarek El-Diasty, MD
Chairman of the Organizing Committee
Of ESUR 06 Symposium

Under the Patronage of Her Excellency Mrs. Suzanne Mubarak

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General Information

Abbreviations

MS Member's Session
L Lecture
WS Workshop
SS Scientific Session
YR Young Radiologist
P Poster Exhibition

Badges:

It is obligatory for all participants to wear their badges visibly throughout the meeting as it is the entrance ticket to all sessions.

Lecture Halls:

Rooms A , B and C are situated at the same floor adjacent each other, on the right hand side of the stairs.
Room D at the same floor at opposite side, on the left hand side of the stairs.
Farhaty Ballroom: Main conference hall: **"BA Floor"**
Akhnaton I: Registration room: **"BA Floor"**
Nefertari II: Board room: **"BA Floor"**
Nefertari III: Secretariat & Presentation room: **"BA Floor"**
Nile Expo: Lunch room: **"NC Floor"**
Check-in and Check-out desk: **Lobby Area**
Tours desk: **"BA Floor"**

Poster Exhibition:

Scientific posters are located in the poster area at the same floor from 8th September afternoon till 11th September morning.

Preview Center:

Preview center will be available at any time of meeting hours. Speakers must upload their presentations 2 hours before the time of session.

Coffee Breaks & Lunch:

Coffee breaks and Lunch will be available for registered participants during the designed coffee break and lunch times.

Saturday Evening Social Programme: Is free of charge for all registered participants.

ESUR 06 Travel Agent: Thomas Cook.

CME credits:

The 13th European Symposium on Urogenital Radiology is accredited by the Royal College of Radiologists to provide the following CME activity for medical specialists.

The 13th European Symposium on Urogenital Radiology is designed for a maximum of 21 hours, category I credits.

Attendance at the Members Day, Friday 8th September, will carry 3 CPD Category 1 credits awardable by the Royal College of Radiologists.
UK based non-ESUR members attending the meeting on the 9th, 10th and 11th, will be entitled to claim 18 Category 1 CPD credits.

PROGRAM OVERVIEW

Friday 8.9.2006	Saturday 9.9.2006	Sunday 10.9.2006	Monday 11.9.2006
	8:00 – 16:00 *Registration* **8:30 – 10:00** Session I (Renal Tumours)	***8:00 – 16:00*** *Registration* **8:30 – 10:00** Session III (Prostate Cancer)	***8:00 – 12:00*** *Registration* **8:30 – 10:00** Session VI (Adrenal, Testicular & Urothelial tumours)
	10:00 – 10:30 ***Coffee break***	***10:00 – 10:30*** ***Coffee break***	***10:00 – 10:30*** ***Coffee break***
11:00 – 17:00 *Registration* **Members' Day**	**10:30 – 11:00** State-of-the-Art Lecture **11:00-11:30** Opening Ceremony **11:30 – 13:00** Session II (Bladder Cancer)	**10:30 – 12:00** Session IV (Cervical Cancer) **12:00-13:00** Session V (Ovarian & Endometrial Cancer)	**10:30 – 11:00** Session VII (Urogenital Imaging guidelines) **12:00-13:00** Session VIII Film Reading Session **13:00 – 13:30** ***ESUR 06 Closing***
12:30 – 14:00 ***Lunch***	***13:00 – 14:00*** ***Lunch***	***13:00 – 14:00*** ***Lunch***	***13:30 – 14:30*** ***Lunch***
14:00 – 14:05 Welcome Introduction **14:05-15:35** Scientific presentation	**14:00 – 15:30** **WSI** Pediatric Urogenital masses **WSII** Contrast Agents (US & MRI) **WSIII** Interventional (upper UT) **WSIV** Renal transplantation	**14:00 – 15:30** **WSV** Interventional angiographic procedures **WSVI** Stone disease, CTU and MRU **WSVII** Urogenital 3D US	
15:35 – 16:00 ***Coffee break***	***15:30 – 16:00*** ***Coffee break***	***15:30 – 16:00*** ***Coffee break***	
16:00 – 17:50 Scientific Presentation	**16:00 – 17:30** SS_1, SS_2, SS_3, SS_4	**16:00 – 17:30** **WSVIII** Pelvic floor imaging **WSIX** Fetal imaging **WSX** Mimics of RCC	
18:00 – 19:00 *General Assembly*			
20:00 *Members' Dinner* ***Nile Cruise***	***19:30*** *Social Programme*	***19:30*** *Sound & Light Show Giza Pyramids*	
		21:00 *Course Dinner*	

MEMBERS' DAY

Friday, September 8th

Venue: Grand Hyatt Hotel – Egypt

Registration: 11:00 – 17:00
Scientific Sessions: 14:05 – 18:00
General assembly: 18:00 – 19:00
Member's Dinner: 20:00

POST-GRADUATE COURSE
IMAGING OF UROGENITAL TUMOURS

Saturday, September 9th to Monday, September 11th

Registration: 8:00 – 16:00
Lectures: 8:30 – 13:00
Workshops: 14:00 – 17:30
Scientific Papers:16:00 – 17:30
Posters
Technical Exhibition
Social Programs

MEMBERS SCIENTIFIC SESSION

Friday, September 8th; 14:10 – 15:30

Friday, September 8th; 16:00 – 18:00

COURSE LECTURES

Saturday, September 9th; 8:30 – 10:00

Session I: Imaging of Renal tumours **p. 27**

Moderators: *P. Choyke (USA), H. Abol Enein (EG)*

Saturday, September 9th; 10:30 – 11:00

State-of-the-art Lecture **p. 38**

Moderators: *S. Morcos (UK)*

Molecular Imaging: *B. Hamm (DE)*

Moderators: *L. Dalla-palma (I), O. Kolokythas (USA)*

1. **Guidelines in Uroradiology:** *T. Wah (UK)* **p. 71**
2. **Contrast Media Guidelines:** *S. Morcos (UK)* **p. 71**
3. **Guidelines in Paediatric Uroradiology:** *M. Riccabona (AT)* **p. 71**
4. **Staging of Uterine Cancer:** *K. Kinkel (CH)* **p. 71**

Monday, September 11th; 12:00 – 13:00

Film Reading Session

Moderators: *L. Derchi (I)*

COURSE WORKSHOPS

Saturday, September 9th; 14:00 – 15:30

WSI: Pediatric Urogenital Masses p. 74

Location: Hall A

Moderators: *D.B. Peskar (SI), A. Ghaly (EG)*

1. **Wilms Tumour:** *P. Wiesbauer (AT)* **p. 74**
2. **Neuroblastoma:** *U. Willi (CH)* **p. 74**
3. **Lower UG Tract:** *P. Wiesbauer (AT)* **p. 75**

WSII: Contrast Agents (US & MRI) p. 76

Location: Hall B

Moderators: *A. Van Der-Molen (NL)*

1. **Contrast-enhanced US of the Kidney:** *O. Helenon (FR)* **p. 76**
2. **Contrast-enhanced US of V-U Reflux:** *K. Darge (DE)* **p. 80**
3. **MR Contrast Media:** *M-F Bellin (FR)* **p. 83**

WSIII: Interventional Procedures (Upper Tract) p. 85

Location: Hall C

Moderators: *S. Moussa (UK), S. Ragy (EG)*

1. **Radiofrequency Ablation of Renal Tumours:** *P. Choyke (USA)* **p. 86**
2. **Percutaneous Therapy for TCC:** *M. Kellet (UK)* **p. 88**
3. **Malignant Obstructive Uropathy:** *S. Moussa (UK)* **p. 88**

WSIV: Renal Transplantation: Acute Dysfunction p. 90

Location: Hall D

Moderators: *J. Jakobsen (N), A. Shokeir (EG)*

1. **Acute Graft Dysfunction:** *R. Barsoum (EG)* **p. 90**
2. **Imaging in Medical Complications:**
   a. **Ultrasound:** *M. Claudon (FR)* **p. 91**
   b. **MRI:** *N. Grenier (FR)* **p. 91**
3. **Imaging in Vascular Complications:** *A. Magnusson (S)* **p. 96**

Location: Hall C

Moderators: S.*Goldman(USA), A. Vargha (HU)*

1. **Benign Renal Tumours:** *S. Goldman (USA)* **p. 117**
2. **Indeterminate Renal Cysts:** *M.Bertolotto (I)* **p. 120**
3. **Pseudotumours:** *S. Hanna (EG)* **p. 121**

SCIENTIFIC SESSIONS

Saturday, September 9th; 16:00 – 17:30

Scientific Session I

Location: Hall A

1. **16:00-16:10;Testicular Microlithiasis: A Prospective Study - Is Ultrasound Follow-Up Necessary?** *J. Richenberg (UK)* **p. 124**
2. **16:10-16:20;Does contrast enhanced US have a practical value in adjunct to color Doppler US in evaluation of patients with acute renal failure? Preliminary assessment.** *M. Bertolotto (I)* **p. 124**
3. **16:20-16:30;A Novel Approach for the Detection of Acute Rejection with Dynamic Contrast Enhanced Magnetic Resonance Imaging:** *AS. El-Baz (EG)* **p. 125**
4. **16:30-16:40;Usefulness of MRI in the evaluation of testis-sparing surgery in male patients with congenital adrenal hyperplasia and testicular adrenal rest tumours:** *S. Takahashi (NL)* **p. 126**
5. **16:40-16:50;Posterior Deep Peritoneal Pelvic Endometriosis with Rectosigmoïd Involvement. What does Endocavitary MRI add to diagnosis? Preoperative prospective study with surgical correlation:** *C. Roy (FR)* **p. 127** **p. 127**
6. **16:50-17:00;Uterine artery embolization in 114 cases of uterine fibroids: Can size, location and number of fibroids affect the clinical success and complication rate?** *K. Firouznia* (Iran) **p. 128**
7. **17:00-17:10;Percutaneous Radiofrequency Ablation of Renal Tumors:** *M. Memarsadeghi (AT)* **p. 129**
8. **17:10-17:20;Initial experience with the \'Resonance TM\' metallic stent for antegrade ureteric stenting:** *T. Wah (UK)* **p. 129**
9. **17:20-17;30;Thermoexpandable metallic stent in the management of malignant ureteric strictures:** *RE Magnusson (SE)*

Saturday, September 9th; 16:00 – 17:30

Scientific Session II

Location: Hall B

1. **16:-10:10;Absence of Renal White Pyramids as a secondary measure in detection of ureteric calculus:** *CN. Sides (USA)* **p. 129**
2. **16:10-16:20;Unenhanced helical computed tomography (UHCT) and extracorporeal shock wave lithotripsy (ESWL) of renal stones: Prediction of outcomes:** *E Karagiotis (GR)* **p. 130**
3. **16:20-16:30;Contrast-Induced Nephropathy (CIN) in Risk Patients: A Double Blind Comparison of Iopamidol and Iodixanol:** *R. Katzberg (USA)* **p. 131**

Saturday, September 9th; 16:00 – 17:30

Scientific Session III

Location: Hall C

Saturday, September 9th; 16:00 – 17:30

Young Radiologists' Session

Location: Hall D

MEMBERS SCIENTIFIC SESSION

Friday, September 8th; 14:10 – 15:30

1. AUTOMATIC KIDNEY TRACKING FOR MR GLOMERULAR FILTRATION ANALYZIS

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PURPOSE: To evaluate a 2D region tracking method for retrospective motion correction without sacrificing temporal resolution.

METHODS: This method addresses periodic motion by a preparative learning phase, before injection of contrast agent. Displacement of the kidney is estimated by a 3 parameters rigid body model (2 translations and 1 rotation). Each image of the enhanced sequence is corrected from the corresponding one from the learning phase using corresponding pre-calculated displacement vectors. The method was tested on five patients imaged for GFR estimation using Rutland-Patlak model.

RESULTS: Corrected time-intensity curves show significantly less fluctuations causes by mismatch of the ROI with the cortex during respiration. Less than 2% of images needed to be manually readjusted. An average variation of 10% vs 28% was found between GFR values obtained with and without correction respectively. Correction allowed up than 25% of average reduction of the SD in the Rutland-Patlak plot.

CONCLUSION: Automatic kidney tracking allows a significant reduction of the error in estimation of the GFR using the Rutland-Patlak plot technique.

2. SUPRANORMAL RENAL FUNCTION AND STRESS RELIEF IN CHILDREN'S OBSTRUCTIVE UROPATHY

ULRICH V WILLI, MD, *PROF, DIAGNOSTIC IMAGING, UNIVERSITY CHILDREN'S HOSPITAL, ZUERICH, SWITZERLAND;* ***DANIELA B HUSARIK, MD; CHRISTIAN KELLENBERGER, MD; MARIANNE VAN DER HOEF, MD; RITA GOBET, MD***
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PURPOSE: Comparing pre- and postoperative renal function (RF) using MAG3 scintigraphy in children corrected for urinary tract (UT) obstruction.

METHODS AND MATERIALS: Retrospective analysis of UT morphology, RF and urinary drainage in 24 patients (mean age: 23,4 months; 1-128m) operated for pyeloureteric or ureterovesical obstruction 1999-2005. UT evaluation including ultrasonography and MAG3 scintigraphy before and after surgical correction (mean post-operative time: 7 months; 2-18m). Inclusion criteria: a) unilateral proximal or distal ureteral obstruction with or without mild ipsi- or contralateral vesicoureteric reflux; b) no other renal or UT abnormality; c) successful surgery.

RESULTS: Improved postsurgical ipsilateral MAG3 clearance: 25%; no change: 50%; "decreased" RF (i.e. "stress relief"): 21% ; loss of function: 4% (one case).

CONCLUSIONS: 1. RF may or may not improve after surgical correction of obstruction, depending on severity and/or duration of obstruction. 2. In relative "supranormal" RF relief of obstruction alleviates obstructive stress, i.e. "reduces" RF. 3. Size and distensibility of renal collecting system(s) and elasticity of renal parenchyma may dynamically influence urinary obstruction and RF. 4. In a child's obstructive uropathy critical combined review of morphological and functional renal parameters is recommended.

3. FUNCTIONAL EVALUATION OF TRANSPLANTED KIDNEYS BY BLOOD OXYGENATION LEVEL-DEPENDENT IMAGING: A COMPARATIVE STUDY TO HEALTHY VOLUNTEERS

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AIM OF WORK: To prospectively determine whether Blood Oxygenation Level-Dependent (BOLD) MRI is an appropriate tool to noninvasively provide reliable information on the functional allograft status compared to matched native healthy kidneys.

PATIENTS & METHODS: Fifteen stable renal allograft recipients and an equal number of matched healthy controls underwent BOLD-MRI on a 1.5T MR system. Seven of the patients with transplanted kidneys were measured twice to determine the reproducibility. Delineations of R2* maps were performed in cortex and medulla separately.An ANOVA model for repeated measurements was used for statistical analysis. To assess reproducibility, residual coefficients of variation between subjects (CVb) and within subjects (CVw) were calculated.

RESULTS: R2* values in the medulla were higher than in the cortex in transplanted ($p<0.007$) and native kidneys ($p<0.0001$) indicating that oxygenation in medulla was lower than in cortex in both transplanted and native kidneys. However, medullary oxygenation was higher in transplanted than native kidneys, possibly due to medication effects and/or renal denervation. For reproducibility of R2* measurements, CVw was low in both medulla and cortex (<5.2%). CVb was also low in cortex (4.1%), but much greater in medulla (15.0%). R2* of the repeated scans were strongly correlated

in medulla ($p<0.0001$), but not in cortex.

CONCLUSION: BOLD-MRI provides highly reproducible results regarding oxygenation status of transplanted kidneys compared to matched volunteers. The low CVw together with high CVb in the medulla indicate that medullary R2* is sensitive to measure oxygenation changes. Therefore it is a promising tool to noninvasively monitor complications after kidney transplantation.

4. MAGNETIC RESONANCE IMAGING IN PATIENTS WITH CHRONIC OBSTRUCTIVE UROPATHY AND COMPROMISED RENAL FUNCTION: A SOLE METHOD FOR MORPHOLOGICAL AND FUNCTIONAL ASSESSMENT

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AIM OF WORK: to assess the role of MRI as a single modality for anatomical and functional evaluation of obstructed kidneys in patients with compromised renal function.

PATIENTS & METHODS: The study included 96 consecutive adults with the diagnosis of unilateral or bilateral chronic obstructive hydronephrosis with compromised renal function (serum creatinine ≥ 1.8 mg/dl). Patients were subjected to gadolinium-enhanced magnetic resonance imaging (Gd-MRI) which determined, the anatomy and function of the 2 renoureteral units through selective calculation of the glomerular filtration rate (GFR) of each kidney. All patients underwent technetium-99m diethylenetriamine-pentaacetic acid (99mTc-DTPA) renal scan as a gold standard for selective determination of GFR of both kidneys. The final definitive diagnosis after retrograde or antegrade ureterogram, endoscopy or open surgery was considered as the gold standard for the diagnosis of obstruction. The sensitivity of Gd-MRI for the diagnosis of obstruction was calculated

in comparison with the gold standard. Moreover, a correlation was made between GFR determined by Gd-MRI and the gold standard isotope GFR.

RESULTS: There were 59 males and 37 females with a mean age ±SD of 52.5±13 years (range 22 to 74). The mean serum creatinine ±SD was 2.4 ± 0.7 mg/dl (range 1.8-3.7). Seven patients had bilateral obstruction and the remaining 89 had obstruction of a solitary kidney. Therefore, the total number of the obstructed renal units was 103. Of the 103 hydronephrotic kidneys, the cause of obstruction was noncalcular in 73 and calcular in 30. Comprehensive MRI study detected the cause of obstruction in all kidneys with noncalcular obstruction (sensitivity of 100%) and in 21 kidneys with calcular obstruction (sensitivity of 70%). When combined with KUB and US, the sensitivity of MRI in detecting the stones was improved to 90% (27 cases were diagnosed). The overall

sensitivity of MRI combined with KUB and US in detection of the various causes of obstruction was 97%. A comparison between isotope GFR of the obstructed kidneys with the corresponding MRU GFR showed a perfect correlation. The mean selective isotope clearance of the corresponding kidney (18± 4.9 ml/min, range 10-30) was not significantly different from the corrected mean MRU clearance (14.6±6 ml/min, range 12-28).

CONCLUSION: Combined static and dynamic MRU is a promising technique that allows anatomical and functional evaluation of obstructed kidneys in patients with impaired renal function.

5. APPARENT DIFFUSION COEFFICIENT (ADC) VALUES OF NORMAL KIDNEYS AND CHANGES ACCORDING TO HYDRATION STATUS

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AIM OF WORK: To determine ADC values in normal kidneys and analyze changes due to hydration status.

PATIENTS & METHODS: Ten volunteers underwent DW- MR imaging of the kidneys with a breath-hold single-shot spin-echo planar (SE EPI) imaging sequence, b values: 300, 500, 800 sec/mm2, in different states of hydration (HS): normal, dehydrated state(DHY) (after a 12-hour fast) and hydrated state (HY)(one hour after drinking water:20 ml/kg body weight). Presence of normal anatomy was assessed with axial and coronal gradient echo (GRE)-T1 weighted and tSE-T2 weighted before the study. Urine osmolarity, sodiuria, and weight were measured at the time of each exam. ADC maps were created for all b values. ADC values were calculated at the cortico-medullary junction on the axial slice encompassing the central portion of the kidneys, positioning three 1 cm2 ROIs in the anterior and posterior labrum and in the intermediate site. Finally we calculated average ADC(avg ADC) of all b values, and compared them between different HS.

RESULTS: The overall mean avg ADC under normal hydration status.was: 2.57 ± 0,20 x 10-3 mm2/sec. Mean avg ADC in HY was 2.47 ± 0,15; mean avg ADC in DHY aws 2.41 ± 0,21. Paired t test analysis showed significant difference between avg ADC in normal vs DHY and vs HY($p<0,05$), however difference between HY vs DHY was not significant. Urine osmolarity and sodiuria resulted significantly different between normal vs DHYvs HS.($p<0,01$)

CONCLUSION: Average ADC values observed in normal kidneys are in accordance with data in the literature. HS significantly influenced avg ADC.

6. RENAL HYPOPERFUSION IN PATIENTS WITH INFARCTION AND PYELONEPHRITIS: EVALUATION WITH CONTRAST ENHANCED US

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AIM OF WORK: To investigate the diagnostic performance of contrast enhanced US (CEUS) for diagnosis of renal perfusion defects (RPD) in patients with acute renal infarcts and with acute pyelonephritis.

PATIENTS & METHODS: 34 consecutive patients with acute renal infarcts (n=22) and acute pyelonephritis (n=12) were retrospectively evaluated. A bolus of SonoVue was injected to examine each kidney, followed by a saline flush. CT was considered as the reference procedure. Digital cine clips of CEUS were evaluated in random order by 2 independent readers blinded to CT findings. Readers were asked to assign a confidence level in diagnosis of RPD at the upper pole, medium portion, and lower pole of each kidney according to a 5-degrees scale ranging from definitely absent to definitely present. ROC curve analysis was employed to assess the overall confidence of diagnosis of RPD, and weighted Kappa values (Kw) were calculated to assess inter-reader agreement.

RESULTS: CEUS effectively identified RPD both in patients with renal infarcts and with acute pyelonephritis. However, while the diagnostic performance of CEUS in patients with renal infarcts was excellent, with very good inter-reader agreement (area under the ROC curve, AUC=0.97-0.98, Kw=0.91), the diagnostic performance in patients with acute pyelonephritis was lower (AUC=0.88-0.89, Kw=0.65).

CONCLUSION: CEUS is a useful and reproducible tool to evaluate renal perfusion defects in men. In particular, it is highly effective to detect renal infarcts, with a diagnostic performance approaching that of TC. The sensitivity is lower for patients with acute pyelonephritis.

7. IMAGING OF KIDNEY CANCERS IN HEREDITARY LEIOMYOMA RENAL CELL CARCINOMA (HLRCC) SYNDROME

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AIM OF WORK: Hereditary Leiomyoma Renal Cell Carcinoma (HLRCC) is a rare subtype of the Multiple Uterine and Cutaneous Leiomyoma Syndrome (MULCS) which is associated with a mutation in the Gene that codes for Fumarate Hydratase. The disease is characterized by cutaneous and uterine leiomyomas and a particularly aggressive form of renal cell carcinoma that metastasizes in 50% of affected individual.s The purpose of this report is to describe the imaging appearances of these tumors

PATIENTS & METHODS: Available Imaging studies (CT, MRI, PET, Ultrasound) were obtained in 22 affected individuals with genetically confirmed HLRCC. Images were retrospectively analyzed and findings were tabulated. Because this is a retrospective study, the imaging is not ystematic and was incomplete in many cases.

RESULTS: Two distinct patterns of primary tumors were found in these patients. The first pattern was a hypoenhancing solid mass that was uniform in density. The poor enhancement suggested a papillary histology which was confirmed, however, these lesions were often aggressive having spread to regional lymphatics while the primary was under 3cm. The second pattern was a multicystic pattern in which a "bubble" like growth was detected in the kidney. These lesions were also quite aggressive; over 50% developed regional and distant metastases. Unlike clear cell carcinoma the pattern of metastases was largely lymphatic, however, lung and bone lesions were found in advanced cases.

CONCLUSION: The renal tumors associated with HLRCC appear to be of a papillary subtype but are highly aggressive. They can be poorly enhancing, solid lesions or multicystic masses. Both lesions spread lymphatically and should be aggressively treated when discovered.

8. CT OF THE KIDNEYS: WHAT SIZE ARE RENAL CELL CARCINOMAS WHEN THEY CAUSE SYMPTOMS OR SIGNS?

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AIM OF WORK: To investigate what size renal cell carcinomas (RCC) have to have reached when they cause macroscopic hematuria or other symptoms and/or signs suggesting an upper urinary tract malignacy.

PATIENTS & METHODS: 232 patients diagnosed with or treated for RCC at our hospital from 1996 to 2002 were included in a retrospective study. The patients were grouped according to their presenting symptoms: incidental finding, macroscopic hematuria, urinary tract symptoms, symptoms due to metastasis or paraneoplastic symptoms and signs.

RESULTS: 67 (29%) of 232 RCCs were incidental findings and measured 4.9±2.6 (2-12) cm. The incidental tumors were significantly smaller ($p<0.001$) than RCCs presenting with clinical signs or symptoms which

measured 8.9±3.2 (3-18) cm. Only 3 of 165 RCCs causing clinical symptoms and/or signs were smaller than 4 cm. No RCC causing macroscopic hematuria was smaller than 4 cm.

CONCLUSION: This study shows the limitations of the diagnostic efforts in patients with clinically suspected RCC. RCC that caused clinical symptoms and/or signs measured on average 8.9 cm. The results of this study imply that an overwhelming part of the RCCs that are smaller than 4 cm are asymptomatic.

9. THE ANGULAR INTERFACE SIGN: NEW SIGN FOR DIFFERENTIATION OF RENAL CELL CARCINOMA AND ANGIOMYOLIPOMA ON MR IMAGING OF SMALL RENAL MASSES

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AIM OF WORK: To assess the shape of the interface between renal masses and normal renal parenchyma as differentiating sign between renal cell carcinoma and angiomyolipoma.

PATIENTS & METHODS: Sixty eight patients with small solid renal masses (< 3 cm) have been examined at 1.5 T (Siemens Symphony, Erlangen, Germany) by T2-weighted half-Fourier turbo spin echo (HASTE), and T1-weighted gradient-echo (GRE) images of the kidney before and after fat saturation in transverse, coronal, and sagittal orientations during breathhold. Additionally, breathhold gadolinium-enhanced fat-saturated T1-weighted GRE images were obtained in the three orthogonal orientations. To avoid bias caused by signal intensity of fat in angiomyolipoma, only fat saturated images were evaluated collectively in the three orthogonal planes by blinded reader for the angularity or roundness of the lesion-kidney interface.

RESULTS: The lesion-kidney interface was round in 44 out of 50 renal cell carcinomas (88%) and angular in the remaining 6 lesions (12%). On the other hand, the lesion-kidney interface was angular in 16 out of 18 angiomyolipomas (89%), and round in 2 lesions (11%). Difference between renal cell carcinoma and angiomyolipoma was statistically significant ($p<0.001$).

CONCLUSION: Angiomyolipoma has angular configuration of the interface with the normal renal parenchyma more frequently than malignant renal neoplasm. This newly described sign may be used, in conjunction with other imaging features, for differentiation between small angiomyolipoma and renal cell carcinoma on MR imaging.

Friday, September 8th; 16:00 – 18:00

1. COMPARISON OF INTRALUMINAL OPTICAL COHERENCE TOMOGRAPHY AND INTRAVASCULAR ULTRASOUND IN THE DELINEATION OF DIFFERENT WALL LAYERS OF PORCINE URETERS EX VIVO

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AIM OF WORK: Catheter-guided optical coherence tomography (OCT) is a new means of intraluminal microstructural imaging, with a spatial resolution of 10-20 µm. We compared delineation of tissue layers of porcine ureters ex vivo between OCT and intravascular ultrasound (IVUS).

PATIENTS & METHODS: Porcine ureters and kidneys were obtained fresh from the municipal slaughtery, cannulated with a 7 F catheter sheath, flushed with normal saline solution, and marked on the outside with surgical suture. Marked positions were examined from within the ureter lumen by means of both OCT (M1, LightLab, Westport, MA) and IVUS. Spatial resolution of IVUS at 40 MHz was 37.5 µm. Delineation of urothelium, lamina propria, and muscle layer (inner and outer layer) was rated as possible (1) or not possible (0). Rates of delineation were compared between OCT and IVUS by means of Chi-Square testing with Yates's continuity correction.

RESULTS: OCT images were obtained in 48 different catheter positions, and IVUS images in 144. Wall layers were distinguished in 48 OCT and 73 IVUS images, respectively (chi square, 35.4678, $p<0.01$). Delineation of Urothelium/lamina propria, lamina propria/muscle layer, and inner/outer muscle layer was possible in 47/35/13 of OCT images and 3/64/2 of IVUS images (chi square, 166.7245, 10.5728, 29.5292, all $p<0.01$)

respectively.

CONCLUSION: Different wall layers of porcine ureters ex vivo are better demonstrated by OCT than by IVUS. For clinical practice, OCT therefore appears to be better suited for the detection of microstructural lesions of the ureter wall.

2. USE OF CT WITH CTA FOR RENAL DONOR EVALUATION LEADS TO HIGHER EXCLUSION RATE

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AIM OF WORK: Objective: compare exclusion rate of potential renal donors in present period with evaluation by CT/CTA and renal scan with historical control group from period with evaluation with IVP, renal scan and catheter angiography

PATIENTS & METHODS: 308 patients were evaluated between 3/05 to 1/06 with CT/CTA. Comparison group of 258 consecutive patients evaluated between 3/04 to 2/05 with IVP and angiography. The number of patients excluded from renal donation due to medical criteria or radiographic findings were determined in both groups

RESULTS: 7% of patients who underwent traditional evaluation with IVP and angiography (with helical CT if indicated due to abnormal findings) were excluded from donation for radiographic findings.17% of patients evaluated with CT/CTA were excluded for radiographic findings. 26 and 23% were excluded from each group respectively for medical criteria

CONCLUSION: Use of multidetector row CT angiography for renal donor evaluation has increased the number of incidental radiographic findings leading to a higher exclusion rate. Additional studies should

address the significance of these incidental findings and their impact on both donor rate and potential donor health

3. CT UROGRAPHY FOR DIAGNOSIS OF BLADDER CANCER

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AIM OF WORK: A prospective study to evaluate the use of Multidetector-Row Computed Tomography Urography (CTU) for diagnosis of bladder tumours in patients with macroscopic haematuria over 40-years of age without urine infection.

PATIENTS & METHODS: Same day CTU and flexible cystoscopy were performed in 200 consecutive patients attending a fast-track haematuria clinic. CTU studies and flexible cystoscopies were performed independently and scored on a 3-point scale to quantify the probability of bladder cancer. Comparisons were made between cystoscopy, pathological findings and CTU.

RESULTS: Prevalence of bladder tumours in this study was 24%. CTU was 93% sensitive & 99% specific, with 98% positive and 97% negative predictive values for the detection of bladder cancer when compared to the histo-pathological findings.

CONCLUSION: CTU offers an accurate method of detecting bladder tumours in this patient group. These results support the use of CTU as a first line screening investigation for this high risk group. The use of CTU for assessing the bladder will obviate the need for flexible cystoscopy in patients with a negative CTU and allow those patients with obvious tumour to be referred directly for resection. CTU allows comprehensive evaluation of the urinary tract by the use of a single test for upper and lower tract assessment.

4. RADIOLOGICAL FINDINGS AND IMAGE GUIDED BIOPSY IN WOMEN WITH PERITONEAL CARCINOMATOSIS AND A HISTORY OF BREAST CANCER

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AIM OF WORK: To identify CT features predictive of the aetiology of peritoneal carcinomatosis (PC) in women with prior breast cancer and to assess the efficacy of image guided peritoneal core biopsy (IGPCB) in these women.

PATIENTS & METHODS: Women with prior breast cancer who represented with PC and underwent (IGPCB) were retrospectively identified. CT examinations performed at representation were reviewed in consensus by two radiologists. The results of IGPCB were compared with the original breast specimens.

RESULTS: 22 women (mean age 56 years) representing at a mean of 8.9 years after initial breast cancer diagnosis were identified. In 21 of the 22 women a definitive histological diagnosis was obtained by IGPCB. There were no significant complications after biopsy. Sixteen women (73%) had ovarian or primary peritoneal cancer, 4 (18%) had recurrent breast cancer and 2 (9%) had malignant mixed Mullerian tumour (MMMT or carcinosarcoma). Twenty CT examinations were available for review. Three of the 4 women with recurrent breast cancer had bone metastases on CT compared to none of the women with ovarian cancer or MMMT. Three of the 4 women with breast cancer had a micronodular appearance to their omentum, with this appearance being seen in one of the women with ovarian cancer and neither of the patients with MMMT. No other radiological features showed any correlation with the final histological diagnosis.

CONCLUSION: The majority of women with prior breast cancer representing with PC had a new diagnosis of ovarian or primary peritoneal carcinoma or carcinosarcoma. The presence of bone metastases and a fine nodular omental infiltrate were associated with recurrent breast cancer. However, CT findings alone were insufficient to allow accurate prediction of the aetiology of the PC. Tissue diagnosis is therefore necessary to allow management decisions and IGPCB provides a safe and accurate method of obtaining this.

5. THE ADDITIVE VALUE OF CONTRAST-ENHANCED TRANSRECTAL ULTRASOUND OVER CONVENTIONAL GREY-SCALE AND DOPPLER TRUS IN PREOPERATIVE LOCALIZING OF PROSTATE CANCER

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AIM OF WORK: To assess the value of contrast-enhanced transrectal ultrasound (TRUS) over conventional grey-scale and Doppler TRUS in localizing prostate cancer (PC).

PATIENTS & METHODS: From June 2004 to July 2005, 52 consecutive patients with clinically localized PC (mean age: 60years, mean PSA: 8.09ng/ml, median biopsy Gleason score: 6) underwent TRUS beforeradical prostatectomy. The prostate was imaged in grey-scale, colour Doppler, and power Doppler mode in the axial plane with the Viking® ultrasound machine. During slow (1ml/min) infusion of sulphur hexafluoride (Sonovue®) another set of power Doppler images with low mechanicalindex was obtained. Three readers (one radiologist (R1) with 1 year of experience in contrast-enhanced TRUS, one radiologist (R2) without prior experience, one urologist (U) with 3 years of experience in TRUS) independently read all imaging and determined the disease stage as stage T2 or T3 on a 5-point probability scale. Whole-mount section histopathology was the standard of reference. Diagnostic performance parameters were calculated and compared using McNemar's test. $P<0.05$ was statistically significant.

RESULTS: The sensitivity of readers R1, R2, and U for gray-scale TRUS was 24%, 23%, and 21%, respectively. Sensitivity for colour Doppler was 32%, 21%, and 14% and for power Doppler 19%, 21%, and 14%. The sensitivity with contrast-enhanced TRUS was 45%, 24%, and 19%. For reader R1, contrast-enhanced TRUS sensitivity was significantly higher than the other modes. Specificities were 75-95% for all modes.

CONCLUSION: Contrast-enhanced TRUS imaging significantly improved the sensitivity of localizing prostate cancer of the experienced radiologist. This technique can thus be useful in enhancing preoperative prostate cancer localization.

6. POWER DOPPLER SONOGRAPHY OF THE FEEDING ARTERIES OF THE PROSTATE GLAND: A NEW APPROACH TO THE DIAGNOSIS OF PROSTATE CANCER?

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AIM OF WORK: To assess the role of spectral Doppler parameters of the feeding arteries of the prostate for the detection of prostate cancer.

PATIENTS & METHODS: 30 patients with a mean age of 65.9±8.4 (range, 46-82) were included. In each patient Doppler indices from bilateral capsular and urethral arteries were obtained. The indices were compared in regard to malignant (G1) and benign (G2) subgroups of

histopathological outcome of TRUS guided prostate biopsy for each side (n=11 and n=49 for G1 and G2, respectively) and to assess whether the indices were significantly altered on the side with cancer compared to contralateral side.

RESULTS: Mean pulsatility index (PI) value of G1 (1.48±0.24) was significantly lower than that of G2 (1.85±0.56)(p=0.04). Significantly lower values for PI, RI for apsular arteries (1.48±0.24 vs. 1.85±0.56, p=0.018; 0.78±0.10 vs. 0.83±0.09, p=0.028, respectively) and higher PI and RI values and lower systolic/diastolic ratios for urethral arteries (1.77±0.33 vs. 1.65±0.39, p=0.043; 0.82 ± 0.06 vs. 0.81 ± 0.09, p=0.046; 6.36 ± 2.54 vs. 7.05 ± 4.95, p=0.043, respectively) were obtained on the side with cancer compared to contralateral side.

CONCLUSION: Spectral vaweform measurements by PD-TRUS may be promising for the differentiation of prostate with cancer from those with benign diseases. Further research is needed to elucidate the potential of spectral Doppler indices of the capsular and urethral arteries for being associated with the current \'gold standard\' for prostate cancer detection--the systematic biopsy, particularly for those cancers with isoechoic texture indistinguishable from the parenchyma with conventional TRUS.

7. Dynamic Contrast-Enhanced MR and Proton MR Spectroscopic Imaging in Localizing Prostate Cancer

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AIM OF WORK: To prospectively determine the prostate cancer localization accuracy of T2-weighted MR imaging, dynamic contrast-enhanced MR imaging (DCE-MRI) and quantitative three-dimensional (3D) proton MR spectroscopic imaging (MRSI), of the entire prostate using whole mount sections as the reference standard.

PATIENTS & METHODS: Thirty-four consecutive men were examined. Mean age and prostate specific antigen level were 60 years and 8 ng/ml, respectively. Median biopsy Gleason score was 6. T2-weighted MR imaging, DCE-MRI and 3D MRSI were performed and based on these image data, two readers with different levels of experience recorded the location of suspicious peripheral zone and central gland tumor nodules on a standardized division of the prostate (14 regions of interest (ROI)). The degree of diagnostic confidence for each ROI was recorded on a five-point scale. The localization accuracy and ROI based receiver operating characteristics (ROC) were calculated.

RESULTS: For both readers, the area under the ROC curve for T2-weigthed MR imaging, DCE-MRI and 3D MRSI were 0.68, 0.91 and 0.80, respectively. DCE-MRI reading performed significantly better for tumor localization than quantitative MRSI ($P < 0.01$). Both DCE-MRI and MRSI were significantly better than reading T2-weighted imaging ($P < 0.01$).

CONCLUSION: The use of DCE-MRI and 3D MRSI showed significant improvement in localization accuracy in prostate cancer patients compared with T2-weighted MR imaging.

8. Molecular imaging techniques for assessing the lymph node status in prostate cancer patients: Comparison between Ferumoxtran-10 enhanced MR imaging and Choline PET-CT

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AIM OF WORK: Ferumoxtran-10 enhanced MR imaging (USPIO-MRI), which can visualize distribution of the macrophage, has shown to be extremely accurate for assessing the lymph node status in patients with prostate cancer. 11C- (or 18F-Fluoro) Choline PET-CT, which is based on the

pathophysiological mechanism in malignant prostate tissue, is also useful tool in preoperative staging as well as detecting recurrent disease. Aim of this study is to compare the clinical values of these two novel molecular imaging techniques for assessing the lymph node status in patients with prostate cancer.

PATIENTS & METHODS: Ten patients with prostate cancer (3 pre-, 7 post-prostatectomy) underwent both USPIO-MRI and Choline (or Acetate) PET-CT. Results for assessing the lymph node status from both modalities were compared. Additional findings on the PET-CT and USPIO-MRI were also determined.

RESULTS: 57 positive lymph nodes (mean diameter of 6.6mm, range 3-20mm) were detected in 9 patients with USPIO-MRI, while 5 nodes in 4 patients with PET-CT. All lymph nodes detected with PET-CT were greater than 7mm (range 7-12mm). USPIO-MRI detected 11 positive lymph nodes in 5 out of 6 patients with negative PET-CT. All of these nodes were smaller than 7 mm (range 3-6mm). 36 positive lymph nodes in 3 patients were proved by lymphadenectomy. Choline PET-CT detected 4 local lesions (3 in pre, 1 in post treatment patients). No other pathology was reported by Choline PET-CT.

CONCLUSION: Ferumoxtran-10 enhanced MRI could find small positive lymph nodes in patients with negative Choline PET-CT.

9. EVALUATION OF THE COMPLICATIONS UNIQUE TO PERIPROSTATIC LOCAL ANESTHESIA BEFORE TRUS GUIDED PROSTATE BIOPSY

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AIM OF WORK: The incidence of complications in the literature for periprostatic anesthetic infiltration before TRUS guided prostate biopsy has been confined to hemorrhagic or infectious complications which are also common without the application of periprostatic anesthesia. We aimed to assess for the first time the frequency of complications unique to local anesthetic infiltration.

PATIENTS & METHODS: 99 patients receiving 10 cm3 (5 cm3 each side) 2% lidocaine injected into the periprostatic nerve plexus under TRUS guidance before prostate biopsy were included. During and after the procedure the patients were requested to express complaints related –at least theoretically- with local anesthesia. Two weeks later periprostatic tissue integrity and vascularisation were investigated by TRUS Doppler examination to reveal fibrosis or infection.

RESULTS: The most common complication encountered was pain due to puncture with the needle for anesthesia (33/99, 33%). Need for repeated minor injections (6/99, 6%) during the biopsy, degradation of the image resolution due to infusion of the anesthetic drug (2/99, 2%) and stinging sensation due to intravascular injection (1/99, 1%) were also noted despite being less common. No patient had urinary incontinence after anesthetic infiltration due to relaxation of the external sphincter. Increased vascularisation within the periprostatic region (1/44, 2%) was uncommon. No TRUS finding consistent with periprostastic fibrosis and no erectile dysfunction associated with the procedure were detected.

CONCLUSION: Although TRUS guided periprostatic nerve blockade is an efficient method for relieving discomfort due to prostate biopsy, further care is needed to avoid and cope with the associated morbidity.

10. DETECTION OF LOCALLY RECURRENT PROSTATE CANCER WITH MAGNETIC RESONANCE IMAGING (MRI) AND MAGNETIC RESONANCE SPECTROSCOPY (MRS) IN CASES OF BIOCHEMICAL FAILURE AFTER RADICAL PROSTATECTOMY

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AIM OF WORK: To evaluate the feasibility of combined MRI and MRS of the pelvic floor in patients with prostate-specific-antigen (PSA) relapse and suspicion of locally recurrent prostate cancer (lrPCA) after radical prostatectomy (RP).

PATIENTS & METHODS: 28 patients underwent MRI (T1ax, T2 ax, cor, sag) and 3D-SE-MRS (TR/TE 1000/130 msec) with combined body-phased-array and endorectal coils 1 to 18 years (mean, 4.1 years) after RP. PSA levels at time of MRI+MRS ranged from undetectable to 17.3 ng/ml (mean, 3.3 ng/ml). MRI data were evaluated for supicious soft tissue masses in the pelvis, especially at the anastomosis. Small-volume 3D-MRS of suspicious regions was evaluated for signal quality and detection of citrate or high levels of choline and/or creatine.

RESULTS: In 6/28 patients, there were neither morphological signs of local recurrence or metastasis at MRI nor evidence of prostatic tissue at MRS. In 15/22 patients, MRI was positive for suspicious soft tissue at the anastomosis. MRS concurred in 13 cases. MRI demonstrated other lesions in 7/22 patients, including suspicious soft tissue within the urinary bladder wall, retained seminal vesicles, pathologic lymph nodes, or osseous metastasis.

CONCLUSION: MRI with an endorectal coil is capable of detecting local lrPCA after RP. However, results imply that MRS may increase the specificity for lrPCA.

11. Endorectal-MR (erMR) Features of High-Grade Prostatic Intraepithelial Neoplasia (PIN) in the peripheral zone: A Retrospective Study with Pathological Correlation.

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AIM OF WORK: High-grade PIN, considered to be a marker for carcinoma indicates repeated biopsy. To evaluate erMR features of HgPIN.

PATIENTS & METHODS: Among 824 TRUS-guided biopsy for suspected prostate cancer we selected cases with previous erMRI study in whom biopsy analysis found HgPIN. ErMR using T2w FSE and axial dynamic Gd T1w. ErMR images correlated with pathologic results.

RESULTS: On pathology, among negative biopsies (382 patients), 38 HgPIN were found at one location inside the gland. Among positive biopsies (442 patients), 20 HgPIN were found on the controlateral lobe of the adenocarcinoma, and 50 cases associated inside or around the carcinoma. A total of 58 HgPIN foci were correlated with erMRI. Location between images and pathology results was accurate in 49 cases. On those images, HgPIN was seen as a localized irregular border area, with moderate to low signal intensity compared to the surrounding normal peripheral zone. All presented an abnormal localized enhancement on Gd T1w. Sensitivity and specificity of erMR for detecting such abnormal zone was respectively 81% and 100%. There was no false positive cases and PPV was 98% (766/777). On the remaining positive cases without accurate location, T2 images showed 2 isolated strandings on the site of biopsy, 3 diffuse irregular signal intensity peripheral zone or no abnormality (4 cases). None of them, there was no abnormal enhancement.

CONCLUSION: erMR can depict abnormalities corresponding to high-grade PIN, especially on injected sequence.

COURSE LECTURES

Saturday, September 9th; 8:30 – 10:00

Session I: Imaging of Renal tumours

Moderators: *P. Choyke (USA), H. Abol Enein (EG)*

1. INTRODUCTION

P. CHOYKE (USA)

2. IMAGING OF RENAL TUMORS: CHARACTERIZATION

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INTRODUCTION

In this talk, we will review recent advances in renal mass imaging with CT and MRI. Specifically we will discuss developments in the use of imaging to differentiate benign from malignant renal lesions and different malignant lesions from one another. We will also examine the role of PET and of immunohistochemical evaluation of biopsy specimens in renal lesion characterization.

HOW TO IMAGE?

Although noncontrast ultrasonography evaluates the internal morphology of cystic lesions with more detail than does CT, ultrasound is considered definitive only when it identifies a renal mass as a simple cyst. Most radiologists recommend that complex cysts and solid masses detected on ultrasound be evaluated subsequently with CT or MRI.

RENAL MASS CT

Adequate CT evaluation of a patient with a known or suspected renal mass requires that at least two series be obtained: usually unenhanced and delayed enhanced images. The two series are required to determine whether any components of a renal mass enhance. Most investigators agree that delayed enhanced images must be obtained at least 100 seconds after initiation of contrast material injection (during either the nephrographic or excretory phases of renal excretion) (1, 2). This is because some renal masses will not be identified if only standard delays of 60-70 seconds are used (3). Also, errors in renal mass characterization will occur if masses are only evaluated using unenhanced and standard enhanced images. Some solid components of cystic masses and some solid masses do not demonstrate detectable enhancement on these standard delayed enhanced CT images (3, 4).

There has been some recent controversy about how much of an increase in attenuation indicates true enhancement on multi-detector helical CT scanners. Hounsfield Unit (HU) measurements vary more widely on multi-detector helical than on nonhelical scanners. For this reason, 10 HU is no longer accepted as the optimal threshold by many investigators (5). Instead, it has been suggested that a change in attenuation of 10-20 HU should be considered indeterminate, with masses demonstrating this limited increase in attenuation requiring additional evaluation (with immediate repeat CT, MRI, ultrasonography, or follow-up imaging) (5). In comparison, increases in attenuation of > 20 HU should be considered to indicate true enhancement (5).

Recently, a few studies have suggested that performing three phase CT by adding early enhanced images (during the early corticomedullary phase (CMP) at 15-35 seconds) can aid in renal mass characterization. Two small studies have shown that early brisk enhancement of a solid renal mass in excess of that of normal renal parenchyma (6) or such that its attenuation exceeds 100 HU strongly suggests that the mass is malignant (7).

RENAL MASS MRI

MRI examinations performed to evaluate patients with known or suspected renal masses should include T1-weighted sequences obtained before and after gadolinium administration. T2-weighted sequences are not as helpful, and some have even suggested that they need not be obtained (8). As with CT, on MRI it is important to determine whether or not any components of a detected renal mass enhance. Qualitative assessment of enhancement can be difficult; however, determination of relative signal intensity change (with true enhancement defined in one series as an increase in signal intensity of 15% of more) and subtraction images are very helpful (9).

DIFFERENTIATING BENIGN FROM MALIGNANT COMPLEX CYSTS

BY IMAGING

In 1986, Bosniak first described his cyst classification system (10), categorizing cysts according to their likelihood of being malignant. This system has undergone a number of revisions, with the most recent version published in 2005 (5). It was originally designed only for use with CT; however, its author has recently stated (5) that it can be applied to MRI. The most recent definitions are as follows:

Category	Features	Likelihood of malignancy
Category I:	1) hairline-thin wall, 2) water attenuation (-5 to + 20 HU) 3) no enhancement (10 HU or more)	0%
Category II:	1) few hairline-thin septa which may enhance (not measurably) 2) fine or short segment of thickened calcification in wall or septa 3) uniformly high attenuation and < 3 cm with sharp margins and no enhancement (hyperdense cysts)	0%
Category IIF:	1) multiple hairline-thin septa which may enhance (but not measurably) few 2) minimal thickening of wall or septa, 3) thick or nodular calcification in wall or septa, 4) totally intrarenal or large (≥ 3 cm) high attenuation lesions that do not enhance (large hyperdense cysts)	
Category III:	1) thickened irregular or smooth walls and/or septa that demonstrate measurable enhancement	50%
Category IV:	1) Clearly malignant masses can have all of the criteria of Cat. III Lesions but also contain distinct enhancing soft-tissue components independent of the wall or septa	100%

According to Bosniak, since lesions classified in Category I or II are always benign, they do not require further imaging or treatment. Category IIF lesions require imaging follow-up, sometimes for as long as five years, since a few of these are malignant. However, Category III and IV cysts are generally treated surgically or with percutaneous ablation.

One recent study suggested a slight modification of the above classification system. Benjaminov et al reviewed 32 Bosniak Category II and III renal masses that were categorized by CT (11). All 21 included cystic cancers had enhancing septa or nodules. No malignancy demonstrated only an enhancing wall. The reviewers concluded that cystic masses with only mural enhancement should be classified as Bosniak IIF rather than Bosniak III lesions.

The Bosniak cyst classification system can be of great assistance in predicting which complex cystic renal masses are more likely to be malignant and how cystic masses of different complexities should be followed; however, regardless of the definitions used, problems will be encountered. This is primarily due to rare exceptions and to interobserver disagreement (12).

When the Bosniak system is used with MRI, it has been observed that while some cystic masses demonstrate similar complexity, as seen on CT, others appear more complex, with the latter demonstrating additional septations and wall or septal thickening or enhancement. This is likely due to the ability of MRI to detect some internal cyst features not visible with CT and to the

fact that MRI is more prone to artifacts. Fluid movement within cysts can produce artifacts that mimic septations. Also, the walls of simple cysts may appear spuriously thickened. In a recent study of 69 cystic renal masses categorized with both CT and MRI (13), seven lesions were upgraded on MRI, with the upgrades having the potential of changing patient management in five of the seven cases. Subsequent follow up suggested that CT had been more accurate in three instances (including one lesion upgraded to Category III by MRI), while MRI was more accurate in three (including one lesion upgraded to Category III by MRI). The nature of the seventh lesion was not definitively determined.

BY BIOPSY

Percutaneous biopsy has been used to differentiate benign from malignant complex cysts. In one study (14), 28 Bosniak Category III cysts were liberally sampled with aspiration and core biopsy needles, with the authors biopsying the most suspicious portions of these lesions, such as cyst walls, septations, and areas of thickening. All 16 patients in whom a biopsy diagnosis of renal carcinoma was made were sent to surgery and the diagnosis was confirmed. In the 11 masses diagnosed by biopsy as benign, benignity was "confirmed" subsequently at surgery (one patient) or by lesion stability for at least one year (10 patients). While these results are promising, malignant complex cysts may grow slowly and might not demonstrate growth after only one year. It is possible that some patients in this study were erroneously diagnosed by both biopsy and imaging follow-up as having benign lesions.

DIFFERENTIATING ANGIOMYOLIPOMA (AML) FROM RENAL CELL CANCER (RCC)

BY IMAGING

Most AMLs can be diagnosed with CT because they contain identifiable macroscopic fat. Visualization of areas within a renal mass measuring – 10 HU or less is considered diagnostic of fat and of an AML (15). On occasion, regions of fatty attenuation may be so small that they are seen on CT only if thinly collimated unenhanced images are obtained (16). Most AMLs are identified easily with MRI, as well. On MRI, They typically have high T1 and T2 signal, and lose signal with fat suppression. Chemical shift imaging is more problematic. This very sensitive technique relies upon the cancellation of signal from fat and fluid on opposed-phase images. AMLs may or may not lose signal on opposed phase images (depending upon their fluid as well as their fat content). Conversely, clear cell renal cancers contain large amounts of intracellular fat and fluid and often demonstrate signal loss on opposed-phase chemical shift images.

Chemical shift imaging can be used in a different fashion to identify AMLs. This involves identification of the characteristic "India ink" artifact on opposed-phase images (17). With AMLs, this artifact is seen between the mass and adjacent renal parenchyma but not between the AML and adjacent perinephric fat. Conversely, hyperdense cysts and cancers only demonstrate the "India ink" artifact at interfaces with perinephric fat (17).

Some AMLs contain only tiny amounts of fat (18). These variants have been referred to as "renal angiomyolipomas with minimal fat". Unlike typical AMLs, these tumors are likely to be wrongly characterized as malignant neoplasms on CT and MRI, since no foci of macroscopic fat are present; however, several other suggestive imaging characteristics have been identified. On CT, AMLs with minimal fat are more likely to have higher attenuation than normal renal parenchyma on unenhanced images, to enhance homogeneously, and to enhance in a prolonged fashion (neither losing nor gaining attenuation values of > 20 HU between 30 second CMP and 120-150 second excretory phase images) (18- 20). Unfortunately, these features are not 100% specific or sensitive. A minority of renal cancers will demonstrate both of these characteristics, while some AMLs will not.

Reliance upon visibly detectable signal loss on fat suppression MRI images to diagnose AMLs in patients with AMLs containing minimal fat also will fail to detect fat in most patients. Another approach is needed. Recently, Kim and colleagues assessed the ability of double-echo chemical-shift imaging to identify minimal fat containing AMLs (21). They found that signal intensity index (calculated by dividing the difference between in phase and out of phase signal intensity by the in-phase signal intensity) and tumor to spleen ratio (calculated by dividing the tumor to spleen in and out of phase ratio by the tumor to spleen in and out of phase ratio and then subtracting one) can be used to distinguish these AMLs from renal cancers. This technique is effective because most

AMLs containing minimal fat, have more lipid than do renal cancers. Using this technique, sensitivity and specificity for differentiating AMLs from non-AMLs is > 90% when a tumor loses at least 25% of its signal (signal intensity index of 25% or more) or has a tumor to spleen ratio of -32% or less. The authors suggest that both calculations be performed and that if their results are in agreement, a diagnosis of AML can be made with confidence.

Although identification of fat within a renal mass generally should be considered diagnostic of AML, there are case reports of macroscopic fat detected by CT in renal malignancies. This occurs as a result of osseous metaplasia (22, 23), engulfed of renal sinus fat, extensive lipid vacuoles and cholesterol clefts in clear cell carcinomas (24), and in renal capsular liposarcomas. In many of the cases in which fat is seen in a renal cancer, so, too is calcification. Since calcifications are exceedingly rare in AMLs, the presence of fat and calcification together in a renal mass should preferentially suggest the diagnosis of renal cancer, particularly if there are only small foci of macroscopic fat present (25).

BY BIOPSY

Percutaneous biopsy can distinguish between AMLs (even those containing minimal fat) and renal cell carcinomas. Most AMLs contain characteristic spindle cells, epithelioid cells, thick-walled blood vessels, and adipocytic cells. Immunohistochemical staining is also helpful, especially when one or more of the cellular components is sparse or absent. AMLs contain HMB-45 and HHF-35 antigens. The former, which is a melanoma-associated antigen, and the latter which is a muscle specific actin, are not found in renal cancer cells (26).

DIFFERENTIATING ONCOCYTOMA FROM RCC (PAPILLARY VS CHROMOPHOBE RCC)

BY IMAGING

Oncocytomas, are benign renal neoplasms, derived from collecting duct cells (27, 28). Large oncocytomas often contain central scars that can be detected on imaging studies. They frequently demonstrate a spoke-wheel vascular pattern at conventional or CT or MR arteriography. Unfortunately, these features do not produce a distinctive imaging appearance. Necrosis in renal cancers and scars in oncocytomas are indistinguishable. Also, many renal cancers demonstrate a spoke-wheel arterial pattern and since renal cancer is much more common, most tumors that have this appearance are malignant. Finally, both renal cancers and oncocytomas have been observed to enhance briskly on early CMP images and to demonstrate prompt washout (7).

BY BIOPSY

Percutaneous biopsy differentiation of oncocytomas from some renal cancers (eosinophilic chromophobe renal cell carcinoma or some papillary cancers, especially the Type II variant) based upon histologic appearance is often difficult, if not impossible (29). Like oncocytomas, chromophobe renal cell carcinomas originate from collecting duct cells. Both tumor types may be eosinophilic due to their containing a large number of mitochondria. Recently, two staining techniques have been utilized in conjunction with the assessment of tumor morphology. These stains, the Hale colloidal iron and the cytokeratin (CK) 7 immunohistochemical stain (the latter using antibodies to one of the 20 different types of CK filaments found in epithelial cells), can facilitate distinction of these two types of tumors in many instances. Usually, with each of these agents, only scattered oncocytoma cells stain focally positive, while all chromophobe renal cancer cells stain positive (29, 30). These differences, and differences in response to other immunohistochemical stains that are being developed (31, 32) have shown much promise in facilitating distinction between these two tumor types.

DIFFERENTIATING BENIGN FROM MALIGNANT TUMORS: ROLE OF POSITRON EMISSION TOMOGRAPHY (PET)

Most renal cancers are 18-fluorine-2-deoxy glucose (FDG)-avid (33). Unfortunately, the kidney normally excretes FDG, making renal cancer detection more difficult, given the high background of normally accumulated FDG. In comparison, at least some benign renal tumors are not FDG-avid. In one small study, neither of two angiomyolipomas demonstrated increased uptake, while 13 of 15 renal cancers did (34). Of course, FDG merely measures metabolic activity, a feature that also can be seen with benign disease. Thus, in the previously cited series (34), increased uptake was noted in one patient with xanthogranulomatous pyelonephritis. At the present time, the most

common role of FDG-PET in renal cancer patients is to evaluate those in whom the primary tumor is known to be FDG-avid for locally recurrent or distant metastatic disease.

DIFFERENTIATING DIFFERENT TYPES OF RENAL CANCER FROM ONE ANOTHER

According to the 2004 classification of the World Health Organization(28) renal cancers are now divided into clear cell, multilocular cystic, papillary, chromophobe, collecting duct, medullary, Xp11 translocation, post-neuroblastoma, and mucinous tubular and spindle cell subtypes, with the last four types being rare. Papillary renal tumors are now divided into two subtypes, with Type II tumors also being rare. Multilocular cystic, papillary Type I, and chromophobe cancers are less aggressive than clear cell renal cancers, often presenting at a lower grade and stage. Sarcomatoid tumors are no longer considered distinct neoplasms. Instead, it is now believed that any type of renal cancer can degenerate and become sarcomatoid. With all these tumors, the most important predictor of tumor aggressiveness and prognosis is its Fuhrman grade.

Several studies have focused on the ability of imaging studies to distinguish papillary from other renal cancers. Most of these appeared before the division of papillary tumors into two types. It is likely that previous reports included mostly or only the much more common Type I papillary cancers. These series have shown that papillary cancers tend to be small (35), homogeneously enhancing (36), and that they enhance to a lesser extent (35-37) than do clear cell carcinomas. Papillary Type II cancers differ markedly from Type I neoplasms, as they are more aggressive and more vascular. On imaging studies, they demonstrate a greater degree of enhancement and, therefore, are not distinguished easily other cancer cell types (37).

Clear cell carcinomas tend to enhance more quickly and more intensely than the majority of other renal neoplasms. In a small series of 40 patients with renal cancers, Jinzaki and associates found that all 29 clear cell cancers had attenuation values of > 100 HU on enhanced images obtained at 35 seconds (7). Only one other neoplasm in the series (one of two included oncocytomas) demonstrated similar early enhancement. Both chromophobe cancers and all five papillary cancers measured < 100 HU at 35 seconds. Interestingly, the papillary cancers and both metanephric adenomas demonstrated continued gradual enhancement between the corticomedullary and nephrographic phases, with the latter obtained at 180 seconds. All clear cell cancers demonstrated de-enhancement between the 35 and 180 second images.

As previously mentioned, on MRI, clear cell cancers often lose signal on opposed-phase chemical shift MR images, while other renal cancer types do not.

There is another suggestive feature of some renal cancers. Collecting duct carcinomas originate within medullary pyramids and for this reason are centrally located. They occur in older patients and are usually of high-grade (28). Renal medullary carcinoma is a rapidly growing, centrally located, high-grade neoplasm that almost always occurs in young black males with sickle cell trait (28). Metastases occur early, so that enlarged lymph nodes and distant metastases are usually present on initial imaging. However, other more common renal neoplasms also may be centrally located, including renal pelvic urothelial malignancies, the other renal cancer cell types, and renal lymphoma. In addition, it is important to remember that renal artery aneurysms are located in the renal sinus.

A variety of malignant tumors can diffusely infiltrate the kidney. These include renal cell cancers, lymphoma, urothelial carcinomas, and metastases (5). Most patients with renal lymphoma and metastatic disease already have known diagnoses. Infiltrative renal cancer can often be distinguished from infiltrative transitional cell carcinoma, because the latter tends to produce intrinsic renal collecting system abnormalities. The former usually merely distorts or compresses the intrarenal collecting system, but usually does not grow into it.

SUMMARY

Recently, attempts to facilitate differentiation of different types of cystic and solid renal masses have intensified. There have been a number of exciting developments in this area, although definitive differentiation of minimal fat containing angiomyolipomas and of oncocytomas from renal cancers by imaging is still often impossible. The emergence of immunohistochemistry has led to improvements in the accuracy of percutaneous biopsy, with further advancements in this area likely in the near future.

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3. PRIMARY TUMOR STAGING: RENAL CELL CARCINOMA

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INTRODUCTION

As in other malignant tumors, prognosis in renal cell carcinoma (RCC) depends on the extent of the tumor and its metastasis at the time of its primary diagnosis. Staging systems formalize the way in which the primary or pre-therapeutic extent of RCC is being described. Surgery is currently the only curative therapeutic approach to RCC (1). However, even when RCC cannot be cured by means of surgery, it has been demonstrated that surgical resection of the primary tumor appears to be an integral part of systematic therapy for metastatic RCC (2). With no other curative therapy at hand, pertinent staging methods imminently relate to prognosis of RCC. Such methods include computed tomography (CT), particularly when performed with multiple detector rows (multidetector-row CT or MDCT), and magnetic resonance imaging (MRI). Preoperative staging of RCC is aimed at evaluating surgical options and optimal surgical technique (1). Since surgical excision of RCC has evolved significantly over the last 4 decades (2), staging systems have evolved along the way.

THE ROBSON CLASSIFICATION

The Robson classification for RCC (3,4) is based on the observation that surgical success and tumor-specific patient survival in RCC depend on the confinement of the primary tumor to certain anatomical landmarks in the body. Confinement of RCC to the renal capsule determines Robson stage I. Extension of RCC to the perirenal fat or the ipsilateral adrenal gland, which is anatomically included within the confines of Gerota's fascia, determines Robson stage II. Extension of RCC into the renal vein, the inferior vena cava (IVC), or regional lymph nodes are the hallmarks of Robson stage III. Direct extension of RCC to neighbouring organs other than the adrenal gland and distant metastasis of RCC each define Robson stage IV. Association between Robson stage of RCC and prognosis has clearly been demonstrated (3-5). Although it is easy to remember and clear-cut in its use of anatomical landmarks, the Robson classification of RCC has greatly been left for the TNM classification.

THE TNM CLASSIFICATION

The TNM classification of the International Union Against Cancer (UICC) distinguishes between the extents of the primary tumor (T-classification), its lymph node metastases (N-classification), and its distant, or blood-borne metastases (M-classification). According to current knowledge on prognosis, certain TNM constellations are grouped together to represent distinct tumor stages of the TNM classification system (Table). While more complicating than the Robson classification at first glance, the TNM classification demonstrates more capability to grow and change with increasing knowledge in the diagnosis and treatment of RCC. The association between post-surgical TNM classification as determined by surgical pathology and tumor-specific 5-year survival of RCC has clearly been demonstrated (6).

CROSS-SECTIONAL IMAGING IN THE STAGING OF RENAL CELL CARCINOMA

Cross-sectional imaging appears to be capable of recognizing small RCCs that are confined to the renal capsule and are adequately treated by means of partial nephrectomy. MDCT correctly determines presence and size of all lesions when 1-mm source images are being evaluated on a

dedicated work station (7). Comparison of largest tumor diameters between CT and gross pathologic examination in patients with non-metastatic RCC reveals that clinical and pathologic size correlate highly, and do not differ significantly (8).

The difficulty of distinguishing between confinement of RCC to the true renal capsule and extracapsular tumor spread is reflected by controversial statements in current radiological literature. Accuracy of MDCT and MRI ranges between 80% and 95% (7,9,10), such that both methods currently do not appear to be fully reliable.

While differential diagnosis between RCC with renal vein (RV) extension and extension into the inferior vena cava (IVC) below or above the diaphragm challenges cross-sectional imaging, differential therapy challenges modern urologic surgery. MDCT and MRI are similarly capable of distinguishing between different levels of venous involvement with RCC tumor thrombus (11,12). As an additional cross-sectional imaging modality to follow CT in the differentiation of tumor thrombus extent in RCC, MRI performs similarly to ultrasonography (13). Surgical resection of RCC tumor thrombus above the diaphragm (TNM 2002 class T3c) previously required sternotomy and cardiopulmonary bypass (CPB). However, it has recently been demonstrated that surgical resection can be successful through a transabdominal approach without CPB (14). Still, patient survival – and, thus, prognosis – after surgery for RCC with venous involvement is subject to controversy (15-17). In view of contradictory results of survival analysis in patients with RCC, it remains to be seen if TNM 2002 classes T3b and T3c need to be re-defined in the future.

Extension of RCC beyond Gerota's fascia may be a challenge to cross-sectional imaging when the fascia is barely transgressed. In such cases, resection of the fascia will probably be the only solution for the urologic surgeon.

Metastasis in regional lymph nodes without synchronous distant metastasis is found in 10-15% of patients with RCC (5). Current cross-sectional imaging criteria for lymph nodes to be suspicious for metastasis include a short-axis diameter of 1 cm or more and loss of kidney-shape with a lymph node hilus that includes fat. Asymmetric grouping of three or more smaller lymph nodes may also be a sign of lymphatic tumor spread in the renal hilus. However, more than 50% of enlarged regional lymph nodes demonstrate at histopathology with hyperplastic or inflammatory change, only (5). Specificity of cross-sectional imaging for metastatic lymphadenopathy is poor (18).

Metastasis of RCC to other organs is most frequently found in the lung (31%), followed by bone (15%), brain (8%), and liver (5%). However, any other organ can be involved (19). Agreement between MRI and surgical-pathologic staging has been shown to be good for M staging, with a kappa score of 0.66, for two independent reviewers, respectively (18).

CONCLUSIONS

It appears that TNM staging of renal cell carcinoma (RCC) evolves with the advancement of surgical techniques and will continue to evolve in the future. Cross-sectional imaging has greatly contributed to the diagnosis and staging of RCC. Both MDCT and MRI perform highly in T-staging of local tumor extent and M-staging of distant metastasis. However, both MDCT and MRI perform poorly in N-staging.

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Table. TNM classification and staging system of renal cell carcinoma (UICC, 2002)

T-classification

T1	confined to kidney, T1a <4 cm, T1b < 7 cm
T2	confined to kidney, > 7 cm
T3	confined to Gerota's fascia
T3a	extending to ipsilateral adrenal or perirenal fat
T3b	extending to renal vein or IVC below diaphragm
T3c	extending to IVC above diaphragm
T4	extending beyond Gerota's fascia

N-classification

N0	no regional lymph node metastasis
N1	metastasis in one regional lymph node
N2	metastasis in more than one regional lymph node
Nx	regional lymph nodes cannot be evaluated

M-classification

M0	no distant metastasis
M1	distant metastasis
Mx	distant metastasis cannot be evaluated

TNM stages

Stage I	T1	N0	M0
Stage II	T2	N0	M0
Stage III	T3	N0	M0
	T1, T2, T3	N1	M0
Stage IV	T4	N0, N1	M0
	any T	N2	M0
	any T	any N	M1

Modified from: Oberneder R, Wagner H, Siebels M, Stieber P, Busch M, Weiss M. Nierenzellkarzinom. In: Urogenitale Tumoren. Manual Tumorzentrum München (Liedl B, ed.), 3rd edition, W. Zuckschwerdt Verlag, München, Wien, New York (2003) pp.: 79-97

4. RENAL TUMORS: NEW DEVELOPMENTS IN DIAGNOSIS AND TREATMENT.

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While at first one might say nothing is new, or not much, regarding diagnosis and treatment of renal carcinoma, in fact some new developments have occurred recently. They are however incremental rather than breakthrough, and some are positive but some rather negative.

IMAGING DIAGNOSIS

Refinements in technique of CT and MRI continue to improve image quality and detectability of renal masses. Multidetector CT allows for thin section, isometric voxel acquisition in multiple phases including CT angiography and 3D reformatted images. These not only improve reliable detection of noncystic renal masses, but allow for detailed planning for nephron sparing surgery or other treatments. Faster MRI techniques including improved coils, parallel coils, 3.0 T, also result in better images. A recent article shows that both techniques are very good and given advances in both, remain essentially equivalent for detection and staging: MDCT sensitivity 93% specificity 68% MRI sensitivity 93% specificity 71% (1).

A significant downside however is that the advances in image quality have not translated into greater accuracy at diagnosis of renal carcinoma. The study mentioned above for example showed that both by CT and MRI, there were numerous false positives. This was largely due to the result that by both procedures all of the nine oncocytomas were prospectively read as renal carcinoma. Similarly, several articles reporting results of radiofrequency ablation (RFA) or cryoablation of renal masses have shown a significant percentage of lesions ablated based on imaging diagnosis alone, have turned out to be benign at biopsy immediately before ablation. Most of these false positives have been oncocytomas or lipid poor angiomyolipomas (AML), some hemorrhagic cysts (2, 3)

Another downside to the improvements in image quality along with the seemingly ever increasing use of CT and MRI is the explosion in detection of small incidental renal lesions that are not clearly benign cyst or AML. In a study at my home institution found that 4% of 308 healthy asymptomatic potential kidney transplant donors had an indeterminate renal lesion or presumed tumor on CT/CTA/CTU pre-transplant evaluation (4).

Management of these lesions remains troublesome, followup vs treatment, interval and duration of followup are issues not resolved by published research. Due to the recognition of the low specificity of imaging diagnosis for renal carcinoma, some have recommended greater use of percutaneous biopsy (3) but whether this would truly be effective in diagnosing these benign renal lesions at most medical centers, including community hospitals, is unproven.

Another set of studies has better defined the potential utility of PET or PET/CT for renal carcinoma, with mixed results. While some studies have shown an increment in staging accuracy especially for advanced renal carcinoma when utilizing PET/CT, it also has become clearly recognized that only about 60-70% of primary renal carcinomas are FDG PET avid (5). Thus PET is clearly NOT useful for detection and diagnosis or for problem solving cases indeterminate on CT or MRI. It is also questionable whether PET is useful in staging a primary that is PET negative, as non-avid metastases would not be detecte (examples from UAB). Perhaps the greatest utility though would be in those patients with advanced renal carcinoma that are PET avid who go on systemic therapy, including new agents with promising results.

TREATMENT

Advances have been made in treatment of renal carcinoma. Work continues to be reported with increasing numbers and longer followup for nonsurgical ablation, both RFA and cryotherapy. These methods remain in evolution with various approaches. Some investigators, especially urologist, have reported laparoscopic or even open approach to both RFA and cryotherapy, while radiologist have concentrated on percutaneous methods, both with good results (6). In some centers, trends have developed that posterior and peripheral lesions are triaged to percutaneous RFA while anterior lesions to laparoscopic ablation, and larger or central lesions to surgical

approach, most commonly by laparoscopic methods (most often at our institution is hand assisted laparoscopy).

Ablation will be a topic for another presentation, of more detail. Suffice it to say here, good to excellent results have been obtained by these various methods in relatively short term followup studies rivaling that of surgical approaches(7). Concern remains about long term results, say 5 to even 10 years. Historically, the urology community was relatively resistant to nephron sparing surgery compared with classic radical nephrectomy until some quite long term results were published by the few centers very active early on in nephron sparing approaches, the same may be true for ablative techniques. One concern is for the possibility of multifocal disease. There is also concern resulting from articles with pathologic analysis of ablated lesions about residual microscopic tumor. In one study, 7 renal carcinomas that had been cryo-ablated underwent post ablation biopsy. In 2 viable tumor was found (8). It is controversial however whether microscopic residual disease would necessarily result in recurrence or possibly be controlled by the immune system.

For many years, systemic medical therapy for advanced renal carcinoma (RCC) suffered with limited success. Monoclonal antibodies failed to produce significant changes. Although some promise occurred with Interleukin, toxicity and mixed results have limited the impact. Several very recent reports however have shown some surprising good response rates for some new agents and combinations. Sunitinib, a small molccule inhibitor with affinity for VEGF and PDGF receptors has shown response rates of 34-40% in patients with metastatic RCC with median time to progression over 8 months (9, 10). A study of an oral multikinase inhibitor, sorafenib, has been report to show absence of progression in 50% on study drug vs 18% on placebo with significant difference in survival time (11). Sorafenib has also shown promising results compared to interferon (12). Finally, patients treated with temsirolimus (an inhibitor of a signaling protein that regulates cell growth and angiogenesis) showed longer survival than those treated with interferon (13)

Further investigation will be needed to determine if these results are confirmed and the overall impact. Initial impact on imaging will be utilization of imaging to follow patients in clinical trials, eventually there may be more use in the community if the initial promising results are confirmed.

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12. Tomczak J et al. A phase 3 randomized study of temsirolimus or interferon in the treatment of first line poor risk patients with advanced RCC. Presented at American Society of Clinical Oncology 2006

Saturday, September 9th; 10:30 – 11:00

State-of-the-art Lecture

Moderators: *S. Morcos (UK)*

MOLECULAR IMAGING: A NEW CHALLENGE TO RADIOLOGISTS

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The rationale of Molecular Imaging is the *in vivo* assessment of patient and disease specific molecular or cellular information with the desire to detect diseases at a molecular level, before they could cause macroscopic/morphologic tissue alterations and thereby getting the opportunity to start disease tailored treatments substantially earlier. Moreover the detection of alterations at the molecular level as responses to treatments, for instance in cancer therapy, could inform weeks to months earlier about the effectiveness of a therapy method, compared with conventional imaging techniques. As a result ineffective treatment methods could be changed earlier, thus improving patient outcome and limiting unnecessary side effects and costs.

To achieve this aim Molecular Imaging research relies on the combination of methods of basic research in biology, chemistry, and physics with applied engineering.

While the development of Molecular Imaging was initiated by nuclear medicine, in the last years methods for Molecular Imaging for almost all established imaging modalities have been developed avoiding the necessity of cyclotrons, nuclear tracers and radiation exposure. Additionally new optical modalities like fluorescence and bioluminescence imaging have been designed specifically for the purpose of molecular imaging. Although most of these technologies are still far from applicable in the clinics, they are already useful in basic biological research and pharmacological development. As an example the fate of stem cells labeled with *Luciferase* were tracked by bioluminescence imaging *in vivo* with excellent sensitivity and specificity based on the inherently zero background of this method. Other examples are the Near Infrared Fluorescence (NIRF) Imaging of early apoptosis as response to tumor treatment and the in vivo imaging of enzyme activity by using activatable NIRF probes.

Central to molecular imaging for all modalities is the rational design of target specific probes matching following requirements: First, a target relevant to the disease or pathology, second, depending of the imaging modality sufficient relative abundance of the target, third, the selection or design of an effective affinity ligand for the target, and fourth the design of a probe with high affinity and specificity for the target, and the coupling to a label detectable by the selected imaging modality.

To date the traditional nuclear molecular imaging techniques PET and SPECT are still on the forefront in the transition of Molecular imaging into the clinics. To compensate for their disadvantages like low resolution and minimal tissue information they have been combined with anatomical imaging (e.g. SPECT-CT's or PET-CT's). With these imaging devises impressive anatomical images with molecular information can be achieved although currently most studies are done with unspecific metabolic tracers like FDG. While the clinical application of bioluminescence imaging remains challenging, NIRF imaging could be applied to surface weighted imaging techniques like endoscopy or for the diagnostic of the skin.

Altogether the *in vivo* results of molecular imaging, mainly conducted in animal models, are promising, but, depending on the modality and probe designs, the transition into the clinics will take more time and work. Meanwhile the application of unspecific techniques like FDG-PET-CT will show, which clinical questions remain to be answered by more specific molecular imaging techniques.

Saturday, September 9th; 11:30 – 13:00

Session II: Imaging of Bladder Cancer

Moderators: *A. Shehab El-Din (EG), Y. Narumi (J)*

1. PRIMARY STAGING OF BLADDER CANCER

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INTRODUCTION

Bladder cancer is a significant health problem world wide, affecting mostly older men, with a 2.5 fold increased incidence in men compared to women, and being twice more common in whites than in blacks. In 2005, bladder cancer was diagnosed in an estimated 61,420 patients in the United States, affecting 44,690 men and 16,730 women, with an estimated 13,060 deaths (1). Worldwide, bladder cancer was responsible for an estimated 132, 432 deaths in 2000. Survival from this disease appears to be less in black populations and in women as compared to white men, despite their lower incidence in these populations, possibly because they seek treatment at higher stages of the disease (2).

EPIDEMIOLOGY AND ETIOLOGY

Transitional cell cancer (TCC) is most common in Europe and North America and accounts for 90-95% of bladder cancers. Exposure to arylamines is a major risk factor in development of TCC, which occurs in cigarette smokers, and in industries such as textile, chemical and rubber industries. Cigarette smoking may contribute to 35-50% of cases in the United States.

Bilharzial bladder cancer is most common in North Africa (2). Adenocarcinomas, sarcomas and metastases from other primary tumors are less common bladder tumors; squamous cell carcinomas and adenocarcinomas occur in patients with chronic bladder infecton and irritation.

DIAGNOSIS

The most commonly used methods to detect bladder cancer currently are urine cytology and cystoscopy. Urine cytology is insensitive in detecting low grade tumors, although when positive, it has nearly 100% specificity. Urine markers to detect bladder cancer are currently being investigated; their role in clinical practice remains undetermined. Molecular markers that may provide prognostic information are also being investigated and include tumor associated antigen (T138), oncogenes, cell cycle regulators, peptide growth factors, etc.

At present, cystoscopy remains the gold standard for the diagnosis and follow up of bladder cancer. The major questions to be answered when a patient is diagnosed with bladder cancer are to determine which patients with noninvasive bladder cancer will progress to invasive disease, and which patients with invasive disease will develop metastatic disease. Unfortunately, the answers to these prognostic questions are still difficult to obtain with currently available studies.

STAGING

As with tumors in other organs, staging of bladder tumors is determined by the depth of bladder involvement, involvement of adjacent tissues, and spread to distant sites. Two staging systems in use are the Jewett –Marshall – Strong system, and the TNM staging system; the latter is the preferred system (Table 1). The stage of the disease has a profound impact on management. Superficial disease is treated with transurethral resection with or without adjuvant intravesical chemotherapy while muscle invasive disease is best treated with cystectomy and urinary diversion (2).

The bladder wall has four layers – mucosa (also known as epithelium), lamina propria (subepithelial connective tissue), muscle layer, and serosa. Two-thirds to three-fourths of patients

have superficial disease that does not invade the muscle. Superficial non-muscle invasive disease is evaluated by cystoscopy and biopsy, and additional staging workup is usually not recommended (3) for this early stage which is usually not a threat to the patient's life. Disease which is stage T2 and beyond has a high risk of progression and metastases, and is life threatening.

80% of urothelial tumors are located at the bladder base, majority are single, and over half measure less than 2.5 cm at cystoscopy (4).

IMAGING

Iintravenous urography (IVU), abdominal and pelvic CT scan, MRI, and bone scan, and chest radiography are all used in evaluating patients with bladder cancer. In general, cross sectional imaging is most useful for disease that has extended beyond the bladder wall, stage T3b or higher. Superficial tumors may not be detectable with any imaging modality.

IVU, CT urography, MR urography and virtual endoscopy can all be utilized in evaluating patients with bladder cancer for synchronous lesions in the upper urinary tract. Although IVU is not useful in evaluating for spread outside the bladder, the detection of ureteral obstruction at the level of the uretero-vesical junction (UVJ) is suggestive of deep muscle invasion. Ureteral obstruction can also be due to mechanical obstruction of the ureteral orifice by a tumor overlying the UVJ.

Ultrasound may be used for initial evaluation of hematuria, and may detect a papillary, hypoechoic mass or area of focal wall thickening. Doppler imaging will show flow and help to distinguish blood clot from tumor. In one study, tumor vascularity on color Doppler ultrasonography (CDUS) was found to be related to tumor size; color Doppler signal was detected when tumors reached 24 mm in size (5). No correlation was found between presence, pattern ad spectral findings of CDUS with tumor stage and grade.

CT is the primary imaging modality used in evaluating bladder cancer. Nephrographic phase scanning before opacification of the bladder lumen with excreted contrast helps in visualizing the enhancing tumor as a nodule in the low attenuation nonopacified urine. On delayed scans, the tumors can be plaque like or papillary. Calcification may be seen in approximately 5 % of tumors, as stippled or nodular clumps on the surface of the transitional cell tumor. Depth of penetration into the bladder wall may be difficult to discern with CT, particularly after a biopsy. Accuracy of CT for staging is reportedly 55-92% (3). Lesions that are small and flat may be missed if the bladder is underdistended. In a recent series of 20 patients, all tumors (100%) were detected on MDCT (6)

MR imaging reportedly has similar staging accuracies as CT, ranging between 62-96%. Overstaging was the most common error in a recent study (7) – perivesical fat stranding, which may be frequently reactive or inflammatory in origin, may be misinterpreted as extravesical spread of tumor.. MRI with dynamic contrast administration may be superior to CT in detecting superficial and multiple tumors, and in detecting extravesical tumor extension and surrounding organ invasion (7); T1-W images are especially helpful in evaluating for spread into the perivesical fat. Bladder cancer has intermediate signal intensity, slightly higher than bladder wall on T2-W images and after gadolinium administration, peak enhancement of the tumor is earlier than that of the bladder wall.

Lymph node metastases occur to perivesical, obturator, internal and external iliac nodes, presacral nodes, and eventually to common iliac and paraaortic nodes. On CT and MR imaging, nodal involvement is assessed by evaluating nodal size; nodes larger than a cm in size are deemed suspicious. The use of ultrasmall paramagnetic iron oxide particles appears to be very helpful in detecting metastases in normal sized nodes (8,9).

Hematogenous metastases commonly occur to liver, lungs, bones, and adrenal glands.

TABLE 1

TNM Classification For Staging of Bladder Cancer

Primary Tumor (T)

Nonmuscle – invasive

Tis Carcinoma in situ

Ta Noninvasive papillary carcinoma

T1 Tumor invades subepithelial connective tissue but not muscle

Muscle –Invasive
- T2a Tumor invades superficial muscle (inner half)
- T2b Tumor invades deep muscle (outer half)
- T3 Tumor invades perivesical tissue
- T 4 Tumor invades adjacent organs

Nodes

N0 No regional lymph node metastases
N1 Metastases to single lymph node < 2 cm
N2 Metastases to single lymph node > 2cm but < 5 cm, or multiple lymph nodes but none >5 cm in largest dimension
N3 Metastases in lymph node >5cm in greatest dimension

Distant Metastases (M)

M0 No distant metastases
M1 Distant metastases

TABLE 2

Comparison between TNM Classification and Jewett –Marshall – Strong system

Jewett-Strong	TNM
-	Tis Carcinoma in situ
-	Ta Noninvasive papillary carcinoma
A	T1 Tumor invades subepithelial connective tissue but not muscle
B1	T2a Tumor invades superficial muscle (inner half)
B2	T2b Tumor invades deep muscle (outer half)
C	T3 Tumor invades perivesical tissue
D1	T4 Tumor invades adjacent organs
D1	N1-3
D2	M1

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2. INTRA VENOUS FERUMOXTRAN-10 MRI FOR THE DETECTION OF SMALL METASTASES

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INTRODUCTION

Pelvic lymph node metastases have a significant impact on the prognosis of patients with malignancies. In prostate cancer, for example, even micro metastases in a single node rule out surgical cure by the available treatment protocols. For bladder cancer lymph node metastasis are

also significant. More than 5 lymph node metastasis or extra capsular growth precludes curative surgical treatment. Thus, the status of the lymph nodes largely dictates the management of the primary tumour.

Surgical open pelvic lymph node dissection (PLND) considered being the only reliable method for assessing lymph node status is an invasive procedure associated with potential complications and side effects. A noninvasive, reliable method for detecting and staging nodal metastasis would reduce unnecessary surgery. Routine cross-sectional imaging modalities like CT and MRI lack the desired sensitivity in identifying metastases as they largely rely on size criteria only, and small metastases in normal size nodes can be missed. Moreover, differences in signal intensity on MR images between normal and cancerous nodes as well as gadolinium enhancement have also proven to be unreliable.

Although very promising in metastatic lung cancer, the role of ^{18}FDG PET-scanning is limited in the urinary tract region, as ^{18}F-fluorodeoxyglucose accumulates in the urinary bladder and kidneys. This makes an evaluation of metastases at this site difficult. Also, in various tumors like prostate and bladder cancer this method is further limited by its low uptake in metastatic nodes. Although the sensitivity of ^{18}FDG PET is slightly better (67%) compared to those of CT and unenhanced MR imaging. This value is, however, not high enough to replace pelvic lymph node dissection.

Ultra small super paramagnetic iron oxide particles (ferumoxtran-10) with a long plasma circulation time have been shown to be suitable as a MR contrast agent for intravenous MR lymphangiography.[1, 2] After IV injection the ferumoxtran-10 particles are taken up by macrophages are transported to the interstitial space and from there through the lymph vessels to the lymph nodes (Figure 1). Thus this contrast agent is cell specific (for macrophages). Once within normally functioning nodes the intracellular ferumoxtran-10 within the macrophages reduces the signal intensity of normal node tissue, because of the T1 and T2*- susceptibility effect of iron oxide, thus producing a signal drop or negative enhancement. In areas of lymph nodes that are involved with malignant cells, macrophages are replaced by cancer cells. Therefore, there is in these areas no uptake of the ferumoxtran-10 particles. In addition, due to increased vascular permeability and increased diffusion in cancer tissue, there is minimal leakage of ferumoxtran-10 particles into the extra cellular space of malignant metastatic areas, which produces a low local concentration and non-clustering of ferumoxtran-10 particles at these sites.[3] Through their T1-relaxivity this can induce an increase in signal intensity on T1-weighted images, producing positive enhancement.[4] Thus the ability of post ferumoxtran-10 MRI to identify metastatic areas in the lymph nodes depends primarily on the degree of uptake of ferumoxtran-10 by the macrophages in normal lymph node tissue and the leakage of ferumoxtran-10 particles in the metastatic area itself. Twenty-four hours after intravenous injection of ferumoxtran-10 normal lymph node and malignant tissue have different signal intensity on MR images. Therefore, this non-invasive technique may result in the detection of metastatic deposits in normal-size nodes.[4]**CLINICAL VALUE**

When using high resolution MR-technique small metastases can be prospectively recognized in small (3-10 mm) size lymph nodes.[5] These small lymph nodes would be considered to be benign in plain MRI or CT examinations. In addition, hyperplastic enlarged nodes can be correctly recognized as non metastatic, based on their low signal intensity. This results in improved sensitivity (~90%), with remaining equal high specificity (~95%) in various tumors.[5-8]

In prostate cancer contrast-enhanced CT and conventional MRI have a low sensitivity (40%), which is improved to 100% on a patient level and to 90% on a nodal level. [5]

In urinary bladder cancer 10/12 metastatic normal size lymph nodes were detected with ferumoxtran-10 MRI only, This resulted in an improved sensitivity (from 76% to 96%), whereas the specificity did not change significantly (from 99% to 95%).[6] When using ferumoxtran-10 MRI patients may be reliably selected for cystectomy, prostatectomy or radiotherapy without the need for invasive and costly procedures such as open and laparoscopic PLND. Furthermore, if the node is >5 mm the presence of malignancy can be confirmed by image guided biopsy, and thus also avoid PLND in these patients. This was the case in 5/80 (6%) patients in the study of Harisinghani & Barentsz. All 5 nodes were confirmed positive. Finally, with Ferumoxtran-10 MRI all pelvic nodes are visualized. Harisinghani & Barentsz showed that in 11% of their patients thanks to ferumoxtran-10 MRI metastatic nodes were detected, which were outside

the classical field of lymph node resection.[5] In patients with a suspicion for a recurrence, e.g. in patients with a PSA-relapse after treatment, this technique may show metastatic nodes when they still are small, thus allowing earlier adequate therapy. Finally, identifying small pathologic nodes will facilitate more appropriate use of sophisticated radiation therapy. For example when positive nodes are accurately identified, precise intensity modulated radiotherapy can be performed. This results in an increased dose on the malignant nodes and a decreased dose, with reduced side-effects, on normal tissues.

In head and neck cancers 25% lymph nodes are positive despite negative preoperative imaging (contrast CT and US biopsy) as metastatic nodes are small (5–10 mm). In addition PET is nonspecific and does not provide anatomic location. Therefore, Extensive surgery -radical neck dissection- is performed in virtually all patients. This result in cosmetic deformity and a complication rate of 36-54%. Mack et al reported that ferumoxtran-10 MRI on was accurate in 26/27 (96%) patients, which resulted in reduced extent of surgery in 26% of patients.[7]

Early results with ferumoxtran-10 MRI in breast cancer show a sensitivity of 78%, a specificity of 96% and a negative predictive value of 97%.[8] The sentinel lymph node procedure in breast cancer has a 3% to 10% false negative rate, furthermore, positive internal mammary lymph nodes are missed in 17%. Finally, the sentinel lymph node is the only positive node in 61% lymph node positive patients These patients all undergo axillary dissection, with subsequent high rate of clinically significant lymph edema. Thanks to its high negative predictive value, potentially in patients with a negative ferumoxtran-10 MRI the axillary dissection may be avoided. Further studies are under its way to validate this statement.

SUMMARY

Using a macrophage (=cell) specific MR-contrast agent and high resolution MR imaging allows the detection of small and otherwise undetectable lymph node metastases in patients with cancers cancer. This has an important clinical impact, as the diagnosis will be more precise and less invasive to obtain. Subsequently this will reduce morbidity and health care costs. However, thorough knowledge of sequence parameters and planes, lymph node anatomy, appearance of normal and abnormal nodes, and pitfalls is essential when using this technique. This implies a very important role for education by expert radiologists, MR-manufacturers, and contrast agent companies.

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3. TYPES OF BLADDER SUBSTITUTES

4. IMAGING OF BLADDER CANCER: POST CYSTECTOMY IMAGING

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There are various types of urinary diversions that include the orthotopic neobladder to the urethra, rectosigmoidal diversions and cutaneous diversions using ileum or colon (1).

Conventional radiographic imaging of the reconstructed lower urinary tract includes radiographic filling studies of the urinary reservoir " pouchography ", urethral micturation studies and intravenous urography (IVU). The long-term follow-up imaging studies focus mainly on the underlying disease and the pouch itself, including the functional quality of the ureteroileal junction and neobladder outlet (2-4).

The accuracy of the diagnosis of tumor recurrence is important for all types of therapeutic approach. Ultrasound demonstrates little diagnostic accuracy. The presence of gas in the intestinal loops which have slipped into the pelvis and of the bones of the pelvic girdle represent a notable technical limitations (5). The results of magnetic resonance imaging appear to be inferior to those of CT. Examination with MRI can be useful for the distinction between fibrosis and edema in radiotherapeutic treatment (6). CT should be considered the principle imaging diagnostic instrument.

Three-dimensional reconstruction using data obtained during CT has provided important information in certain reconstructed lower urinary tract. The additional time and effort required for the 3D reconstruction of a neobladder do not seen justified in the routine examination of the asymptomatic patient with a normally functioning urinary tract. Patients with postoperative morbidity and unexpected findings discovered during routine examination benefit from 3D reconstruction (7)

Further processing of the 3D information using animation effects may be performed to simulate a virtual endoscopy of the surgically created lower urinary tract. This enables not only an endoscopic " fly through " effect of the pouch, but also of the nipple, the afferent ileal limb, and the ureters (8)

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Sunday, September 10th; 8:30 – 10:00

Session III: Imaging of Prostate Cancer

Moderators: *E. El-Zalouey (EG), J. Barentsz (NL)*

1. UROLOGISTS' EXPECTATIONS:

H. BADAWY (EG)

2. EARLY DETECTION:

R. OYEN (BL)

3. IMAGING OF PROSTATE CANCER: DETECTION AND STAGING

HESHAM BADAWY, JELLE BARENTSZ, FRANÇOIS CORNUD AND RAYMOND OYEN
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Detection of prostate cancer mainly relies on PSA assay and sextant TRUS guided biopsies with a 10 to 12 samples protocol. Yet early diagnosis of prostate cancer is still a challenge as PSA lack specificity and a lot of unnecessary biopsies are still performed in patients without cancer and repeat series of biopsies are often required to detect a tumor missed on the first set of biopsies. As a consequence, saturation biopsies (30 cores in average) are becoming more and more popular to detect the tumor with a potential risk of overdiagnosis and thus overtreatment of insignificant latent tumors. In patients with one or several previous negative sets of biopsies and a persistant biological suspicion of prostate cancer, emerging imaging modalities such as contrast enhanced TRUS and MRI, or MR spectroscopy can be used to target biopsies in order to improve detection of clinical significant carcinomas.

Local staging of prostate cancer is a still more important challenge, because treatments based on radiation therapy (brachy and external beam radiation therapy with modulation intensity) are gaining wider acceptance and require to determine if a newly diagnosed prostate cancer is confined or nonconfined. TRUS guided biopsy of the extraprostatic spaces can detect extracapsular extension or seminal vesicle invasion in selected cases. However, in most newly diagnosed prostate carcinomas, TRUS guided biopsies can only estimate a low, intermediate or high risk of extraprostatic spread. If patients with a low risk do not have further investigations in many institutions (if surgery is the planned treatment), patients with intermediate and high risk of T3 disease should be investigated to further evaluate the local stage of the disease. Endorectal MRI is the modality of choice to accurately assess extraprostatic spread, the accuracy being still increased since 3 Tesla magnets are available.

Nodal staging of prostate cancer cannot be accurately done by cross sectional imaging because the only available criteria to detect invaded nodes is the nodal size. Non enlarged invaded nodes can only be detected by lympho-MRI with the use of iron particles capted by normal nodes and not capted by invaded nodes (partially or entirely). The alternative to this new modality is PET-CT scan using choline as a marker. The accuracy of both techniques needs to be further assessed to determine which technique will be routinely used in the future and indications of the examination need to be defined.

Bone staging still relies on bone scintigraphy which has a poor specificity. CT scan, MRI and bone biopsy are often required to evaluate a positive bone scan. Recently combination of surface coils has been proposed to perform a "skull to toe" MRI in a coronal plane. T1 weighted and STIR sequences are used and a sagittal acquisition of the whole spine is also performed. Accuracy of whole body MRI is under evaluation to determine if MRI can replace bone scan in the detection and follow up of bone metastases. Choline PET-CT scan is also a promising modality to detect bone metastases. The future will determine which modality (whole body MRI combined with

lympho MRI or PET-CT scan) will be the most accurate to determine the nodal and bone staging of prostate cancer.

4. ADVANCES IN MANAGEMENT

F. CORNUD (F)

Sunday, September 10th; 10:30 – 12:00

Session IV: Imaging of Cervical Cancer

Moderators: *A. Bergman (S), M. El-Badawi (EG)*

1. CANCER CERVIX IMAGING: WHAT THE SURGEON NEEDS?

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Cancer care is critically dependent on imaging technologies, which are used to detect tumors early, when they are easier to treat, and to guide therapy or surgery.

The surgeon needs an imaging modalities that could detect the precancerous lesions of cancer cervix so that more cancers can be diagnosed and treated before there is any evidence of anatomic change.

The surgeon needs an imaging modalities that accurately detecting whether a tumor has invaded vital tissue, grown around blood vessels, or spread to distant organs.

The surgeon needs an imaging modalities that could monitor his patients' progress and response to therapy without the need for biopsies.

The surgeon needs an imaging modalities that allow precise delivery of various tumor-destroying approaches (chemicals, radiation), which minimizes trauma and damage to healthy tissue, shortens recovery times, and reduces healthcare costs.

The surgeon needs an imaging modalities that help in eliminating the suffering and death due to cancer. For example, not only to cure some cancers, but in many cases to provide minimally invasive, well-tolerated palliative therapies. This will transform cancers from deadly illnesses into chronic, well-managed diseases that have little adverse effect on the daily lives of patients.

2. STAGING OF CERVICAL CANCER WITH MR IMAGING

AHMED-EMAD MAHFOUZ, MD FRCR
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MR imaging has been the imaging method of choice for the initial staging of cervical carcinoma due to its multi-planar capabilities and high soft tissue contrast. The first part of this presentation reviews the technical aspects of MR imaging of the cervix with particular emphasis on the sequences used, planes of imaging, and the use of contrast agents. The second part reviews the role of MR imaging in the initial staging of cervical carcinoma with particular emphasis on the signs of spread of cancer to the parametria, uterus, urinary bladder, rectum, vagina, and pelvic wall, as well as spread to lymph nodes.

3. IMAGING OF POST-TREATMENT CHANGES AND CHARACTERIZATION OF RECURRENCE

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INTRODUCTION

Carcinoma of the cervix is the most common gynecologic malignancy in Portugal.

In the majority of oncological centers treatment is determined by FIGO (International Federation of Gynecology and Obstetrics) staging classification which is based on clinical observation. In our institution, we use TNM classification based on FIGO staging.

Radical surgery is indicated on tumors under or equal to 4 cm, in pelvic inflammatory disease, non-obese patients, young patients, and in those who deserve to preserve the ovarian function. Patients on upper stages are treated with combined chemotherapy and radiotherapy and for patients on stage IVB chemotherapy is the treatment of choice. Detection of enlarged para-aortic or inguinal lymph nodes is considered extrapelvic tumor extension (stage IVB).

FIGO staging system has some practical difficulties that may imply some inaccuracies. It is well established, in the literature, that MR is the best imagiological exam in patients evaluation undergoing surgical treatment, mainly in those cases, that are clinically difficult, such as large bulky cervix, primary endocervical lesions mainly adenocarcinomas. For that, in treatment planning, we also use the information based on pelvic MR, as this imaging modality has an excellent accuracy for the evaluation of tumor extension and size.

Our MRI protocol includes transverse T2-weighted images of kidneys and infrarenal periaortic node chain, to detect hydronephrosis and gross adenopathy, obviating the CT scan of the abdomen.

In this presentation we are going to describe and illustrate the most common features of post treatment changes and cervical cancer recurrence.

1 – SURGICAL TREATMENT

1A – SURGICAL PROCEDURES

Stage IA1 carcinoma without lymphovascular space invasion is usually treated with conization or total abdominal hysterectomy (TAH). TAH requires resection of the uterine corpus and cervix and a small cuff of the upper vagina. The residual vagina is sutured. During the procedure the uterovesical, round, and broad ligaments are incised; however, the cardinal ligaments, which are intimately related to the uterus, are left intact. There is minimal disturbance of the trigone of the bladder and the ureters.

Modified radical abdominal hysterectomy with bilateral pelvic lymphadenectomy is used for patients on stage IA_1 with lymphovascular space invasion and for patients on stage IA_2. This procedure removes the cervix and the upper vagina (proximal 1 – 2 cm), including paracervical tissues. The ureters are dissected in the paracervical tunnel to the point of entry into the bladder. Because the ureters are unsheathed and retracted laterally, parametrial and paracervical tissue can be safely removed medial to the ureter.

Radical abdominal hysterectomy is indicated for most patients with stage IB_1 and in some cases of stage IIA (IIA tumor≤ 4 cm with small vaginal invasion). This procedure consists of removal of the uterus, the upper third of the vagina, and the parametrial, paracervical and upper paravaginal tissues. All uterine ligaments are resected, including the cardinal ligaments that are dissected free of the ureters and are detached at the pelvic sidewall. Lymph node dissection, with removal of all the pelvic nodes distal to the common iliac vessels, is undertaken at the same time.

Pelvic exenteration is performed on a few selected stage IVA lesions and recurrent or persistent carcinoma of the cervix. In patients with malignant disease, the most important criterion for resectability is that the tumor is confined to the central pelvis without evidence of extension to the pelvic sidewall or of distant dissemination. Exenteration may be total or partial. Total exenteration consists of removal of the bladder, urethra, uterus, vagina, and rectum, together with all the pelvic supporting and connective tissues. Partial exenteration is either anterior, with the rectum preserved, or posterior, with maintenance of the bladder and the urethra. Most exenterations are supralevator, with the pelvic floor musculature left in situ. However, infralevator exenteration is occasionally necessary, being the pelvic floor muscles resected together with the vulva.

1B – POST SURGERY PATHOLOGICAL CHANGES

1B1 – CT findings

The CT appearance of the central pelvis is similar after total and radical hysterectomy. In addition to the absence of the uterus, the opposed vaginal fornices typically form a linear soft tissue configuration. Nodularity or fullness of the lateral fornix, seen on postcontrast CT may mimic a mass lesion.

If the ovaries were retained its position should be documented. The site of the surgical approach may be visible and metallic clips along the pelvis sidewall can be detected at the site of lymph node dissection.

After total exenteration, the pelvis is devoid of the bladder, urethra, genitalia, and rectum. The patient has a urinary diversion and a colostomy. In patients who have undergone anterior pelvic exenteration, there is no identifiable bladder or pelvic genitalia, but the rectum remains in situ and the potential space in the anterior pelvis is filled by bowel. Sometimes the rectum occupies a more anterior position. After posterior pelvic exenteration, the rectum and pelvic genitalia are absent and the bladder extends into the posterior pelvis.

The most common complication of cervical biopsy is stenosis of the cervical canal that, occasionally, results in hematometra or hematocervix and can be detected by fluid collection in the middle of the uterine corpus or in the cervix respectively.

CT is often the primary imaging method for the diagnosis of postoperative pelvic abscesses. The imaging hallmark of an abscess on CT is a complex fluid that demonstrates mass effect. CT is also exquisitely sensitive for small gas bubbles. Gas bubbles, however, are an infrequent finding in most abdominal abscesses and are demonstrated in probably only one third of patients. Therefore, the CT appearance of an abscess is often nonspecific and may be mimicked by other complex fluid collections, such as a hematoma, lymphocele or seroma. In selected patients, diagnostic needle aspiration must be performed for precise diagnosis. Contrast medium enhancement often facilitates identifying pelvic abscesses and distinguishing solid inflammatory masses (ie, phlegmon) from liquefied pus.

If a pelvic hematoma is suspected on the basis of clinical findings and a falling hematocrit, preliminary noncontrast CT scans are helpful to identify areas of high attenuation (30–60 HU).

Postoperative collections of lymphatic fluid are common 2 to 4 weeks after lymphadenectomy. The majority of lymphoceles is asymptomatic and they are ultimately resorbed without sequela. In a small percentage of patients, lymphoceles may encapsulate and cause pelvic pain, venous thrombosis, or signs and symptoms of infection. On CT, lymphoceles appear as low attenuation lesions that may mimic the appearance of an abscess. Attenuation values of lymphoceles, in fact, may be less than water, owing to the lipid content of lymphatic fluid. Lymphoceles have a characteristic location along the anatomic pathway of major lymphatic chains.

Postoperative adhesions commonly develop after gynecologic surgery and are a major cause of small bowel obstruction (5% after radical hysterectomy).

1B2 – MR findings

After total and radical hysterectomy, we can detect the absence of the uterus and the vaginal cuff is located posterior to the bladder and anterior to the rectum at the level of the acetabula. It should be symmetric and sharply marginated from the surrounding fat. The upper limit of normal

size of the vaginal cuff is 2 cm in anteroposterior diameter. Nodularity or fullness of the lateral fornix, seen on T1WI, may mimic a mass lesion. In most cases, a normal vaginal cuff is confirmed by visualizing a smooth, low-signal intensity muscular wall on T2WI. In some cases, however, fibrotic scar tissue is present at the vaginal vault. The scar demonstrates medium to low-signal intensity on T2WI. In addition, after radical hysterectomy, the medium- to high-signal intensity residual vagina is short. The bladder and bowel may adhere to its margins. Also the position of retained ovaries should be documented on MR; the site of the surgical approach may be visible and metallic clips along the pelvis sidewall can be detected at the site of lymph node dissection as small areas of signal void.

After total exenteration, the anatomic considerations described on CT changes can be documented on MR.

A hematometra or hematocervix can also be found on MR due to stenosis of the cervical canal as a complication of biopsy.

After conization, extensive shortening with subsequent incompetence of the cervix may occur.

Postoperative hematomas, lymphoceles, abscesses, fistulas, and venous thromboses can be detected and characterized with MR imaging.

2 – RADIOTHERAPY

2A – DESCRIPTION OF RADIOTHERAPY EFFECTS

Radiotherapy induces significant normal tissue injury in about 5-10% of patients. The gastrointestinal tract is more susceptible to injury than the urinary tract and patients vary in their tolerance to radiotherapy. For example hypertension, diabetes mellitus and localized infection all increase the risk of radiation damage. The risk of radiation damage is also dependent upon the total dose of irradiation, volume of irradiated tissue, the size of irradiation fractions and the duration of therapy. In patients who have previously undergone surgery or chemotherapy the risk is also increased.

Radiation damage is due to destruction of intracellular DNA which results in cell death. Tissues with a high turnover, such as epithelial cells are affected before other tissues, such as vascular endothelium and connective tissue. Early radiation reactions result from epithelial necrosis whereas chronic radiation injury is due to vascular and stromal damage. Radiation reactions are divided into acute, subacute and chronic. Acute reactions occur within the first 3 months, subacute from 3 months to 1 year and chronic radiation effects after 1 year.

2B – POST RADIOTHERAPY PATHOLOGICAL CHANGES

2B1 – CT findings

Marker seeds placed in the cervix to provide a landmark for external beam therapy are observed in CT and can be also a useful marker for radiologists.

The uterus and the ovaries will decrease in size following radiotherapy.

Changes in the intact uterus are characterized by bilateral parametrial "whiskers" or poor definition and irregularity of the parametria without pelvic sidewall disease extension.

Classic radiation therapy-induced changes are thickening of the bladder wall with reduced bladder capacity, thickening of the pelvic ligaments and an increase in the amount of fat in the peri-rectal space. The peri-rectal space which normally measures a maximum of less than 1.5 cm at S4/5 shows a marked increase due to the presence of excessive fat. Additional characteristics radiation-induced changes are a diffuse increase in density of the posterior pelvic fat and thickening of the perirectal fascia. The bowel wall is thickened and in severe cases this may be seen throughout the colon and small bowel loops within the pelvis.

Hydrometra or pyometra are indicative of cervical obstruction caused by radiation-induced stenosis. The obstruction appears as a symmetrically enlarged uterus with a low-attenuated nonenhancing central mass. The central low attenuation and lack of contrast enhancement help differentiate an obstructed uterus from other causes of uterine enlargement.

Ureteric strictures caused by radiation fibrosis are relatively rare. They appear smooth and

tapered.

Women presenting pelvic pain after radiotherapy might have fractures and osteonecrosis as a radiation effect between 4 months and 4 years after treatment. The insufficiency fractures are located in pelvic bones and osteonecrosis in the femoral head. The sacral fractures are usually present on CT as vertical linear lesions in the sacral alae parallel and adjacent to the sacroiliac joints. The iliac fractures are usually vertical, parallel to the adjacent pubic symphisis and extend through the flat junction of the superior and inferior pubic rami. The absence of a history of trauma and the presence of multiple fractures provides in most cases reliable evidence that the fractures are insufficiency-type stress fractures occurring in bones with diminished resistance and presence of some degree of osteoporosis. Differential diagnosis with bone metastases is important to avoid further therapy.

2B2 – MR findings

Immediately after radiation, inflammation, edema, and capillary hypervascularity are seen. Pathologically low-signal intensity areas on T2WI correspond to low cellularity, prominent fibrosis, and hemosiderin deposits in the necrotic tissue; however, high-signal intensity on T2WI after treatment may represent residual tumor or peri-tumoral edema/inflammatory tissue. Post-treatment edema or inflammation is especially prominent within the first 6 months of treatment. As a result, the accuracy and the specificity of MR examinations at less than 6 months after the beginning of radiation therapy are significantly lower than they are for examinations performed after more than 6 months. The use of contrast enhancement may lead to an increase in false-positive findings; however, gadolinium-enhanced T1WI is helpful in evaluating patients with fistula formation.

Marker seeds placed in the cervix to provide a landmark for external beam therapy may be visualized on MRI. The cervix reconstitutes after radiotherapy with resolution of the tumor mass, which is often rapid, so that within weeks there is restoration of T2WI low-signal intensity fibrous stroma, whose signal intensity is often very low due to a profound fibrous reaction.

The uterus of a post-menopausal woman may decrease in size following radiotherapy.

A patient of reproductive age will demonstrate more profound changes due to the occurrence of menopause with decrease in size of the uterus, loss of the junctional zone anatomy, low-signal intensity of the uterine body, marked thinning of the endometrium and low-signal intensity of the cervix as it reconstitutes. The ovaries will decrease in size often demonstrating low-signal intensity and will no longer have physiological cysts evident on MRI. The vagina also demonstrates a decrease in signal intensity.

Changes in the intact uterus are characterized by bilateral parametrial poor definition and irregularity of the parametria without pelvic sidewall disease extension.

Classic radiation therapy-induced changes are thickening of the bladder wall with reduced bladder capacity, thickening of the pelvic ligaments and an increase in the amount of fat in the peri-rectal space, producing a halo effect about the rectum. Additional characteristics radiation-induced changes are a diffuse increase in signal intensity of the posterior pelvic fat and thickening of the perirectal fascia. The bowel wall is thickened and in severe cases this may be seen throughout the colon and small bowel loops within the pelvis.

Pelvic wall shows diffuse, usually bilateral symmetric high signal intensity of the muscles within 6 months after radiation. In the late phase, the pelvis wall shows decreased signal intensity. After contrast administration, diffuse enhancement is seen in the muscles of the radiation field.

The bone marrow after radiation therapy demonstrates high-signal intensity on T1WI related to increased fat content, with the margins of this change matching the dimensions of the radiation port.

Hematometra or pyometra are indicative of cervical obstruction caused by radiation-induced stenosis.

3 – PERSISTENT DISEASE

Persistent disease is defined as evidence of the tumor that is clinically present after treatment

or development of a new tumor in the pelvis within the treatment period.

A residual tumor may be recognized on postcontrast CT scans in which the tumor may appear as a soft tissue mass enlarging the cervix with diminished intravenous enhancement compared with normal cervical tissue.

A residual tumor displays high-signal intensity on T2WI, similar to the corresponding primary tumor. MRI is superior to CT for delineating the tumor. Most tumors that respond to therapy decrease in size within 6 months, and most of these tumors also show decreased signal intensity because of radiation fibrosis; however, large primary tumors (> 50 cm^3) may show delayed response.

4 – RECURRENCE

Recurrence is defined as local tumor regrowth or the development of metastasis discovered 6 months or more after complete healing of the primary lesion.

The recognized 5 years follow-up for cervical cancer includes annual thorax X-ray and CT of the abdomen and pelvis in the 2 first years and imaging studies are performed according clinical observation in the last 3 years. Up to one third of patients develop recurrent tumor in the pelvis by three years after treatment of their primary tumor.

4A – LOCAL RECURRENCE

4A1 – CT findings

CT has been used extensively to screen patients with known or suspected recurrent cervical cancer. Clinical examination and CT are complementary cost-effective techniques to evaluate disease extent and assist in decision making either to perform an exenterative procedure or alternative tumor resection for disease control or to document inoperable disease with CT-guided biopsy. Serial CT scans provide an objective measurement of tumor response to radiation therapy, chemotherapy, or both in nonsurgical candidates.

Unlike the use of CT in primary cancer staging, CT has both a high sensitivity and specificity and a low false-negative rate in recurrent disease detection. CT is valuable in the assessment of central pelvic tumor recurrence; parametrial, perineal, and pelvic sidewall tumor extension; bladder and rectal invasion; pelvic lymphadenopathy; bony erosion from adjacent lymph node metastases; the site of ureteral obstruction; pelvic vein thrombosis.

A major limitation of CT is the differentiation of radiation therapy-induced and/or postsurgical fibrosis from recurrent tumor. Also, vesicovaginal and/or rectovaginal fistulae resulting from radiation therapy may be difficult to differentiate from fistulae resulting from recurrent tumor when no other findings are present on CT scans.

The distinctive CT findings of pelvic recurrent tumor are asymmetry; the presence of a soft tissue mass with hypodense tumor foci; compression and invasion of normal adjacent organs; and mass extension to involve the pelvic sidewall, iliopsoas muscle, or innominate bone with or without bone destruction.

In patients who have an equivocal CT, a CT-guided aspiration cytologic examination or core biopsy is an accurate way to differentiate recurrent tumor from posttreatment changes. In some patients, however, nests of tumor cells surrounded by dense fibrous tissue cannot be aspirated successfully to confirm recurrent disease.

4A2 – MR findings

MR imaging is used for identifying recurrent pelvic tumor and distinguishing it from posttreatment fibrosis and it may be the only imaging technique that can identify the co-existence of recurrent tumor with fibrosis.

On MR imaging, fibrosis typically shows low signal intensity on both T1WI and T2WI.

MRI is superior to CT for delineating the tumor. On T2WI, a recurrent tumor demonstrates increased, often heterogeneous, signal intensity. Lesions larger than 1 cm are accurately depicted. Smaller lesions, however, may be affected by partial volume averaging and are more difficult to assess. When recurrence occurs within the preserved cervix, obstruction of the cervical os may

occur and may result in hydrometra.

Central recurrences may also grow anteriorly, resulting in continuous spread to the urinary bladder and even to the anterior abdominal wall. Such local recurrence with anterior extension may lead to ureteral obstruction by direct encasement of the ureter or by tumor infiltration of the bladder wall, resulting in obstruction at the ureteral orifice. In addition to ureteral obstruction, tumor extension to the urinary bladder predisposes the patient to vesico-vaginal fistula. Central pelvic recurrence may extend posteriorly to involve the rectum, with a recto-vaginal fistula developing in some instances, or it may extend laterally to involve the pelvic sidewall. Gadolinium-enhanced T1WI is helpful in evaluating patients with adnexal or pelvic sidewall recurrence and patients with fistula formation.

Tumor extension into the bladder and rectum is suggested by abnormally high signal intensity in their walls on T2WI. The use of gadolinium chelates is helpful in the assessment of bladder and rectal invasion.

Evidence of cancer at the pelvic sidewall and the presence of lymph node metastases make the patient ineligible for curative exenteration.

Tumor producing a desmoplastic reaction demonstrates low signal intensity on T2WI. Follow-up imaging is useful in distinguishing recurrent disease from radiation induced fibrosis. Fibrosis progressively decreases in size, whereas recurrent tumor grows with time.

4A3 – PET findings

PET accurately demonstrates central recurrence in patients with indeterminate findings at CT or MR imaging. This modality can detect recurrences in small lesions of less than 1 cm in the vaginal cuff, retrovesical area, and pelvic wall, where it is difficult to differentiate between fibrosis and recurrence.

PET is significantly more accurate than CT or MR in detecting small metastatic lymph nodes, especially in patients in whom the fat content of the retroperitoneum is low.

4B – Distant recurrence

The use of intensive pelvic radiation therapy has resulted in a shift away from pelvic recurrence toward distant recurrence. Approximately 70% of recurrences are estimated to be distant or combination of local and distant metastases. Most of the distant metastasis is detected in already far-advanced state with clinical symptoms such as cough, hemoptysis, and pain.

Imaging findings of distant lesions are nonspecific and indistinguishable from involvement by other primary malignancies.

4B1 – CT findings

CT is used to detect para-aortic lymphadenopathy; pulmonary parenchymal and mediastinal lymph node metastases. Less typical manifestations such as peritoneal carcinomatosis and solid organ metastases also occur. Peritoneal metastases, including peritoneal carcinomatosis, are more common than metastases to the liver. The prevalence of peritoneal carcinomatosis has ranged from 5% to 27%.

The prevalence of lymphatic involvement by the tumor varies with the histologic type of the tumor. Patients with adenocarcinoma of the cervix have a greater prevalence of metastases than patients with squamous cell carcinoma. Lymphatic involvement, in cervical cancer, progresses from the paracervical, parametrial, internal and external iliac, and obturator nodes to the sacral, common iliac, inguinal, para-aortic and extra abdominal nodes (retrocrural, mediastinal and supraclavicular), worsening the prognosis.

After pelvis and lymph nodes, the solid organs of the abdomen are the most frequent sites of involvement by recurrent cervical carcinoma. CT is useful for detecting clinically unsuspected extrauterine metastases and lymph node metastases. The intraabdominal solid organ most commonly involved is the liver. Liver metastases have been reported in approximately one third of patients with recurrent cervical carcinoma. Hepatic recurrence of cervical carcinoma usually appears as multiple focal lesions with variable enhancement patterns at CT. The adrenal gland is the next most commonly involved intraabdominal solid organ. Adrenal metastases have been noted

in 14% to 16% of patients with recurrent cervical carcinoma. The involvement of other abdominal solid organs such as the spleen, kidney, pancreas, or gastrointestinal tract is rare, and in almost all cases, widespread metastasis involving other organs also occurs.

Lung metastases from recurrent cervical carcinoma develop in less than 15% of patients. Pulmonary metastasis may exist for a significant period of time before becoming symptomatic. Typical patterns of lung involvement are pulmonary nodules (71%), mediastinal and hilar lymphadenopathy (32%), and pleural metastasis (27%). Rare findings include endobronchial obstruction (5%) and lymphangitic carcinomatosis.

The prevalence of osseous metastases in patients with recurrent cervical carcinoma ranges from 15% to 29%. Vertebral bodies, especially lumbar, are by far the most frequently involved bones followed by the pelvis, ribs, and extremities.

4B2 – MR findings

MR imaging is superior to CT in the assessment of bone metastases and shows more extensive involvement.

MR is a useful study to delineate involvement of medulla and nerve roots in patients who have low back pain, sciatica, or both and who have an equivocal or negative CT study.

4B3 – PET findings

PET can show whole body image at one time. Distant metastases, which usually escape routine pelvic imaging, can easily be detected.

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Sunday, September 10th; 12:00 – 13:00

Session V: Imaging of Ovarian and Endometrial Cancer

Moderators: *K. Kinkel (CH), D. Salem (EG)*

1. OVARIAN MASS CHARACTERIZATION AND STAGING

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OVARIAN MASS CHARACTERIZATION

The vast majority of ovarian masses is diagnosed by US during the gynaecologic examination. Depending on the age of the patient and the morphologic features of an adnexal mass on Sonography further imaging is often warranted. Appropriate information by CT and particulary by MRI is important for several reasons. In equivocal pelvic masses it aids in defining its exact origin and thus in establishing a differential diagnosis. In adnexal masses further characterization, particulary discrimination between benign and malignant ovarian lesion may directly affect the surgical decisions, including the adequate therapeutic approach, surgical technique and need of subspeciality cooperation. Furthermore, in times where endoscopic surgery has become very popular, thorough pre-treatment evaluation should diminish the possibility of encountering an unexpected ovarian cancer.

Most common used imaging features suggestive of malignancy are: lesions size larger than 4cm, thickness of wall or septae exceeding more than 3mm, papillary projections, necrosis, partially cystic and solid internal architecture, a lobulated solid mass and presence of tumor vessels (1-4).

Contrast enhanced studies in CT and MRI assist in tumor characterization, especially in the depiction of papillary projections and necrosis. None of these imaging criteria, however are specific enough as a single factor to reliably diagnose ovarian cancer. The likelihood of malignancy increases with solid nonfibrous elements, thickness of septae, and presence of necrosis. Ancillary findings such as presence of lymphadenopathy, peritoneal lesions, and ascites improve the diagnostic ability to diagnose ovarian cancer. The combination of tumor size and architecture and ancillary signs improves prediction of malignancy, and yields an accuracy of 89-95% (2), (4).

Necrosis within a solid portion of an ovarian mass was most predictive sign of malignancy in a multivariate logistic regression analysis of complex adnexal masses studied by MRI**.** Solid nonfatty nonfibrous tissue with or without necrosis has also been reported as a valuable predictor of malignancy (5). Thick walls and septations are less reliably signs of malignancy, as they may also occur in abscesses, endometriomas and benign neoplasm such as cystadenofibromas and mucinous cystadenomas (5).

Papillary projections are typical for epithelial ovarian neoplasms. They are most often associated with epithelial cancers with low malignant potential, and may also be found in invasive carcinomas. In the latter the gross appearance is usually dominated by a solid component.

Psammona bodies which represent tiny calcifications are found in CT in approximately 10% of serous epithelial ovarian cancers**.** Calcifications may also be identified in benign ovarian stromal tumors, e.g Brenner tumors or thecomas. These tumors are typically solid and tend to show extensive coarse calcifications.

STAGING OVARIAN CANCER

In most western countries ovarian cancer ranks fifth in cancer related mortality in women after lung, breast, colorectal and pancreatic cancer. Among the gynecological cancers it is the most lethal cancer type and is responsible for more deaths than in cervical and endometrial cancer combined. It is estimated that one woman in 70 will develop ovarian cancer, and 1 woman in 100 will die of the disease. The strongest patient related risk factor for ovarian cancer is increasing age.

The vast majority of epithelial ovarian carcinomas are diagnosed in the postmenopausal period, with a mean age at diagnosis of 59 years.

In patients with a family history of breast and ovarian cancer, ovarian cancers occur up to 10 years earlier. In females younger than 20 years of age germ cell tumors account for more than 2/3 of malignant ovarian tumors.

Ovarian cancer is usually clinically silent and about 75% of women present with advanced stages. This is why despite developments in diagnosis and treatment the overall survival rate has changed only little within the last decades (6)

Stage at the time of diagnosis is besides residual postoperative tumor burden the most important prognostic factor. Overall survival rates are directly related to the stage at initial presentation. Reported 5 year survival rates are 95% for localized disease, 81% for localized disease, and 31% for advanced disease (6) Among the cancer types clear cell cancer seems to have a poorer prognosis even in early stage disease.

Surgical staging is the gold standard to evaluate a patient with ovarian cancer, and it is the basis to determine whether additional therapy is necessary. Staging of ovarian cancer is based upon the extent and location of the tumor found at initial staging laparotomy. The latter requires a comprehensive staging laparotomy including hysterectomy, bilateral salpingo-oophorectomy, omentectomy, peritoneal biopsies and washings, and lymph node biopsies.

The most commonly used staging classification are the FIGO and TNM classification systems.

Surgical staging can be preceeded by a series of preoperative tests. Recently, CT and MRI have been widely accepted as adjunct imaging modalities for preoperative tumor assessment (7-9). The imaging findings for staging ovarian cancer have been adopted according to the FIGO classification. They include stage I with disease confined to the ovaries, stage II which is characterized by local tumor extension into the pelvic soft tissues and to organs within the true pelvis. Stage III is characterized by extrapelvic peritoneal dissemination or regional lymph node metastases. Hematogenous metastases and supradiaphragmatic lymphadenopathy are found in stage IV ovarian cancer.

Although definitive staging of ovarian cancer is based upon the findings at surgery, preoperative assessment of the tumor extent by imaging may influence patient management. Accurate preoperative assessment of ovarian cancer, may aid the surgeon in better determining sites for biopsy, and allow also the depiction of tumor deposits which might be difficult to visualize intraoperatively, e.g the diaphragm, splenic hilum, stomach, lesser sac, mesenteric root, and paraaortic nodes above the level of the renal hilum. Furthermore it may alert the surgeon of the need for a subspecialist cooperation, or for referal to an oncology center.

CT and MRI perform similarly in staging of ovarian cancer with reported staging accuracies of 78-90% (8, 9). According to the ACR guidelines CT is currently the primary imaging modality for staging ovarian cancer. MRI is recommended in equivocal cases or in case of contraindication to contrast enhanced CT. Recently PET/CT has also been used for staging ovarian cancer. Helical CT improves the performance of detecting peritoneal implants with a reported sensitivity of 85-93% and a specificity of 91-96% for detection of peritoneal implants (8), (10).

In case of extensive cancer and signs of non-resectability on CT or MRI, candidates may be selected who may benefit from neoadjuvant therapy prior to surgery. Several studies have addressed the role of imaging in predicting resectability of patients with advanced ovarian cancer. Resectability, as defined by imaging depends on the location and size of peritoneal implants. Most commonly used criteria indicating suboptimal cytoreduction include: a.) retroperitoneal presacral implants, b.) lesions in the root of the mesentery, extensive disease (larger than 2cm) along the undersurface of the diaphragm or lesser sac, liver surface implants in the gall bladder fossa and interhepatic fissure, c) suprarenal paraaortic lymph nodes, and d) liver parenchymal, pleural and pulmonary metastases. CT and MRI performed recently equally accurate in detecting inoperable tumor and prediction of suboptimal debulking in ovarian cancer with reported sensitivity of 76%, specificity of 99%, PPV of 99% and NPV of 96% (11).

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2. IMAGING OF UTERINE CANCER: USE OF MR IMAGING

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In this review I will describe the normal MR appearances of the uterus and the optimum examination technique for assessment of uterine cancer. I will also cover the differential diagnosis of the enlarged uterus as assessed by MR imaging.

By far the most common uterine cancer is cancer of the endometrium. Cervical cancer may extend up into the lower uterus and ovarian cancer may invade through the serosa of the uterus. Metastases from other sites are rare, although diffuse infiltration from breast cancer is recognised.

Less common primary tumours include carcinosarcoma and sarcoma, some of which arise in pre-existing fibroids, rarer forms of adenocarcinoma e.g. papillary serous carcinoma, small cell carcinoma and lymphoma.

Endometrial cancer is a disease of older women. Less than 5% of cases occur in premenopausal women. It has similar incidence to ovarian and cervical cancer but much lower mortality as most women present with early stage disease (appendices 1, 2) since unexpected vaginal bleeding is a worrying symptom. Prompt assessment is required to distinguish those women with cancer from those with other benign, senile and atrophic pathologies.

MR imaging is part of a diagnostic algorithm for the rapid diagnosis and staging of uterine cancer. This begins with ultrasound (US) whose role in women suspected of having endometrial cancer is to identify those who do not require hysteroscopy and guided biopsy. There is no role for ultrasound in women who will undergo hysteroscopy and biopsy irrespective of the findings of US.

Primary indications for ultrasound or hysteroscopy

- Post-menopausal bleeding (PMB): bleeding after six months amenorrhoea is the cardinal symptom of endometrial cancer
- Persistent unexpected bleeding with hormone replacement therapy
- Persistent unexplained vaginal discharge in a postmenopausal woman
- Pre-menopausal bleeding: persistent or heavy intermenstrual bleeding, symptoms which demand consideration of cervical cancer

Women should attend with a full bladder. Before the scan the menstrual state should be recorded, as well as any history of gynaecological surgery, IUCD and any medications such as Tamoxifen, HRT etc. If cyclical HRT is being taken, the scan should be timed for the withdrawal bleed.

Minimum US imaging protocol of the endometrium

- Uterus in longitudinal and transverse sections (LS and TS)
- Endometrium in LS and TS
- **Measure double layer thickness of endometrium in LS excluding any fluid**
- Both ovaries and any other adnexal lesion
- Both kidneys

Detailed questions and extended protocol if abnormality found

- Is the endometrium uniformly or focally enlarged?
- Is the endometrium cystic or not?
- Is there any fluid in the endometrial cavity?
- Is the subendometrial darker halo intact?
- Are any submucosal fibroids or endometrial polyps identifiable?
- What is the relative width of endometrium compared to overall uterine width?
- Colour Doppler of the endometrium and uterine arteries
- A search for distant spread in abdomen

Criteria for diagnostic US assessment

A postmenopausal endometrial **double layer thickness of 4mm or less effectively excludes endometrial cancer** and in these women hysteroscopy can usually be avoided.

Colour flow Doppler signal present within the postmenopausal endometrium raises the likelihood of cancer.

Low impedance flow (RI less than 0.5) and high peak systolic velocities (over 40cm/s) in a postmenopausal fibroid raise the possibility of sarcomatous change.

Investigation after abnormal US

Hysteroscopy and guided biopsy are required for women with postmenopausal bleeding and a thickened endometrium.

If hysteroscopy is not readily available, then saline infusion sonohysterography and pipelle biopsy may help select those who need further intervention.

A chest radiograph (CXR) completes basic staging assessment and as many women have co-morbidity may be required as part of the anaesthetic assessment.

The role of MR imaging is emerging as a staging tool

Surgical management of endometrial cancer may be influenced by the findings of MR imaging in two situations. Deep myometrial invasion (stage IC) and high grade tumour increase the risk of nodal metastases. These patients require nodal dissection for adequate surgical staging. Involvement of the cervical stroma (stage 2B) indicates the need for radical hysterectomy.

Multidisciplinary discussion between specialist gynaecological surgeons, oncologists, pathologists and radiologists is central to defining treatment options and usually follows staging examinations but may occur earlier if there are problems such as co-morbidity which limit investigation and treatment options. It is particularly important that women with high grade disease (G3) and pathologies other than endometrial cancer e.g. papillary serous, small cell and clear cell carcinoma or sarcoma are assessed in cancer centres.

Absolute indications for MR imaging with proven or suspected endometrial cancer

- Histologically high grade (G3) tumour
- Suspicion for advanced disease, especially cervical involvement
- Patients who represent a poor operative risk and will not undergo surgical staging
- Inability to properly assess the endometrium hysterocopically e.g with cervical stenosis

Relative indications for MR imaging with proven or suspected endometrial cancer

When a decision to perform lymphadenectomy rests on the likelihood of stage IC disease

Technique for MR imaging of endometrial cancer

- Avoid vaginal tampon
- Intravenous anti-peristaltic agent – Glucagon or Buscopan

- Phased array pelvic coils
- Sagittal SFOV (20 cm) T2W sequence through the pelvis
- 'Inclined axial' SFOV T2W sequence perpendicular to the endometrial cavity
- 3 or 4mm sections with SFOV, ideally 512 matrix size
- LFOV axial FISP and coronal T1W sequences through the retroperitoneum and pelvis to assess nodal disease and hydronephrosis
- Supervision of the examination by radiologist experienced in gynaecological MR
- Optional post-contrast images

The uterus has three zones on T2W MR imaging: the endometrium is a mixed intensity zone in the centre of the uterus and may be expanded by fluid; the junctional zone surrounds this and uniformly hypointense relative to the endometrium and outer myometrial zone. This zonal anatomy may be lost after the menopause and in women taking the contraceptive pill and is also abnormal in adenomyosis.

Invasive endometrial carcinoma disrupts the low SI junctional zone (JZ) on the T2W sequences, extending for a variable depth into the myometrium. Invasion of the JZ indicates stage 1B and of the outer half of the myometrium as stage 1C.

The JZ may be indistinct in post-menopausal women and in this group of women and others with uncertain depth invasion on T2W images, dynamic gadolinium enhanced T1W sagittal and 'inclined' axial SFOV images are helpful in defining tumour and assessing depth of invasion.

For contrast enhancement dynamic fat suppressed gradient echo sequences are optimal. With this technique the tumour is hypointense, less vascular, than myometrium and there is a sub-endometrial enhancement (SEE) which defines the tumour margin. The maximal tumour to myometrium contrast is at about 90-150 seconds after contrast injection.

The key role of staging is to define women with deep muscle invasion from superficial disease, those with cervical invasion and with locally advanced disease. MR imaging is best at assessment of myometrial invasion and cervical invasion but still relatively insensitive to nodal metastasis.

A diagnostic role for MR imaging in Endometrial Cancer

Some women with suspected endometrial cancer refuse formal examination and / or hysteroscopy. For others cervical stenosis or other technical issues limit its success. Here MR imaging may be useful in the diagnosis of cancer by demonstrating myometrial invasion. MR imaging is the best non-invasive examination for distinction of the origin and nature of the indeterminate pelvic mass and should be used early in investigation of such a woman with bleeding.

MR imaging and the less common forms of Uterine Cancer

There are a group of women with endometrial cancer at hysteroscopic biopsy whose eventual diagnosis is carcinosarcoma. These biphasic tumours are prone to sampling error. They are more common in women with a history of tamoxifen medication. The biphasic nature of the tumour may be apparent at MR imaging as the sarcoma element shows much greater enhancement than the carcinoma element.

There are no reliable MR indicators of sarcomatous change within fibroids confined to the uterus. Rapid growth on serial US is the best indicator.

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Recent review

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Appendix 1: FIGO Staging – Carcinoma of the Corpus Uteri

Carcinoma of the corpus uteri: Pathological staging FIGO nomenclature (Rio de Janeiro 1994)

Stage Ia Tumour limited to the endometrium.
Stage Ib Invasion to less than half of the myometrium.
Stage Ic Invasion equal to or more than half the myometrium.
Stage IIa Endocervical glandular involvement only.
Stage IIb Cervical stromal invasion.
Stage IIIa Tumour invades the serosa of the corpus uteri and/or adnexae and/or positive peritonial cytological findings.
Stage IIIb Vaginal metastases.
Stage IIIc Metastases to pelvic and/or paraaortic lymph nodes.
Stage IVa Tumour invasion of bladder and/or bowel mucosa.
Stage IVb Distant mestastases, including intra-abdominal metastasis and/or inguinal lymph nodes.

Appendix 2: Stage grouping for endometrial cancer, FIGO cf UICC

FIGO		***UICC***	
Stage	***T***	***N***	***M***
0	Tis	N0	M0
Ia	T1a	N0	M0
Ib	T1b	N0	M0
Ic	T1c	N0	M0
Iia	T2a	N0	M0
IIb	T2b	N0	M0
IIIa	T3a	N0	M0
IIIb	T3b	N0	M0
IIIc	T1	N1	M0
	T2	N1	M0
T3a	N1	M0	
T3b	N1	M0	
Iva	T4	Any N	M0
IVb	Any T	Any N	M1

Monday, September 11th; 8:30 – 10:00

Session VI: Imaging of Adrenal, Testicular and Urothelial Cancer

Moderators: *H. El-Kappany (EG), P. Pavlica (I)*

1. IMAGING OF ADRENAL TUMORS

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INTRODUCTION:

The increased use of imaging modalities such as ultrasound, computed tomography, and magnetic resonance imaging has increased the number of incidentally detected adrenal masses. Up to 5% of abdominal CT- examinations performed for reasons other than suspected adrenal lesion will demonstrate an adrenal mass. In the absence of extraadrenal malignancies the majority of these lesions will turn out to be nonhypersecretory and benign. However, this is not true for a patient with a known malignancy. In this special case it is difficult to assess the relative likelihood of an adenoma and a malignant lesion. Until few years ago, adrenal biopsy, resection, or clinical follow-up were the only methods of distinguishing benign adenomas from malignancies. Development of semiquantitative techniques has lead to an increasing reliance on both, CT and MRI and thus, has essentially reduced the number of adrenal biopsies and unnecessary resections. In addition, complications associated with these invasive techniques, such as pneumothorax,

bleeding, and tumor tracking may be avoided. This may also result in cost-reduction and improved patient care.

Patients suspected to suffer from endocrinologically active adrenal tumors which are very rare in comparison to nonfunctional adrenal masses, should always undergo biochemical testing to confirm or exclude the clinical diagnosis. If an adrenal mass turns out to be hypersecretory, the patient requires a specific – mostly surgical – therapy. Further attention must be paid on anatomical details and also on the distinction of benign and malignant lesions. This is of utmost importance, since laparoscopic adrenalectomy has become the new gold standard in the surgical treatment of benign adrenal tumors which necessitate removal.

IMAGING TECHNIQUES

Ultrasound

Ultrasound is inexpensive, detects adrenal lesions, and discriminates cystic from solid lesions. However, ultrasound has low sensitivity for detection of small masses compared with CT and MRI. Sonographic evaluation poorly characterizes solid adrenal masses, and poorly detects extension into adjacent structures or to exclude distant metastases.

Computed tomography (CT)

CT is generally the preferred primary modality for evaluation of the adrenal glands. CT is fast, readily available, and offers the highest spatial resolution. The latest generation of CT machines (multidetector CT) allows rapid acquisition of very thin slices with excellent spatial resolution. With a nearly isotropic data set post-processing enables us to perform multiplanar reformations and thus, viewing adrenal masses in multiple planes. In addition, anatomic details and extension of adrenal lesions into adjacent structures can be better evaluated. This proves to be extremely helpful in the era of laparoscopic adrenalectomy.

Contrast CT and delayed images help characterize enhancement and vessels in the region of the adrenal. Unenhanced CT, however, is often the key series in the evaluation of "incidentalomas" or potential adenomas. Diagnosis of adenoma when the density is < 10 HU has a sensitivity of 74% and a specificity of 96% (1). Since many adrenal lesions are incidentally detected on contrasted CT, enhancement patterns of adrenal lesions have been studied to help obviate the need for a separate non-contrast CT, which would require imaging on a separate visit. Immediate post-contrast density is variable and non-discriminatory. Several authors have reported high sensitivity and specificity for density readings on delayed post-contrast CT, but varying cut off values (25-37 HU) and delay times have been used (15-60 min). In one study of 78 lesions, all adenomas had CT < 37 HU and all non-adenomas had density > 41 HU on 30 min delay after contrast (2). This yielded a specificity and sensitivity for adenoma of 100 and 100%, respectively. Another study showed that no malignant lesions had density of less than 25 HU at a 15 min delay (3). This allows 100% specificity with only minimal interruption of the patient flow in CT. The same study showed 96% sensitivity and 100% specificity for adenoma using a 40% washout after 15 min delay compared to immediate post-contrast images (3).

Magnetic resonance imaging (MRI)

With the advent of dynamic gadolinium enhanced- and chemical shift (CSI) - techniques MR imaging has become a well-accepted diagnostic method in the characterization of adrenal masses. Many studies have shown sensitivities and specificities for differentiation of adenomas from non-adenomas ranging between 81-100%, respectively 80-100% (4-9). Korobkin et al. [10] and Outwater et al. [11] showed that the presence of histologic lipid in many of the examined adenomas accounted for the low attenuation on unenhanced CT, causing a loss in signal intensity on chemical shift MR imaging.

In addition, MRI has the best contrast resolution for adrenal evaluation. The spatial resolution is adequate for detection of lesions as small as 0.5-1.0 cm. MRI adrenal studies should include T1 weighted axial images for anatomic detail and T2 weighted axial images (12). Fat suppression is used so that heavily T2 weighted images are not degraded by chemical shift artifact from the fat which surround the adrenals. Contrast helps to characterize enhancement patterns and on delayed post-contrast MRI series washout curves similar to that on delayed post-contrast CT can be achieved.

Multiplanar imaging helps detect extension of adrenal masses into adjacent structures.

Thus, MRI proves to be an adequate alternative for imaging of adrenals without applying radiation dose. MRI is the first choice in patients with allergy to iodine contrast media.

Positron Emission Tomography (PET)

Whole body positron emission tomography with 18-F-flourodeoxyglucose (18-FDG) allows malignant adrenal lesions to be recognized. The contribution of 18-FDG PET has been well evaluated in large studies in relation to lung cancer, and is highly accurate in differentiating benign non-inflammatory lesions from malignant disease. Using 18-FDG PET, these studies have shown a 100% sensitivity and specificity for the diagnosis of malignant adrenal mass when CT or MRI identify enlarged adrenal glands or a focal mass. Recent studies have reported false positive results as a result of 18-FDG uptake by pheochromocytomas and adenomas. 18-FDG PET also has the ability to detect metastatic lesions in non-enlarged adrenal glands, but its accuracy in this situation has not been fully evaluated. In addition, 18-FDG PET has the advantage of simultaneously detecting metastases at other sites. PET may be a useful tool for evaluating masses that are indeterminate by both CT and MRI. PET can substitute for percutaneous biopsy and has the advantage of being non-invasive (13).

Percutaneous Adrenal Biopsy

With improved imaging techniques, such as contrast medium washout measurement o CT and chemical-shift MRI, only a small proportion of adrenal masses cannot be characterized accurately and require percutaneous biopsy for diagnosis. However, before percutaneous biopsy, the possibility of a pheochromocytoma must be excluded because of the risk of an adrenal crisis induced by biopsy. In a recent study by Harisinghani et al (14), the NPV of adrenal biopsies was shown to between 98% and 100%. These authors concluded that a single negative biopsy for malignancy can be regarded as a true negative, and there is no necessity to repeat the biopsy. Percutaneous CT-guided adrenal biopsy is a relatively safe procedure. Minor complications include abdominal pain, hematuria, nausea and small pneumothoraces. Major complications, generally regarded as those requiring treatment, occur in 2.8-3.6% of cases and include pneumothoraces requiring intervention, and hemorrhage. There are also isolated reports of adrenal abscesses, pancreatitis and seeding of metastases along the needle track (14).

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2. TESTICULAR TUMORS

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TESTICULAR ULTRASOUND

US is commonly regarded as the primary imaging modality to evaluate the testis
- Easily performed
- High-frequency, high-resolution transducers can be used
- Palpable scrotal masses can be examined during palpation

Examination technique
High-frequency transducers
Machine settings to maximize detection of slow flow signals
Three steps
Axial and longitudinal scanning of testes to analyze volume, echo texture
Axial imaging of both testes to compare findings
Color Doppler examination to evaluate vasculature
Normal anatomy
Homogeneous, medium-level texture; mediastinum testis and epididimis easily identified
A small amount of fluid around the testis is normal
Testicular appendages can be seen, especially when surrounded by fluid
Testicular vessels
- Easily identified by color Doppler

Enter the parenchyma at the mediastinum and through branches from capsular arteries
Transtesticular arteries (54%)
50% monolateral
25% bilateral
23% associated to a vein
61% superior third
35% middle third
3% lower third

IMAGING OF THE TESTIS

Also MRI can be used to image the testis
The use of surface coils allows high resolution imaging
Homogeneous structure, of intermediate signal intensity in T1-weighted images
High signal intensity in T2-weighted images
The mediastinum testis and epididymis are hypointense in T2- weighted images

THE TESTICULAR MASS

Is there really a mass?
Is the mass intra or extra testicular?
Is it bilateral?
Can we identify its nature?

IMAGING TESTICULAR MASSES

US is the primary imaging modality to evaluate testicular masses
Almost 100% sensitive in detecting testicular masses
98% - 100% sensitive in differentiating intra- vs. extra-testicular lesions (over 70% of them are benign)
Color-Doppler sometimes useful; lesions > 1.6 cm usually hypervascular
Given the high sensitivity of US, MR imaging is rarely needed to image the testis
It is suggested as a"problem-solving technique" in three cases:
discrepancy between US and clinical findings
non conclusive US findings
possible diffuse neoplastic involvement of testis

Testicular MRI is more and more frequently used:
in 1998: MR after US in 34/2358 exams (1.4%)
in 2002: MR after US in 26/622 exams (5.02%)

TESTICULAR TUMORS

Testicular tumors are only 1% of all neoplasms in men, but are the most common solid malignancy in the 15 - 32 years age group
Three peaks of prevalence can be observed:

15 - 32 years (the most important)
71 - 90 years (mostly lymphomas or metastases)
0 - 10 (a much smaller peak)
Incidence rates are 6 - 10 times higher in white than in black men

They have been increasing in the last century, both in the USA and in northern European countries
Survival rates for pts with testicular cancer have increased to 95% over the past 30 years
Clinical presentation
Painless enlargement of the testis or testicular nodule
Almost 25% of pts with some kind of scrotal discomfort (possibly misinterpreted as epididymitis)
Heavy sensation or dull pain of the scrotum or lower abdomen in some cases
About 7% associated with symptomatic hydrocele
In about 10% initial findings due to metastatic disease
About 5% have gynecomastia at diagnosis

CLASSIFICATION

Germ cell tumors	***Non germinal tumors***
Precursor lesions	Leydig cell tumor
Intratubular germ cell neoplasia	Granulosa cell tumor
Tumors of one histologic type	Fibroma-thecoma
Seminoma	Gonadoblastoma
Embryonal carcinoma	Lymphoma
Yolk sac tumor	Leukemia
Choriocarcinoma	Metastases
Teratoma: Mature, Immature and with malignant transformation	
Tumors of more than one histologic type	

METASTATIC SPREAD

Germinal tumors spread mainly via lymphatic route to retroperitoneal nodes
There may be passage from one side to the other
10% from right to left
3% from left to right
From retroperitoneal nodes, tumor can extend, via thoracic duct to supraclavicular nodes, mediastinum and lungs
Hematogenous spread occurs later
Choriocarcinoma and yolk san tumors are the exception, presenting primarily with hematogenous spread (lungs, liver, brain, bones, kidneys adrenals, gastrointestinal tract)

STAGING

There is a variety of staging methods, and this makes often difficult to compare different series
The most diffuse staging classifications are that of AJCC and that used at the Royal Marsden Hospital
The first is a clinico-pathologic system; the second is a clinical staging system
In clinical practice, pts are often classified in two categories: a low or advenced stage of disease
Low stage:
Tumor limited to testis, epididymis or spermatic cord (T1 - T3)
None or moderate nodal involvement (N0 - N2)
Advanced stage:
Tumor involving the scrotal wall (T4)
Significant lymphoadenopathies (N3) or distant metastases (M1)

At the diagnosis, metastases are present in 20% - 25% of seminomas and in more than 40% of non seminomatous germinal tumors
Up to 30% of pts with disease limited to the testis will develop metastases in 2 years: 20% to retroperitoneal nodes; 10% to the lungs
Tumor markers have an important role in diagnosis and follow-up
Alfa-fetoprotein increases in yolk sac tumors and in mixed tumors with yolk sac components

Increased beta-hCG are found in tumors with sincitiotrophoblasts (seminomas e choriocarcinomas)
Latticodehidrogenase is a non-specific marker, linked to tumoral bulk
During follow-up, serial measurements of tumor markers allows identifying recurrences, even before they are visible at imaging

SEMINOMA

The most common testicular tumor (35% - 50%)
Originates from germ cells; it is often a "pure" tumor
At diagnosis:
75% with disease limited at testis
20% with retroperitoneal lymphnodes metastases
5% with extranodal metastases
Can be multifocal
Bilateral tumors are rare, but possible (2%)
US: hypoechogenic nodules; large lesions can be heterogeneous; usually hypervascolarized

EMBRYONAL CARCINOMA

Non seminomatous germ cell tumor
It is the second in frequency
Present in 87% of mixed germ cel tumors; rare as a pure lesion (2% - 3%)
More aggressive than seminoma
Structure more heterogeneous than seminoma, often with indistinct outer margins

YOLK SAC TUMORS

80% of pediatric testicular tumors
Often before 2 years of age
Present in 44% of mixed germinal tumors of adults
Alfa-fetoprotein levels increased in 90% of cases
Testis increased in volume, with heterogeneous echotexture; it can be difficult to recognize.

TERATOMA

Second in frequency in the pediatric age group
Usually before 4 years of age
Teratomatous elements in about half of mixed germ cell tumors of adults
Complex internal structure, with heterogeneous appearance: cysts, calcifications, hyperechogenic areas

"BURNED-OUT" GERM CELLS TUMORS

It is a well known but relatively non-understood phenomenon
Pts present with extratesticular disease, but normal clinical testicular examination
Two hypotheses:
Primary extragonadal germ cell tumor
"burned-out" primary with diffuse metastases
Many of these patients have small hyperecogenic scars or calcifications in a otherwise normal testis

NON GERM CELLS TUMORS

About 4% of all testicular tumors
More frequent in the pediatric age group (up to 10% - 30% of testiculr tumors in children)
90% of these lesions are benign
Leydig cells tumors (the most common: 1% - 3%; 30% with associated endocrine syndrome – virilization, gynecomastia, and diminished libido)
Sertoli cells tumors (less than 1%; can cause gynecomastia)
Granulosa cells tumors
Fibroma-tecoma
Non-specific US findings

LEUKEMIA - LYMPHOMA

Lymphoma is the most common testicular tumor >60 years (5% of all testicular tumors)
It occurs in <1% of patients with systemic disease
Bilateral in 38%; epididymis and spermatic cord are often involved
Testicular involvement from leukemia is rare; the testis, however, is a common site of recurrence in leukemic children (80% are in remission at bone marrow)
Non specific US findings; lesions are usally hypervascular at color-Doppler

IS IT POSSIBLE TO DIFFERENTIATE AMONG DIFFERENT TYPES OF TUMORS?

Not all US detectable lesions within the testicle are malignant neoplasms

Orchitis
Hemorrhage
Ischemia
Infarction
Clinical presentation is the key for the diagnosis, since most of these lesions have acute symptoms (pain, trauma)
Inflammation usually starts at epididymis; 20% involves the testis
However: also tumors can present with testicular pain, a mass can be noticed by the pt after a trauma
Short-term follow-up is indicated if there are questions, to identify changes over time of orchitis and hematoma
Granulomatous epididymo-orchitis
tuberculosis
syphilis
fungi
parasites
Nodular appearance
epididymal involvement is the key
multiple involvement is helpful
clinical history
Tuberculosis
Epididymis primary site, with testis secondarily involved
30% bilateral
50% with abscess and fistulas

TUBULAR ECTASIA OF THE RETE TESTIS

Can be considered as a normal variant, thought to occur secondary to obstruction in the epididymis or efferent ductules
Often bilateral and associated with spermatocele
It can be misinterpreted as an heterogeneous mass (possibly, a teratoma)
Easily recognized by:
its location (at the mediastinum testis)
its typical structure at high-resolution US (a series of thin, dilated tubules)

TESTICULAR CYSTS

Can be encountered in 8% - 10% of cases
Located within the tunica albuginea or within the testicular parenchyma
Tunica albuginea cysts can be often palpated and addressed to diagnostic imaging; recognition of their classic location and structure is straightforward
Intratesticular cysts are usually incidentally found and not palpable
Often near the mediastinum testis
Their diagnosis can be more problematic, since can be considered safely as cysts only if no septa or solid components are present in or around them

ADRENAL RESTS HYPERPLASIA

Aberrant adrenal rests may become trapped within the developing testis during fetal development
Seen in 7.5% - 15% of newborn and 1.6% of adults
Usually less than 5 mm
In congenital adrenal hyperplasia and in (rare) Cushing syndrome (elevated levels of adrenocorticotropic hormone) can enlarge to form masses
It is important to recognize them as benign lesions to avoid unnecessary orchidectomy
Treatment with glucocorticoid replacement therapy results in stabilization or even regression
If diagnostic problems exist, venous sampling shows elevated levels of cortisol

These lesions may present at US with hypoechoic pattern or as heterogeneous masses with acoustic shadowing
At MR imaging, they have been reported with low intensity at both T1- and T2-weighted images

EPIDERMOID CYSTS

Are benign testicular germ cell tumor (about 1% of testicular neoplasms), from monodermal development of teratoma or from squamous metaplasia of surface mesotelium
True cysts, filled-in with laminated, cheesy material, with no malignant potential

Can be recognized, both at US and MR
On US, well circumscribed, round masses, with hyperechoic wall (sometimes calcified) and laminated, onion-skin internal appearance; no flow signals on color-Doppler
On MR, target appearance, with low-signal-intensity capsule; keratinized content with high signal on both T1- and T2- images
Imaging findings characteristic, but not pathognomonic
Teratoma and other tumors may mimic epidermoid cysts
Great care in evaluating for irregular borders, as possible signs of malignancy
Testis-sparing surgery rather than orchiectomy is suggested
especially important in pts with bilateral lesions

RISK FACTORS

Prior testicular tumor
Positive family history
Infertility
Intersex syndromes
Cryptorchidism
Testicular microlithiasis

In pts with testicular cancer, the risk of developing a contralateral tumor is 20 times higher than in general population
A history of testicular cancer in a first-degree relative increases the risk factor 6 times
Pts with infertility problems are at higher risk for tumor
Biopsy in infertile men shows prevalence of intratubular neoplasia in 0.4% - 1%, even without associated history of cryptorchidism
Unsuspected tumors can be found during US evaluation of testis in infertile men
cryptorchidism
Incomplete descent of the testicles from the retroperitoneum into the scrotum
Cryptorchidism is strongly associated with carcinoma
Although the occurrence of cryptorchidism is low (< 1%), a history of cryptorchidism is noted in 3.5%-14% of pts with testicular tumor also to controlateral one
Decreased fertility and other genitourinary obnormalities are often associated
The risk of malignancy is not limited to the cryptorchid testis, but also to contralateral one
Orchiopexy does not appreciably decrease the risk of tumor development

Then, cryptorchidism is considered as a manifestation of generalized embryogenetic defect resulting in bilateral dysgenetic gonads

US is used to evaluate the inguinal region for cryptorchid testis
MR imaging seems better than US for detection of the cryptorchid testis
Is better in detecting intra-abdominal testes
Is better in determining agenesis
microlithiasis
Is a condition detectable by US only
MR is normal in these cases
Presence of small, hyperechogenic foci within the testis, non associated with structural changes around them
Pathologically, small calcifications in seminiferous tubules, thought to originate from degenerating cells within the tubules.
Although it has been argued that a systemic or metabolic dysfunction may underly TM (association with pulmonary microlithiasis has been described), at present TM are regarded as the result of a primary testicular process
Testicular microlithiasis
The prevalence of TM is not known
Most studies are retrospective, and report this diagnosis in 0.6% - 9%
A recent prospective series of pts submitted to US for suspected testicular disease reports TM in 18.1%
It has been classified in a"classic" form (>5 TM per testis), and in a "limited" form (<5 TM per testis)
TM can be bilateral
Several associations have been noted:

cryptorchidism
infertility
Klinefelter syndrome
atrophy
testicular tumors
These seem to identify TM as occurring in dysgenetic gonads
Association with tumors:
3/40 pts (8%) with "classic" TM
9/155 pts (5.8%) with "limited" TM
only 3/884 pts (0.3%) without TM had cancer
The association of TM with tumors seems to indicate an increased risk in these pts
Tumor development has been shown in pts with previously detected TM
Gooding, AJR 1997
Frush, AJR 1996
However, a recent study of 72 pts with TM followed-up for 42 months failed to demonstrate tumor development (a too short follow-up?) Bennett, Radiology 2001
Although it seems reasonable to offer some kind of surveillance to these pts, there is no consensus in literature about its timing (annual screening?) and the efficacy of this program

3. UROTHELIAL TUMORS

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INTRODUCTION: EPIDEMIOLOGY AND PATHOLOGY

The urinary tract is lined by transitional cell epithelium from the renal calyces to the bladder neck in the female and the membranous urethra in the male. This entire urothelial lining has the potential to undergo malignant transformation at a single and/or multiple sites. The urinary bladder is by far the most common location for these tumors.

In the upper urinary tract, urothelial neoplasms of the renal pelvis, infundibula and calyces amount for less than 10% of all renal tumors and about 5% of all urothelial tumors. The ureter is the least common origin for urothelial lesions in the upper tract, its incidence being about one fourth of that of the kidney. The vast majority of the ureteral lesions are found in the lower part of the ureter. Caucasian males are affected at a significantly higher rate than do females or black males. As expected, these tumors are most common in older patients. Bladder cancer is the fifth most common cause of cancer deaths in men and the most common cancer in the urinary tract (kidneys, ureters, bladder, and urethra). As is the case with upper tract disease, bladder cancer is most common among white, elderly males. More than 90% of bladder neoplasms are transitional cell carcinomas. In clinical practice, transitional cell carcinoma of the bladder presents as either a low grade superficial or high grade invasive neoplasm. Histologically, four tumor grades are used; grade 0 are papillomas covered by normal bladder mucosa; grade I are well differentiated tumors with little anaplasia; grade II are moderately differenctiated lesions; and, grade III are poorly differentiated neoplasms with marked pleomorphism and frequent mitoses. A special type of transitional cell neoplasm of the bladder is the carcinoma in situ, a poorly differentiated lesion that may be found in patients with high grade superficial or muscle invasive tumors, tends to recur, and often progress to muscle invasive disease itself. Although the lesion often responds to intravesical BCG instillation, and its course may be protracted, its prognosis is usually poor.

A common characteristic of urothelial neoplasms regardless of location is theirlikelihood to develop synchronous or metachronous lesions. A long list of investigations in the literature supports and proves this potential multifocal involvement. Bilateral upper tract synchronous or metachronus tumors occur in 2-5% of cases. Metachronous lesions in the urinary tract have been reported in 11-13% of patients with upper tract neoplasia within an approximate 2 year period from the time of initial diagnosis. Upper tract tumors may occur in 2-4% of patients with bladder lesions, and, in case of occupational bladder cancer, in as many as 13%. Simultaneous bilateral ureteral transitional cell carcinoma has been reported to occur in 2-9% of cases. Furthermore,

synchronous bladder tumors are encountered in up to 24% of patients with renal and 39% with ureteral transitional cell carcinoma. It is estimated, that 30-75% of patients with upper tract urothelial neoplasms will develop bladder tumors at some time in their life.

Many cases of urothelial cancer have been historically linked to chronic exposure to occupational carcinogens (aniline dyes, combustion gases, chlorinated hydrocarbons, and aldehydes used in the rubber and textile industries). Aromatic amines are common bladder carcinogens. Additionally, dietary nitrites and nitrates have been implicated. Occupations at risk for inducing bladder as well as upper tract cancer include autoworkers, painters, truck drivers, drill pressers, leather and metal workers, and persons using organic chemicals at work, such as dry cleaners, plumbers, paper manufacturers, beauticians, dental technologists and physicians. Cigarette smokers have a higher incidence of urothelial cancer than nonsmokers do, up to 3-4 times. This risk is proportional to the number of cigarettes smoked and duration of smoking, and is higher for upper tract than bladder disease. Permanent cessation of smoking reduces, but does not eliminate, the risk for urothelial neoplasms. Analgesic abuse (phenacetin and, less clearly, aspirin) is a documented risk factor for transitional cell carcinoma of the upper tract and bladder. Cyclophosphamide (Cytoxan), likely through its metabolite acrolein, has been tentatively linked to urothelial neoplasms. Chronic infections and irritation from calculi or catheters predisposes patients to squamous cell carcinoma. Schistosomiasis is associated with increased incidence of squamous cell carcinoma of the ureter and bladder, whereas pelvic radiation for carcinoma of the cervix has been linked to increased risk for transitional carcinoma of the bladder. Finally, an association of low grade upper tract only transitional cell tumors, often multiple and bilateral, has been documented among members of families afflicted with Balkan endemic nephropathy. In view of the rather indolent course of these tumors and the fact that they often are multiple and bilateral, nephron sparing surgery has been proposed as the treatment of choice.

Nontransitional cell carcinomas of the urothelium are uncommon. Squamous cell carcinoma represents about 3-7% of bladder and 1-7% of upper tract tumors. Its association with schistosomiasis in endemic areas and chronic infection, irritation, long-term catheterization, calculi, bladder diverticula and smoking is well established. It is usually diagnosed at an advanced stage of the disease and its prognosis is poor. Radical cystectomy without or with preoperative radiation is the best treatment venue. Adenocarcinoma represents about 2% of bladder and less than 1% of upper tract tumors. Adenocarcinoma is the most common type of cancer in patients with bladder exstrophy. Both upper tract and bladder tumors develop in response to chronic inflammation, irritation or calculi, as in the case of squamous cell carcinomas. Their prognosis is poor, as they do not respond to radiation or chemotherapy, and require surgery. Bladder tumors are commonly associated with cystitis glandularis rather than carcinoma in situ. The rare urachal carcinomas are usually adenocarcinomas, although other histologic types may occasionally be found. Metastatic adenocarcinoma to the urothelium is rare. It often arises in the gastrointestinal tract, breast, prostate, endometrium, and ovary. Since a primary urothelial adenocarcinoma is also rare, patients diagnosed with adenocarcinoma of the bladder should undergo a search for other primary sites before definitive treatment is given.

A number of uncommon benign and premalignant lesions may also involve the urothelium. Among the former, von Brunn's nests, cystitis cystica, squamous metaplasia without cellular atypia, and nephrogenic adenoma (metaplastic reaction of the urothelium to trauma, infection, or radiation that histologically resembles primitive renal collecting tubules) are more common. The latter include dysplasia, leukoplakia (may progress to squamous cell carcinoma), cystits glandularis (may be precursor to adenocarcinoma), and inverted papilloma, usually is a benign proliferative lesion, which, however, may occasionally undergo malignant transformation and/or coexist with transitional cell carcinoma.

DIAGNOSIS AND STAGING OF UROTHELIAL TUMORS

The diagnosis of a urothelial neoplasm is usually suspected on the basis of clinical symptoms (painless, gross or microscopic hematuria, urinary frequency with dysuria, flank pain) and urine cytology, and is confirmed by cystoscopy, and/or rigid/flexible upper tract endoscopy with biopsy of suspicious areas in the bladder under direct vision, brush biopsy of upper tract lesions. Percutaneous access to upper tract disease has been technically accomplished and

reported, however, the risk of the tumor seeding of the retroperitoneum and/or percutaneous track makes this approach undesirable.

Imaging studies play an integral part in the diagnosis and staging of urothelial neoplasms. Traditionally, intravenous urography (IVU) with compression and retrograde urography (RU) have been the major diagnostic tools in the detection of upper tract disease. The latter is performed to better visualize the collecting system, when the IVU fails to clear the calyces, renal pelvis or ureter, such as in the case of urinary tract obstruction or poor visualization for other reasons. The patient with renal failure cannot be evaluated by IVU and usually undergoes RU at the time of cystoscopy. The yield of IVU is estimated at 50-75% of cases and the findings include filling defect(s) and/or irregularity of the urothelium in one or more sites. Calyceal, UP junction or ureteric obstruction by tumor results in caliectasis, calyceal amputation, dilatation proximal to the obstructing lesion or lack of function. Adherence to meticulous technique in the performance of the IVU is essential, and experience in the interpretation of these studies increases the diagnostic yield.

In recent years, technological advances resulting in rapid acquisition of thin section CT and MR images coupled by work stations able to rapidly process and reconstruct these images at 3D or multiple 2D planes (MIP, SSD, MPR), have led to unique and exciting applications throughout the human body. CT and MR urography are among the newest techniques introduced to satisfactorily image the urinary tract in patients with urologic disorders including hematuria. In addition to the technological advances, a major driving force in the development of the newest techniques has been the inability of conventional urography (though it achieves excellent visualization of the urothelium) to adequately evaluate the renal parenchyma (mass lesions) and walls of the urinary tract. With helical (single and, especially, multidetector) CT or MR, the entire urinary tract can be repeatedly imaged at different phases of contrast enhancement with a single injection of intravenous contrast material. The result is visualization of the vascular phase/supply, renal parenchyma (nephrogram) and collecting system (pyelogram), all within a few minutes from the injection. MR urography has the added benefit of being applicable to patients with renal failure or history of significant reaction to contrast media.

Many different protocols have been suggested for CT urography. In some instances, multiphasic CT (nonenhanced and enhanced) and conventional radiographs are combined. CT evaluates the urinary tract for calcifications and the renal parenchyma for masses, while the urothelium is examined by excretory phase CT or conventional radiography. Other investigators recommend the use of both the nephrographic and pyelographic (excretory) phases of CT urography, whereas others use the excretory phase alone. Interpretation of the study includes evaluation of the 2D images, and MIP or 3D-volume rendered reconstructions.

As a further enhancement of the technique, some investigators recommend the use of ureteral compression, and others the administration of furosemide and/or intravenous saline to induce increased diuresis. Ureteral compression can be used to distend the upper tract and its release may facilitate opacification of the lower ureters, therefore two sets of scans are obtained to cover the entire, optimally distended urinary tract. Most protocols call for 2.5 mm collimation and 1.25 mm reconstruction interval. Supine imaging is the rule, however, prone images in the excretory phase may be helpful in opacifying the distal ureters, as is the case with IV urography. Discovery of filling defects requires correlation with nonenhanced images to exclude calculi. Attention should also be paid to distinguish clots from tumors, which can be accomplished based on enhancement patterns.

A potential major issue with multiphasic CT scanning is the amount of radiation delivered to the patient. This has to be evaluated in context with the age of the patient and expected benefit from the procedure. Adjusting imaging parameters (mAs, high speed versus high quality pitch, shortening the area to be imaged, etc) may help to reduce the exposure. Follow-up studies can also be tailored in an effort to reduce radiation exposure.

MR urography has been used to a lesser extent in the evaluation of hematuria or urologic disorders in general. Single shot FSE MRI has been successfully used to visualize the urinary tract. More recently, 3D-SPGR MR urography has been reported to generate satisfactory studies of the urinary tract, further enhanced by the administration of furosemide. Technical problems encountered with both CT and MR urography usually have to do with incomplete visualization of segments of the urinary tract and most technical refinements focus on producing reliable and

reproducible opacification of the entire tract. Reports on virtual CT of MR cystoscopy and ureteroscopy will undoubtedly be expanded and improved. Their aim is to better image bladder and ureters, the former being a part of the urinary tract that radiologic techniques have not been very successful in evaluating, aiding rather than replacing conventional cystoscopy.

Urothelial tumors may spread both via lymphatics to regional pelvic and retroperitoneal nodes as well as via the hematogenous route. The lymphatic spread occurs earlier and independent of the hematogenous one. Common sites of hematogenous metastases are the liver (38%), lung (36%), bone (27%), adrenal glands (21%) and intestine (13%). Local invasion of adjacent organs or structures may also occur. Preoperative staging and follow-up, extend of disease imaging for urothelial neoplasms is usually carried out by the easily available and less expensive CT scanning with intravenous contrast enhancement, if possible. Recently published reports suggest that contrast enhanced MRI is better than CT in diagnosing stages T2 or higher in bladder cancer, however, differentiation between stages T1 (superficial tumor, lamina propria invasion) and T2 (tumor invades muscularis propria) is not easily possible. MRI does better with T3 tumors (perivesical/periureteral fat invasion). Fast dynamic MRI has also been successful in the diagnosis of metastatic pelvic lymph nodes, even when their size is normal. Metastases in nodes may show an early enhancement not seen in normal lymphoid tissue, therefore guiding needle or surgical biopsy and helping to correctly stage the primary bladder tumor. The same principle of early tumoral enhancement on dynamic MRI has been used to diagnose and, hopefully better stage, the original bladder neoplasm.

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Monday, September 11th; 10:30 – 12:00

Session VII: Urogenital Imaging Guidelines

Moderators: *L. Dalla-palma (I), O. Kolokythas (USA)*

1. GUIDELINES IN URORADIOLOGY

T. WAH (UK)

This lecture aims to provide an overview of current status of uroradiology guidelines for the Making Best Use of a Department of Clinical radiology (MBUR) 6th Edition in the United Kingdom. This is part of the major review process which have been undertaken by the Royal of College of Radiologists (RCR) in the UK for updating all the guidelines in the MBUR 6th Edition. The uroradiology guidelines are currently under review by a group of expert panels throughout the UK using the Delphi process. The expert panel for uroradiology is a group of experts (10 to 15 experts) carefully selected and anonymised by a facilitator to review the guidelines. A consensus needs to be achieved amongst the experts during the review process and this may be repeated up to three rounds for each guideline. The literature searches are provided centrally by the RCR to assist the expert panel to appraise the new evidence related to each of the guideline.

2. ESUR GUIDELINES ON PREVENTION OF CONTRAST INDUCED NEPHROTOXICITY; IS THERE A NEW CONSENSUS?

PROFESSOR SK MORCOS, *SHEFFIELD, UK* ***AND PROFESSOR H THOMSEN,*** *COPENHAGEN, DENMARK*

There are several new guidelines that have recently been published in the literature on prevention of contrast induced nephrotoxicity. Unfortunately, they have not resulted in better understanding of this complication but in our view have caused some confusion and uncertainty. Guidelines should be based on proven clinical practice and consensus amongst experts on the subject. Guidelines should be concise, clearly written, using accurate terminology and avoiding vague recommendations.

The ESUR guidelines on the prevention of contrast medium induced nephropathy, which required 3 years of preparation and involved wide consensus, remain valid in spite of the large number of new studies reported in the literature since its publication in 1999 particularly in relation to the use of the isoosmolar dimer iodixanol and the antioxidant acetylcystein in high risk patients. So far it is unclear whether there is a different in nephrotoxic potential between *low osmolar non ionic monomeric* and *iso-osmolar non ionic dimeric* contrast media. Various studies have reported conflicting results. However, it is clear that all contrast media can cause nephropathy in patients with risk factors. Administration of acetylcystein has been shown both to be effective in preventing contrast medium induced nephropathy in some studies and to be without any effect in others. Even the results of several metaanalyses have been conflicting. Therefore, the contrast media safety committee of the ESUR does not for the time being recommend acetylcysteine or any specific contrast medium for routine use in prevention of contrast medium induced nephrotoxicity.

The ESUR recommendation of extracellular volume expansion and use of the smallest possible dose of low or iso-osmolar contrast media have been found to be consistently effective in reducing the risk of contrast induced nephrotoxicity. Volume expansion can be achieved with the intravenous injection of at least 100 ml/hr of 0.9% saline solution starting at least 6 hours before contrast administration and continuing for 6-12 hours afterwards. However, this regime is not suitable for patients who are in congestive heart failure and for urgent examinations. We continue also to recommend that concurrent administration of nephrotoxic drugs such as gentamicin and non-steroid anti-inflammatory drugs should be avoided for at least 48 hours before contrast administration.

The presentation will highlight the contentious issues on prevention of contrast nephrotoxicity and emphasize the importance of the ESUR guidelines on the prevention of this complication.

3. SUGGESTIONS FOR GUIDELINES IN PAEDIATRIC URORADIOLOGY: PAEDIATRIC URINARY TRACT INFECTION, NEONATAL HYDRONEPHROSIS AND OBSTRUCTIVE UROPATHY, VCUG AND UROSONOGRAPHY IN CHILDREN

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OBJECTIVE:

To develop and present basic procedural and imaging guidelines for some common paediatric uroradiologic conditions.

METHOD:

In working groups the present status of imaging procedures and imaging algorithms throughout the various European countries was assessed and compared to present knowledge and current literature evidence. From this, a basic statement was condensed in order to establish a baseline consensus agreement for all European countries with regard to imaging algorithms and procedural details for various typical paediatric uroradiology indications. In developing these proposals, evidence based (as much as possible) suggestions and regional availability and individual variance have been taken into consideration to allow for sufficient flexibility to efficiently apply these guidelines in different areas and centres.

RESULTS:

As a result from these efforts, procedural guidelines on how to perform paediatric urosonography (including contrast-enhanced urosonography) and how to properly perform VCUG in infants and children have been edited and are suggested for discussion and approval by the ESUR members and ESUR board. Further more, a basic imaging algorithm for paediatric urinary tract infection and neonatal hydronephrosis (including paediatric obstructive uropathy) have been developed and will be proposed.

CONCLUSIONS:

Imaging and procedural guidelines for paediatric urinary tract infection, neonatal hydronephrosis and paediatric obstructive uropathy, and VCUG and urosonography in infants and children are being presented in order to establish an agreement in how and when to image these children throughout the ESUR community.

4. UROGENITAL IMAGING GUIDELINES: STAGING OF ENDOMETRIAL CANCER

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Endometrial cancer is the fourth most frequent cancer in women. Surgical treatment options depend on the local extent of disease including lymphadenectomy, omental and peritoneal biopsies in selected high risk patients. Preoperative identification of those patients with imaging is best performed with MRI of the pelvis assessing deep myometrial, cervical and lymph node invasion. To reduce potential pitfalls or misinterpretation of false negative or false positive findings of myometrial or cervical invasion, MRI images should be acquired with enough technical quality to allow adequate image interpretation. Due to published material with low quality images, the female pelvis committee of the European Society of Urogenital Imaging (ESUR) decided to start a working group to establish technical guidelines for endometrial cancer staging with MRI.

MRI protocols were collected from 9 European institutions from ESUR members (one representative from one European Country) and published literature between 1999 and 2005 was reviewed through Medline literature search for technical protocol information including field strength and type of coil, patient preparation, type of sequence (detailed geometry and contrast

information). The results were presented in an exel sheet including descriptive statistics (mean, SD) and discussed at the ESUR meeting in Ljubliana 2005.

Among the nine ESUR members, six worked at 1.5T, two at 1.0T and one institution at 0.5T. Agreement concerned fasting and intramuscular injection of peristaltic inhibitors, anterior and superior saturation bands, the use of a combination of several T2-weighted (TR/TE 400/90 msec) and T1-weighted post-contrast images for the assessment of myometrial invasion. Oblique coronal and axial slice orientation according to the long and short axis of the endometrial cavity should be applied under medical supervision. Slice section of 4mm should avoid difficulties in analyzing small postmenopausal uteri or underestimation of myometrial depths invasion due to thin overstretched myometrial walls by large tumors.

A single discordant subject concerned the type of contrast-enhanced T1-weighted sequences: 2D versus 3D sequence, a single or up to 8 dynamic post-contrast acquisitions, the length of a single dynamic acquisition varied between 18sec and 3min21seconds. Dynamic image acquisition has been recommended after the publication of Yamashita in 1993 observing less contrast between the tumor and the normal myometrial at 5min post injection compared to 1min30 after intravenous contrast injection when normal myometrium demonstrates strong early enhancement. Manfredi et al demonstrated in 2004 that optimal tumor to myometrial cancer contrast was obtained at 2min30 compared to 30 seconds and 1min30 after intravenous contrast injection.

A discussion was raised about the utility of dynamic scanning due to the known optimal time point and possible false negative findings of deep myometrial invasion in small uteri with decreased spatial resolution of dynamic scans. A single high spatial resolution 3D gradient echo sequence was suggested as the optimal post-contrast sequence for myometrial staging. Due to rectilinear k-space sampling in the y direction during 3D sequences, the signal intensity of 3D sequences corresponds to the post-contrast acquisition at the middle of the acquisition time (for example 2min30 for a single 3D sequence acquisition time of 5minutes). An increased sequence length allows selective fat suppression during image acquisition and a matrix of 512x512 that should increase detection of deep myometrial invasion and allow the diagnosis of transmyometrial invasion with higher confidence.

In conclusion, in patients send for MR staging of an endometrial carcinoma, the female pelvis group of ESUR suggested the use of three T2-weighted sequences followed by a single post-contrast acquisition at optimal image orientation according to the results of the sagittal, oblique short and long axis T2-weighted images. Selection of imaging planes requires medical supervision during image acquisition. Further research should test the accuracy of a single high resolution 3D gradient echo sequence in patients with endometrial cancer to diagnose myometrial and cervical stroma invasion.

COURSE WORKSHOPS

Saturday, September 9th; 14:00 – 15:30

WSI: Pediatric Urogenital Masses

Location: Hall A

Moderators: *D.B. Peskar (SI), A. Ghaly (EG)*

1. WILMS TUMOUR

P. WIESBAUER (AT)

2. NEUROBLASTOMA

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Originating from neuroblasts of the neural crest, neuroblastoma (NB) arises in the sympathic ganglion chain or adrenal medulla. It is the third most common malignant disease in children. The stages are: I: NB confined to the organ of origin; II: NB extending beyond the organ of origin but not crossing the midline of the body; III: NB extending across the midline of body; IV: Metastatic disease (predominantly skeletal);

IVs ("special"): NB stage I or II with one or more distant manifestation/s of: liver and/or skin and/or bone marrow.

Pathogenetic, biological and clinical aspects: Up to 60% of patients have metastatic disease at presentation. Metastatic spread is lymphatic and hematogenous with predilection of the skeleton. Metastatic behavior is age dependent. Catecholamine metabolites are increased. 24 hour urine collection is more reliable than spot test. Paraneoblastic syndromes (i.e. "myoclonic encephalopathy of infancy" and "intractable diarrhea") are associated with NB. Degree of cell differentiation (i.e. maturation) varies resulting in neuroblastoma (malignant), ganglioneuroblastoma (semimalignant), and ganglioneuroma (benign). Maturation state may change within a given tumor. Histopathologically, malignant neuroblasts are small, round and rosette-forming cells, occasionally difficult to distinguish from similar cells in Ewing sarcoma, leukemia and rhabdomyosarcoma. Grades of malignancy of NB are determined cytogenetically by a normal or increased number (amplification) of the oncogene N-MYC within chromosome 2. Other unfavorably determining cytogenetic factors are: 1p deletion of chromosome 1 and the 17q+ of chromosome 17. The child with NB presents rather sick with fatigue, pallor, pain, and even weight loss (as opposed to a child with nephrolastoma, unless traumatized). Infantile IVs NB is known for its commonly benign course. In young infants, "maturation toward benignity" and even "disappearance" of NB are possible phenomena. *Abdominal manifestation* (including thoraco-abdominal disease) accounts for 70 to 80% of NB. *Thoracic manifestation* of NB accounts for 10 to 15%. Primary sacrococcygeal NB is less frequent. In the pelvis, NB presents as a retrorectal mass, possibly with urinary retention. Cervical NB is rare. Differential diagnostic aspects depend on the site of tumor manifestation (table 1). Imaging evaluation by US, MR or CT shows the lesion as simple or complex, solitary or multiple.

Table 1: Differential diagnostic aspects of neuroblastoma with regard to its location:

Abdomen: adrenal mass, renal mass (incl. upper pole lesion in duplex system),
B-NH-lymphoma, teratoma

Chest: teratoma, inflammatory pseudotumor, thymus

Pelvis: teratoma, PNET, rhabdomyosarcoma

Skull: child abuse, osteosarcoma (post radiation therapy)

Skeleton: leukemia, lymphoma, Ewing sarcoma

Spine: CNS tumor

Neck: lymphoma, PNET, rhabdomyosarcoma

Imaging approach and strategy: If an abdominal mass is suspected, a *plain radiography of the child's abdomen in supine position* is strongly recommended as the initial step. Appreciation of the mass process regarding location, size, density (incl. calcifications) and effect upon adjacent structures (incl. skeleton) and possible interference with the gastrointestinal and/or urinary tracts may be key to further evaluation and diagnosis. Subsequent ultrasonography thus is often more successful. MR or CT should follow, not preceed US. The child's history, clinical findings and laboratory results must be considered in the making of imaging diagnosis. Additional *antero-posterior and lateral radiographic views of the chest* are indicated in NB. *US* permits to establish a reasonable diagnostic assumption based on the anatomical findings in most cases. It may allow demonstration of separation between an adrenal NB and the ipsilateral kidney by relative structural motion from respiration. Although biopsy might follow US without further delay for confirmation and eventual initiation of treatment, *magnetic resonance imaging* (MRI) or *computed tomography* (CT) have become routine in the imaging protocols of NB. MRI is the preferred for demonstrating tumor extension into the spinal canal and because no radiation is involved. Although involvement of the spinal canal by NB may be extensive, associated or subsequent neurological abnormality or dysfunction is relatively mild in most cases or may be absent. Skeletal *scintigraphy* is used in the evaluation of metastatic bone disease for staging of NB. MIBG (meta-iodobenzylguanidine) scintigraphy demonstrates manifestation of NB as well of other primary and metastatic neuroectodermal tumors by marking abnormal chromaffine cell activity. Whole body MRI is increasingly used for staging of NB.

Biopsy: In a potentially malignant mass, histological characterisation or proof is required prior to the decision for specific therapy (immediate or secondary tumor excision after initial chemotherapy). Transcutaneous biopsy under direct vision by US or controlled by CT under general anaesthesia is an established procedure in children. If the paravertebral location or small size of the tumor renders direct guidance by US difficult or unsafe, CT is recommended instead.

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3. LOWER UG TRACT

P. WIESBAUER (AT)

WSII: Contrast Agents (US & MRI)

Location: Hall B

Moderators: *A. Van Der-Molen (NL)*

1. CONTRAST-ENHANCED US OF THE KIDNEY

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INTRODUCTION

Conventional ultrasonography (US) of the kidney is still facing some limitations due to poor contrast ratio of B-mode imaging for parenchymal disease identification and limited sensitivity of color Doppler US for the detection of cortical blood supply and deep pedicular vessels. Ultrasound contrast agents (USCAs) improve these two limitations and allow the development of new applications for renal blood flow quantification. These improvements result from an increased acoustic response obtained from the microbubbles, as well as from the development of pulse sequencing and signal processing. The kidney offers promising applications as USCAs improve the detection of abnormal micro and macrovascular renal disorders.

1 USCA PHARMACOKINETICS

Current USCA are manufactured with stabilized microbubbles. These microbubbles contain air or perfluorocarbon gases, and are stabilized using a capsule and several surfactants. These two approaches (change in the gas composition and combined shell plus surfactants) have increased the persistence of the microbubbles up to several minutes. USCAs can be administered intravenously, using bolus injection in most clinical applications or continuous infusion using a power injector for quantitative studies when a steady-state concentration is required. The microbubbles increase the backscattered signals and thus improve the detection of blood flow with any Doppler technique (continuous, pulsed, color, power Doppler). Using specific imaging sequences that can detect microbubble resonance, the echostructure of the renal parenchyma is changed depending on the blood flow. Typically, microbubbles remain in the blood pool without sticking to the capillary walls or being phagocyted, unlike in liver parenchyma. No delayed phase can be detected due to the absence of accumulation in the kidney. The microbubbles simply travel through the renal microvasculature and do not pass the Bowman's capsule. They cannot reach the interstitial compartment and they are not excreted into the collecting system. Thus, their pharmacokinetics is strongly different from iodinated contrast agents and Gadolinium chelates. In most cases, the gas dissolves into the plasma and is eliminated through the lungs. The surfactants and shell components are eliminated by the liver and the kidney. USCA tolerance in clinical practice is excellent and no renal toxicity has been reported. The administration of USCAs can be repeated even in patients with renal failure.

2 CONTRAST-ENHANCED US IMAGING MODALITIES

USCAs cannot be detected with conventional B mode imaging in the renal parenchyma. Conventional Doppler modalities, including color, power and spectral Doppler imaging, are very sensitive to the presence of microbubbles viewed as conventional scatterers. Contrast-enhanced CDUS benefit is reduced by artifacts such as color blooming and saturation. Specific US imaging sequences have been designed to take advantage of the microbubble resonant properties by varying imaging parameters such as acoustic power, transmit and receive frequencies, pulse frequency, pulse phase and amplitude or by triggering the pulse emission to the cardiac cycle or an internal clock. These specific US imaging sequences are not technically different from those used for contrast-enhanced US of the liver parenchyma.

However, three main differences separate renal from liver USCA pharmacokinetics: the lack of microbubble accumulation in the vascular tree, the blood supply from a unique arterial system and the exposure of the feeding vessels to the US beam when the renal parenchyma is

imaged. When the examination is performed at intermediate to high acoustic power (MI above 0.7), the pulse repetition frequency should be reduced to detect tissue enhancement, allowing fresh microbubbles to refill the capillaries. This specificity applies mainly to air microbubbles. When the microbubble resonance is significant at low acoustic power (MI < 0.3) as it is for perfluorocarbon microbubbles, their destruction remains limited and the kidney can be studied in real time in many anatomical planes during a few minutes. Among the specific US imaging sequences developed by the manufacturers, Pulse or Phase Inversion Imaging, Cadence Contrast Pulse Sequencing (CPS) technology and Vascular Recognition Imaging (VRI) are at present the most efficient in our experience.

3 NORMAL FINDINGS

Using conventional PD and CDUS, the cortex is filled with color signals with color blooming artifacts at peak enhancement. The filling of subcapsular vessels depends on the attenuation of the ultrasound beam with depth, the intensity of the enhancement and the color Doppler sensitivity of the US system. Typically, color blood flow should reach the renal capsule. The distribution of the Malpighi's pyramids is easier to appreciate. The distribution of the color signals over the cortex is homogeneous. The renal artery can be easily followed from the ostium to the renal sinus, and detection of accessory arteries is facilitated. Normal Doppler tracing showed an increase in brightness and delineation of the Doppler envelope due to the improved signal-to-noise ratio. Some bubble artifacts with high intensity spikes are noticed when individual bubbles cross through the Doppler sample volume.

With low MI real time imaging techniques, the detection of main renal vessels is facilitated by the limited blooming artifact. The lumen is filled with microbubbles and the walls are better followed. However, the diagnosis of renal artery stenosis still remains on spectral Doppler analysis.

The renal cortex is rapidly filled with microbubbles. Pyramids are strongly hypovascular and their enhancement is difficult to detect at high acoustic power. However, pyramids are enhanced when low MI imaging techniques are used, such as MicroVascular Imaging and MicroFlow Imaging. The renal parenchyma is perfectly homogeneous with no cortico-medullary differentiation 40 to 60 sec after injection. The duration of the enhancement does not typically exceed 3 min after SonoVue® injection. It is reduced compared to liver imaging as no microbubble accumulates in the parenchyma. The kidney should be studied during the wash-in and was-out phases. It is then necessary to repeat the injection for each side.

4 VASCULAR DISORDERS OF THE KIDNEY

4.1 Pedicular vascular disorders

Renal artery stenosis

In current practice, USCA are not much used for the assessment of RA stenosis because recent Doppler sensitivity increase strongly reduced the rate of technical failure. New area for USCAs in RVH include 1) functional studies to improve the selection of patients that will effectively beneficiate of angioplasty or surgery and 2) direct assessment of the RA walls and patent lumen. After a bolus injection of an USCA, the area under the time intensity curve can be calculated for each kidney, using PDUS or pulse inversion technique. In case of significant stenosis, the peak enhancement can be significantly delayed and reduced and the integrated enhancement lowered on the stenotic side [**1**]. During continuous infusion of the USCA, the blood flow can be estimated using destruction reperfusion sequences with real-time low MI Pulse Inversion Imaging. In the future, improvements in contrast enhanced US should allow high resolution real time imaging of the RA in order to assess wall abnormalities and allow direct measurements of the patent lumen.

Renal vein thrombosis

The US diagnosis of RV thrombosis can be difficult due to attenuation related to the depth, low flow and poor angle of insonation.

The administration of USCAs makes RV assessment much easier because microbubbles increase the Doppler signal intensity due to their capability to cross the renal microvasculature [**2**]. However, CDUS settings should be tuned to avoid excessive blooming that might obscure partial RV thrombosis. Real time low MI imaging such as Pulse Inversion Imaging, Cadence CPS and VRI

imaging is more appropriate as partial thrombus remains hypoechoic within the enhanced RV lumen.

In case of tumor thrombus, it is critical to assess the extension of the tumor thrombus in the inferior vena cava. USCAs improve the detection of thrombosis and help differentiate bland from tumor thrombus, as tumor tissue strongly enhances after injection.

4.2 Peripheral vascular disorders

Renal segmental infarction and cortical necrosis

The diagnosis of small or distal perfusion defects in native and transplanted kidneys by CDUS remains difficult despite the improvement of the Doppler techniques, particularly when the kidney is deep, hypoperfused and moving with breath. Perfusion assessment at the level of the upper and lower poles also is limited by the direction of the vessels perpendicular to the US beam.

USCAs improve the detection of the microvasculature of the kidney. When the renal function is compromised, they provide critical information without any renal toxicity even at the bedside of the patients. Renal infarcts are seen as color flow defects with sharp edges. However, appropriate settings should be used to avoid blooming artifacts that may obscure small lesions. Non linear imaging at low MI provides a much higher resolution and improves the delineation of small infarcts. In renal transplants, they play a critical role to differentiate ischemia due to medical complications, such as acute tubular necrosis and acute rejection, from true infarction. Contrast-enhanced US can be repeated to follow the course of the ischemic complication at no risk for renal function. In cortical necrosis, the perfusion defect is a thin hypoechoic band sitting beyond the subcapsular cortex.

False aneurysm and arterio-venous fistula

Iatrogenic arterial false aneurysm appears as hypoechoic round-shaped mass filled with color Doppler signals with a typical to-and-fro pattern on pulsed Doppler spectrum obtained from the feeding vessel. USCA administration improves the detection of the flowing pouch when it is deep in the parenchyma, particularly after renal surgery. It also has the potential to detect active perirenal bleeding with higher sensitivity compared to contrast-enhanced-CT or angiography.

CDUS is the modality of choice to diagnose post-biopsy arterio-venous fistulas. Most cases do not require the injection of USCA for diagnosis. However, USCAs can be useful to assess low flow arterio-venous fistulas and malformations, particularly in native and deep kidneys.

Quantitative assessment of renal perfusion

USCAs allow non invasive estimation of the renal blood flow and provide quantitative measurement of local blood volume and microbubble velocity in selective region-of-interest (ROI). These measurements are performed using destruction-reperfusion imaging sequences during infusion of the USCA. However, the relationship between true renal blood flow and ultrasonic estimation of the blood flow is complex and depends on numerous parameters, such as the microbubble concentration, ROI position, complex distribution of the acoustic energy in the imaging plane, artifacts such as the "entrance in the slice" phenomenon [**3,4**]. The technique also is facing some limitations, including the administration of USCA with slow infusion and the absolute necessity to avoid any displacement of the probe or the kidney during at least 20 sec.

The potential clinical applications are wide particularly for renal transplants blood flow quantitative evaluation, functional assessment of renal artery stenosis and to evaluate urinary tract obstruction [**5**].

5 INFECTIOUS DISORDERS

Contrast-enhanced US increases the sensitivity of conventional B-mode imaging in the diagnosis of acute pyelonephritis by 33 %. However, no significant improvement was found between THI and contrast-enhanced US according to Kim and coll. [**6**]. In a quantitative study performed in renal transplants in our department, the overall sensitivity of non contrast US modalities for the detection of wedge-shaped areas was below 32 %, except for Harmonic compounding imaging (Harmonic Sono-CT). Contrast-enhanced US was equally sensitive to Harmonic Sono-CT but the averaged contrast ratio between APN lesions and the surrounding

parenchyma was significantly higher (10.1 dB vs. 7.8 dB). This significant higher contrast ratio should improve APN diagnosis and reduce inter-observer variability of US studies. For the detection of renal abscesses, contrast-enhanced US and Harmonic Sono-CT exhibited the same sensitivity of 100%, while conventional B-mode one was 41%.

6 RENAL TUMORS

6.1 Detection of renal masses

USCA has the potential to improve the detection of small renal masses, especially those that exhibit isoechoic pattern since the normal renal vascular architecture is altered. At peak enhancement, hypovascular small masses may appear as round-shaped cortical lesions with reduced signals, underlined by the massive blood flow enhancement obtained from the normal surrounding vessels [**7,8**]. The detection of iso and hypervascular masses is much more difficult at contrast-enhanced US since these lesions remain isoechoic to the surrounding enhanced parenchyma due to the enhancement of the normal renal parenchyma. Therefore contrast-enhanced US should remain less sensitive than CT or MR imaging.

6.2 Characterization of renal masses

Diagnosis of renal pseudo-tumoral variants

USCAs are very useful in the characterization of pseudotumoral variants (lobar and junctionnal dysmorphisms, fetal lobation) by demonstrating normal postcontrast enhancement of the suspicious area which should remain homogeneous and synchronous to normal cortex during the overall transit of the microbubbles. The branching of vascular tree must be smooth and the vascularization of the pseudo mass arises from the branches surrounding the lesion. The improved evaluation of pyramid spacing and cortical thickness is also helpful to rule out the presence of malignant tumors [**8**]. The number of unnecessary imaging procedures to diagnose renal pseudotumors should become reduced with the increased number of renal contrast-enhanced US examinations.

Diagnosis of solid malignant tumors

No reliable pattern at US can differentiate solid benign lesions such as oncocytomas, angiomyolipomas from RCCs. Some suggestive patterns (central stellate scar, spoke wheel distribution of tumor vessels) that have been described at CT in the diagnosis of large oncocytomas can also be seen at US but with a lower detection rate and confidence [**9**].

On the other hand, USCAs are useful for the assessment of tumor ablation during radiofrequency procedures (**10**).

Characterization of cystic renal masses

USCAs can play a critical role in the characterization of complex cystic masses. The strong enhancement of the vascularity in septations and mural nodules improve lesion classification (indeterminate cystic masses of type III vs cystic RCC that belong to category IV of the Bosniak cassification) and may change therapeutic options. However, contrast-enhanced US may be too sensitive as it can detect only a few microbubbles traveling in the wall or septations, with a superior time and spatial resolution compared to any other imaging modalities, and therefore can lead to false positive result. Additional clinical studies are necessary to evaluate the potential of this technique for characterization and follow-up of indeterminate cystic masses.

CONCLUSION

Contrast-enhanced US is the modality of choice for the US detection of infarction and cortical necrosis particularly in renal transplants. Because of the increased sensitivity of Doppler US systems, the diagnosis of renal artery stenosis is not anymore a major indication. However, functional imaging provides promising additional information that can help better select patients that should be referred to angioplasty. At present, USCAs are helpful to differentiate solid neoplasms from pseudo-tumor variants and to better characterize complex cystic masses. The administration of USCA can be repeated even in case of compromised renal function. Because most multicenter clinical trials were performed with outdated US imaging techniques, additional studies are required to define current renal indications for USCAs.

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2. CONTRAST-ENHANCED SONOGRAPHIC DIAGNOSIS OF VESICOURETERAL REFLUX

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The diagnosis of vesicoureteric reflux [VUR] with ultrasound [US] became feasible for routine use with availability of stabilized US contrast media [CM] in the mid-90s. Successively, contrast-enhanced voiding urosonography [VUS] has gone through methodological improvements. In Europe an increasingly widespread use of VUS can be observed. The aim of this presentation is to give a critical overview of the current status of VUS.

The basic procedure includes a pre-contrast scan of the bladder and kidneys, followed by intravesical administration of US CM and a repeat of the scan plus during voiding. Reflux is diagnosed when echogenic microbubbles are detected in the ureter or pelvi-calyceal system. The US modalities available for VUS have seen major improvements over the years. All started with fundamental modality and later color-Doppler was added. With harmonic imaging a major advance in the depiction of microbubbles was achieved and even the diagnosis of intrarenal reflux became feasible. The most recent developments in the US modality for VUS involve the use of contrast specific imaging modalities with low or high MI [e.g. "Agent Detection Imaging", Sequoia®, Acuson]and the possibility to visualize the grey-scale image and the refluxed microbubbles together or separately, including the ability to perform real-time dual imaging. The US contrast medium most commonly used is Levovist® [Schering, Germany]. There are first reports emerging regarding the application of the second generation US contrast medium SonoVue® [Bracco, Italy] that shows positive potential with respect to dose and cost reduction.

There are many studies comparing VUS with voiding cystourethrography [VCUG] and direct radionuclide cystography, incorporating overall more than a thousand patients. It has been repeatedly shown that significantly more refluxes are detected with VUS. Compared to VCUG there is about 10% increase in reflux detection rate. The concordance rate between VCUG and VUS in most studies is around 90%. In the remaining 10% VUR is diagnosed only by one of the imaging modalities. In these cases 80% of refluxes in VUS are grades II-V, whereas in VCUG 90% are grades I-II. Grading of reflux in VUS is similar to VCUG. The grading in VUS and VCUG are in 85% concordant. The main reason for discordant grading is that more than 50% of grade I refluxes in VCUG are grad II or higher in VUS. The feasibility of performing urethral examination during VUS and the fully concordant results with VCUG were recently reported.

The main advantages of VUS compared to the radiological methods are the increased sensitivity combined with lack of radiation exposure. The limiting factors of VUS are the relatively longer examination time (20 – 30 min) and the higher cost of US CM. With the use of the newer generation US contrast medium and advanced contrast imaging modalities there is the potential to reduce the examination time by half. Currently, for routine use VUS is selected as the primary imaging modality in follow–up cases, for screening and as a first examination in girls. VCUG is often carried out as the first examination in boys, for imaging urethral and bladder pathologies and preoperatively.

LEARNING OBJECTIVES:

1. To understand the background for the use of US for diagnosis of vesicoureteric reflux.

2. To learn how contrast-enhanced voiding urosonography is performed.

3. To become familiar with contrast-specific US imaging modalities.

4. To comprehend the diagnostic efficacy of contrast-enhanced voiding urosonography in comparison to voiding cystourethrography and direct radionuclide cystography.

5. To critically appraise the pros and cons of contrast-enhanced voiding urosonography.

6. To be familiar with the current selection criteria for contrast-enhanced voiding urosonography.

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3. MR CONTRAST MEDIA

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MR contrast agents have demonstrated their clinical usefulness in a variety of organs for improved detection of various neoplastic, inflammatory and functional abnormalities. They include non-specific extracellular contrast agents and organ-specific contrast agents. Gadolinium chelates are the most widely used extracellular, non-specific contrast agents. Organ specific contrast agents used for magnetic resonance (MR) imaging of the genitourinary tract include superparamagnetic iron oxide particles which are still under development. Iron oxide particles are mainly T_2-agents whereas Gadolinium agents are mainly T_1-agents. Their use in many clinical indications is justified because, in conjunction with improved imaging techniques, these safe and image-enhancing contrast agents add morphologic and functional information compared to unenhanced MR images.

GADOLINIUM CHELATES

Gadolinium (Gd), a paramagnetic metal in the lanthanide series is their active constituent. These paramagnetic agents can be classified into four main categories according to their biochemical structure, e.g., macrocyclic vs linear, and to their charge, ionic vs non-ionic.

For clinical use, the recommended dose is 0.1 mmol/ kg; however gadodiamide and gadopentetate are approved for MR angiography at doses up to three times the standard, and gadoterate at a dose of twice the standard. After injection, they are rapidly distributed into the intravascular space and then throughout the extracellular space. They diffuse freely into and out of the extracellular space but do not enter tissues with specialized vascular barriers. These agents accumulate in tissues with abnormal vascularity; after intravenous administration, they are excreted unchanged by passive glomerular filtration.

The tolerance of Gd chelates is excellent at both standard and higher doses, with no clinically relevant difference among these agents. A meta-analysis of data obtained for 13,439 patients enrolled in phase IIIb-IV studies who received 0.1 or 0.2 mmol/kg of Gd-DTPA reported an adverse event rate of 1.15% and of 2.6 % in patients with a known history of allergy [1]. The most frequently reported adverse events are nausea, headache and vomiting; they are not severe and do not require specific treatment. Anaphylactoid reactions, involving respiratory, cardiovascular, cutaneous, gastrointestinal and/or genitourinary manifestations have been reported with a prevalence of between 1 / 100,000 to 1 / 500,000 [2]. Most patients who experienced anaphylactoid reactions had a past history of respiratory difficulties or respiratory allergic disease. Two studies [3-4] reported that the risk of adverse reactions to Gd chelates was higher in patients with a prior history of reaction to iodinated contrast media. Premedication of these patients remains controversial.

Although gadolinium-based contrast media with administered doses not exceeding 40 ml at 0.1 mmol of gadolinium per milliliter are regarded as non-nephrotoxic in a healthy population, documentation of impaired renal function has appeared in the literature [5-9]. Low glomerular filtration rate and diabetic nephropathy were determined as the independent risk factors of acute renal failure (ARF) in Ergün's series [5], which retrospectively analysed 473 patients with chronic renal failure in whom gadolinium was used as the sole contrast agent at a dose of 0.2 ml/kg. In this study, ARF was observed in 12.1% of patients with stage 3 and 4 renal failure; older age, low baseline creatinine clearance, diabetic nephropathy and lower haemoglobin and albumin levels appeared to be risk factors for ARF. In addition, the use of gadolinium chelates as a substitute for

iodinated contrast media is contraindicated in patients with increased risk of nephrotoxicity [10-11].

In most indications, rapid T_1-weighted imaging is required to maximize enhancement between the normal tissues and focal lesions [12-13]. A contrast rate of 2 mL/second is sufficient to produce excellent dynamic contrast-enhanced images. A flush with saline of 20 mL at a rate of 2 mL/second is recommended as well as the use of MR imaging-compatible power injectors and automated detection of the bolus. Gradient echo imaging techniques are the cornerstone for all timing strategies. Quantitative and semiquantitative image analysis and image postprocessing can be performed on a workstation. Subtraction of the unenhanced set from the contrast-enhanced data sets is often required for accurate assessment of subtle enhancement and optimal contrast between vessels and background tissue. Subtraction is often the initial step for further imaging processing, including 3D reconstructions (including MIP and Volume Rendering).

Gd-enhanced MR imaging plays a crucial role in the characterization and pretherapeutic staging of renal masses. The scanning protocol should include unenhanced MR imaging followed by imaging during the arterial, venous, and nephrographic phases. It allows detection of small enhancing solid areas within a cystic renal mass; the nephrographic phase is the most sensitive for tumor detection but some cystic neoplasms are so hypovascular that a delay of 2 minutes may be needed to demonstrate enhancement. Tumor thrombus within the renal veins or IVC is best assessed on 3D GRE T_1-weighted images. 3D MR angiography is widely used in patients with suspected renovascular disease to detect and quantify renal artery stenosis [14]. Optimal arterial opacification requires scanning with rapid temporal resolution. A high resolution breath-hold fat-suppressed 3D T_1-weighted spoiled GRE sequence is generally performed in a coronal-oblique plane before and after Gd injection in these patients. Gd chelates may also be used for MR urography. 3D coronal-oblique T_1-weighted images are obtained after injection of 10 mg of furosemide to augment diuresis and approximately 10-20 minutes after the initial injection of Gd. Then a MIP image is created, with a similar appearance to a conventional urogram obtained after injection of iodinated contrast medium [15]. Gadolinium chelates are currently used for functional MR imaging of the kidneys. Rapid clearance blood pool agents are preferred to commercially available Gd compounds because they have a higher molecular weight that limits their diffusion without compromising their glomerular filtration. Evaluation of the glomerular filtration rate (GFR) requires injection of a contrast medium that is excreted by the kidney [15-16]. Rohrschneider et al [15] demonstrated that similar results could be obtained with dynamic contrast-enhanced T_1-weighted MR images and scintigraphy in measuring split function, in normal and pathologic conditions.

ULTRASMALL SUPERPARAMAGNETIC IRON OXIDES

Ultrasmall superparamagnetic iron oxide particles (USPIO) are novel magnetic resonance contrast agents specifically developed for intravenous MR lymphography. They are specific for the reticulo-endothelial-system (RES) and provide information on lymph node morphology and function. They have been used to improve the detection of node metastases, and are still in the experimental stage. In normally functioning lymphatic tissue, USPIO particles are taken up by macrophages and cause a decrease in signal intensity (SI) on T_2 and T_2*-weighted images by their magnetic susceptibility effect and T_2-shortening effects. Metastatic nodes, in which macrophages are replaced by tumor cells, do not exhibit USPIO uptake and their signal intensity remains unchanged on postcontrast images. USPIO particles are composed of iron oxide crystals coated with polymers to avoid uncontrolled aggregation of the magnetic crystals. USPIO salt solutions are prepared by co-precipitation of magnetite in the presence of a coating material. Sinerem® and Combidex® are provided as lyophilized powders consisting of biodegradable USPIO particles, Dextran and dihydrated sodium citrate. They are reconstitued by mixing the lyophilized powder with 9.7 mL of 0.9% normal saline solution, yielding a dark reddish-brown aqueous solution. The osmolality of the solution is 365 mosm /kg. The appropriate volume of drug is then diluted in 100 mL of 0.9% saline solution and administered through a syringe with a 5-μm filter, as an intravenous infusion. The recommended infusion time is 25-35 minutes.

Clinical tolerability is generally excellent [17]. However, side effects may include lumbar pain, rash, a transient decrease in blood pressure and arrhythmia. The iron oxides are biodegraded in phagolysosomes within macrophages. The iron oxide core is incorporated into the plasma iron

pool and is subsequently incorporated into hemoglobin. All published studies in humans show a trend in increased diagnostic efficacy with USPIO-enhanced MR imaging for differentiating benign from metastatic nodes [17-19]. The results of the phase 2 European trial have been reported in 1998 [17] in 30 patients with urologic and pelvic cancer who received USPIO at a dose of 1.7mg Fe/kg. The overall sensitivity was 100% and the specificity was 80%. The SI distribution of metastatic nodes was at an SI ratio significantly higher than that of benign nodes on GRE T_2*-weighted images. Nine of 27 (33%) metastatic nodes showed an increase in SI on postcontrast T_1-weighted images that could be related to leakage of USPIO particles into tumorous tissue. The most recently published study [19] included 80 patients with presurgical T1, T2, or T3 prostate cancer. USPIO-enhanced MR imaging correctly identified all patients with nodal metastases, and a node-by-node analysis had a significantly higher sensitivity than conventional MR imaging (90.5 percent vs 35.4 percent) or nomograms. In these studies, false negative results were mainly related to very small foci of metastatic tissue (<5 mm) in normal-sized nodes; false positive results included benign reactive nodes with follicular hyperplasia or localized nodal lipomatosis. In addition, USPIO particles have also been used as an MR functional imaging contrast agent to assess renal blood volume and flow as they have no interstitial diffusion and are not excreted by the kidneys.

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WSIII: Interventional Procedures (Upper Tract)

Location: Hall C

Moderators: *S. Moussa (UK), S. Ragy (EG)*

1. RADIOFREQUENCY ABLATION OF RENAL TUMORS

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The number of small and asymptomatic renal tumors has dramatically increased and with it the 5 year survival statistics for renal cancer have greatly improved. As more of these tumors were removed by radical nephrectomy, surgeons and patients began to question whether nephron sparing procedures might not make more sense. The introduction of laparoscopic partial nephrectomy meant even less invasive procedures for the patient. The logical next step was the introduction of minimally invasive treatments requiring only light sedation and no hospital stay. Radiofrequency ablation (RFA) and cryotherapy have now become routine procedures in many hospitals.

Radiofrequency ablation is essentially the production of coagulative necrosis after exposure to high frequency electrical energy. For it to be successful the body is electrically grounded and an electrical circuit is formed between the device and ground. Of course, most of the energy is deposited within several centimeters of the probe because of high electrical impedance. The Bovie coagulator, operating on the same principle has been used for over 30 years during surgical procedures to stem the loss of blood by coagulation. The technical challenge for RFA was to build radiofrequency probes that created a uniform sphere of evenly heated tissue without charring the tissue. Charring or carbonization leads to an insulating effect that inhibits the transfer of heat, reducing the effectiveness. Pulsed RF and cooled probe RF were developed to prevent charring. With sufficient power these probes can effectively ablate fairly large spheres of tumor [1].

A companion method of ablation, cryotherapy, involves the installation of liquid nitrogen through a heat transfer probe. A spherical iceball forms at the tip of the probe. The freezing of the cytoplasm leads to expansion and crystallization of intracellular contents both of which tend to rupture cell membranes, however, the true killing effect does not occur until thawing occurs. Thus freeze-thaw cycles are required for effective cell killing [2].

IMAGE GUIDANCE

Both RFA and Cryoablation require image guidance. Some centers rely exclusively on ultrasound but most centers utilize some combination of CT, MRI or Ultrasound to place the probe accurately. In our center, CT is mostly used to guide the probe into the tumor. For RFA there is no means of monitoring heat generation in real time for CT or ultrasound. During RFA microbubbles form in the tissue rendering the target tissue difficult to see. Research has suggested that MRI (observing changes in the T1 or phase of heated tissue)could provide real time heating assessment of the RFA, however, there are substantial technical challenges to perform RFA in the MR environment including the use of MR compatible RF probes and then to operate such probes in the MR environment [3]. Cryotherapy has the distinct advantage of demonstrating changes, obvious on MRI by the absence of signal or on CT as a decrease in attenuation during the ice ball. Both MRI and CT aid in the guidance of these minimally invasive therapies [4].

PATIENT SELECTION

Like all procedures in medicine, care should be exercised in selecting patients. Even with the considerable experience of RFA and cryotherapy worldwide, these procedures are still not considered the gold standard for therapy of renal cancer. However, they have become more universally accepted in a variety of situations. Patients with hereditary renal cancers in whom repeated surgical procedures would otherwise be necessary are good candidates for RFA/cryo [5]. Similarly, elderly patients who require treatment but who are high risk for surgery and patients with single kidneys in whom surgery could result in loss of the remaining kidney are good candidates for RFA/cryo. Other indications include massive hematuria due to tumor bleeding [6].

Tumor location plays a role in patient selection. Peripheral lateral tumors are ideal as a clear path to kidney tumor can be found without interfering structures. Deeper tumors can be problematic because of the heat sink effect caused by large vessels in the renal sinus. The patient must be prepared to undergo surgery of this lesion if it recurs after RFA/cryo. Another complication of treating deep lesions is the trapped calyx caused by the inadvertent occlusion of

the upper or lower pole collecting system. Similarly lower pole exophytic tumors or tumors near the renal hilum can lead to hydronephrosis and obstruction if the ureter or pelvis is included in the treatment field [7]. This complication can be difficult to treat and may require extended stenting and/or surgical repair.

Patients with bleeding disorders or immunologic disorders are relatively contraindicated as bleeding and/or infection can occur.

PROCEDURE

The RFA/cryo procedure usually takes less than one hour. Intravenous conscious sedation with local anesthesia is desirable. The skin is prepped and draped and a biopsy needle is placed within the tumor. This material is sent for histologic analysis. In some centers RFA/cryo does not proceed until the diagnosis has been made by the pathologist [8]. Our approach is to obtain the biopsy but proceed to the treatment at the same time. It should be noted however, that a high percentage (up to 30% in one study) of incidentally detected renal masses were benign[9]. For lesions adjacent to bowel a "cushion" of fluid can be instilled to separate the lesion from the bowel. [8]

Treatment with RFA/cryo is dependent on the success of tissue heating/freezing. Thermistors in the RF probe indicate the temperature at the periphery of the treated tissue but can be misleading. Imaging can be used to ascertain the size and shape of the iceball during cryo. It is possible to treat multiple lesions at one session. Most investigators advocate treating while the probe is removed to sterilize the tract of the probe.

The patient is observed for a period of hours after the procedure. Generally, after recovery from anesthesia they can be discharged home. Some are better off with an overnight stay if the procedure begins in the afternoon. Usually discharge is possible by the next day. Occasionally, the patient may have pain associated with procedure, usually it is relieved by analgesics. Complications can include severe pain due to partial damage to the nerve especially during tract ablation, perinephric hematoma or urinoma, renal obstruction due heat injury to the ureter or collecting system and infection/abscess.

FOLLOW-UP

It is vital that the patient be checked periodically to insure that the lesion was satisfactorily treated. We generally obtain our first post treatment study at 3 months. We perform pre and post contrast scans (arterial and venous phase). A successful treatment will demonstrate a lesion slightly denser than renal parenchyma (40-55HU) on pre contrast scans with minimal (<10HU) enhancement after contrast [10]. Slowly progressive enhancement can be seen on the arterial and venous phases and is generally related to granulation or "burn" tissue. Clearly, a rim of enhancing tumor is a sign that the treatment is incomplete. We take an aggressive approach to this and retreat as soon as possible or advocate for surgical removal as soon as possible. It is important to keep in mind that even if a 3cm tumor is reduced in size to a few remaining millimeters of tumor it is biologically still a 3cm tumor and should not be allowed to regrow. It is still uncertain what the effects of partial RFA/cryo are on tumor biology so caution should be exercised in such patients. Often a perinephric "halo" is seen in the fat around the treated lesion due to fat necrosis.

Patients should continue to be followed at 3 month intervals for at least the first year followed by annual or semiannual imaging afterwards. Several patterns can be seen. The most common for RFA is a poorly enhancing nodular density in the kidney with a halo around it which gradually involutes over time to become a scar. This process can take several years. Additionally, one may see that the adjacent renal parenchyma has an "embarrassed" blood supply which may revert to normal. Evidence of a trapped calyx, hydronephrosis or recurrence should be sought on every scan [7]. We continue to follow patients on a yearly basis after their first year for evidence of recurrence. This may take several years to appear.

It should be mentioned that in patients who have metastatic disease, RFA/cryo can be used to palliate symptoms. This is particularly true of bone metastases.

FUTURE DEVELOPMENTS

The future of minimally invasive treatments of kidney tumors is bright. Certainly current methods are successful for treating small peripheral lesions. Unmet needs include the ability to accurately conform the treatment to the size and shape of the lesion rather than having a "one size fits all" approach. Furthermore, methods of amplifying the effect within the kidney tumor while minimizing the effect in normal tissue is being considered with certain targeted therapies that render the tumor more vulnerable to heating or freezing. Better methods of monitoring kidneys for early recurrent disease such as with PET scanning are under evaluation. The minimally invasive treatment of larger renal tumors is also being considered using multi-probe arrays. These developments offer hope for the future that therapies can be delivered with minimal discomfort and inconvenience to the patient.

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2. PERCUTANEOUS TREATMENT OF TRANSITIONAL CELL CARCINOMA OF THE UPPER URINARY TRACT

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Following the initial successes of Percutaneous Nephrolithotomy and Endopyelotomy we attempted percutaneous resection of low grade low stage transitional cell carcinoma of the renal pelvis followed by local radiotherapy to the track. Our experience with 26 patients between 1985 and 2002 will be presented with follow up and complications. Six patients had bilateral synchronous disease. Iridium wire radiation was used initially followed by Brachytherapy to sterilise the track. In the last 4 years flexible uretero-renoscopy with Homium Laser resection has become the treatment of choice.

3. MANAGEMENT OF MALIGNANT URETERIC OBSTRUCTION

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Ureteric obstruction secondary to advanced malignant disease in the pelvis or abdomen resulting in renal impairment if left untreated can rapidly progress into a terminal event. This is now becoming a common urological problem following recent trends of more aggressive

oncological treatments.

THE MAIN CAUSES ARE MALIGNANCIES OF:

- Prostate
- Bladder
- Cervix
- Colo-rectal
- Uterus
- Others malignancies with retroperitoneal involvement

OBSTRUCTION OF THE URETER MAY BE DUE TO:

- Direct tumour spread
- Extrinsic compression from:
  - Tumour
  - Nodal metastasis
- Post-radiation fibrosis
- Post operative scarring

The initial management involves decompression of the collecting system by the retrograde insertion of a ureteric stent or drainage by nephrostomy tube and staged antegrade stent insertion.

Insertion of ureteric stents is now an established urologic and radiologic procedure. The majority of stents are inserted in a retrograde fashion by the Urologist at cystoscopy.

Antegrade insertion is usually undertaken by Radiologists when a nephrostomy tube is already in situ or when retrograde insertion is unsuccessful. In difficult cases a combined approach is used.

Antegrade stents can be inserted as a primary procedure or staged after the initial nephrostomy drainage.

THE TYPES OF STENTS USED ARE:

The double J stent

These are the most commonly used stents. Their main advantages are the ease of insertion and relatively low cost. In most cases however they require to be changed at intervals of between 4 to 6 months due to the potential problem of obstruction and encrustation.

In tight stricture parallel stents can be placed in the ureter to provide better drainage.

Metallic stents

These are less widely used and more expensive. Careful patient selection is recommended. The limited experience with these stents suggests that they are more suitable for strictures in the mid-ureter. Modern development in stent design has shown some promise to overcome the problem of encrustation and urothelial hyperplasia.

Extra-anatomic stents

This is a more invasive combined surgical and radiological procedure requiring general anaesthesia and careful patient selection.

The different techniques of stent insertion, general principles, potential pitfalls and complications are presented and discussed including the importance of the initial renal access, choice of catheters, guide wires and use of dilators.

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WSIV: Renal Transplantation: Acute Dysfunction

Location: Hall D

Moderators: *J. Jakobsen (N), A. Shokeir (EG)*

1. ACUTE RENAL GRAFT DYSFUNCTION

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Acute graft dysfunction (AGD) is usually defined as the rapid deterioration of graft function, with a rise of serum creatinine by more than 0.3 mg/dl (29.3umol/l), over a few hours, days or weeks. It is a fairly common event following kidney transplantation, with a reported incidence between 20% and 80% during the first year. Most events occur during the first three months, with a decremental frequency with the passage of time; but they continue to occur so long as the graft survives. AGD may be attributed to; a) donor factors as type (living versus cadaveric), demographics, pre-harvesting morbidity, ischemia time, preservation technique, etc. ; b) Recipient factors as hemodynamic adequacy, immunological matching, pre-existing or acquired infections, coagulation disorders, etc. ; c) Iatrogenic factors including surgical complications, inadequate immediate post-operative care, the use of nephrotoxic medications, etc.

Two events may lead to acute graft dysfunction on the surgical table: acute graft thrombosis and hyperacute rejection. The former may be due to a surgical fault or to an unexpected recipient's hypercoagulable state; the latter to presensitization. Both often lead to immediate graft loss.

Primary graft dysfunction (PGD) is the failure of the graft to function or to pull through shortly after engraftment. It may be attributed to delayed onset of the graft thrombosis or accelerated rejection, which is pathogenetically similar to hyperacute rejection, both being caused by preformed antibodies to the donor's Class I Major Histocompatibility (MHC) antigens. Yet, PGD is more often an expression of acute tubular injury or necrosis (ATN) induced by perioperative hypovolemia, hypotension, or ischemia/reperfusion damage. It may also occur with thrombotic microangiopathy (TMA) that reflects massive endothelial injury caused by an immunological insult, viral infection, or complicates treatment with calcineurine inhibitors (CNIs).

The onset of ATN or TMA may be delayed for several days, following successful primary function. Yet the later AGD develops, the less likely are they to blame; acute cellular rejection (ACR) and dug toxicity being far more frequent. With the modern advances in immunosuppression, the clinical syndrome ACR has become so blurred that a beside diagnosis cannot be made with certainty. The usual clinical dilemma is to distinguish in between ATN, ACR and CNI toxicity. While there are certain clinical, laboratory and imaging profiles that may favor one diagnosis over others, the final conclusion is often made by graft biopsy.

Graft ureteric obstruction is an unusual cause of early AGD, particularly with the routine use of a ureteric stent for the first postoperative week. Obstruction may occur following removal of the stent due to a surgical fault, a blood clot or a stone. It may be induced by external compression by a hematoma or a lymphocoele in a critical site. Fortunately, all these complications are readily diagnosed by a bedside ultrasonographic assessment, and seldom cause confusion with acute parenchymal or vascular disease.

Ureteric obstruction is an increasingly recognized complication of Polyoma (BK) viral infection, which may lead to ureteric stricture, typically during the second half of the first year or later. This usually follows an acute febrile illness due to acute viral interstitial nephritis, which mimics ACR and can only be firmly distinguished by renal biopsy.

Cytomegaloviral (CMV) infection is another potential cause of AGD, either due to the hemodynamic consequences of acute disease, precipitation of ACR, or to graft arterial occlusion.

The list of AGD due to infection is expanding, being influenced by local ecology and health standards. HIV, HCV, bacterial pyelonephritis, tuberculosis, malaria, babesiosis and leishmaniasis are among the reported agents in this context.

Recurrence of the original kidney disease in the graft may lead to AGD. This has been particularly reported in recurrent hemolytic uremic syndrome, crescentic glomerulonephritis, and the occurrence of Goodpasture syndrome in patients with Alport's syndrome, being exposed to normal basement membrane antigens that they do dot recognize as "self".

Many of the mentioned causes of AGD are confusing, which requires an advanced level of awareness and experience of the clinician, radiologist and pathologist. With the improving imaging techniques, many of these conditions can be diagnosed or suggested if the radiologist's index of suspicion is sufficiently high. It is hoped that one day the imaging and laboratory modalities would become sensitive and specific enough to minimize the frequent need for the highly invasive biopsy.

2. A. ACUTE RENAL DYSFUNCTION: ROLE OF ULTRASOUND IN MEDICAL COMPLICATIONS

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Postoperative serial sonography is usually performed to detect complications and aid in post-transplant management. Potent immunosuppressive drugs have resulted in significant advances in survival of patients and renal grafts, and the signs initially described on greyscale ultrasound in the case of acute rejection are no more observed. The role of duplex Doppler sonography in the early detection of rejection remains controversial. For some authors, RI analysis, when studied serially and in the right clinical settings, allows an early diagnosis of renal rejection with high sensibility and specificity. In other series, it does not contribute to the diagnosis of acute allograft dysfunction, and renal biopsy should be performed when ultrasound has excluded the possibility of urological and vascular complications. Ischemic injury, which occurred prior to organ harvesting, may play a dominant role in determining intrarenal resistance. Power Doppler may be more sensitive, and contrast-enhanced sonography might identify acute rejection earlier than conventional techniques.

More than 80% of renal transplant recipients suffer at least one case of infection during the first year after transplantation. Focal pyelonephritis may appear as areas of increased or decreased echogenicity, which are non-specific, and contrast-enhanced sonography may also be helpful in analysing perfusion defects.

2.B. RENAL TRANSPLANTATION - ACUTE DYSFUNCTION: IMAGING OF MEDICAL COMPLICATIONS WITH MRI

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Worldwide, the population treated with renal replacement therapy reached almost 1.7 million at the end of 2003, representing approximately 1.3 million patients who undergo dialysis and 400,000 patients who are alive with a kidney transplant (Lameire et al., 2005). The number of patients treated for end-stage renal disease doubled during the last decade in the United States and Europe, where dialysis consumes about 2% of health care budgets, with <0.1% of these patients requiring treatment (De Vecchi et al., 1999). Based on the European Renal Association–European Dialysis and Transplant Association registry (25 countries of the European Union),

approximately 360,000 patients are undergoing renal replacement therapy, with 66% of them on dialysis and 34% living with a functioning graft; the percentage of kidneys transplanted from living donors varies widely among the European countries, between <10% to >50%. [ERA–EDTA Registry: ERA–EDTA 2003, Annual report. Amsterdam, The Netherlands, 2004, Academic Center].

The principal cause of graft loss after the first year is chronic allograft nephropathy (CAN), followed by patient death, late acute rejections, nephropathy recurrence and polyomavirus infection (Hariharan S, 2001). However, prolongation of graft survival also means extended exposure of the patient to side effects associated with immunosuppressive therapies, mainly infections and cancers, and other late-onset cardiovascular, bone and/or metabolic complications. The first year after transplantation is special, as it is characterized by the highest rates of acute rejection and opportunistic infections, like cytomegalovirus. In this review, we successively address the early (first year) and late (after the first year) medical complications.

1. MR ASSESSMENT OF THE GRAFT

MRI of the renal graft is performed with body phased-array coils, using adequate sequences for visualizing successively the renal parenchyma and its environment, the vascular tree, and the excretory system. Today, MRI protocols assure complete evaluation of the entire graft, including renal parenchyma morphology and perfusion, the vascular tree and the excretory system (Fig 1). On T_1-weighted (T1w) (spin-echo or gradient-echo) sequences, the normal corticomedullary differentiation is visible on normally functioning kidneys: the medulla generates a lower signal intensity (SI) than the cortex. On T_2-weighted (T2w) sequences (usually obtained with a fast spin-echo technique), the medulla generates a higher SI. Gadolinium (Gd) injection gives an accurate delineation of perfused and non-perfused areas of the graft and high-resolution 3D-MR angiograms can be obtained for the entire arterial tree – from the iliac axis to the third or fourth order branches. However, the distal vascular tree (from interlobar to interlobular arteries) cannot be visualized. The same 3D sequence must be repeated 5 minutes after Gd injection (or later if necessary) to obtain MR-urograms and furosemide injection is generally not necessary for that purpose.

2. EARLY POSTOPERATIVE PHASE

2.1. MEDICAL COMPLICATIONS

2.1.1. Clinical considerations

Different causes can be responsible for the failure or deterioration of renal graft function.

Primary non-function is characterized by immediate anuria without subsequent improvement. It is favored by certain risk factors: elderly donor, hypertension, prolonged ischemia, kidneys from children implanted into adults.

ATN is characterized by delayed recovery of renal function. It becomes manifest 12–24 hours after revascularization as anuria or renal insufficiency with preserved diuresis. In particular, it is favored by the donor's age and vascular history, intensive care of the donor (hemodynamic status) and drugs used, difficulties encountered during organ excision (multiple organs), perfusion and cooling fluids used, duration of cold ischemia. ATN resolves spontaneously over the first 2 weeks, depending on the degree of ischemia–reperfusion injury.

Acute rejection, in the majority of cases, is mediated by T lymphocytes and modern immunosuppressant therapies are able to prevent it more-and-more frequently. The actual acute rejection rate is 10–15%. Acute rejection remains the primary cause of graft loss in the short term and represents, above all, a major risk factor for the development of chronic graft dysfunction. Clinical signs are few in number and become manifest late, with a painful and enlarged graft, markedly diminished diuresis and febricula. Imaging is useful for the differential diagnosis, excluding abnormalities of the large vessels or the excretory pathway. The definitive diagnosis and the severity of the episode are provided by a renal biopsy showing lymphocyte infiltration of the tubules and the interstitium, with vascular lesion(s) in the most severe cases.

The possibility of drug nephrotoxicity has to be excluded, either directly caused by calcineurin inhibitors (cyclosporin A, tacrolimus) or more indirectly amplified by drug interactions. Again, the definitive diagnosis is provided by the biopsy.

2.1.2. MR imaging

Except for severely injured kidneys with primary non-function, distinguishing clinically between these medical entities may be difficult and, unfortunately, imaging techniques have not yet played a major role in alleviating that difficulty, thereby still justifying renal biopsies.

Findings on MR T1w-sequences detecting these entities overlap. The graft may or may not be enlarged. Initially, based on early experimental and clinical studies, decreased corticomedullary differentiation (CMD) on T1w sequences was considered specific to acute rejection (Hricak et al., 1986, Rholl et al., 1986). Now, this feature is considered non-specific for any nephropathy (Neimatallah et al., 1999). Proposed mechanisms are either lower cortical signal intensity due to edema or increased medullary SI resulting from decreased tubular flow or deposition of protein or blood components (e.g., hemoglobin). The intensity of the CMD decrease was initially shown to be associated with the degree of renal insufficiency and supposedly absent when serum creatinine reached 3.0 mg/dl (Semelka et al., 1994). However, in acute renal failure (ARF), CMD may remain preserved, at least within 2 weeks of developing ARF, and its degree seems now to be independent of the serum creatinine level (Chung et al., 2001). Similarly, signal changes on T2w images are highly variable.

Macrophages, may infiltrate renal tissues in specific renal graft dysfunctions (rejection and ATN) (Grau et al., 1998). Ultra-small superparamagnetic particles of iron oxide (USPIO) are avidly captured by extrahepatic cells with phagocytic activity which include circulating monocytes and resident macrophages that are present in most tissues.

Several models of experimental nephropathies in rats were used to demonstrate the detectability of intrarenal macrophagic activity in vivo. Models of acute (Yang et al., 2001, Ye et al., 2002) and chronic graft rejection (Beckmann et al., 2003) in rats showed diffuse homogeneous SI decreases in the 3 renal compartments (Fig 45). Conversely, signal diminution was found only within the medulla in a model of ischemia–reperfusion, with no change within the cortex (Jo et al., 2003). The degree of SI decrease of was always correlated with the number of macrophages within each renal compartment and disease severity.

The results of the first clinical study on 12 patients were recently reported (Hauger et al., 2004). MRI was performed 3 days after USPIO injection (Sinerem®, Guerbet Group) to ensure getting rid of signal changes from the vascular blood volume, knowing that USPIO half-life in blood is 36 hours. A significant SI decrease only within the medulla was observed in patients with ATN, whereas patients with acute rejection had diffuse SI decreases (Fig 46). Those preliminary clinical findings seem to corroborate experimental observations and call for larger multicenter clinical trials and evaluation of imaging 2 days after injection to shorten the time to diagnosis.

3. PARENCHYMAL NECROSIS

These medical complications, mainly severe ATN or acute rejection, may result in defective distal perfusion. It is most often limited to the cortex (cortical necrosis) or extends into the medulla (total necrosis).

In cortical necrosis, the graft may appear normal on T1w images and hyperintense on T2w images. In hemorrhagic cortical necrosis, the cortex may appear hyperintense on T1w images and hypointense on T2w sequences. Gd-enhanced MRI clearly shows the in-depth extension of the parenchymal devascularization (Helenon et al., 1992) (Fig 28c, 29). These changes may be limited to the outer cortex, run along the capsule or cover the entire outer and inner cortex thickness (Fig 28a). When necrosis extends into the medulla, no enhancement is seen in the entire parenchyma, while the main arteries and veins remain patent in the pedicle and sinus.

4. GRAFT INFECTION

Urinary infections are common during the first month following transplantation. They are usually nosocomial bacterial infections, sometimes facilitated by the presence of catheters, which can lead to real pyelonephritis of the graft or the development of renal or perirenal abscesses. Sometimes, perigraft abscesses may be secondary to bacterial contamination of a preexisting fluid collection (hematoma, lymphocele or urinoma). The most frequently encountered microorganisms are: *Staphylococcus aureus*, *Escherichia coli*, enterococci and *Candida albicans*.

Renal parenchyma infection may be seen as an increased graft volume and/or areas of decreased or increased signal intensity on T2w images. Gd-enhanced MRI is able to distinguish between infection and infarction in most of cases, because enhancement is observed in the former and not in the latter, except for a thin peripheral capsular rim. But imaging is not able to differentiate between infection and rejection.

Chronic allograft nephropathy (CAN)

CAN can be defined as a progressive deterioration of renal function appearing several months after transplantation (Halloran et al., 1999). Four types of lesions can be found in graft biopsies: hyperplasia of the vessel intima, tubular atrophy, interstitial fibrosis and/or allograft glomerulonephritis. Different scores have been devised to classify CAN according to its severity. The most widely used is the Banff classification, based on the extent of the fibrosis and the tubule lesions in the cortical zone (Racusen et al., 1999).

Kidneys suffering from CAN are decreased in size and have poorer corticomedullary differentiation and, sometimes, mild dilatation of the renal calices and pelvis. Most imaging techniques focus on the loss of parenchymal vascularity in the cortex to recognize this entity.

2.4 EMERGENT IMAGING TECHNIQUES

4.1. Perfusion studies

As mentioned above, renal perfusion is decreased during acute rejection. With MRI, renal perfusion can be measured using pulsed arterial spin-labeling (or spin-tagging) with endogenous water used as a diffusible tracer (Golay et al., 2004). With this technique, a perfusion-weighted image can be generated by the subtraction of an image in which inflowing spins have been labeled from an image obtained without spin-labeling. Quantitative perfusion maps can then be calculated (in mL/min/100 g of tissue) when T1 of the tissue and efficacy of labeling are known. This method was applied to a model of acute rejection in rats at 4.7 T (Wang et al., 1998). During severe rejection, the renal cortex-perfusion rate in allogeneic kidneys was very low (undetectable) compared to the value in syngeneic kidneys. Moreover, the renal cortex-perfusion rate determined by MRI was significantly correlated with histological rejection. However, these methods are complex to implement in a clinical setting and their concordance with established methods has never been adequately assessed. Hence, their impact in clinical practice remains uncertain.

Use of first-pass dynamic contrast-enhanced imaging acquisitions makes quantification of absolute or relative renal perfusion possible. The most widely used technique for that purpose is MRI. MR technical and methodological issues for quantification of renal perfusion have been extensively described elsewhere (Grenier et al., 2006). Gd-chelates (Sharma et al., 1995) and iron oxide (Gaschen et al., 2001) have been used for that purpose, with the latter being restricted to the vascular compartments during the first pass, while the former diffuses within the interstitial space and the glomeruli. These bolus tracking techniques have the advantage of being less prone to movement artifacts than spin-labeling techniques. Using superparamagnetic particles of iron-oxide (SPIO), Beckmann et al. (Beckmann et al., 1996) showed that perfusion rates correlated significantly with the histological score of acute and chronic rejections.

First-pass Gd-enhanced acquisitions allow, in the same time, to measure glomerular filtration rate. Several models have been proposed and GFR maps can also be calculated but validation with reference methods is still required.

4.2 Blood oxygen level-dependent (BOLD) MRI

The outer medulla is particularly sensitive to hypoxia because the active reabsorption process within the thick ascending loop of Henle requires high level oxygen consumption (Brezis et al., 1995). Therefore, decreased medullary blood flow or increased tubule reabsorption may induce medullary hypoxia and secondary ischemia.

Using a multi-echo gradient-echo sequence, R2* maps can be obtained showing a higher R2* within the medulla (i.e. lower pO_2) (Fig 43). The BOLD technique does not measure pO_2 directly but allows intrarenal R2* (1/T2*) measurements that are closely associated with the deoxyhemoglobin concentration. Therefore, absolute R2* values cannot be used in practice.

Sadowski et al. (Sadowski et al., 2005) showed that medullary R2* values were significantly

lower (corresponding to increased oxygen concentration, probably due to decreased consumption) in patients with acute graft rejection than in normally functioning kidneys and in transplants with ATN, with a threshold value of 18/sec for separation of these groups. On the other hand, cortical R2* values were significantly higher in ATN than in acute rejection.

Diffusion MRI

Water movements related to transport during reabsorption and concentration–dilution functions can be studied by measuring the diffusion characteristics of the kidney. However, diffusion imaging is a challenging technique within the kidney due to the extreme sensitivity of diffusion-weighted sequences to several sources of artifacts. Apparent diffusion coefficient (ADC) values are higher in the cortex than the medulla and medullary diffusion is anisotropic (Ries et al., 2001) (Fig 44). Preliminary results in patients indicated a low variability of calculated ADC and showed a significant inverse relationship between serum creatinine and ADC values (Vermathen et al., 2005). However, the exact role of this method in evaluating the diagnosis and prognosis of acute renal diseases remains to be defined.

CONCLUSION

The culmination of more than a century of trials and errors, renal transplantation, as it is practiced today, is a relatively simple intervention that gives excellent results as long as a rather strict procedure is respected. It requires a multidisciplinary approach to the patient, harmoniously combining the competencies of the nephrologist, radiologist and urologist. This close-knit association and the contribution of each specialist before and after surgery should optimize the chances of successful transplantation and limit perioperative complications. Moreover, should the latter fail, the multidisciplinary approach contributes to achieving optimal treatment. The spectrum of late complications is quite broad, and awareness and understanding of them are important to assure good management of transplanted patients. This management requires systematic screening for risk factors, reasonable preventive drug use, an active vaccination policy, and aggressive and rapid treatment of events as they arise. It also means that patient education must start early, even before transplantation, with emphasis placed on compliance with the regimen prescribed, life style and appropriate diet. Development of non-invasive imaging techniques has already transformed the diagnosis of many of these complications, by rapidly providing complete useful morphological information. Emerging methods, once they have found their place, will soon further enhance that knowledge by adding functional data obtained during the same imaging sessions.

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3. IMAGING IN VASCULAR COMPLICATIONS:

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4. UROLOGICAL COMPLICATIONS AFTER RENAL TRANSPLANTATION: ROLE OF INTERVENTIONAL RADIOLOGY

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The urological complications after renal transplantation have been addressed in many reports. The most commonly reported urological complications are urinary leakage and/or ureteric obstruction. The complication rate is slightly higher in patients who received kidneys from living donors than in those who received organs from cadavers (1,2. This is presumably a result of more extensive hilar dissection required during harvesting from the living donor, with the attendant risks of injury to the blood supply of the ureter (3).

The reported incidence of urinary leakage is 1.2% to 8.9% (4). Almost half of the ureteric leaks were managed by percutaneous techniques. This is currently used as the initial management in all cases; open surgical revesion can be used subsequently if this fails (3).

The reported incidence of obstruction by interinsic lesions of the ureter is 1.3% to 10.2% (5).Most of obstructions involve the distal ureter or the VUJ. Various causes are possible in the pathogenesis of this complication. Ischaemia of the ureter, urinary leaks with peri-ureteric fibrosis (5) , technical problems (6) and ureteritis resulting from acute rejection episodes (7) were all implicated Percutaneous drainage with antegrade dilatation and stenting of ureteric strictures can be attempted initially. For failures, open surgical revision is necessary.

In the management of urinary fistula and/or obstruction, early intervention with percutaneous drainage of the kidney reduces morbidity, sepsis and the risk of losing graft function (8). In general, proper and prompt treatment should not affect the graft and/or the patient's survival.

The development of peri-graft lymphatic collection is not uncommon. Khauli et al. (9) reported and incidence of 36%, most of which were small and resolved spontaneously. The source

of lymph production is either the perivascular lymphatics of the recipient or the renal hilar lymphatics of the donor. Active treatment of lymphoceles is only indicated if they are large enough to become symptomatic or cause an obstruction of the ureter. Percutaneous drainage with sclerotherapy can be tried initially, but if these measures are not sufficient, marsupialization by an open or laparoscopic procedure is then necessary (3).

In this contribution, the urological complications after renal transplantations are described, with analysis of the possible predictors and the different interventional radiology procedures adopted in their management.

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Sunday, September 10th; 14:00 – 15:30

WSV: Interventional Angiographic Procedures

Location: Hall A

Moderators: *D. Rickards (UK), A. Sami (EG)*

1. EMBOLIZATION OF UTERINE FIBROIDS.

DR NIGEL COWAN MA FRCP FRCR

LEARNING OBJECTIVES:

This workshop will allow you to be able to:

- appreciate why fibroids are significant,
- classify fibroid related symptoms in a meaningful way,
- describe to a patient the technique of uterine artery embolisation,
- list the essential pre-assessment steps prior to UAE,
- select patients for referral to UAE,
- select out patients unsuitable for UAE,
- understand the significance of the pre-assessment MR findings,
- describe the blood supply to the uterus,
- explain the predicted outcomes of UAE,
- explain the difference between technical and clinical success rates,
- understand the significance of a patent uterine-ovarian artery anastomosis,
- compare complications of UAE with those of hysterectomy,
- minimise potential complications of UAE,
- theorize about potential reasons for failure of UAE,
- identify post-procedure patients requiring urgent re-referral,
- know what to say to a women who wants children post-UAE.

REFERENCE

1. Uterine artery embolization and gynaecologic embolotherapy. James S Spies and Jean-Pierre Pelage. Lippincott Williams & Wilkins, Philadelphia, USA, 2005

2. VARICOCELE EMBOLIZATION

DR. S. A. MOUSSA, MB BCH, FRCS ED, FRCR
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Varicocele is defined as dilated veins of the pampiniform plexus. The condition is more common on the left side due to the different drainage of the spermatic veins.

Although the association between varicocele and testicular damage has been known for some time the aetiology, pathophysiology and management remains controversial.

STUDIES HAVE SHOWN THAT:

Varicocele can exert a deleterious effect on the testes and their function. This can be a progressive effect during adolescence

Treatment of the condition can improve some of the sperm parameters

Treatment can improve testicular discomfort associated with varicocele.

Varicocele are found in approximately 15% of men and about 40% of men attend for sub fertility investigations

POSSIBLE CAUSES OF LEFT SIDED VARICOCELE:
Deficient or incompetent valves
Compression of the left renal vein (Nutcracker phenomenon)

DIAGNOSTIC MODALITIES:
Clinical examination (+ hand held Doppler)
Scrotal ultrasound (with colour flow Doppler)
Scrotal scintigraphy
Venography (usually as a preliminary to embolisation)
Thermography.

MANAGEMENT:
In men who are asymptomatic and with no fertility problems, no interventions are required
Surgical management can be:
Conventional open surgery with varicocelectomy, ligation or high ligation
Laparoscopic ligation

RADIOLOGICAL EMBOLIZATION

Some of the above aspects will be discussed, in particular our experience with technical aspects of varicocele embolisation, including catheters and guide wires choice, embolisation materials and potential complications.

3. EMBOLIZATION IN UG EMERGENCIES

TAREK A. EL-DIASTY , MD
DEPARTMENT OF RADIOLOGY , UROLOGY AND NEPHROLOGY CENTER , MANSOURA UNIVERSITY
MANSOURA – EGYPT

Several traumatic and neoplastic causes may lead to significant renal hemorrhage and sever hematuria. Transcatheter selective arterial embolization is an effective parenchymal sparing procedure in management of life threatening renal hemorrhage.

Traumatic injury to the renal vasculature is a well recognized and most worrisome complication of percutaneous renal procedures such as renal biopsy, percutaneous nephrostomy (PCN) and percutaneous nephrolithotomy (1). The most common causes of hemorrhage post percutaneous renal procedures are pseudoaneurysms and areterio-venous fistulas (2).

Percutaneous intra-arterial embolization is the treatment of choice, which not only is life saving but ultimately a kidney sparing procedure. Embolization of the peripheral vessels is preferable to frank exploration, even in a transplanted kidney (3, 4).

Treatment of angiomyolipomas beneficial is in limiting the sometimes life-threatening complications of spontaneous bleeding (5).

Therapeutic embolization of the bladder may be an effective method of controlling persistent hematuria caused by radiation cystitis, chemical cystitis, or direct tumour invasion of the bladder in patients who are unresponsive to intravesical instillation of therapeutic agents or surgery (6,7) . Selective embolization of the anterior division of the hypogastric artery is required bilaterally, even if the bleeding can be predominantly localized to one wall of the bladder (8).

High flow arteriogenic priapism is uncommon and usually occurs after trauma to the genitoperineal area. Angiography in this case illustrated the causative arteriovenous fistulae or pseudoaneurysms.

Treatment consists of superselective embolization of the feeding artery resulting in detumescene(9) .

In this lecture, the techniques , types of embolic material and results of selective embolization in different urologic emergencies will be addressed .

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1- Rao A, Pandey UC. Transarterial embolization of iatrogenic renal vascular injury . Ind J Radiol Imag 2004; 14, 3:303-307 .

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WSVI: Stone Disease, CTU and MRU

Location: Hall B

Moderators: *C. Roy (F), S. Morcos (UK)*

1. IMAGING OF URINARY CALCULI

F. STACUL

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Intravenous urography (IVU) had for many decades a central role in the work up of patients with urinary stones. At the beginning of the ninethies it was suggested to replace IVU with ultrasonography (US) associated with the plain film of the abdomen (KUB), eventually followed by IVU in unsolved cases (1). Shortly after unenhanced spiral CT (UHCT) was proposed for imaging patients with urolithiasis further questioning the residual role of IVU (2). No doubts the accuracy of UHCT in this setting is extremely high, and the technique began to be considered as a gold standard (3). Moreover CT findings are capable to affect patient treatment and prognosis (4). Furthermore, additional urinary or extraurinary abnormalities can be detected by UHCT (5). As a result, UHCT was suggested as the first (and only) imaging modality for investigating patients with

renal colic in the large majority of the American papers. In Europe a different approach was followed in many Institutions, consisting of KUB plus US followed by UHCT in unsolved cases in view of its lower cost and above all of lower x-ray dose to patients as compared to UHCT as the sole investigation (6). Therefore it appears there is no residual role for IVU, but nevertheless in some Institutions this procedure is still performed to some extent because of some functional information it provides and of the preference of some urologists (7).

However the situation is evolving. The problem of the radiation dose in CT received much attention in the last years (8) and major steps forward occurred.

UHCT protocols providing an accuracy close to 100% with a radiation dose equivalent to that to KUB were suggested (9). Moreover multidetector scanners (MDCT) improved the image quality providing valuable CT urographies and therefore CT appears capable of replacing IVU in the limited number of patients who require intravenous contrast as well (10).

The game really appears to be over for IVU.

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2. EXTENDED ABSTRACT CTU RECOMMENDATIONS SYLLABUS ESUR 2006

A. VAN DER-MOLEN (NL)

CTU WORKING GROUP

CT Urography (CTU) is a new technique which is developing continuously and is practiced in a variable manner. The CT Urography Working Group of the European Society of Urogenital Radiology presents a literature review and a draft version of practice guidelines for indications and CTU imaging techniques.

DEFINITION

CTU is defined as a *dedicated multiphasic CT scanning technique optimized for the imaging of the urinary tract in which intravascular contrast medium is used and in which high-resolution images of the renal parenchyma and urinary tract (including bladder) are obtained*.

INDICATIONS

CTU has been used to diagnose a multitude of pathologies including renal masses, upper tract urothelial tumors, and benign abnormalities such as papillary necrosis, urolithiasis, infection, trauma, and normal variant anatomy. The principal disadvantage of CTU compared with other imaging tests is its increased radiation dose.

CTU can be used as a first line imaging test in patients with a high pretest probability for urological cancer. Important risk factors include: age > 40-years, macroscopic hematuria, smoking,

and (now rare) working in the aniline dye industry. Studies have shown that a cause for hematuria can be established in 35-42% of examinations. In this select group of patients, radiation dose is less important so a comprehensive multiphase study is possible. A cost-effective approach in such patients would be to replace the traditional work-up of ultrasound, IVU, and cystoscopy by a faster-track CTU and cystoscopy work-up. A suggested treatment algorithm is as follows:

Evaluation of patients with painless microscopic or macroscopic hematuria				
Probability TCC	Lowest	Low	Medium	High
Hematuria	Micro < 40yr	Macro < 40yr	Micro > 40yr	Macro > 40yr
First line tests	Cystoscopy	Cystoscopy	Cystoscopy	Cystoscopy
	Ultrasound	Ultrasound	Ultrasound	CTU
	↓	↓	↓	↓
Follow-up	Watch & wait if negative	IVU if US&CYS negative and symptoms persist	CTU or IVU if US&CYS negative and symptoms persist	RP or URS if CTU&CYS negative and symptoms persist

CTU can also be used as a problem-solving test if other tests are negative and significant symptoms persist. Such a study may be tailored to the clinical question based on clinical information and pathology under consideration. Modifications include varying the number of phases, changing the contrast protocol, coverage or additional maneuvers. Still when CTU is performed for benign diseases and in younger patients radiation doses should be kept low, which limits the number of phase acquisitions.

TECHNIQUE

Many different details of the examination such as positioning, prehydration, value of additional maneuvers, and dose containment have been the focus of (very) recent studies.

PREPARATION

The CTU study does not need any special preparation. Positive contrast media for the bowel are to be avoided as they interfere with 3D images. Oral administration of 1000ml water shortly before the study is easy and cheap and may assist in evaluation of associated findings. Water acts both as a negative contrast medium for the bowel and promotes diuresis. It may also protect the kidneys somewhat from nephrotoxic effects of the iodinated contrast medium.

POSITIONING

Supine positioning is most frequently used for CTU. Results of different patient positioning have been mixed, with good results for prone studies in the earliest reports but inconsistent results reported more recently. Apparently, other factors may play a greater role. Given the more cumbersome position for the patients, prone imaging can not be advocated for routine use, but may improve distal ureteral opacification in some patients.

INTRAVENOUS CONTRAST INJECTION

Most frequently a concentration of 300 mgI/ml is used. Contrast injection schemes are closely related to the number of scan phases. Two major approaches have been followed: 1) a 3 to 4-phase study using unenhanced, nephrographic and excretory phase series following a single bolus of contrast medium (CM), versus 2) a 2 to 3-phase study using unenhanced and a combined nephrographic-excretory phase series following a split-bolus technique. Recently a three-phase injection protocol has been introduced which also provides CT angiographic information within a single phase series. This protocol is actually a dose-efficient hybrid of renal carcinoma staging, renal donor and CTU protocols.

It is still controversial how to split the contrast injection. Initially a lower volume (40-50 ml) bolus was used to opacify the collecting systems and ureters, followed by a higher volume (100ml) for parenchymal imaging. Newer studies have advocated the reversal or a 50-50 split of the contrast volume of 2ml/kg. Published flow-rates and injection durations have been variable -

usually the first urinary system "loading" bolus has been injected at a slightly higher rate (2.5-4 ml/s) than the second parenchymal bolus (2-3ml/s). The significance of these differences in injection rates is unclear.

Delay times for excretory phase imaging have been studied with the single bolus techniques. Increasing the delay from 300 to 450 to 720s has been shown to improve opacification of the ureteral segments. This is in line with other studies that suggest an optimal imaging delay of 10-15 min (600-900s) following contrast administration. When furosemide is administered this delay may be reduced to 7-8min (420-480s). Few groups have used low-dose test images to evaluate the adequacy of ureteral filling and to individualize the start of the excretory phase. For split-bolus protocols, most centers used delays for the combined nephrographic-excretory phase of 10-11min (600-660s) after start of the first and 90-120s after start of the second bolus.

ANCILLARY MANEUVERS

As CTU needs to be optimized to visualize the urinary tract, additional measures to improve the distention and opacification of different parts of the urinary tract on excretory phase images have been studied. Compression bands, long used in IVU, have shown mixed results in CTU. Although the renal collecting system and pelvis can show improved distention during compression, longer delays for the ureteral part of the study are probably more relevant than the compression release itself. Rapid administration of an additional intravenous saline bolus (usually 250ml) during CTU before contrast administration has not proved beneficial in most recent studies and can lead to unpredictable results with inhomogeneously high density values in the collecting system. Therefore, the benefits of compression bands and intravenous saline bolus hydration are minimal, and these maneuvers can not be advocated for routine use.

More promising is the use of low-dose (0.1mg/kg) furosemide for improved distention, as well as for improved dilution and distribution of the excreted contrast medium. It results in more homogeneous opacification of the collecting system and ureters. Due to the diuretic effect excreted contrast medium has a lower attenuation (250-500 HU). Most urinary calculi (except uric acid stones which are infrequent) can be visualised in the enhanced urinary tract lumen. This may open the way to elimination of the unenhanced phase for urolithiasis. Low-dose test scans (e.g. after 4 and 6 min after start of (first) CM injection) can be easily incorporated with this technique. An additional logistic benefit of this maneuver is that high-quality excretory phase images can be obtained earlier thus reducing scan time to 10 min. With furosemide, 5-6 min is probably a good indicative waiting time between contrast boluses when split-bolus technique is used. To avoid dehydration and risk of contrast nephropathy, especially in older or dehydrated patients, this technique might best be combined with oral prehydration with 800-1000ml water or a supplementary slow-drip peri-procedural infusion of $\leq$ 500ml iv saline.

SCANNING PARAMETERS

Scanning parameters have evolved with improvements in multidetector CT technology.

Slice collimation has decreased from 1.25-2.5mm on 4-slice scanners to 0.75-1.25mm on 16-slice scanners to 0.5-0.625mm on 64-slice scanners. From 8-16-slice onwards near-isotropic data-sets can be obtained in all phases providing high quality multiplanar reformatting (MPR) in all planes. Thus far, most studies have not yet utilized such thin collimation for unenhanced and nephrographic phases, but for excretory phase imaging high resolution is mandatory.

Pitch values in 4-slice CT were high to keep breath-hold times short, but breath-hold times in 16-64-slice are no longer a limiting factor and pitch can be lowered. Depending on the specific CT system used, with newer scanners pitch is usually selected between 0.8-1.2 depending on the coverage required. Additional (unnoticed) exposure by over-ranging may increase effective doses by 10-20% and should be considered in protocol design, whereby thinnest collimation, low pitch (< 1.0), and thin slices are favourable.

RECONSTRUCTION PARAMETERS

Reconstruction parameters have not evolved in the same manner, because work-flow in many centers is not yet based on interactive volumetric imaging. For unenhanced and nephrographic phases, 2.5-5mm thick axial reconstruction is the rule, while only for the excretory phase dataset, reconstruction slice thickness approaches collimation thickness. Thus, the full

capability of CT is not used and study reading still relies heavily on axial imaging because of slow integration of MPR/3D capabilities into routine PACS stations. It is recommended to reconstruct all phases with near-isotropic voxels to allow for interactive evaluation in any direction using thick MPR (3-5mm) technique. To maintain image noise within reasonable levels, slice thickness should be 25-30% higher than collimation. Reconstruction index (RI) can be chosen closer to the value of slice thickness (25% or less overlap) yet still provide high-quality MPR and 3D because of small voxels approaching isotropy. However, to avoid data overflow, RI should not be smaller than in-plane pixel size (voxel size 0.7x0.7x0.7mm).

POSTPROCESSING PARAMETERS

3D postprocessing is strikingly similar throughout published studies, but is no longer limited anymore to the excretory phase images only. Routine viewing on a 3D workstation now consist of MPR in all possible planes using thin-slab technique (scan thin - view thick) to manage dose and noise requirements. Coronal MPR may be read faster than axial images but are otherwise diagnostically equivalent. Usually curved MPR along the course of the ureters and thin-slab average intensity projections (AIP), maximum intensity projections (MIP), or volume rendered (VR) images in (semi) coronal planes are added for interactive image evaluation. These should not be read without the source (or MPR) images as diagnostic performance can be significantly impaired.

RADIATION DOSE

Radiation dose is one of the most important driving factors in optimization of CTU techniques and selecting justified indications. Strongly correlated with the number of phases, current CTU protocols can be associated with high effective doses of up to 35 mSv. Dose management technology in CT has led to optimization of CT protocols using XY-, Z-, or XYZ (3D) modulation of the dose. In some systems this can also be combined with 3D adaptive noise filtration. Even though low-dose CT for urolithiasis has been around for more than 10 years, studies on low-dose CTU techniques are only just becoming available. For protocol optimization the volume CT dose index (CTDIvol) is the best radiation dose parameter.

Results have shown that urolithiasis can be detected with (ultra) low-dose techniques with a CTDIvol of 1-3 mGy, while it has been shown that diagnostic excretory phase imaging can be done well at 6-7 mGy in average weight (60-80kg) patients. Doses for the nephrographic phase are usually at slightly higher levels (e.g. 7-9 mGy). Detection and staging of malignant diseases like transitional cell carcinoma require high-resolution, low-noise studies and are thus performed using a (significantly) higher CTDIvol (7-12 mGy).

Table: Lowest mAs values per scanner for 120 kV, CTDIvol 7.0 mGy and pitch 1.0

Scanner type	***Collimation***	***Tube Charge***	***DLP 400mm***	***Effective Dose***
	mm	*mAs*	*mGy cm*	*mSv*
GE Lightspeed 16	16x0.625	60.5	280	4.9
Siemens Sensation 16	16x0.75	84.5	280	4.7
Philips Brilliance 16	16x0.75	88.0	278	5.1
Toshiba Aquilion 16	16x0.5	44.5	280	4.7
Siemens Sensation 64	32x0.6	99.0	279	5.2
Toshiba Aquilion 64	64x0.5	57.8	280	4.9

DLP and E values (average) have been calculated for a single phase - exposed range of 400mm

PROPOSED APPROACH

The detriment of radiation dose is very different in susceptible patient populations (children and young women) than in adult patients. Also benefit-detriment ratios are different in patients with benign from patients with malignant diseases. Therefore it is surprising that research has focused on only one CTU technique to encompass all clinical indications. Accordingly, we propose a more differentiated approach as the next logical step in the evolution of CTU as a powerful yet dose-efficient technique for urinary tract assessment.

Screening situations or the depiction of congenital variants in the anatomy of the urinary system would be best served by a low-dose technique while a more comprehensive evaluation of

other benign or unclear diseases (or in cases where CTU is used as a problem-solving test) could be done at a slightly higher dose. In the evaluation of patients with a high pretest probability of malignant disease an increased radiation dose is justified and dose should not be a limiting factor as long as the ALARA-principle is kept in mind. Details of CTU protocol recommendations can be found in the table below.

April 2006, ESUR Working Group on CT Urography

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Table: Differentiated approach to CTU protocols

Protocol items	***Screening & Congenital diseases***	***Other Benign diseases***	***Malignant diseases***
Typical CTU use	Problem-solving	Problem-solving	First-line test
Indications	Congenital anomalies Hydronephrosis - benign cause Traumatic or iatrogenic ureter lesions	Hematuria - low-medium risk R/TCC Chronic urolithiasis & PCNL planning Complex urinary tract infection (TBC)	Hematuria - high risk R/TCC Hydronephrosis - malignant cause
Preparation	1000ml water po (optional)	1000ml water po (optional)	1000ml water po (optional)
Positioning	Supine	Supine	Supine
Additional maneuvers	0.1mg/kg furosemide iv	0.1mg/kg furosemide iv	0.1mg/kg furosemide iv
	≤ 500ml saline iv drip (optional)	≤ 500ml saline iv drip (optional)	≤ 500ml saline iv drip (optional)
Number of phases	1	2 *(see note 3)*	3 *(see note 3)*
Phases	Combined nephrographic-excretory	Unenhanced Combined nephrographic-excretory	Unenhanced Nephrographic Excretory
Radiation dose ***(note 1)***			
Unenhanced phase		CTDIvol 1-3 mGy DLP 40-120 mGy cm	CTDIvol 1-3 mGy DLP 40-120 mGy cm
Nephrographic phase	CTDIvol 6-7 mGy DLP 240-280 mGy cm	CTDIvol 6-7 mGy DLP 240-280 mGy cm	CTDIvol 7-12 mGy DLP 140-240 mGy cm
Excretory phase			CTDIvol 7-12 mGy DLP 280-480 mGy cm
Scan Range			
Unenhanced phase		Top kidneys - bladder base (40cm)	Top kidneys - bladder base (40cm)
Nephrographic phase	Top kidneys-bladder base (40cm)	Top kidneys - bladder base (40cm)	Top kidneys - bottom kidneys (20cm)
Excretory phase			Top kidneys - bladder base (40cm)
Scanning			
Unenhanced phase		4x2-2.5mm - P 1.0-1.5 16x1-1.5mm - P 0.9-1.2 64x0.5-0.625mm - P 0.8-	4x2-2.5mm - P 1.0-1.5 16x1-1.5mm - P 0.9-1.2 64x0.5-0.625mm - P 0.8-

		1.0	1.0
Nephrographic phase	4x1-1.25mm - P 1.0-1.5 16x0.75-1.25mm - P 0.9-1.2 64x0.5-0.625mm - P 0.8-1.0	4x1-1.25mm - P 1.0-1.5 16x0.75-1.25mm - P 0.9-1.2 64x0.5-0.625mm - P 0.8-1.0	4x1-1.25mm - P 1.0-1.5 16x0.75-1.25mm - P 0.9-1.2 64x0.5-0.625mm - P 0.8-1.0
Excretory phase			4x1-1.25mm - P 1.0-1.5 16x0.5-0.75mm - P 0.9-1.2 64x0.5-0.625mm - P 0.8-1.0
Reconstruction			
Unenhanced phase		3-5/3-5mm image review/PACS 4-slice - 2-2.5/1-1.25mm iMPR/3D 16-slice - 1-2/0.8-1mm iMPR/3D 64-slice - 0.7-1/0.7-1mm iMPR/3D	3-5/3-5mm image review/PACS 4-slice - 2-2.5/1-1.25mm iMPR/3D 16-slice - 1-2/0.8-1mm iMPR/3D 64-slice - 0.7-1/0.7-1mm iMPR/3D
Nephrographic phase	3-5/3-5mm image review/PACS 4-slice - 1.0-1.5/0.7-1mm iMPR/3D 16-slice - 0.8-1/0.7-1mm iMPR/3D 64-slice - 0.7-1/0.7-1mm iMPR/3D	3-5/3-5mm image review/PACS 4-slice - 1.0-1.5/0.7-1mm iMPR/3D 16-slice - 0.8-1/0.7-1mm iMPR/3D 64-slice - 0.7-1/0.7-1mm iMPR/3D	3-5/3-5mm image review/PACS 4-slice - 1.0-1.5/0.7-1mm iMPR/3D 16-slice - 0.8-1/0.7-1mm iMPR/3D 64-slice - 0.7-1/0.7-1mm iMPR/3D
Excretory phase			3-5/3-5mm image review/PACS 4-slice - 1.0-1.5/0.7-1mm iMPR/3D 16-slice - 0.8-1/0.7-1mm iMPR/3D 64-slice - 0.7-1/0.7-1mm iMPR/3D
Postprocessing	Curved MPR along ureters Thin-slab (5-50mm) AIP Thin-slab (5-50mm) MIP or VR	Curved MPR along ureters Thin-slab (5-50mm) AIP Thin-slab (5-50mm) MIP or VR	Curved MPR along ureters Thin-slab (5-50mm) AIP Thin-slab (5-50mm) MIP or VR
Contrast injection (*note 2)*	Split bolus	Split bolus	Single bolus
Injection timing	Injection 1 = 25-33s Wait 5 min = 300s Injection 2 = 25-38s	Injection 1 = 25-33s Wait 5 min = 300s Injection 2 = 25-38s	Injection 1 = 50s
Injection 1	75-100ml CM300 @ 3ml/s, or 55-75ml CM400 @ 2.3ml/s	75-100ml CM300 @ 3ml/s, or 55-75ml CM400 @ 2.3ml/s	150ml CM300 @ 3ml/s, or 115ml CM400 @ 2.3ml/s
Injection 2	50-75ml CM300 @ 2ml/s, or 40-60ml CM400 @ 1.5ml/s	50-75ml CM300 @ 2ml/s, or 40-60ml CM400 @ 1.5ml/s	
Injection delays			

Nephrographic phase	100-120s after start Injection 2 ≈	100-120s after start Injection 2 ≈	100-120s after start Injection
Excretory phase	450-490s after start Injection 1	450-490s after start Injection 1	450-490s after start Injection
Test images *(optional)*	240s + 400s after start Injection 1	240s + 400s after start Injection 1	240s + 400s after start Injection 1

Note 1 *CTDIvol and DLP levels refer to patient weight between 60-80kg*

For < 60 kg - multiply by 0.7; For 80-100 kg - multiply by 1.5; For > 100 kg - multiply by ≥ 2.0

Note 2 *Contrast injection adapted to weight:*

Split: Injection 1: 1.0-1.4 ml/kg CM300 - injected with 0.043 ml/kg/s flow; Injection 2: 0.7-1.0 ml/kg CM300 - injected with 0.03 ml/kg/s flow

Single: Injection: 2.0 ml/kg CM300 - injected with 0.043 ml/kg/s flow

Note 3 Malignant disease protocol can be done with a combined nephrographic-excretory phase (see protocol benign diseases), but at higher dose levels

Note 4 iMPR/3D = interactive MPR or 3D (workstation)

3. MR UROGRAPHY IN STONE DISEASE

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With the almost unlimited availability of ultrasonography and multislice spiral computed tomography (MSCT), MR urography is not established as imaging modality of first choice in the diagnosis of urolithiasis. To date, unenhanced MSCT is regarded the gold standard in urinary stone detection, whereas MR imaging has the disadvantages of higher cost and especially a limited value for the direct identification of small soft tissue calcifications, which, on the other hand, are easily diagnosed with unenhanced MSCT.

Nevertheless, MR urography has become a routine imaging modality in a growing number of uroradiology departments during the past 10 years owing to an increasing value of MR urography techniques in many urologic diseases both in adult patients and in children. Because urolithiasis is a common and probably the most frequent differential diagnosis in all kinds of urinary tract disorders, it is important to be aware of the patterns of calculi in MR urography. From a more in-depth viewpoint, there exist interesting aspects and potential applications for MR urography also in urolithiasis:

Stones can be detected on either T2-weighted static-fluid MR urograms or on T1-weighted gadolinium excretory MR urograms. Static-fluid MR urography is performed using preferrably a heavily T2-weighted HASTE sequence or a standard 3D turbo-spin-echo sequence, whereas breath-hold T1-weighted 3D gradient-echo sequences are employed for excretory MR urography [1]. The gadolinium-enhanced MR urography technique provides detailed images of nondilated and moderately obstructed urinary tracts without marked impairment of the renal excretory function [1]. With increasing degree of dilatation, T2-weighted static-fluid MR urography has proved to be an excellent imaging tool, which is independent of the renal function and can be used even in nonecxreting kidneys [1]. In both MR urography techniques, maximum intensity projection images are reconstructed from the source datasets to provide typical urographic views.

Several studies dealing with both T2- and T1-weighted MR urography have demonstrated that stones are exclusively identified on the basis of more or less "typical" filling defects [2-9]. Most of the stones present as round-shaped or branched signal voids inside the unenhanced or contrast-enhanced urine [2,3,5,7,8,9]. The signal void of a calculus is explained by the lack of resonating protons inside the stone matrix and by magnetic susceptibility effects, the latter of which are more pronounced in calcified stones. Hypointense filling defects, however, are unspecific and it may

occasionally be difficult to distinguish a small calculus from a blood clot, a polyp, or a surgical clip. In addition, it must be emphasized that filling defects must be found by analysis of the single source images of each MR urographic data set. Even large stones may become obscured on maximum-intensity-projections [1].

MR urography can be easily combined with standard T1- or T2-weighted pulse sequences in the axial plane, which may provide additional information about the nature of a filling defect [1,5]. On standard spin-echo sequences, a calculus remains hypointense, whereas a small tumor demonstrates a soft-tissue signal. Furthermore, it has also been recommended that a single plain film radiograph (KUB) be included in the assessment of MR urograms for a better detection of calcifications [5,10,11].

In acute ureteral calculus obstruction, a perirenal stranding is often visible on T2-weighted static-fluid MR urograms [9,11,12]. Such perirenal fluid collections most likely represent oedema or lymphatic extravasation [12] and cannot always be distinguished from leakage by a forniceal rupture using exclusively T2-weighted imaging [12]. On the other hand, the combination of static-fluid and gadolinium excretory MR urography allows us to differentiate safely between perirenal oedema and leakage of contrast-enhanced urine.

In the literature, we meanwhile find several studies analyzing the performance of MR urography in ureterolithiasis quantitatively [5,7,9,11,13]. In a work by Jung et al., excretory MR urography with 3D gradient-echo sequences demonstrated a sensitivity of 90 % in 72 patients with ureterolithiasis in comparison to 68 % obtained with standard urography [7]. Sudah et al. reported a sensitivity and specificity of up to 100 % for the detection of stones in 26 patients with acute flank pain using also T1-weighted excretory MR urography [9]. With T2-weighted static-fluid MR urography, Sudah et al. only achieved a sensitivity of less than 60 % [9]. In another report, Sudah et al. could demonstrate that MR urography may even be as accurate as spiral CT in the detection of ureteral stones in 32 patients [13]. The intravenous administration of a low dose diuretic agent (e.g. 5-10 mg of furosemide) for improved depiction of the gadolinium-enhanced urinary tract in excretory MR urography cannot be generally recommended in patients presenting with an acute stone colic. On the other hand, the use of low-dose diuretics is usually not a problem in chronic nephrolithiasis without acute obstruction.

In a recent study by Regan et al., unenhanced CT was compared with T2-weighted static-fluid MR urography performed in combination with abdominal radiography (KUB) [11]. MR urography plus KUB demonstrated ureteral stones in 72% of patients with calculi visible on CT [11]. T2-weighted MR urography was especially superior to CT in the detection of secondary signs of ureterolithiasis including perirenal stranding and ureteral dilatation. The visibility of perirenal stranding in acute ureteral obstruction achieved a sensitivity of 77% for MR urography versus 45% for CT [11]. The combination of perirenal stranding plus ureteral dilatation on T2-weighted MR urograms demonstrated a sensitivity of 93 % versus 80% in CT.

In conclusion, it becomes clear that all present studies confirm a good overall value of MR urography in the diagnosis of ureteral calculus disease. However, the studies cited focus on ureterolithiasis, whereas systematic data are still missing with regard to the diagnostic value of MR urography in nephrolithiasis. From our own experience (unpublished), we know that MR urography is markedly inferior to CT concerning the sensitivity for the detection of small calculi located in the calices and papillary tips.

With regard to the clinical routine, it obviously appears unrealistic that MR urography will be able to replace unenhanced MSCT and ultrasonography plus KUB in the primary diagnostic management of patients presenting with acute stone colic. Unlike MR urography, unenhanced MSCT allows for direct identification of calcifications, provides shorter examination times, is immediately available, and less costly. On the other hand, MR urography, performed in addition to ultrasonography, may be useful in acute urolithiasis if radiation exposure has to be avoided, e.g. in pregnant women (only T2-MR urography) and in children (T1 and/or T2 MR urography).

Apart from its limited value in acute calculus obstruction, MR urography may play a role in patients with chronic urolithiasis, in whom neither ultrasonography nor unenhanced MSCT can sufficiently explain the complicated state of the chronically affected urinary tract. MR urography not only helps to avoid radiation exposure by repeated CT or standard radiographic examinations. MR

urography especially allows for accurate visualization of the entire urinary tract anatomy, thus MR urography is always a potential alternative to contrast-enhanced CT urography. It has been outlined recently that in chronic urolithiasis resistant to treatment, MR urography may provide valuable information about the complicated anatomy of the stone-carrying calix and can also disclose other anatomic variations of the collecting system, which potentially affect the passage of a stone [1,8]. Using the single slices of the pulse sequences, MR urography also allows to measure the size of calculi [7,8,9]. But we have to keep in mind that magnetic susceptibility effects of calculi make it difficult to provide their precise diameter with use of MR images [8]. Nevertheless, those anatomical and morphological data may be of clinical relevance for the planning and the performance of lithotrypsy or endourologic stone removal. MR urography may be carried out to explain or to determine the therapeutic outcome of any stone therapy in chronic urolithiasis.

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WSVII: Urogenital 3D US

Location: Hall C

Moderators: *M Riccabona, N. Arafa (EG)*

1. POTENTIAL OF THREE-DIMENSIONAL ULTRASOUND (3DUS) APPLICATIONS IN THE (PAEDIATRIC) URINARY TRACT (COVERING BLADDER AND KIDNEYS)

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DEPARTMENT OF RADIOLOGY, DIV. OF PAEDIATRIC RADIOLOGY, UNIVERSITY HOSPITAL GRAZ, AUSTRIA

OBJECTIVE:

To present the current status of 3DUS in the children's urinary tract. It aims to present an overview of 3DUS value and potential in this field.

CONTENT:

This brief overview shall try to comprehensively cover the present technical status and diagnostic value of 3D-/4DUS applications in the urinary tract (i.e., covering the urinary bladder and kidneys), focussing on the authors main field, i.e., paediatric (uro)radiology. Clinically valuable 3DUS applications in the urinary bladder include the more accurate volume calculation even in irregular shape, and the potential of virtual cystoscopy. Kidney 3DUS may not only be useful for improving differential diagnosis and documentation in complex anatomy, but also improves display and comprehensive visualisation of the dilated pelvo-caliceal system and assessment of real renal parenchymal volume in hydronephrotic kidneys. Results of 3DUS studies in these indications will be presented, as well as some methodical issues and practical tips on "how to do 3DUS". Finally, some future aspects will be discussed.

CONCLUSION:

3DUS is a relatively new imaging technique that is a relatively inexpensive and radiation free, but yet underutilized in (paediatric) uroradiology. 3DUS is easily applicable in everyday diagnostic work, is feasible in infants and children, and seems promising and full of interesting potential. Furthermore, 3DUS may improve standardisation, documentation, and comparison during follow-up or with other sectional imaging. And 3DUS promised to be a useful teaching and counselling tool, as any pathology can be virtually rescanned without the patient necessarily being present.

2. 3D US OF THE PROSTATE, URETHRA AND LOWER PELVIS

PAWEL WIECZOREK (PL)

3D high frequency ultrasound has been proven to be superior to 2D ultrasound in endocavital ultrasound imaging. The reasons are the precision of the 3D data acquisition and the opportunity to post process the data such as multiplanar reconstructions or render mode.

Novel endosonographical techniques with perpendicular and parallel beam formation with a built-in 3D 360° rotational mode allow obtaining not only the axial plane mode but also the volume structure of examined organs. New generation of linear high frequency transducers with a free hand 3D acquisition mode enable very precise and detailed imaging of pelvic organs. These advantages are very helpful in urinary incontinence, which is becoming an even-more critical medical and social problem. Latest reports from the AUA (American Urology Association) in May 2005, UCLA School of Medicine found 38% incontinence among more than 23 million women surveyed. Traditional routine imaging methods such as transvaginal, introital, transrectal or translabial ultrasound, MRI with endorectal/endovaginal coil, have disadvantages and seem to be insufficient in the precise evaluation of anatomic disorders of pelvic floor.

Recently 3D endorectal ultrasound has been applied to staging of rectal tumours and the evaluation of lymph node enlargement. This method appeared very useful owing to its high precision in the imaging of the anal canal as well as the opportunity of post processing enabling better visualisation of the neoplasmatic involvement. There is number of publications proving very high sensitivity of the method in assessment of rectal tumours.

Another application of 3D imaging in endorectal ultrasound is the diagnostics of fistulas. This technique appeared very useful method in this field, particularly using hydrogen peroxide enhancement. It is a very accurate technique in the diagnostics of primary/secondary fistula tracts.

The application of 3D in prostate ultrasound is valuable. Scientific studies confirm that 3D imaging identifies extra capsular extension of prostate cancer better than any other imaging technique. The most helpful might be the coronal view, which in routine 2D section is not available. This technique is also very useful diagnostic tool in the diagnostics of male infertility, which very often has its origin in anatomical disturbances of urogenital tract.

3. 3D US IN UROGENITAL IMAGING

E. MERZ (D)

OBJECTIVE:

This session - covering 3DUS in gynaecology, obstetrics, urethra, pelvic floor, prostate disease, and (children's) urinary tract - aims to present an overview or "state of the art" review of 3DUS in urogenital radiology.

CONTENT:

It will cover an overview of the present status and diagnostic value of 3D-/4DUS in obstetric and gynaecology ("the value of 3DUS in obstetrics and gynaecology – an introductory illustration and basic overview"), the potential of 3DUS in the pelvic floor, the anal canal, the prostate and the ureter ("3DUS of the prostate, the urethra and the lower pelvis, respectively the pelvic floor"), and 3DUS applications in the urinary tract (covering bladder and kidneys). The latter will be focussing on paediatric applications ("potential of 3DUS applications in the paediatric urinary tract").

CONCLUSION:

3DUS is a relatively new imaging technique that is yet underutilized in urogenital radiology, but seems promising and full of interesting and efficient potential that might be implicated into standard diagnostic procedures and algorithms.

Sunday, September 10th; 16:00 – 17:30

WSVIII: Pelvic Floor Imaging

Location: Hall A

Moderators: *A. Shafik (EG), M. Cervigni (I)*

1. DIAGNOSIS OF PELVIC FLOOR DYSFUNCTION: THE UROLOGIST'S POINT OF VIEW

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For many years the cystourethrogram has been proposed as a radiographic method to evaluate the anatomic configuration of the bladder and urethra in women with stress urinary incontinence. The diagnostic criteria used in cystourethrogram are posterior vesicourethral angle, the angle of inclination of the urethral axis with the longitudinal axis of the body and the position of the bladder neck in relation to the symphysis pubis at rest and during straining. Disappointing results of surgical correction of stress incontinence have occurred in a significant number of cases even though the procedure has been technically successful. This is because of the lack of understanding of normal anatomy and physiology of pelvic floor and because of the failure of the available diagnostic tools to depict the exact pathology underlying the various forms of dysfunction. Additionally 30% of those who undergo surgery for stress incontinence develop vaginal prolapse and 27% of those who undergo colposuspension need reoperation for enterocele and posterior compartment prolapse. This has prompted a search for a more accurate preoperative diagnostic procedure that would detect the patients most likely to respond to surgical treatment, thereby permitting better selection of cases. MRI has evolved as the optimal method for evaluation of pelvic floor dysfunction. Preoperative MRI can help determine which compartments of the pelvic floor are damaged and can help identify fascial and muscle defects and hence dictate a defect-specific approach. Postoperatively MRI can detect complications and identify causes of surgical failure.

2. POINT OF VIEW OF THE GYNECOLOGIST:

M. CERVIGINI (I)

3. POINT OF VIEW OF THE PROCTOLOGIST

A. FARAG (EG)

Management of Functional Anorectal Disorder is becoming a common practice in many Colorectal, Gynecologic, Urologic, Neurological and General Surgical Units all over the world. The Mechanism of Anal continence and normal defecation is Complex interaction of Mechanical, Sensory and Reflex components of the Colon, rectum, Anal Canal and the pelvic floor musculature. Besides physiologic studies such as Anorectal Manometery, PNTML, Pelvic floor EMG and Spinal and Cerebral Evoked Potentials, Pelvic floor Imaging is becoming a main stay in the workup of those patients.

Colonic Transit Time using radio-opaque markers, Defecography, Balloon defecography, Sintigraphy, Endorectal Ultrasonography, Perineal US, Transvaginal US, and pelvic floor and Anal Canal MRI using Endo-anal Coil or Phased array technique both in the static and dynamic phases are among those imaging modalities.

Relative merits of each technique and the need for combination of techniques will be presented in brief.

4. MRI OF PELVIC FLOOR DISORDERS

RANIA FAROUK EL SAYED,
ASS. LECTURER OF RADIODIAGNOSIS. RADIOLOGY DEPARTMENT, CAIRO UNIVERSITY, EGYPT.

The term "Pelvic Floor" refers to the pelvic diaphragm, the sphincter mechanism of the lower urinary tract, the upper and lower vaginal support, and the internal and external anal sphincter. Pelvic Floor dysfunction is a general term that has come to describe genital prolapse and conditions that adversely affect the female continence mechanisms (urinary and fecal).

Magnetic resonance imaging is a novel noninvasive imaging modality that can be used for the assessment of pelvic floor dysfunction. It relies on static sequences with a high spatial resolution to study the active and passive pelvic supporting elements morphology, and on fast imaging dynamic sequences during contraction, rest, and straining for functional correlation. Prolapse of the various pelvic compartments is detected with respect to organ position relative to the pubococcygeal line during dynamic phases. Compared with clinical examination, its input appears to be especially invaluable in the middle compartment (peritoneal and enterocele) and to assess complex prolapses involving more than one pelvic compartment.

The aim of this lecture is to give a basic comprehensive review for the MRI anatomy of the pelvic floor, which patient can benefit from MRI compared to other imaging modalities, how to perform the MRI examination, how to read and how to report the MRI findings in respect to the urologist, gynecologist and proctologist clinical point of view and requirements

5. POSTOPERATIVE MRI IN PELVIC FLOOR DYSFUNCTION

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PURPOSE:

Are there any reasons for performing postoperative cine MRI in pelvic floor dysfunction? A review of the literature, including our own experiences in verifying the success of abdominal sacrocolpopexy in patients with vaginal vault prolapse.

METHOD/MATERIALS:

We performed postoperative functional MRI in 25 patients having undergone sacrocolpopexy and correlated the diagnostic results with those of postoperative gynaecological examination. We

used a 1.5 Tesla magnet unit. Opacification of vagina and rectum was achieved by filling them with sonography gel. The vagina was considered full as soon as gel appeared at the orifice and the filling of the rectum was discontinued as soon as the patient expressed an urge to relieve her bowels. Urethrea and bladder were not opacified.

The examination was performed with the patient lying head first, supine and her legs slightly apart. An absorbent pad prevented the gel from running out. No premedication was given. We used a body-array surface coil. Functional cine MRI was performed using static axial and sagittal T2-weighted turbo-spin-echo sequences (TR 3500-3800 ms, TE 99 ms, matrix 308 x 512, 2 acquisitions, field of view 370-250 mm, slice thickness 3 / 5 mm) and a dynamic fast-imaging-with-steady-precession sequence (True FISP) using the visible patch as reference (TR 5,8 ms, TE 2,6 ms, flip angle 70°, matrix 197 x 256,field of view 270 mm, 30 measurements i. e. one every 1,3 s). During the examination the patient was asked to relax her pelvic floor muscles, contract them slowly, relax again and then to increase the intraabdominal pressure by straining in order to defecate

RESULTS:

Our method of functional MRI proved to be especially beneficial for the postoperative detection of enteroceles (13 cases as opposed to 6 on clinical exam.) and for the achievement of a generally good and full visibility of the vagina itself but also of the patch interposed between vaginal vault and os sacrum (full visibility in 13, partial in 9 cases) and its exact fixation location on the latter (22 cases). We could thus assess the patch´s "functioning". In those three cases in which the patch could not be visualised, a vaginal vault descent was diagnosed.

CONCLUSIONS:

Most articles in the literature stress the usefulness of functional cine MRI. The literature manly focuses on aspects of method in comparisson to other modalities, and displayes the various kinds of findings. Only few articles outline and compare different surgical approaches. Cost effectiveness studies are still missing.

As our study shows nevertheless functional cine MRI might help individually plan surgery, provide reliable postoperative follow-up data after sacrocolpopexy in particular, but also become an instrument for the understanding of benefits and flaws of the various surgical approaches for the repair of vaginal vault prolapse.

WSIX: Fetal Imaging

Location: Hall B

Moderators: *P. Brugger (AT), M. Shady (EG)*

1. FETAL MRI: INDICATIONS AND METHODS

DANIELA PRAYER, PETER C. BRUGGER
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Since about ten years, the use of ultrafast MR-sequences allows an acquisition of a series of images in about 20 seconds [1]. This development has caused a revival of fetal MR-imaging, as it made until then practiced sedation of the pregnant woman or immobilization of the fetus by curarization via the umbilical vein, unnecessary.

"Classical" indications for fetal MRI are based on unfavorable conditions for ultrasound (US) assessment like maternal obesity or anhydramnios [2]. In the meantime it could be shown that MRI may discriminate tissue components that lie beyond the resolution of ultrasound, and may delineate also very small anatomical structures [3, 4]. Thus, MRI has become already a frequently used adjunct to prenatal ultrasound [3]. The steadily increasing indications to perform fetal MRI have also developed as a consequence of improved methods, especially of ultrafast sequences that contain information beyond T2-contrast [5].

Indications for fetal MR-imaging that are already widely accepted include:

- The workup of CNS- and extra CNS malformations: there the demonstration of the extent of organ-involvement may specify individual prognosis and identify a potential genetic background that may bare a risk of recurrence.
- Brain pathologies, where MRI may help to assign a present pathology to an acquired or malformative background [6].
- Determination of the degree of lung maturation (by volumetry and assessment of signal intensities of the lungs) [7]. This may help with prognostic estimation in pathologies such as diaphragmatic hernias, premature rupture of membranes or any thoracic malformation.
- Maternal disease (infection and/or immunologic diseases). These conditions might either have an impact on the fetus directly, or may lead to fetal damage via placental impairment. By means of MRI fetal and/or placental pathologies may be identified.
- Previous child with possible or proved genetically determined disease. MRI may prove or exclude the respective morphological changes.
- Second opinion in case of planned termination of pregnancy.

Regarding the methods of fetal MRI, a crucial point is correct positioning of the pregnant woman within the magnet, with the receptor elements as close to the fetal regions of interest as possible. In large fetuses (after 30 gestational weeks (GW)) repositioning of the coil may be necessary during the examination. The choice of sequences has to be adapted to fetal age, organ of interest and clinical question. While T2-weighted (T2w) single shot fast-spin-echo (SFSSE) sequences are the mainstay of fetal MR-imaging, other sequences, such as T1w GRE -, diffusion-weighted, steady-state free precession, and dynamic sequences hold the potential of important additional information. T1-weighted sequences may demonstrate meconium, fat, protein-rich structures (pituitary, thyroid, cysts), and hemorrhage, diffusion-weighted sequences show (pre) myelinated structures of the brain, acute cerebral ischemic lesions, functional kidneys, and may help with differential diagnosis of tissues or fluids that present themselves isointense to amniotic fluid on the other sequences. Gross and intrinsic fetal movements can be visualized by dynamic steady state free precession sequences. These informations may enhance diagnostic accuracy with respect to fetal neurological assessment (gross movements) and gastrointestinal stenoses (intrinsic movements). As fetal tissues mature, their signal relationships change- which has also be to considered when selecting sequences and sequence parameters respectively. Efficacy of fetal MR-imaging depends on the application of a tailored MR-protocol that has to be carefully planned in each case.

Regarding the developing genitourinary (GU) system, T2-weighted SSFSE- and thick-slab T2-weighted SSFP sequences will demonstrate the configuration and walls of hollow organs. To differentiate the content of these organs (urinary fluid, hemorrhagic components, protein-rich components, sedimentation..) additional T1-w, FLAIR and/or T2* information is required [5, 8]. Normal kidneys can be recognized by their bright signal on diffusion-weighted sequences [9]. This may help to define the position of a displaced kidney. As malformations of the GU may be parts of more extended malformative syndromes, the whole fetus has to be screened in each case for further anomalies. Regarding the fetal GU, a special situation is present in case of suspect bilateral renal agenesis: there, ultrasound is handicapped by anhydramnios, a condition that does not interfere with the quality of MR-imaging. There, a reliable diagnosis can be made.

With improvement of the MR-methods and increasing knowledge about normal and pathological fetal development more and more indications for fetal MRI are evolving. Especially regarding the fetal GU system we expect that it will become possible to ameliorate prognostic predictions with respect to the degree of renal function that might be expected.

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2. MAGNETIC RESONANCE IMAGING OF THE FETAL UROGENITAL SYSTEM

PETER C BRUGGER (AT)

INTRODUCTION

The past decade witnessed an upturn of fetal magnetic resonance imaging (MRI) as an adjunct in prenatal diagnosis. A vast amount on literature accumulated on this subject with emphasis on the fetal central nervous system, thorax and lungs. Although briefly mentioned in accounts on fetal extra-CNS MR-anatomy [1-6], apart form early case reports [7-9] and communications on small series [10], the fetal urogenital tract has not received special attention until recently [11-19].

IMAGING

Imaging the fetal urogenital tract relies on a large scale on T2-weighted fast spin echo and sequences steady-state free-precession (SSFP) sequences. T1-weighted sequences are not vital in imaging the urogenital system, but essential for further evaluation of the fetal abdomen. Neither do echoplanar sequences contribute much to visualization of the fetal urogenital system. Diffusion weighted imaging (DWI) provides further information on the integrity of the renal parenchyma, and the apparent diffusion coefficient can be calculated [19].

MRI OF NORMAL GENITOURINARY TRACT

Fetal kidneys present with intermediate signal intensity on T2-weighted images and can be recognized from 19 gestational weeks (GW) onwards. Delineation of the fetal kidneys is facilitated by the presence of perirenal adipose tissue providing T2-weighted contrast. The renal pelvis is seen as a centrally T2-weighted hyperintense structure from 19 GW onwards. The characteristic renulation of the prenatal kidney is also detectable. As the length of the fetal kidneys in millimeters approximately equals GW, visualization of internal anatomy relates to the spatial resolution of the MR images. Distinction between the T2-weighted hypointense appearing renal cortex and medulla is possible by 22 GW on T2-weighted sequences, and to a lesser extent on SSFP sequences. Further intrinsic details like medullary pyramids become visible only in older fetuses (> 30 GW). Renal vessels can usually not be depicted. Due to their internal architecture kidneys have anisotropic properties and thus can be selectively visualized with DWI.

The fetal urinary bladder is easily recognized as a fluid filled midline structure. Identified by its topographical relationship to the umbilical arteries. The latter are usually best seen on SSFP sequences, and to a lesser degree as flow-void on T2-weighted sequences (depending on fluid filling of the adjacent bowels). Because of the small size of the fetal pelvis the major part of it is situated cranial to the pubic symphysis, and when fluid filled, may reach the level of the umbilicus, thereby occupying considerable portions of the abdomen in older fetuses. The bladder wall can also be demonstrated.

Normal ureters are not visible unless dilated. The same holds true for the urethra.

Contrary to earlier reports [4] the external genitals can usually be visualized from GW 19 onwards, except in cases of severe oligohydramnios. Visualization of genital structures is possible in all three planes, but best seen on sagittal and axial slices. The fetal testes can be seen when descended into the scrotum. Except in case of ascites, intraabdominal testes can not be demonstrated, since they not display the characteristic hyperintensity on SPIR sequences as seen in adults, which would allow selective imaging. Likewise, ovaries are only seen in pathological conditions. Uterus, vagina and prostate can not be selectively visualized.

MRI OF THE PATHOLOGICAL UROGENITAL TRACT

Fetal urogenital anomalies are often associated with oligohydramnios that makes the performance of fetal ultrasound difficult. Since MRI is not affected by diminished amniotic fluid, it is considered a valuable additional method to ultrasonography in such cases [12], and can be used to differentiate between renal agenesis and preterm rupture of membranes [20]. Especially when dealing with fetuses younger than 20 GW, using orthogonal planes with a small field of view, high resolution and DWI is essential in imaging the fetal body, so as to avoid a false diagnosis of renal agenesis [21].

MRI can help to determine the origin of cystic masses within the fetal abdomen, and differentiate genitourinary from gastrointestinal abnormalities [20]. In this context T1-weighted sequences are particularly useful in establishing the topographical relationships of the lesion and in distinguishing it from the fetal bowels. With respect to retroperitoneal masses further differentiation is possible with MRI, e.g. between adrenal hemorrhage and cystic renal lesions [22], or the extent of retroperitoneal lymphangiomas [23].

Ectopic kidneys lack their adipose tissue investment and are thus more difficult to distinguish from surrounding bowels, especially in fetuses less than 24 GW old, when fluid-filling of the fetal intestines is not yet present. In such cases DWI is instrumental in demonstrating the location of renal tissue.

In uropathies caused by lower urinary tract obstruction (LUTO) the urinary bladder is dilated and thick walled. However, MRI is reported to be equal to ultrasound in the accuracy of identifying a LUTO, but is no better at differentiating the causes [5, 24]. On the other hand, MRI has been used successfully to distinguish dysplastic changes in the kidney from variants in normal cortical development [11].

Autosomal recessive polycystic kidney disease presents with bilateral enlarged kidneys with T2-weighted hyperintense signals [15], while in autosomal dominant polycystic kidney disease enlarged kidneys with or without cysts may be seen. The detection of small cystic lesions will depend on the spatial resolution of the images.

In duplex systems, ectopic ureteral insertion can be demonstrated with fetal MRI, and intravesical or prolapsed ureteroceles [14, 25] have been reported.

In fetuses with urogenital malformations associated anomalies have been found in 50% [26]. MRI can define the anatomy of complex malformations such as cloacal malformations, bladder exstrophy [14, 15], caudal regression syndrome (VATER association), megacystis microcolon intestinal hypoperistalsis syndrome [14, 27], hydrometrocolpos [28], or in case of conjoined twins.

CONCLUSION

Fetal MRI can visualize both normal and pathologic conditions of the fetal urogenital tract. Beyond doubt ultrasound is the modality of choice for the initial prenatal screening of fetal anomalies. In case of limited ultrasound conditions (maternal obesity, oligohydramnios, or unfavorable fetal position), fetal MRI is a useful complementary imaging modality, especially in complex malformations involving the urogenital tract. The additional information provided by fetal MRI reportedly ranges from 36% [12] to 69% [17]. However, further studies are needed to identify those situations in which fetal MRI may contribute most.

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3. ULTRASOUND OF THE FOETAL UROGENITAL SYSTEM

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There are several congenital anomalies known to affect the foetal kidney. Some of these may be fatal and need termination of pregnancy. Other less severe anomalies may need management soon after delivery including nephrectomy.

The foetal kidneys start to produce foetal urine from about 14 weeks gestation, and although this has no function in terms of filtering the foetal blood it is the major source of liquor from 14 to 16 weeks onwards. Between 18 and 22 weeks gestation the foetus begins to "breath". This is vital to develop the complex channels and branches of the future airways within the lungs.

Ultrasound scanning of the normal kidney is usually an easy task. The foetal kidneys are located within the abdominal region on either side of the spine. Antenatal ultrasound scanning is

an efficient modality to foetal renal abnormalities. The amount of liquor therefore is an adequate index of the severity of the renal affection. Counseling of the parents need special skills. The prognosis of the baby depends largely on the severity of the affection of one or both kidneys. Foetal renal anomalies include **renal agensis, multicystic dysplastic kidneys, polycystic kidneys as well as obstructive uropathies.** In cases of **renal agenesis**, absence of the liquor requires special skills to reach the diagnosis. This is in contrast to **cystic dysplastic lesions** of the kidney (including the multicystic dysplastic kidneys and polycystic kidneys) where contrast between the fluid and solid part of the kidney gives vivid images of the anomalies. **Upper obstructive uropathies** will cause hydronephrosis. These lesions are usually easy to visualize on ultrasound scanning during the second and third trimester. In severe cases, the kidney may dilate to form an abdominal cyst. This cyst can obstruct the intestine and lungs causing polyhydramnios. **Lower obstructive uropathies** affects male foeti and are due to posterior urethral valve. In ultrasound the distended bladder filled most of the abdominal cavity and can easily be visualised. Associated hydroureter and hydronephrosis are not uncommon.

During my presentation I will demonstrate some images that will include the spectrum of these anomalies.

WSX: Mimics of Renal Cell Carcinoma

Location: Hall C

Moderators: *S.Goldman , A. Vargha (HU)*

1. BENIGN RENAL TUMORS

STANFORD M. GOLDMAN, M.D (USA)

INTRODUCTION

Renal masses can be looked at as tumors that enlarge appositional growth or tumors that infiltrate or invade interstitium grow. Dr. David Hartman formerly of AFIP used to use the term of balls and beans to represent appositional and interstitial growth, respectively. I use the concept of the ice cream cones to represent appositional growth and the change from an orange to grapefruit as interstitial growth. In appositional growth a mass slowly displaces parenchyma. In interstitial growth, the tumor spreads along the tubules and interstition of the kidney, uniformly enlarging the kidney with renal function preserved until very late in the process.

The tumors that will be discussed are that of the isolated angiomyolipoma, the angiomyolipoma as part of tuberous sclerosis complex, the oncocytoma, the multilocular cystic nephroma, the fibrous polyp, the hemangioma, and, as time permits, an assortment of leiomyomas, fibromas, renninomas (juxtaglomerular tumors), renal fetal hamartoma, etc. (1,2)

THE ANGIOMYOLIPOMAS

The angiomyolipomas are mostly small asymptomatic and initially found at autopsy and now on CT (3). Of the significant angiomyolipomas 75% are isolated in middle-aged females, 20% are part of the tuberous sclerosis syndrome, and 5% which have bilateral lesions but without the stigmata of tuberous sclerosis.

In the classic presentation, these patients came in with flank pain (75%, 41% mass), hematuria (30%) and hypotension (18%).

Pathologically, these tumors are composed of fat, blood vessels and lyomatous (i.e. smooth muscle) tissue. These lesions bleed because there is no real elastica in these blood vessels. There often stretch out as so-called micro-aneurisms. On plain film, rarely the lesion can be seen with fat. On angiography, they are very vascular often micro-aneurysms. On CT these lesions are extremely vascular with the so-called micro-aneurysm pattern. On ultrasound classically these lesions are hyperechoic (4,5). This is not however pathomneumonic and a CT must be done to confirm the diagnosis. CT's of these lesions are characterized by the significant

amount of fat in most cases, well over 95% (6,7). However, there is a small group of patients where the fat is not clearly identified on the study. Sometimes these small lesions will measure just below classic fat levels such as -30 and they may enhance to that of water density (8,9,10). Some lesions do not demonstrate fat even under these circumstances. One can use fat suppression techniques on MRI if the diagnosis is suspected. One should especially be cognizant of this lesion when high-density smooth lesion is demonstrated on a non-enhanced CT which enhances exuberantly and uniformly on CT post-contrast injection (11). In the old days it was thought that these lesions had to be removed because of the possibility of bleeding which was often severe enough to cause hypertension and death. Now, lesions that are asymptomatic and below 4 cm can be watched and growth is now known to occur (12,13,14). Some of the large lesions may best be treated with embolization such as a young woman seen by us with a bleed after skiing (15). This benign lesion has been shown to metastasize to lymph nodes and into the vena cava (16,17,18,19,21,22). These lesions can present as a classic fat lesion on MRI with high signal on T1 and T2 images. Fat suppression MRI techniques will confirm the initial impression.

Angiomyolipomas can be part of the tuberous sclerosis triad which is mental retardation, adenoma sebaceum and mental retardation. This multiple organ syndrome also develops an entire host skin lesions such as café au lait spots, fibro-epithelial tags, shagreen patches. The heart can be involved with myxomas and rhabdomyomas. In the lung, there may be lymphangiomatosis.

These patients may have sporadic bone changes on plain film with a flare-like pattern in the pelvis and somewhat similar sclerotic changes in the tufts of the fingers. The lesions may develop slowly or grow quite rapidly (22). Although intratumoral fat is usually the hallmark of angiomyolipomas, fat can be seen in oncocytomas and renal cell carcinoma. In the oncocytomas and many of the renal cells the lesion is actually invading and surrounding the perinephric fat. However, true renal cell carcinomas with fat have been reported in a few cases but almost invariably with calcification being present (23,24,25,26).

THE ONCOCYTOMA

Oncocytoma (27,28,29) became a distinctive entity for radiologists because of a typical angiographic appearance of its structural pattern (30,31). It is tumor of the proximal tubular cells where the oxyphil cell, unlike renal cell carcinoma is seen. This tumor is reddish and it does not usually necrose and is quite homogenous. Occasionally a central scar is seen and it is through this central scar that a spokes-wheel pattern is noted.

Angiographically, this lesion became of interest in the early seventies because of the spokes-wheel pattern. On ultrasound and CT, the lesion is quite large in order to be diagnosed and fairly uniform except for an occasional central scar. AFIP (32) tends to feel the diagnosis cannot be made by CT. We are not as nihilistic. This is also true in MRI (33,34,35) but the central scar may low signal on both T1 and T2, it may be low signal on T1 and high signal on T2 or high signal on both. Of interest is the fact that occasionally oncocytomas pick up iodohippurate as compared to glucoheptonate which it will not pick up. This is because it is a proximal cell lesion and iodohippurate is excreted by distal tubules. It has also been shown to be visualized on Technicium 99 Sestamibi studies.

Although it said that one can make this diagnosis by biopsy this is to be frowned upon because one can obtain oncocytic cells from renal cell carcinomas.

MULTILOCULAR CYSTIC NEPHROMA

The multilocular cystic nephroma is a unilateral lesion with multiple septae that do not communicate with the rest of the normal kidney. It is non familial and at one time was considered a cystic lesion. It is now felt to be a benign tumor although occasional metastases are seen. In children under five the lesion is slightly male dominant although this may just be a statistical factor (36,37,38,39,40). However, in adults there is definitely a significant pre-ponderance in females. Theoretically this is of importance in the sense that a multilocular lesion in males should absolutely be removed. In a female, there may be some desire to watch these lesions although we have not been successful in convincing the patient to watch the lesions for reasons that will be discussed. We have also not seen lesions that were amenable to partial resection because of the time of visualization they were too large. The differential in childhood is that of a Wilms tumor. These

tumors do have a tendency to herniate into the pelvis on retrograde studies but so do Wilms tumors.

FIBROUS POLYPS

Although very commonly seen in the ureter, these can also be found in the renal pelvis. These lesions may be on a stalk. Clots can mimic this finding. These can be removed readily if recognized pre-operatively (41).

HEMANGIOMAS

Hemangiomas are often small lesions in the medulla near the collecting system and they bleed in the subcapsular area or into the calyceal system and are often hard to visualize (42,43). There is a current concept that AVMs, in fact, may be considered hemangiomas or cavernous hemangiomas. As such, on an angiography these are hypovascular lesions. When large enough, they may be mistaken for a transitional cell carcinoma. On IVP, the lesion may not be seen at all except for the clot that is present. Occasionally, on the angiogram; one can see coiled blood vessels. Unlike other AVMs, there is no rapid shunting and no response to epinephrine. Only a few of the angiomas have been seen on ultrasound and these were hyperechoic. On CT's some women had significantly, and others minimally, depending on the flow characteristics and/or the clot present.

LEIOMYOMAS

Leiomyomas are much more common in women and 70% are white females (44,45). There can be clinically significant although most are small and multiple and can, therefore, be picked up routine CT's or on CT's for pain or bleeding. A palpable mass may be present. Usually these are of great size when diagnosed, however, more are being seen smaller because of CT. The lesions are nonspecific and may rarely calcify just like fibroids. The lesions are well circumscribed on angiography with moderate to significantly-increased vascularity. No AV shunts are noted. On ultrasound the lesions are homogenous filling defects or an intraparenchymal lesion with limited through transmission. The benign from malignant are impossible to distinguish as they get larger and there may be sarcomanous degeneration in the benign tumor. The leiomyosarcoma is often not encapsulated but one cannot always rely on this finding.

OTHER LESIONS

The other lesions are mesoblastic nephroma (renal fetal hamartoma), metanephric adenoma (46), fibromas (47,48,49,50) and the juxtaglomular tumor (renninoma) (51,52.53).

CONCLUSION

In conclusion, the benign tumors represent a group of interesting lesions in which the diagnosis can be suggested in a number of the lesions. Some are very specific and definitive and others require surgical removal for diagnosis.

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2. INDETERMINATE RENAL CYSTS

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Although diagnostic imaging modalities are extremely accurate in the diagnosis of renal masses, diagnostic difficulties are sometimes encountered with US, CT and MRI. The main diagnostic problem is the differential diagnosis between benign and malignant tumors, mainly in cases of complex cystic masses of the kidney.

In general, a greater number of problematic renal masses are found with US, since this modality is more extensively performed as a first imaging approach. Diagnostic difficulties with US are due to technical limitations and/or the complexity of the lesion itself. Technical limitation are due to limited spatial and contrast resolution, although modern equipments have significantly improved these parameters. Other limitations may be due to artefacts and extremely obese patients..

For complex cystic masses, the difficulties in the definition of the benign or malignant nature of the lesion is due to the presence of some findings such as calcifications, thick septae, vegetations, blood and purulent debris. The contribution of colour-power Doppler and US contrast media in the solution of some of the diagnostic difficulties will be illustrated.

Problematic renal masses can be seen, although in a less number of cases, with CT and MRI. Indeterminate renal masses in CT are due to very small size, internal septae, blood, debris.. MRI has similar difficulties but it provides a higher contrast resolution enabling better characterization of fluid content in cases of hemorrhagic cysts. Furthermore, using dynamic sequences and gadolinium, MRI can demonstrate minimal enhancement in poorly vascularized tumors.

3. RENAL PSEUDOTUMOR

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The term "pseudotumor" is used to several anatomic variants that can simulate a renal mass, the most frequent of which are hypertrophied column of Bertin, persistence of fetal lobulation, and the dromedary or splenic hump [1]. Also it includes nodular compensatory hypertrophy, renal sinus lipomatosis, and compression by blood vessels may simulate tumors of the kidney [2].

Zwirewich et al [3] stated that Lobar dysmorphism is one of a number of normal anatomic variants that may simulate renal mass lesions on cross-sectional imaging.

Pseudotumoral lesions of the kidney are usually discovered on urography and simulate a neoplasm, but are histologically composed of normal tissue.

It is therefore of the utmost importance to make a clear-cut diagnosis with the help of ultrasonography, CT-scan, and in some cases, arteriography [2].

Some authors presented atypical cases of renal pseudotumors as in a case presented by ***Fumadó Ciutat et al*** [4]. They presented a 60 year old man who presents a renal mass founded incidentally at a control computed tomography corresponding to a esteatonecrotic granuloma, secondary to an enolic acute pancreatitis a few months ago.

In 1978, ***Nusbacher & Bryk*** [5] published cases of hydronephrosis of the lower pole of a duplex kidney simulating a renal pseudotumor.

Grieten et al, 1992 [6] described a case of a surgically retained, encapsulated sponge presenting as an unusual cause of renal pseudotumor in a man who had a partial nephrectomy for renal cell carcinoma 1 year before. The nonspecific sonographic appearance of a hyperechoic renal mass and the atypical CT features of a thick-walled indeterminate mass suggested a hematoma, a hemorrhagic cyst, or a hemorrhagic neoplasm. A retained surgical sponge within a thick fibrotic capsule adhesive to the renal capsule was found at surgery.

Tanaka et al, 1999 [7] reported a case of renal SOL suspected to be a malignant tumor**.** Left radical nephrectomy was then performed. Pathological examination revealed a sclerotic fibrous lesion with a rather distinct margin and no evidence of malignancy. This patient had a history of chronic pachymeningitis that formed a thoracic epidural focus causing spinal cord compression and the histologic appearance of this focus was similar to the renal lesion. It was concluded that this was a rare case of a renal pseudotumor associated with multifocal fibrosclerosis.

Aessopos et al, 2000 [8] reported a case of a patient with Behçet's disease who developed a renal mass raising the suspicion of a malignant neoplasm. The pathologic examination revealed an inflammatory pseudotumor. The concurrent presentation of these two entities seems to be more than coincidental.

Pedrosa et al, 2001 [9] descrided an unusual case of fat necrosis presenting as multiple, bilateral renal pseudotumors in a patient with acute pancreatitis.

Horino et al, 2004 [10] stated that Actinomycosis has sometimes been misdiagnosed as another neoplasm, especially as malignant lymphoma, and nephrectomy has been performed to establish the diagnosis.
The organism causing actinomycosis is known to exist as an anaerobic, harmless saprophyte in the mouth, tonsils, and gastrointestinal tract. The clinical types of actinomycosis are cervico-facial in 60%, thoracic in 15%, and abdominal in 25% of cases. It was reported that the appendix is the most common organ affected by abdominal actinomycosis. Renal actinomycosis is relatively rare. Since the first case of solitary renal actinomycosis was described in 1878, only approximately 50 cases have been described. The routes of infection to the kidney include the bloodstream and direct expansion from contiguous structure, although infection before actinomycosis in the present case could not be determined. The patient had untreated dental caries, which caused repeated oral infection, suggesting that *A. israelii* and/or related anaerobic filaments in the oral cavity could have been the source of the infection in the kidney. A number of authors emphasize the difficulties involved in arriving at a diagnosis preoperatively. Early diagnosis is important for minimizing the morbidity of disease and preventing unnecessary surgery. However, radiologic findings are usually nonspecific. The findings of an avascular or hypovascular mass on angiography and accumulation of Ga on scintigraphy are still not helpful for making the definite diagnosis of actinomycosis. Radiologically, a vascular mass including renal leiomyoma, renal pseudotumor caused by pyelonephritis, and papillary renal adenocarcinoma should be differentiated.

CT scanning is useful for showing the extent and characteristics of abdominal actinomycosis. It was reported that dense contrast enhancement in the walls or solid components of the masses was noted in 80% of patients, although these appearances are nonspecific in actinomycosis and sometimes can be seen in other inflammatory diseases.

MRI could be a most useful tool for diagnosis of renal actinomycosis. Actinomycosis is characterized as a low- to isointensity mass on T1-weighted MRI and as a low-intensity mass on T2-weighted MRI. The finding of a low-intensity mass on T2-weighted MRI should particularly be emphasized because most cases with actinomycosis show this feature. MRI findings in the present case showed the same characteristics as above. However, renal malignant lymphoma is characterized on MRI as an iso- to high-intensity mass on T2-weighted MRI, which is different from the finding of actinomycosis.

Bildirici et al, 2004 [11] reported that renal inflammatory pseudotumor is a very rare benign condition of unknown etiology characterized by proliferative myofibroblasts, fibroblasts, histiocytes, and plasma cells.

The histogenesis of inflammatory pseudotumor is uncertain, but it is generally thought to arise as the result of an inflammatory reaction to surgery, trauma, infection or malignancy. It may also occur without any previous insult. The lesion is generally regarded as reactive or

postinfectious, originating in an inflammatory process. It has been reported to occur in many organs, including the lung and orbit, though its occurrence in the kidney is very rare. Histologically, inflammatory pseudotumor of the urogenital tract is typically composed of spindle cells within a collagenous or myxoid matrix, with a mixed inflammatory cell infiltrate of plasma cells, lymphocytes, and histiocytes. A paucity of nuclear pleomorphism and low-mitotic activity are suggestive of inflammatory pseudotumor rather than malignancy. The results of immunohistochemical staining vary, but most recent studies have suggested that the spindle cells of an inflammatory pseudotumor are of fibroblastic or myofibroblastic origin [12].

Ishikawa et al, 2004 [13] reported a case of a patient presenting complaining of a tumor in the left upper abdomen without tenderness. Suspecting renal cell carcinoma of the dark cell type, a nephrectomy was performed. Microscopic examination showed a proliferation of spindle cells containing numerous blood vessels. A diffuse infiltrate of lymphocytes and plasma cells was scattered throughout the lesion.

Inflammatory pseudotumor is a rare benign tumor entity. Because inflammatory pseudotumors mimic malignant tumors both clinically and radiologically, the radiologist should be familiar with this entity. Inflammatory pseudotumor most commonly involves the lung and the orbit, but it has been reported to occur in nearly every site in the body. For making a definite diagnosis a biopsy is often essential. The treatment options are varied and consist of surgery, high-dose steroids, irradiation, and chemotherapeutics [14].

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SCIENTIFIC SESSIONS

Saturday, September 9th; 16:00 – 17:30

Scientific Session I

Location: Hall A

1. TESTICULAR MICROLITHIASIS: A PROSPECTIVE STUDY - IS ULTRASOUND FOLLOW-UP NECESSARY?

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AIM OF WORK: Testicular microlithiasis (TML) has been reported to have a high association with testicular cancer. Our aim is to show that following up TML patients with ultrasound on a yearly basis to monitor development of testicular cancer is unnecessary.

PATIENTS & METHODS: In Brighton and Sussex University Hospital NHS Trust, 2656 men were referred for scrotal ultrasound between January 2000 and December 2004. Of the 2656 men, 51 had TML and were followed up by a single radiologist annually. The results were recorded as TML grade at presentation, distribution, adjunct pathology, and whether there were any changes during follow-up, notably whether any developed testicular mass.

RESULTS: Fifty-one out of 2656 (1.9%) had TML at presentation. Their age range was 15 to 83 (mean 41 years). The number of follow-up ultrasounds performed on each patient ranged from 1 to 8 (mean 3.33).

They were followed up between 15 and 76 months (mean 33.3 months). During this period, no one developed testicular cancer. Four of the cohort had undergone orchidectomy in the past for testicular cancer, and 1 man had bilateral testicular atrophy.

CONCLUSION: This surveillance study, the largest in the published literature, indicates that regular sonographic surveillance is not required for patients with TML, and no other risk factor. In men with TML and a history of testicular malignancy or atrophy, annual surveillance is recommended.

2. DOES CONTRAST ENHANCED US HAVE A PRACTICAL VALUE IN ADJUNCT TO COLOR DOPPLER US IN EVALUATION OF PATIENTS WITH ACUTE RENAL FAILURE? PRELIMINARY ASSESSMENT.

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AIM OF WORK: To investigate whether contrast enhanced US (CEUS) has a role to evaluate patients with acute renal failure (ARF) in whom ischemic disorders were clinically suspected.

PATIENTS & METHODS: we evaluated 20 consecutive patients with ARF for suspected ischemic or embolic causes following endovascular repair of abdominal aortic aneurysms or other angiographic maneuvers. After preliminary grey-scale and color Doppler US, CEUS was performed using low acoustic power, contrast specific modes. All examinations were digitally recorded for retrospective evaluation.

RESULTS: Six/20 patients presented with renal ischemia. There were 2 patients with bilateral renal infarctions, 1 with unilateral renal infarction and contralateral renal artery stenosis, 3 with acute cortical necrosis (ACN). Nine/20 patients had istologically proved atheroembolic renal disease (ARD) , one had disseminated intravascular coagulation (DIC). In the remaining patients the cause of renal impairment was not determined. At CEUS Infarctions presented as wedge-shaped

segmental perfusion defects. ACN presented with non-enhancing renal cortex and enhancing hilar vessels. Delayed contrast enhancement associated with focal hypoperfused areas during the early arterial phase were appreciable in 6/9 patients with ARD and in 3 with IRA from undetermined causes. No perfusion defects were appreciable in the remaining 5 patients (one with DIC, 3 with ARD, 1 with IRA from undetermined causes.

CONCLUSION: In patients with ARF color Doppler US usually shows significant reduction of color signal which hampers visibility of perfusion defects. Microbubble contrast agents are not nephrotoxic and provide an effective noninvasive tool to identify renal perfusion defects in these patients.

3. A Novel Approach for the Detection of Acute Rejection with Dynamic Contrast Enhanced Magnetic Resonance Imaging

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AIM OF WORK: Acute rejection is the most common reason of graft failure after kidney transplantation, thus early detection is crucial to the survival of the transplanted kidney function. In this paper, we introduce a new approach for the automatic classification of normal and acute rejection transplants from Dynamic Contrast Enhanced Magnetic Resonance Imaging (DCE-MRI). The proposed algorithm consists of three main steps. The first step isolates the kidney from the surrounding anatomical structures by evolving a deformable model based on two density functions; the first function describes the distribution of the gray level inside and outside the kidney region and the second function describes the prior shape of the kidney. In the second step, a new non rigid registration approach is employed to account for the motion of the kidney due to patient breathing. To validate our registration approach, we use a simulation of deformations based on biomechanical modelling of the kidney tissue using the finite element method (F.E.M.). Finally, the perfusion curves that show the transportation of the contrast agent into the tissue are obtained from the cortex and used in the classification of normal and acute rejection transplants. Applications of the proposed approach yield promising results that would, in the near future, replace the use of current technologies such as nuclear imaging and ultrasonography, which are not specific enough to determine the type of kidney dysfunction.

PATIENTS & METHODS: For the protocol of DCE-MRI, during the development of this study, we observed that a good selection of the imaging protocol is as important as the image analysis – if not more important. The key point in the protocol is to take the images as fast as possible while trying to conserve the quality. A compromise in image quality results in too much noise and partial volume effects; but on the other hand, a compromise from speed results in less data points that prevented us from being able to classify the signals. Therefore, with collaborative efforts, the protocol was modified a number of times to acquire a standard and better quality imaging. The protocol described below has been found to be the optimum with the current MRI hardware (a Signa Horizon GE 1.5T scanner).In our protocol, gradient echo T1 imaging is employed by a Signa Horizon GE 1.5T scanner (Signa Horizon LX Echo speed; General Electric Medical Systems, Milwaukee, WI, USA) with the use of phased array Torso surface coil, and the contrast agent Gadolinium DTPA is introduced via a wide bore veno-catheter placed at antecubital vein at a rate of 3-4 ml/sec with a dose of 0.2 ml/kg.BW. Images are taken at 5mm thickness with no inter-slice gap, repetition time (TR) 34 msec, TE minimum, field of view (FOV) 42 X 42 cm and matrix of 600 X 600. For each patient, 150 temporal sequences of coronal scans are taken with 4 second intervals.

RESULTS: The ultimate goal of the proposed algorithms is to successfully construct a renogram (mean signals) from the DCE-MRI sequences, showing the behavior of the kidney as the contrast agent perfuse into the transplant. In acute rejection patients, the DCE-MRI images show a delayed perfusion pattern and a reduced cortical enhancement. We tested the above algorithms on thirty patients. The normal patient shows the expected abrupt increase to the higher signal intensities and the valley with a small slope. The acute rejection patients show a delay in reaching their peak

signal intensities. From these observations, we have been able to conclude that the relative peak signal intensity, time to peak signal intensity, the slope between the peak and the first minimum, and the slope between the peak and the signal measured from the last image in the sequence are the major four features in the renograms of the segmented kidney for classification.To distinguish between normal and acute rejection, we used a Bayesian supervised classifier learning statistical characteristics from a training set for the normal and acute rejection. The density estimation required in the Bayes classifier is performed for each feature by using a linear combination of Gaussians (LCDG) with positive and negative components, their parameters are estimated using a modified EM algorithm which appeared in [65]. In our approach we used 50% of the data for the training and the other 50% for testing. For testing data, the Bayes classifier succeeds to classify 13 out of 15 correctly (86.67%). For the training data the Bayes classifier classifies all of them correctly, so the over all accuracy of the proposed approach is 93.3%. All these values are calculated with respect to biopsy results.

CONCLUSION: In this work we presented a framework for the detection of acute renal rejection from Dynamic Contrast Enhanced Magnetic Resonance Images which includes segmentation of the kidneys from the abdomen images, non-rigid registration and Bayes classification. For the segmentation of the kidneys from the abdomen images, we introduced a new deformable model which evolves with both the gray level information of a given abdomen image, and the shape information obtained from a database of manually segmented kidneys. The energy function of this deformable model is a combination of (i) the gray level density and, (ii) the prior shape information as a 1D density function. For these density estimations, we introduced a modified EM algorithm which closely approximates the densities. Following the segmentation, we introduced a non-rigid registration algorithm which deforms the kidney object on iso-contours instead of a square lattice; which gives more degrees of freedom to get accurate deformation. After non-rigid registration, the kidney is segmented into cortex and medulla, and the average gray level value of the cortex for the whole sequence of a patient is plotted. The features extracted from these signal plots (renograms) are put into a Bayesian classification to understand if the transplanted kidney is going under acute rejection or if it is functioning normal.

Our future work will include testing more patients; and testing the robustness of our approach. Also, we will try to classify the other possible diseases after transplantation, and even try to understand the severity of rejection. With such developments, we believe that image analysis of DCE-MRI has the high potential to replace the current nuclear imaging tests or the invasive biopsy techniques.

4. USEFULNESS OF MRI IN THE EVALUATION OF TESTIS-SPARING SURGERY IN MALE PATIENTS WITH CONGENITAL ADRENAL HYPERPLASIA AND TESTICULAR ADRENAL REST TUMOURS

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AIM OF WORK: To evaluate the usefulness of MRI in the assessment of bilateral testicular adrenal rest tumours (TART) and testicular volumes before and after operation in male patients with congenital adrenal hyperplasia (CAH) and TART who were treated with testis-sparing surgery.

PATIENTS & METHODS: Seven male CAH patients with TART (mean; 30 years, range; 23 to 51), who were treated with testis-sparing surgery, underwent testicular MRI before, 6 and 20 months after surgery at a 1.5-T MR unit. An investigator measured the testicular volumes and the tumours on transverse T2WI using public domain software (ImageJ, NIH). The presence of residual tumour and the signal characteristics of the testes were visually assessed.

RESULTS: TART (mean; 8.3g, range; 0.5 to 22.9) were successfully enucleated in all patients without complications. No residual tumour was seen on postoperative MRI. The measured volume

of the tumours on preoperative T2WI (mean; 9.6 mL, range; 0.5 to 30.3) showed a good correlation to the weight of surgical specimen (R^2=0.81). In all patients the testes decreased in volume after the surgery (mean; -41%, range -4 to -81).Six months after surgery four testes in two patients with large tumours (>10g) showed irregular low signal areas adjacent to the mediastinum testis representing scar tissue, which decreased in size 20 month after the surgery.

CONCLUSION: MRI is useful for both preoperative assessment of TART and postoperative follow-up of residual tumour and testicular volume in male CAH patients with testicular adrenal rest tumours treated with testis-sparing surgery.

5. Posterior Deep Peritoneal Pelvic Endometriosis with Rectosigmoïd Involvement. What does Endocavitary MRI add to diagnosis? Preoperative prospective study with surgical correlation.

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AIM OF WORK: US and MRI are able to detect rectosigmoid infiltration but their usefulness in the preoperative staging is still debated.

The purpose of this investigation is to assess added value of TVUS and MRI obtained by both phased-array body (bMRI) and endovaginal (evMRI) coils for predicting intestinal involvement.

PATIENTS & METHODS : 47 underwent preoperatively TVUS, bMRI and evMRI in order to attempt complete endometriosis resection of the nodule. MRI was performed using standard T2w FSE and T1w SE images before and after Gd.

Images were retrospectively reviewed and correlated with findings during surgery and pathological analysis.

RESULTS : At pathology, 43 women presented a deep muscle layer invasion, 2 an isolated serosal involvement and 2 had no intestinal extension. All nodules had well-defined borders, low signal intensity with small hyperintense spots on T2w (18 cases). All were homogeneous and hypoechoic on TVUS. Spiculated strandings were most often seen on MR T2w (44 cases) than on TVUS (35 cases). Deep extension was correctly diagnosed as a hypoechoic or hypointense homogeneous thickening of muscle layer in 32 cases on TVUS (Se : 74%) and 41 cases on MR (Se : 95%). An additional pattern as a hyperintense layer of mucosa surrounding the nodule was found on MR for all cases. EvMRI was clearly better to diagnose intestinal involvement for small lesions (inferior to 2 cm) localized inside Douglas pouch or recto-vaginal septum..

CONCLUSION : MRI gives additional information over TVUS for diagnosis of rectal involvement before surgery. evMRI assess small size nodule extension.

6. Uterine artery embolization in 114 cases of uterine fibroids: Can size, location and number of fibroids affect the clinical success and complication rate?

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AIM OF WORK: To evaluate the efficacy of uterine artery embolization (UAE) in uterine fibroids and to determine whether the size, location and number of fibroids affect the therapeutic efficacy and complication rate.

PATIENTS & METHODS: One hundred fourteen patients with symptomatic fibroids were treated by bilateral uterine artery embolization using PVA (500-710micron) particles.

We controlled patients before UAE and afterwards at months 1, 3, 6, 12 and 24 by questionnaires/interviews and also by pelvic sonography and MRI.

We evaluated the complications and outcome according to the baseline volume of the dominant fibroid as well as the location and number of the fibroids. Arbitrarily, we categorized the patients in two groups according to the size of fibroid; less than or equal to 50cm3 and greater than 50cm3. Then we compared the success and complication rate in these two groups. Similarly, we considered two other cut-off points; the primary fibroid size of 70 and 100 cm3, and repeated the analysis.

RESULTS: After two years, the clinical symptoms improved markedly (all p values<0.01).

An average of 62% reduction in dominant fibroid volume was achieved at month 24 of follow-up. We found no difference in the mean relative reduction of fibroid volume and uterus volume, in fibroid related symptoms changes, and also in complication rate among the groups on the basis of baseline fibroid size, number and location of fibroids (all p values>0.2).

CONCLUSION: UAE is an effective treatment for uterine fibroids with few complications. The primary size, location and number of the fibroids affect neither the success rate nor complications.

7. PERCUTANEOUS RADIOFREQUENCY ABLATION OF RENAL TUMORS:

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AIM OF WORK: To evaluate the outcome of 16 patients after percutaneous radiofrequency ablation of renal tumors.

PATIENTS & METHODS: Sixteen patients (nine women, seven men; mean age, 61 ± 9 years) with 24 unresectable renal tumors (mean volume, 4.3 ± 4.3 cm3) underwent CT-guided (n = 20) or MR imaging–guided (n = 4) percutaneous radiofrequency ablation using an expandable electrode (Starburst XLTM, RITA Medical Systems, Mountain View, CA) with a 150-watt generator. The initial follow-up imaging was performed within 1-30 days after RF ablation, using either a 16-row MSCT scanner (Sensation 16; Siemens, Forchheim, Germany) or a 1.5-T MR scanner (Gyroscan Intera; Philips, Best, The Netherlands). Subsequent imaging was performed at 3-6 month intervals. Residual tumor volume and coagulation necrosis was assessed, and Pearson correlation tests were obtained to determine the strength of the relationships between tumor size, necrosis size, and number of ablations.

RESULTS: Overall, 97 overlapping RF ablations were performed (mean, 3.5±1.5 ablations per tumor) in 24 sessions. Five or more ablations per tumor created significant larger necrosis volumes than 1-2 (p= .034) or 3-4 ablations (p= .020). A complete ablation was achieved in 21/24 tumors (primary technical success, 88%). Two of 3 residual tumors were retreated and showed complete necrosis there after. No complication was observed during the procedure; however, 2 major complications (1 percutaneous urinary fistula, 1 ureteral stricture) were observed during follow-up. No further clinically relevant complications were observed and renal function after RF ablation remained stable. The mean follow-up time was 11.2 months (range, 0.2–31.5 months). The mean volume of the coagulation necroses was 10.2 ± 7.2 cm3, and 6.9±*6.7 cm3, at the first and at the last follow up after RF ablation, respectively. At last available follow-up one recurrent tumor ocurred at the necrosis margin, another patient with one residual tumor could not scheduled for treatment.

CONCLUSION: The midterm results of percutaneous RF ablation for renal tumors are promising and show that RF ablation is well-suited to patients who are not candidates for surgical resection.

8. INITIAL EXPERIENCE WITH THE \'RESONANCE TM\' METALLIC STENT FOR ANTEGRADE URETERIC STENTING

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AIM OF WORK: We describe our initial experience with a new metallic ureteric stent, designed to provide long term urinary drainage in patients with malignant ureteric strictures. It aims to achieve longer primary patency rates than conventional polyurethane ureteric stents where encrustation and compression by malignant masses limit primary patency rates. The 'ResonanceTM' metallic double-pigtail ureteric stent (COOK, Ireland) is constructed from coiled wire spirals to minimise tissue in-growth and the manufacturer recommends interval stent change at 12-months.

PATIENTS & METHODS: Seventeen 'ResonanceTM' stents were inserted via an antegrade approach into fifteen patients between December 2004 and March 2006. The causes of ureteric obstruction were malignancies of bladder (n=4), colon (n=3), gynaecological (n=5) and others (n=3). 1 patient had the stent changed after 12 months,

RESULTS: patients had their stents changed at 6-months. These stents were draining adequately with minimal encrustation. 4 patients are still alive with functioning stents in-situ for 1 to 8months 7 patients died with functioning stents in place (follow-up periods of 1 week to 8 months). 3 stents failed from the outset due to bulky pelvic malignancy esulting in high intra-vesical pressure, as occurs with conventional plastic stents.

CONCLUSION: Our initial experience with 'ResonanceTM' metallic ureteric stent indicates that they may provide adequate long term urinary drainage (up to 12-months) in patients with malignant ureteric obstruction but without significantly bulky pelvic disease. This obviates the need for regular stent changes and would offer significant benefit for these patients with limited life expectancy.

9. THERMOEXPANDABLE METALLIC STENT IN THE MANAGEMENT OF MALIGNANT URETERIC STRICTURES

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AIM OF WORK: To evaluate the assess, period of stent treatment and indication for stent withdrawal in patients treated with thermoexpandable metallic stent for ureteric obstruction due to malignancy.

PATIENTS & METHODS: 19 patients with malignancy were referred to our department for treatment with thermoexpandable metallic stent. The stent insertion was successful in 19 of 21 attempts. Two patients received 2 stents.

RESULTS: In 8 cases the stent was malfunctioning during the first month, and therefore removed. Among the remaining 11 stents, one patient still has a functioning stent, three patients died with a functioning stent. Indications for stent withdrawal were stent occlusion in six patients and stent dislocation in one patient.Median stent treatment time was 6 months. Of the patients who had functioning stents after 1 month the median stent treatment time 14 months.

CONCLUSION: Insertion of thermoexpandable stents can be difficult in patients with malignancy. In many cases the stents are malfunctioning post-operatively.In more then 50% of the patients the stent treatment is satisfying, but occlusion can occur and follow-up is necessary.

Saturday, September 9th; 16:00 – 17:30

Scientific Session II

Location: Hall B

1. Absence of Renal White Pyramids as a secondary measure in detection of ureteric calculus

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AIM OF WORK: The objective of this study is to determine the diagnostic value of the absence of renal white pyramids (WP) as a secondary sign in detecting ureteric calculus.

PATIENTS & METHODS: Non-enhanced axial CT scans of the abdomen/pelvis performed for renal colic, flank pain, or hematuria, were retrospectively analyzed from September 1, 2005 through January 31, 2006. All patients with the presence of ureteric calculi were included in the study and patients with renal calculi, renal tumors, prostate tumors, bladder tumors and patients with renal transplants were excluded from the study. Three hundred twenty six (326) patients met the inclusion criteria. A statistical analysis was performed to assess the utility of absence of renal white pyramid in detecting ureteric calculi.

RESULTS: Ureteric calculi were present in 138/326 patients and of these, 30/138 (Group A) patients (22%) had absence of the WP in the kidney on the side of the ureteric calculus. 188/326 patients had no ureteric stones, and of these 143/188 patients had bilateral absence of WP, 36/ 188 had presence of bilateral WP, and 9/188 (Group B) (4.5%) had unilateral absence of the WP. The WP absence is more common on the side of the ureteric calculus (Groups A and B) with $p<0.0001$, the sensitivity and specificity of the absence of WP is 22% and 95% respectively; with positive predictive value of 77%, and negative predictive value of 62%.

CONCLUSION: The absence of the white pyramid on the side of the ureteric calculus with its contralateral presence has high specificity and diagnostic utility as a secondary sign in detecting ureteric calculi.

2. Unenhanced helical computed tomography (UHCT) and extracorporeal shock wave lithotripsy (ESWL) of renal stones: Prediction of outcomes

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AIM OF WORK: UHCT has proved to be the most sensitive and accurate imaging modality of diagnosing urinary stones. We studied whether stone characteristics as determined by UHCT are associated with the outcomes of ESWL.

PATIENTS & METHODS: During the last year, 50 patients aged 35—77 years, with renal stones <2 cm, were included in this prospective study. Patients underwent UHCT on the same day just prior to ESWL and 3 months later. For each stone, each location was recorded as being in the renal pelvis, the upper, middle or lower calyces. Its shape was recorded as round or non-round. Its size was recorded by using the largest dimensions measured on axial and coronal reformat images. Its mean density was recorded by measurement of a region of interest just smaller than the stone. The UHCT images 3 months after ESWL were assesed by another radiologist.

RESULTS: The outcome of ESWL was considered successful in 36 patients (72%). A maximal stone size of more than 12 mm, a stone burden >700 mm^3, a maximal stone density >900 HU and the presence of non-round stones were statistically significant predictors of failure of ESWL.

CONCLUSION: The analysis of renal stone characteristics by UHCT is helpful in predicting the outcome of ESWL. It allows appropriate selection of patients thus avoiding ineffective and costly ESWL.

3. CONTRAST-INDUCED NEPHROPATHY (CIN) IN RISK PATIENTS: A DOUBLE BLIND COMPARISON OF LOPAMIDOL AND LODIXANOL

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AIM OF WORK: To prospectively compare the effects on renal function of two radiocontrast agents, iopamidol-370 (796 mOsm/kg) and iodixanol-320 (290 mOsm/kg), in patients with renal impairment undergoing contrast-enhanced multidetector CT (CE-MDCT) examinations using a multicenter, double-blind, randomized parallel-group design.

PATIENTS & METHODS: A total of 166 patients with stable moderate-to-severe chronic kidney disease (serum creatinine, SCr,> or equal to 1.5 mg/dL and/or creatinine clearance, CrCl, 10-59 mL/min) undergoing CE-MDCT of the liver or peripheral arteries were randomized to receive equi-iodine doses (40 gI) of either iopamidol-370 or iodixanol-320, injected intravenously at 4 mL/sec. SCr and CrCl were obtained at screening, baseline, and at 48-72+ or -6 hrs post-contrast. CIN was defined as an absolute increase > or equal to 0.5 mg/dL and separately as a relative rise in SCr > or equal to 25% from baseline to 48-72 + or - 6 hrs post-contrast.

RESULTS: A total of 153 patients were included in the final analysis (13 patients excluded because of: Lack of follow-up, hemodialysis immediately after contrast, insufficient number of protocol-mandated screening SCr measurements, or pre-contrast daily average CrCl variation >1%). The two study groups were comparable with regard to all baseline characteristics, including SCr and CrCl. An absolute increase > or equal to 0.5 mg/dL in SCr was observed in 2.6% (2/76) of patients receiving iodixanol-320 and in none of the patients receiving iopamidol-370 (95% CI [-6.2, 1.0], p=0.2). A relative > or equal to 25% increase in SCr occurred in 4.0% (3/76) of the patients receiving iodixanol-320 and in 3.9% (3/77) of the patients receiving iopamidol-370 (95% CI [-6.2, 6.1],p=1.0).

CONCLUSION: The rate of CIN was low and not statistically different in patients with moderate-to-severe chronic kidney disease after the administration of iopamidol-370 or iodixanol-320 for CE-MDCT.

4. IMAGE QUALITY AND DOSE REDUCTION IN MULTI-DETECTOR CT-UROGRAPHY: STUDY IN AN ANTHROPOMORPHIC PHANTOM.

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AIM OF WORK: To investigate visibility and delineation of the ureter at different anatomical levels and different computed tomography (CT) dose parameters using an anthropomorphic phantom.

PATIENTS & METHODS: The ureter phantom consisted of a human pelvis and lumbar spine in a box of water with two flexible tubes(diameter, 3mm) filled with iodinated contrast agent (300mgI/ml, dilution 1:10) simulating the ureter. The phantom was examined using two multi-detector CT scanners (Philips MX8000, 4-row, and Philips Brilliance 40, 40-row) with varying tube current time products (41-262mAs/slice at 120kV) and different collimations (0.67, 1.5 and 2.5mm for the 40-row CT and 1.3, 2, 3mm for the 4-row scanner, respectively). Visibility and delineation of the ureter was graded by two independent readers using a 4-point scale (1, very good, 2, good, 3, moderate, 4 poor) at 3 different anatomical levels (vertebral body L5, sacroiliac joint and lower

pelvis. Minimal necessary CT dose for reliable ureter visualization and delineation was evaluated for each level.

RESULTS: Visibility of the ureter was very good for all scanning parameters at 4- and 40-row CT independent of the anatomical level. Delineation of the ureter decreased with reduced tube current time product at all anatomical levels. However, minimal required dose was highest at the level of the sacroiliac joints, followed by the lower pelvis.

CONCLUSION: Delineation of the ureter depends considerably on the imaged anatomical level and the extent of dose reduction in CT urography. However, visibility of the ureter appears less critical.

5. Magnetic Resonance Urography for the Evaluation of Upper Tract Transitional Cell Carcinoma

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AIM OF WORK: To determine whether upper tract transitional cell carcinoma (TCC) can be detected on MR urography (MRU), and to review the MRU appearance of these tumors

PATIENTS & METHODS: 29 high-risk patients with bladder TCC (n=9), or history of TCC (n=20) underwent MRU to evaluate for upper tract TCC. MRU was performed using coronal and axial 3D and 2D SPGR sequences acquired in the arterial, nephrographic and excretory phases of enhancement following the administration of 250 cc of normal saline, 10-20 mg Furosemide, and 20 cc of gadopentetate dimeglumine. Prospective MRU reports were reviewed and two radiologists retrospectively reviewed the images of pathologically proven TCC to characterize the MRU appearance of these tumors.

RESULTS: 46 upper tracts were evaluated and 11 foci of TCC were found on pathology in 7 patients (size: 5mm-4cm). 8 of these tumors were prospectively identified on MRU and 3 tumors (less than 1cm)could not be visualized prospectively or retrospectively. Five tumors showed early enhancement of the urothelial mucosa associated with wall thickening and 3 presented as masses. There were 5 false positive MRU results due to wall thickening (n=1) and early mucosal enhancement with (n=3) or without (n=1) wall thickening, 3 false negative readings, and 13 true negative MR studies confirmed on pathology.

CONCLUSION: MRU is a useful imaging technique for the detection of upper tract TCC. Tumors manifest as areas of focal wall thickening associated with early enhancement of the urothelial mucosa, and a mass.

6. Nontraumatic Spontaneous Rupture of the Kidney: Etiology and CT findings

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AIM OF WORK: To study the usefulness of CT scan in determining the etiology of spontaneous rupture of the kidney.

PATIENTS & METHODS: We rerospectively analyzed the CT findings of spontaneous rupture of the kidney in eleven patients. Four were male and seven were female, and they were aged between 20 and 71(mean, 46.6)Both pre and post contrast enhanced CT scan was performed in all patients.

RESULTS: Spontaneous renal trupture was induced in seven cases by neoplasms, in three cases by infection or inflammation and in one, by renal cyst. Common CT findings of rupture of the kidney were the accumulation of high density fluid in the perirenal and anterior pararenal space and inhomogeneous irregular low density of renal parenchyma and the rupture site. Angiomyolipoma showed fat and an angiomatous component in the lesion, while acute and chronic pyelonephritis revealed thinning of the renal parenchyma and an irregular renal outline. Renal cell ca showed a dense soft tissue mass in the parenchyma. Well defined round low density lesions were noted in the case of renal cyst and renal abscess.

CONCLUSION: CT is very useful in diagnosing and determining the etiology of non -traumatic spontaneous rupture of kidneyand plays an important role in the evaluation of emergency cases

7. ENHANCEMENT FEATURES OF PAPILLARY AND CLEAR CELL RENAL CARCINOMAS

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AIM OF WORK: To compare the enhancement features of the various subtypes of papillary renal cell carcinoma and see if how they differ from clear cell renal carcinomas

PATIENTS & METHODS: The density measurements of 18 pathologically proven papillary renal cell carcinomas and 18 clear cell renal carcinomas were evaluated with unenhanced and nephrographic phase imaging. A region of interest was placed over the tumors in both phases of imaging to determine enhancement. Size, density measurement and degree of enhancement were compared.

RESULTS: The mean tumor size for both groups was 4 cm with mean age for papillary tumors being 65 years while that for clear cell was 56 years. Using the Welch 2 sample t-test assuming unequal variances, there were no significant differences in mean pre-contrast density between the two tumor types (p=0.97), but mean post-contrast density for papillary tumors was 62.1 vs 88.3 for clear cell carcinomas (p=0.002) and the pre to post contrast density difference between the tumor types was also significant (p=0.003). Among the papillary tumors, some Type I and Type II tumors were large and heterogenous.

CONCLUSION: Papillary and clear renal cell carcinomas cannot be distinguished on unenhanced images. However papillary tumors demonstrate significantly less enhancement as well lower pre to post contrast density difference compared to clear celltumors; however, papillary tumors of both subtypes can be quite large and heterogeneous.

8. ARTIFACTUAL WALL THICKENING OF CYSTIC RENAL MASSES ON MRI

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AIM OF WORK: Simple renal cysts seen on CT/US can appear thick-walled on MRI, thereby "upgrading" them on the Bosniak system. We hypothesized that wall thickening can be artifactual, due to data truncation, partial volume effects, and post-acquisition processing.

PATIENTS & METHODS: Simulated k-space data for a 4cm cyst were created in a 40cm FOV (512x512 matrix). Additional k-space data sets were created using the central 256x256 and 256x128 points. Noise was simulated such that cyst SNR was ~7, 14, and 20 for the three images, respectively. Actual cyst wall thickness was set at 0.25mm, and cyst:wall signal at 1:4. An inverse 2DFFT yielded simulated images. A Fermi filter was applied to reduce ringing (norm on GE

scanners). Images/profiles were examined for wall thickening. Seven patients with initially thick-walled renal cysts on FS-SPGR images, were scanned with increasing resolutions (256x128, 256x256, 512x512). Wall thicknesses were measured, and the average measurement at each resolution compared to the others using a two-tailed paired Student's t-test.

RESULTS: Simulations showed apparent cyst wall thickening at low resolution, and predictably improving with higher resolutions. was confirmed in seven patients, whose cyst walls proved to be artifactually thickened on low resolution imaging, more marked in the phase encoding (PE) direction, and becoming thinner as resolution improved ($p<0.01$, 128vs256, 256vs512, 128vs512 PE steps).

CONCLUSION: Thickening of cyst walls on MRI can be artifactual. Upon encountering thick walled cystic renal lesions clinically, higher resolution images should be acquired to exclude apparent thickening, and the direction of wall thickness (its relationship to the PE direction) should also be considered.

Saturday, September 9th; 16:00 – 17:30

Scientific Session III

Location: Hall C

1. Role of Dynamic Ultrafast MR imaging in the Assessment of Stress Urinary Incontinence

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AIM OF WORK: The aim of this study is to evaluate the efficacy of dynamic ultrafast MRI in the assessment of stress urinary incontinence (SUI) as well as its role in the evaluation of the pelvic floor anatomy and laxity among incontinent and continent women.

PATIENTS & METHODS: The study included 30 female patients with different degrees of stress incontinence. Thirty continent females with different obstetric history constituted our control group and where divided into three groups, nulliparous (n=10), those with previous vaginal delivary (n=10) and those with previous cesarean section (n=10).MR imaging of the pelvic floor was performed using axial T2-weighted fast spin-echo images followed by mid-sagittal ultrafast T2-weighted single-shot fast spin-echo images before and after straining. Cystography was performed for all 30 patients with stress incontinence. The bladder neck position, vaginal vault position and urethral angle were evaluated before and after straining on the MRI and cystography images and in both the continent and incontinent group of patients.

RESULTS: The mean distance between the bladder neck and the pelvic floor did not differ among the four groups at rest. No statistically significant difference was found in the degree of bladder neck descent on both dynamic MRI and cystography in the incontinent group of patients P = 0.1). On dynamic MRI bladder neck descent was found to be greater in the incontinent group (3.8 + 1.0 cm) than in the continent group (1.3 + 0.9 cm) and the difference was statistically significant (P = 0.0001). Bladder neck descent was greater in continent females with vaginal delivary (2.0 + 0.7 cm) than in the continent females with previous cesarean section (1.3 + 0.5 cm) (P = 0.05).

CONCLUSION: Dynamic ultrafast MRI is an accurate and valuable technique that can be used for the assessment of patients with SUI. In addition to being non-invasive, the technique is without radiation hazards and shows the pelvic floor anatomic details that are not seen on conventional cystogrpahy.

2. Detection Of The Bladder Tumor With 3D Ultrasound Andvirtual Sonographic Systoscopy

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AIM OF WORK: Bladder tumor is one of the most common types of malignant neoplasm of the urinary tract. The purpose of this study was to evaluate the role of 3D ultrasound and sonographic cystoscopy in the detection of the bladder tumors. To our knowledge this is the first report about 3D ultrasound and sonographic cystocopy of the bladder tumors.

PATIENTS & METHODS: Twenty-eight patients with suspected or known bladder tumors were included this study. All patients examined 3D ultrasound and conventional cystoscopy within 15 days. The number, size, location, and morphologic features of the lesions were evaluated on gray scale, 3D virtual, and MPR images obtained with the patients. The lesions were recorded as polypoid, sessile or wall thickening. The results of 3D sonographic cystoscopy were compared with the findings conventional cystoscopy, which is considered gold standard.

RESULTS: Twenty-five (89.2 %) of 28 3D virtual sonographic cystoscopy were good or excellent image quality. Images in three examinations were suboptimal due to inadequate bladder distention. Two of these patients had wall thickening, one of them had sessile tumor. Gray scale sonography with MPR demonstrated tumoral lesion with extravesical extension in these patients. Conventional cystoscopy revealed 37 lesions in remained 23 of 25 patients, 3D ultrasonographic virtual cystoscopy detected 32 (86.4 %) of these 37 lesions.

CONCLUSION: 3D-US is a promising alternative non-invasive technique for use in the detection of bladder tumors and its localization and perivesical spreads. This study demonstrated that 3D-US and virtual sonographic cystoscopy is a feasible technique for use in the detection of bladder lesions greater than 5 mm. The location, size, and morphology of the tumors shown on 3D-US images were agreed well with the findings of conventional cystoscopy.

3. Adnexal masses: Accuracy of characterization with multidetector CT on a 16-row CT scanner

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AIM OF WORK: The aim of our study was to assess the accuracy of multi-detector CT on a 16-row CT scanner in the detection and characterization of adnexal masses.

PATIENTS & METHODS: We prospectively examined 69 women with clinically or sonographically detected adnexal masses. The CT protocol included scanning of the abdomen after intravenous administration of nonionic contrast material on the portal phase using a detector collimation of 16 X 0.75 mm and a pitch of 1.2. Multiplanar reformatted images were evaluated for the presence of an adnexal mass lesion and differentiation between benign and malignant ones, using the surgical and pathologic findings as the standard of reference.

RESULTS: A total of 87 lesions were examined (62 benign and 25 malignant). MDCT detected 82 of the 87 (94%) adnexal masses. In differentiating between benign and malignant adnexal masses MDCT had a sensitivity of 83 %, specificity of 93 %, a positive predictive value of 83 % and a negative predictive value of 93 %.

CONCLUSION: Multidetector CT on a 16-row CT scanner demonstrated satisfactory results in the detection and characterization of adnexal masses.

4. IS THERE A ROLE FOR CT IN ROUTINE FOLLOW UP OF TREATED OVARIAN CANCER

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AIM OF WORK: The National Cancer Institute in the USA recommends no CT in the follow-up of women with treated ovarian cancer. A unique UK national trial afforded us an opportunity to test this empirical advice.

PATIENTS & METHODS: 97 patients who had been randomized to maintenance interferon or no further treatment following surgery and/or induction chemotherapy for stage IC to stage IV ovarian cancer within a national phase III clinical trial, were retrospectively evaluated. The trial protocol stipulated clinical follow-up with CA125 estimates every two, three, four months during the first, second and third year after randomization, and six monthly thereafter. Routine CT was performed every six months for the first two years or with concern for relapse.

RESULTS: 66 patients were completely assessable and included in the final analysis of whom 54 patients were CA125 marker positive (MP) at diagnosis and 12 were CA125 marker negative (MN). In the MP patient group progressive disease (PD) was diagnosed by clinical and/or rising CA125 in 47 of 51 patients (92.2%). Three remain in remission with a complete response (CR). Of the 12 MN patients 8 relapsed but only 2 were found to have PD on clinical and/or CA125 criteria (25%) with six (75%)found to have PD on CT alone. Four MN patients remain in remission.

CONCLUSION: The majority of MN patients in this study with PD were identified by CT alone and therefore, regular follow up CT should be considered in this small patient subgroup. Clinical assessment and estimation of CA125 in MP patients identified over 90% of PD in MP patients, thus supporting the NCI recommendation that routine CT scanning is not indicated in follow-up of treated ovarian cancer.

5. 3T MRI ACCURACY IN PREOPERATIVE EVALUATION OF ENDOMETRIAL CARCINOMA

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AIM OF WORK: To assess the diagnostic accuracy of 3T phased-array MRI in evaluating the degree of myometrial infiltration and cervical involvement in endometrial carcinoma.

PATIENTS & METHODS: 3T phased-array MRI was performed in 36 patients (mean age 63,07 ± 14,64 years) with biopsy-proven endometrial carcinoma. Sequences used: Axial T1w SE, Axial T2w fat-suppressed SE, Sagittal and Paracoronal T2w SE, Para-coronal THRIVE and Sagittal T1w SE after Gadolinium-DOTA administration. Histerectomy was performed in all the patients within one month. Anatomical findings, considered as the gold standard, were compared to MRI results in assessing the depth of myometrial invasion and the cervical involvement. A statistical evaluation was performed and our results were compared with those reported in literature.

RESULTS: At histology 6 cases of intramucosal neoplasm were detected, 6 with invasion < 50%, 16 with invasion > 50% and 8 cases with transmural involvement. At MRI, 2 cases of intramucosal cancer were not detected, while the degree of myometrial invasion was understaged in 2 patients. Cervical involvement was found in 8 patients and all confirmed at histology, with 100% accuracy. In assessing the degree of myometrial invasion, concordance between MRI results and anatomical findings was 88.8%, with mean sensitivity, specificity and accuracy respectively of 88.5%, 93.3% and 95.3%. K index was 0.97.

CONCLUSION: 3T MRI can be considered a reliable tool in preoperative evaluation of endometrial cancer, since its diagnostic performance in assessing myometrial and cervical invasion sets at the highest rate reached with 1.5 T MRI.

6. TRANSRECTAL ULTRSOUND GUIDED OCTANT BIOPSY OF PROSTATE IN THE MANAGEMENT OF PATIENTS WITH BORDERLINE SERUM PROSTATE SPECIFIC ANTIGEN (4-10NG/ML): AN INDIAN SCENARIO.

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AIM OF WORK: The key elements in the early detection of prostate cancer are digital rectal examination (DRE) and prostate specific antigen (PSA) estimation. These tests may trigger transrectal ultrasound (TRUS) guided biopsy of the prostate for the provision of histological diagnosis. Serum PSA >10 ng/ml is clearly suggestive of prostatic carcinoma and levels < 4 ng/ml nearly exclude the diagnosis. However, management decision in patients with borderline serum PSA (4-10 ng/ml) is usually difficult.The aim of the study was to evaluate the prevalence of prostate cancer in patients with borderline serum PSA (4-10 ng/ml).

PATIENTS & METHODS: We prospectively studied 100 patients (age group 55 to 75 years) with clinical diagnosis of benign prostate hyperplasia (BPH) having borderline serum PSA (4-10 ng/ml). All these patients were subjected to TRUS and subsequent TRUS guided octant biopsy of prostate. All samples were individually subjected to histopathological examination (HPE) to diagnose or exclude malignancy. Gleason's score was calculated in all positive cases of prostate cancer.

RESULTS: Of the 100 patients, 12 (12%) showed focal hypoechoic lesion suspicious for cancer in peripheral zone (PZ) of prostate on TRUS, but malignancy was confirmed only in 8 of these on HPE. Thus TRUS had sensitivity rate of 67% in diagnosing prostate cancer. In 4 patients (4%) who had normal prostate on TRUS, cancer was detected by random sampling of PZ. This showed that TRUS alone is not reliable to detect or exclude prostate cancer.

CONCLUSION: TRUS guided octant biopsy should be undertaken when serum PSA level is >4 ng/ml. Prevalence of prostate cancer in our study was 12. Octant biopsies of prostate are particularly valuable when serum PSA levels are in borderline range and no evidence of cancer is found on DRE.

7. ROLE OF LOCAL PERIPROSTATIC NERVE BLOCK VERSUS INTRARECTAL LIDOCAINE GEL IN PAIN REDUCTION DURING TRANSRECTAL ULTRASOUND-GUIDED BIOPSY OF THE PROSTATE

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AIM OF WORK: To evaluate the role of local anesthesia in reducing pain during transrectal ultrasound-guided prostate biopsy (TRUSPB). Two methods are compared; local periprostatic nerve block and instillation of intrarectal lidocaine gel. Also, this study aims to assess if there is increase in the incidence of complications when employing either methods.

PATIENTS & METHODS: From August 2004 to February 2006, 218 patients underwent TRUSPBs. Patients were randomized into 2 equal groups; either to have bilateral periprostatic nerve block by 10 cc of 1% lidocaine solution injected under ultrasound guidance (Group I), or placement of 10 cc of 2% lidocaine gel intrarectally (Group II). Pain during biopsy was assessed using a 10-point Linear Visual Analog Pain Scale

RESULTS: The mean pain score was 2.4 for patients in group I, and was 3.7 for patients in group II . There was statistically significant difference in the range of pain scores among the 2 groups, where 86% of patients in group I had a score less than 5 compared to only 60% of patients in group II who had the same range of pain score. TRUSPBs under local anesthesia using local periprostatic nerve block had no significant increase in the incidence of complications.

CONCLUSION: Patients should have local anesthesia prior to TRUSPBs to decrease the procedure pain and improve the patients tolerance permitting the number of biopsy cores to be increased as necessary without increasing patients' distress. Local periprostatic nerve block is more efficient than intrarectal lidocaine gel in controlling pain with no significant increase in complications incidence.

8. MR-GUIDED PROSTATE BIOPSY IN A CLOSED MR-SCANNER AT 1.5 TESLA

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AIM OF WORK: To investigate a biopsy device for MRI-guided transrectal biopsy of the prostate.

PATIENTS & METHODS: The MR-compatible biopsy device comprises a needle guide that is visualized by MRI and controlled mechanically from outside the MR imager, which allows for MRI-guided positioning and removal of biopsies in a closed MR imager at 1.5 Tesla using a body phased-array-coil. A total of 16 patients have so far been examined. They had elevated PSA levels of 5,7 to 82,2 ng/ml and one or several suspicious areas in the prostate at prebiopsy prostate MRI (combined endorectal body phased-array coil). These patients underwent removal of up to nine prostate biopsy cores in the prone position using automatic and semi-automatic MR-compatible (16-G) needles guided by MRI.

RESULTS: The needle guide could be visualized and positioned in all cases. Histology of the biopsy specimens confirmed prostate cancer in 8 of the 16 patients. In one patient, the suspicious basal areas could not be reached with the biopsy device. In the other 7 patients, histology demonstrated prostatitis rather than prostate cancer. No complications were observed.

CONCLUSION: The device investigated here allows for obtaining MRI-guided biopsies of prostate areas suspicious for cancer on MR images.

9. PHASED ARRAY 3T-MRI IN PREOPERATIVE STAGING OF PROSTATE CANCER.

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AIM OF WORK: To assess the diagnostic accuracy of torso phased-array 3T MRI in preoperative staging of prostate carcinoma.

PATIENTS & METHODS: From September 2004 and July 2005, 32 consecutive patients, ranging in age between 57 and 70 years (mean 66 years), affected with ultrasound-guided biopsy proven prostate cancer, underwent, before surgery, to torso phased-array 3T MRI.The images were jointly evaluated by two radiologists experienced in prostate MRI.The diagnostic accuracy of 3TMRI in assessing the local tumor stage was calculated, assuming the histological evaluation of the resected prostate specimen as the reference test.

RESULTS: The sensitivity, specificity, positive predictive value and negative predictive value in evaluating extracapsular tumor spread were respectively 78%, 86%, 87% and 75%.

CONCLUSION: The diagnostic accuracy of 3TMRI in detecting extracapsular tumor is similar to that achievable with endorectal-coil 1,5 T MRI. Therefore it can be used in preoperative local staging of prostatic cancer.

Saturday, September 9th; 16:00 – 17:30

Young Radiologists' Session

Location: Hall D

1. POTENTIAL OF MRI IN DETECTION AND MIGRATION MONITORING OF SPIO-LABELED STEM CELLS IN RATS WITH ACUTE RENAL FAILURE AT 3T.

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AIM OF WORK: To evaluate magnetic resonance imaging (MRI) for a quantitative and qualitative in vivo monitoring of intraaortal injected iron oxide-labeled MSC into rats with acute kidney injury (AKI).

PATIENTS & METHODS: T2*w MR Imaging and T2*/R2* Relaxometry were performed in rats before and at different time points up to 2 weeks after ischemic/reperfusion AKI and intraaortal injection of MSCSPIO, cell culture medium or SPIO particles alone using a clinical 3T scanner (Philips Intera) with a dedicated animal coil. SNR, R2* and T2* of kidneys, liver, spleen and bone marrow were assessed and tested for statistical significance (student's t-test, $p<0.05$). Renal function (CREA, BUN), histology (H&E, Prussian blue, CD68 immunohistochemistry), body weight and kidney volume were monitored.

RESULTS: MSCSPIO administration resulted in a significant renal SNR reduction (35±15%) and an R2* increase (101±18.3%) with MSCSPIO predominance in renal cortex in contrast to an AKI-induced increase of SNR/T2* in control animals (medium, SPIO). Liver, spleen and bone marrow showed a delayed SNR decline/R2* increase in MSC animals caused by migration of MSC in contrast to an immediate signal loss in SPIO control animals. The increase of kidney volume and the decrease in renal function and body weight was reduced in MSC treated animals ($p<0.05$).

CONCLUSION: This study demonstrates the potential of MRI for qualitative and quantitative in-vivo cell-tracking and monitoring of organ distribution of magnetically labeled MSC in AKI.

2. A TRILATERAL COMPARISON OF SPLIT RENAL FUNCTION WITH RESPIRATION-TRIGGERED DYNAMIC MRI, GAMMA CAMERA RENOGRAPHY AND COMPUTED TOMOGRAPHY

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AIM OF WORK: The aim of this study was to evaluate a respiration-triggered, dynamic and contrast-enhanced MRI sequence using a low dose of Gd-DTPA for measurement of split renal function. The results were compared with both gamma camera renography and computed tomography.

PATIENTS & METHODS: In a study group of 25 patients, 99mTc-MAG3 renography was performed to evaluate the presence of renovascular hypertension. Split renal function was calculated with a Patlak plot. The same subjects also underwent a dynamic MRI study including 200 two-dimensional respiration-triggered scans, with 2 mL Gd-DTPA administered intravenously. Split renal function was calculated from the area under the signal-time curve. In a subset including

15 of the patients, a CT scan was also performed and the total attenuation values of each kidney were used to estimate split renal function.

RESULTS: The average difference between MRI and renography expressed as right kidney's function in per cent of the total was -3.1 ± 6.6 (-19 – 10) percentage points. The comparison between renography, MRI and CT indicated close relationships in all three cases with correlation coefficients between 0.92 and 0.94. None of the three methods diverged considerably from the other two.

CONCLUSION: MRI offers the possibility of acquiring a dynamic study of the individual kidney's relative function, and respiration-triggered imaging is a robust method for continuous long-time imaging. The results are well comparable with the standard scintigraphic method. An estimation based on a single sequence CT scanning gives results not differing from the other two methods.

3. IMAGING APPEARANCES OF AUTOSOMAL RECESSIVE POLYCYSTIC KIDNEY DISEASE: THE RELATIONSHIP BETWEEN HEPATIC AND RENAL FINDINGS IN THE CHILDHOOD FORM OF THE DISEASE.

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AIM OF WORK: It is traditionally thought that the neonatal form of Autosomal Recessive Polycystic Disease (ARPKD) is predominantly a renal disease with only minor hepatic disease whereas the childhood form emphasizes hepatic dysfunction while renal disease is relatively mild. We sought to explore the relationship between liver and renal disease in ARPKD using sonography and MRI of the abdomen.

PATIENTS & METHODS: 28 Children with clinically confirmed ARPKD who ranged in age from 2-18 years were evaluated with sonography and MRI. Two children were unable to undergo MRI because their parents did not consent to the MRI. Evaluation of imaging included the degree of liver disease, biliary cysts and dilation and renal disease.

RESULTS: The liver demonstrated varying degrees of increased echogenicity reflecting hepatic fibrosis. Biliary cysts were found in the right lobe and were sometimes accompanied by biliary dilation. The kidneys were typically enlarged with cystic ductal ectasia and punctuate echogenic foci. There was no consistent relationship between the degree of liver, biliary and renal disease. Congenital hepatic fibrosis was demonstrated by severely increased echodensity but was associated with mild (medullary only) to severe (medullary and cortical) disease in the kidneys. Biliary cystic disease was similarly associated with mild to severe renal disease. Biliary disease was best depicted on MRCP sequences whereas liver and renal pathology was more easily identified on sonography.

CONCLUSION: There is no consistent relationship between hepatic, biliary and renal cystic changes in the childhood form of ARPKD. ARPKD appears to present as a spectrum of hepatic, biliary and renal disease that overlaps in all three areas.

4. WHAT IS THE CLINICAL IMPORTANCE OF REFLUX MISSED ON FLUOROSCOPIC VOIDING CYSTEOURETHROGRAPHY AND DEMONSTRATED ONLY BY CONTRAST-ENHANCED VOIDING UROSONOGRAPHY?

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AIM OF WORK: Contrast-enhanced Voiding-urosonography(CE-VUS) has been found with higher sensitivity compared to fluoroscopic-voiding cysteourethrography(VCUG).The purpose of our study

is to evaluate the clinical importance of reflux missed on VCUG and demonstrated only by CE-VUS as an expression of pathological findings on renal cortical scintigraphy (DMSA).

PATIENTS & METHODS: A total of 146 refluxing children on either VCUG or VUS(61 males, 85 females, median age: 1.83 years) were also studied with DMSA within 6 months following the first proven UTI.Ninety-nine of them read VUR positive on both examinations while the remaining 47 ones only on VUS using harmonic imaging and a 2nd generation U/S contast-agent (SonoVue®,Bracco,Italy).Kidney abnormalities associated with VUR were excluded from our study. Results of reflux on both examinations were studied in association with DMSA findings using McNemar's, chi-square, t-Student's and Fisher's statistical tests. Results were analyzed according to age (<2yrs, >2yrs).

RESULTS: Overall 204 refluxing and 88 nonrefluxing KUU were evaluated. Renal damage was detected in 47/204 refluxing KUU(23%) and in 3/88 nonrefluxing ones(3.5%).The difference in renal scar formation between children refluxing and non-refluxing on either method was significant (p<10-6).No significant difference in scar formation was found between 9 children(10/94KUU:10.6%)with reflux missed on VCUG and demonstrated only on VUS vs 37/198KUU:18.6% from 99 children refluxing on both methods(p=0.2).The incidence of scar formation was more common in children <2yrs (25/176KUU:14.2% vs 13/116:11.2%)

CONCLUSION: Reflux missed on VCUG and demonstrated only on CE-VUS correlates positively with renal scar formation especially in younger age group and higher grades of VUR.

5. IMAGIOLOGICAL ASPECTS OF PERSISTENCE AND RECURRENCE OF CERVICAL CANCER

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AIM OF WORK: To evaluate imagiological and clinical findings of persistence and recurrence of cervical cancer.

PATIENTS & METHODS: We reviewed clinical files and radiological exams of 489 patients with histological proven cervical cancer diagnosed in 1997-98.

RESULTS: The patients' mean age was 53.7 years, raging 23–91. Pathological diagnosis revealed 82.4% of squamous cell carcinoma and 11.8% of adenocarcinoma. FIGO staging showed 4.6% of patients in stage IA or less, 24.4% in IB, 45.5% in II and 17.4% in III and greater. Persistence occurred in 14% (n=70) of women and increased with higher stage. 52.9% died, within an average of 13.8 months. Local tumor progression caused fistulas (n=7), hydronephrosis (n=15), colon occlusion (n=4), ascites (n=2), pelvic abscess (n=2) and urethral stenosis (n=1) in which imaging was helpful. Recurrence was diagnosed in 16.5% of patients and didn't increase with higher stage nor was related to histological type. 62.2% of these presented as a central mass in pelvis or regional lymph node metastasis. Lungs were the most common site of distant involvement (32.4%) followed by bone (16.2%), liver (16.2%) and brain (12.1%). Metastatic lymphadenopathy was more frequent in para-aortic (50.0%), supraclavicular (17.4%) and mediastinal nodes (13.0%). Recurrence occurred in average 23.9 months after therapy (range 5.8–84.8 months).

CONCLUSION: Cervical cancer is a prevalent disease in Portugal, still diagnosed in advanced stages. Recurrence and persistence are common, and imaging is helpful to identify them during follow-up. Care must be taken to include distant lymph nodes, such as para-aortic and mediastinum. Recurrence appeared to be independent of clinical stage greater than IA.

6. Dynamic Contrast Enhanced MRI Of The Prostate – Evaluation Of The Dynamic Series By A New Software Application - Preliminary Results

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AIM OF WORK: This study introduces a dynamic contrast-enhanced (DCE) MRI protocol and software application for MRI examination of the prostate to detect prostate cancer in the peripheral and transitional

zone of the prostate. The results of the MRI examination were compared with the histo-pathological results after prostatectomy.

PATIENTS & METHODS: Seven (7) patients (median age of 66 yrs.) were included in the study. Patients underwent MR imaging at 1.5 Tesla Siemens Avanto, Erlangen, Germany) using a combined endorectal and pelvic phased-array coil. A transversal T2 weighted sequence (3mm slice thickness) was performed in all patients, followed by a transversal T1-weighted sequence (3mm slice thickness) using a 256x256 matrix before contrast media injection (mask image). Finally a T1-weighted dynamic series (3mm slice thickness, 128x128 matrix) with a high temporal resolution of 35 seconds per phase was performed before and following contrast administration. These "fast" T1-weighted sequences were repeated 6 times after starting the contrast media bolus (injection rate: 4ml contrast media/sec; 0.2 ml Gd-DTPA/kg BW). DCE T1-weighted sequences were evaluated by a dedicated software application (CAD Sciences, White Plains, New York, USA). The software also combines the mask image and the dynamic series to produce a high resolution parametric analysis (256x256 matrix) using a 4–compartment Tofts pharmacokinetic model.Using both, T2-weighted images and parametric images derived from the dynamic series, tumor areas were marked and correlated with histo-pathological results after prostatectomy.

RESULTS: In 6 of 7 patients the DCE-sequences software evaluation pointed out suspicious tumor areas, all but one were multifocal. In 6 of 7 patients the defined tumor areas corresponded with the histo-pathologically defined tumor areas. Only in one patient the DCE-sequences software failed due to extensive motion artefacts of the patient.In 3 of 7 patients stage T3 was diagnosed by MRI. All of the T stages were confirmed by histopathology.

CONCLUSION: Preliminary results show that DCE-sequences software evaluation improves the diagnostic accuracy of carcinoma detection within the peripheral and transitional zone of the prostate.

7. Fast non-invasive 3D proton-MR Spectroscopic Imaging of the in vivo Human Prostate at 3 Tesla

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AIM OF WORK: To investigate if MRSI of the prostate with a combination of external surface coil elements at 3T can differentiate between cancer and healthy tissue throughout the whole prostate using whole-mount section histopathology as standard of reference.

PATIENTS & METHODS: After written informed consent, 45 men (age range, 51 to 70 years) underwent MR imaging at 3T with external surface coils for signal reception. MRSI was done with an acquisition-weighted 3-dimensional water-lipid suppressed point resolved spectroscopy pulse sequence of ~9 minutes. Based on whole-mount section histopathology of resected prostates, 1 to 4 voxels per tissue were retrospectively classified into healthy peripheral zone, central gland, (peri-)urethral zone and cancer. Cancer voxels were further classified according to cancer size and a radiological measure for matching certainty of histopathology and MRI. After visual inspection of automated fitting of classified voxels the choline + creatine to citrate ratio (CC/C) was calculated

for all tissues. ROC curves were used to assess the accuracy of discriminating cancer from different healthy tissues.

RESULTS: After excluding 4 patients with no useful voxels, a median of 82% of the classified voxels per patient passed visual inspection and was used in the analysis. CC/C of all healthy tissues differed significantly from cancer (P<.001). AUCs for discriminating cancer from healthy tissue were .84 for the peripheral zone and .69 for the complete central gland.

CONCLUSION: 3D proton-MRSI of the complete prostate with a combination of external surface coils at a magnetic field strength of 3T can be used to discriminate cancer from healthy tissue.

8. IMAPS: AN INTERNATIONAL MULTI-CENTRE ASSESSMENT OF PROSTATE MR SPECTROSCOPY

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AIM OF WORK: To prove in an ongoing multi-center trial that proton-MR spectroscopic imaging data (at 1.5T) allows for both detecting and localizing prostate carcinoma in the two major anatomic areas of the prostate.

PATIENTS & METHODS: 67 male patients (from 8 institutions) with proven prostate cancer who were to be treated with a radical prostatectomy had signed a locally approved informed consent form before the MR exam. Pulse sequence: 3D spectroscopic imaging with water/lipid suppression and an echo time of 120 ms for use on 1.5T Siemens Magnetom scanners. With a short TR (650 ms) and a weighted acquisition scheme the total acquisition time is between 10 and 12 minutes. Voxel assignment: A spectroscopist and radiologist classified at least 1 to 4 independent voxels to 4 different tissues in the prostate, blinded to the spectra, on the basis of the histopathological analysis of the complete prostate and the MRSI matrix overlaid on T2-weighted images. From these voxels values for the Choline+Creatine to citrate ratio (CC/C ratio) were calculated as a marker for tumor tissue.

RESULTS: The mean CC/C (± SD) for healthy tissue in patients is 0.31 ± 0.14 for the peripheral zone, 0.38 ± 0.15 for the central gland, 0.43 ± 0.23 for the (peri-)urethral zone. The median CC/C for tumor tissue is 0.77, with 25% percentile 0.54. At CC/C thresholds of 0.45 (PZ) and 0.53 (CG) the specificity / sensitivity of discriminating cancer from healthy tissue is respectively 0.85 / 0.82 and 0.77 / 0.73.

CONCLUSION: Although CC/C ratios of tumor voxels overlap with healthy tissues, these values can be used to detect and localize prostate cancer.

POSTER ABSTRACTS

POSTER 1:

CT FINDINGS OF ACUTE ABDOMEN IN UROGENITAL FIELD

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Acute abdomen is common clinical situation induced by various diseases, and it is very important to differentiate surgical emergency from medial disease in clinical field. In the diagnosis and differential diagnosis of urogenital diseases, CT is one of important & useful imaging modalities

Aim of Work: To define and demonstrate the important CT findings of various diseases causing acute abdominal and/or pelvic pain in urogenital field.

Patients & Methods: Among 25,032 patients who received CT due to acute abdominal and/or pelvic pain in our hospital during recent 10 years, 5,215 patients with available CT and final diagnosis of urogenital disease were retrospectively analyzed by two radiologists.

Results: CT findings of the various disease entities causing abdomen and/or pelvic pain in urogenital field will be discussed and illustrated, such as pelvic inflammatory disease, tubo-ovarian abscess, ruptured ovarian cyst causing hemoperitoneum, ovarian torsion, ectopic pregnancy, endometriosis, adenomyosis, acute pyelonephritis, renal abscess, renal infarction, renal injury, urinary stone, and inflammation in vas deference, etc.

Conclusion: Familiarity with these urogenital CT findings that cause acute abdominal and/or pelvic pain will allow the radiologists & clinicians to guide appropriate treatment of affected patients and may eliminate the need for further imaging evaluation.

POSTER 2:

PRUNE BELLY SYNDROME: IMPORTANCE OF MRI TO DETECT COMPLEX UROGENITAL MALFORMATIONS IN PUBERTY

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Aim of Work: The aim of the study is to demonstrate that a complete definition of the complex urogenital alterations can be obtained only by a prolonged follow-up.

Patients & Methods: A two month aged child affected by Prune Belly Syndrome (PBS) was referred to our Institution and followed up for ten years. At first observation, clinical evaluation, ultrasonography, CUM and MRI demonstrated bilateral testicular ritention, right kidney hypoplasia, left refluent bilateral megaureter, hypotonic bladder and dilation of neck bladder/proximal tract of posterior urethra. Patient underwent left orchidopexy and right nephroureterectomy. Ultrasonographic and CUM controls, performed until patient was 9 year aged, showed only inconstant left RVU and posterior urethra without impressions. At last follow-up, the clinical status was complicated by nephrite.

Results: Last ultrasonography and MRI examinations confirmed kidney inflammation. On the bases of the only MRI, prostatic hypoplasia was suspected, never reported at previous controls

Conclusion: Several genito-urinary alterations affecting social and relational life of PBS patients can be detected only in late physical development of these young patients. Therefore, PBS patients need to be studied not only in the first months of life to detect early the most common malformation of genito-urinary tract, but also during puberal development. MRI is the powerful examination to detect complex uro-genital malformations.

POSTER 3:

SPECTRUM OF ANGIOGRAPHY FEATURES OF RENAL FIBROMUSCULAR DYSPLASIA: A PICTORIAL REVIEW

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Aim of Work: To evaluate the varied imaging features of renal fibro-muscular dysplasia(FMD) and its mimics by catheter angiography and its impact on subsequent angioplasty.

Patients & Methods: We retrospectively looked at 16 patients who underwent renal angiography at our institution for the main indication of resistant hypertension secondary to FMD over a 10-year period.

Results: All the patients underwent catheter angiography.Fifty percent of these patients exhibited typical angiographic features of FMD. Seven patients went on to have transluminal angioplasty

Conclusion: Knowledge of the typical and atypical features of renal FMD and its mimics facilitates accurate diagnosis and aids subsequent angioplasty.

POSTER 4:

IMAGING OF URETHRAL DISEASE: PICTORIAL REVIEW

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Aim of Work: To review adult urethral anatomy, to describe the pathological entities, and to evaluate the current role of imaging in these processes.

Patients & Methods: We reviewed the current literature as well as our combined imaging material of normal and abnormal urethras on this topic. While we emphasized urethrography with its pitfalls of other imaging techniques were reviewed and presented. The key features of the urethral diseases on contrast urethrograms and cross-sectional imaging studies were illustrated with representative examples.

Results: This study included 1) congenital abnormalities (duplication and Cowper's syringocele), 2) traumatic injuries (penetrating, blunt and iatrogenic) including post-traumatic and post-irradiation urethral fistulae, urethral injury associated with rupture of corpus cavernosum, and urethral disruption after pancreatic transplant, 3) acute and chronic inflammatory diseases (gonorrhea, tuberculosis, and condyloma acuminatum) including urethral stricture, periurethral abscess and fistulae, 4) urethral stricture disease, 5) acquired urethral diverticula, 6) urethral stones (native and migrant), and 7) primary neoplasms including squamous cell carcinoma, transitional cell carcinoma, and adenocarcinoma and metastatic tumors.

Conclusion: One can become familiar with urethral disease and its imaging manifestations. Clinical information is often essential in both initial diagnosis and in treatment planning.

POSTER 5:

MALIGNANCY IN FUSED KIDNEYS: REPORT OF THREE CASES

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Aim of Work: Within renal aberrations, the most frequent one is the horseshoe kidney. Adenocarcinoma is the most common primary renal neoplasia. The association of tumor and horseshoe kidney is uncommon, with only 135 cases described in the literature. Association of

tumor with crossed-fused ectopia is exceedingly rare. There are rare reports of cases combining Abdominal aortic aneurysm and RCC in Horse shoe kidney.

Patients & Methods: During the past 7 years 3 patients with fusion anomalies & tumor have been diagnosed at our institution. Two cases of horse shoe kidney with RCC and Wilm's tumor. One case of RCC in crossed fused ectopia. The clinical, diagnostic peculiarities of each case are presented and the recent literature on this topic is reviewed. The primary imaging is CT in all the cases. We are showing CT Angiography, done in a RCC in our Multislice CT.

Results: One case of renal cell carcinoma, in horse shoe kidney with skeletal and pulmonary secondary deposit is reported. There is metastasis to mandible. Other case of Wilm's tumor in Horse shoe kidney with Pulmonary metastases is illustrated. The third is a case of Renal cell carcinoma in Crossed fused ectopia.

Conclusion: The commonest tumor reported in kidney fusion anomalies is renal cell carcinoma, although its reported incidence is no higher than that in the normal population. In the case of transitional cell carcinomas, diagnosis is usually made at an advanced stage. The value of thorough urologic and radiological investigations is stressed. Angiography, whether classical or in combination with multi-slice CT, is considered essential in order to confirm renal anomalies and the tumor situation and to plan the surgical app

POSTER 6:

MR IMAGING AND H MR SPECTROSCOPY IN THE EVALUATION OF PROSTATE CANCER.

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Aim of Work: the prostate cancer is second most common cause of death for cancer in men. The aim of this scientific topic is the evaluation of diagnostic performance and accuracy of MR imaging and of H MR spectroscopy imaging in the diagnosis and staging of prostate cancer.

Patients & Methods: Between April 2005-January 2006 MR and MR Spectroscopy were performed in 58 patients enrolled on the basis of PSA value, rectal exploration and transrectal ultrasound. The examinations were performed with a 1,5 T imager with endorectal coil, without

intravenous contrast injection, using the following sequences: axial and coronal T2 FSE, from seminal vesicles to the prostate apex, axial T1 SE with the same spatial coordinates as the T2, axial T1 SE from aortic bifurcation to the prostate apex, and PRESS 3D CSI (spectroscopy sequence).

Results: The MR imaging detected 45/58 positive cases for

carcinoma, the integrated imaging (MR+MR Spectroscopy) improved the total positive cases up to 52. The transrectal biopsy confirmed 49/58 cases (the three false positives at MR Spectroscopy the biopsy demonstrated prostatitis), 9 cases were negative for carcinoma. The results of MR Spectroscopy showed a linear correlation with tumour grade (Gleason score).

Conclusion: Our experience comfirms the optimal diagnostic accuracy of integrate MR imaging in the diagnosis and staging (based on local extention) of prostate cancer; moreover the techinique offers the possibility to optimize treatment planning.

POSTER 7:

IS NECESSARY ULTRASONOGRAPHY IN THE DIAGNOSIS OF UPPER TRANSITIONAL CELL CARCINOMA ?

NOVAC C, RADU VD, CIUTA CM, TANASE VERONICA

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Aim of Work: There remains wide variation in the imaging pathways for investigation of haematuria or any other symptom which leads to the diagnosis of an upper transitional cell carcinoma (TCC). A combination of ultrasonography (US), intravenous urography (IVU), cystoscopy, completed by retrograde pyelography (RP) and computedtomography (CT)has been proposed and widely implemented for investigation of haematuria. Consensus has not yet been

reached to the role of ultrasonography in positive diagnosis of upper TCC, the method being classically considered a less useful method in the diagnosis of this relatively rare disease. The objective of this study was to assess the accuracy of US for diagnosis of upper TCC and to compare it to the other imaging methods.

Patients & Methods: The files of all 200 patients who were diagnosed with upper TCC in our clinic between 1996 and 2005 were reviewed. The following data were collated: results and efficiency in positive diagnosis of US compared to the results of IVU, RP and CT. All USs were performed by the same uroradiologist, who also conducted and reported the results of IVU and RP.

Results: US revealed in 80 patients (40%) direct image of upper TCC, in 57 patients (28,5%) hydronephrosis (HN) grade 1, in 35 patients (17,5%) HN grade 2 and in 34 patients HN grade 3. We used the 3 grade classification of the HN. 72 patients (36%) had no distention of the pelvicalyceal system. In the group of the patients with direct image of the tumor, 40 (50%) associated HN, meanwhile 40 cases (50%) did not. Also we have to notice that in 31 pactients (15,5%) US was normally, the rest of 169 patients (84,5%) having at least one pathological sign(direct image and/or HN). This shows us a 84,5% sensibility of the method, with a 91% specificity.The results of all the method used are demonstrated in the table 1.

Method	Nr. patients	Percent(%)	Sensibility(%)	Specificity(%)
US	200	100	84,5	91
IVU	193	96,5	74,4	88,77
RP	92	46	89,9	100
CT	45	22,5	91,1	94,3

Conclusion: US, performed by a well-trained uroradiologist, has proved to have results almost equal to IVU in the diagnosis of upper TCC. Also it was the only method which diagnosed upper TCC in asymptomatic patients. For future US combined with urinary cytopathology may become part of a screening method of upper and bladder TCC.

POSTER 8:

USE OF IMAGE GUIDED PERCUTANEOUS BIOPSY FOR INDETERMINATE RENAL MASSES: CURRENT PRACTICE

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Aim of Work: With increasing sophistication of imaging modalities, many small indeterminate renal masses are detected, posing therapeutic dilemmas. We sought to identify current practice on the value of diagnostic percutaneous needle biopsy in these cases.

Patients & Methods: All UK NHS consultant urologists were sent a questionnaire regarding their use of needle biopsy for indeterminate renal masses. Data were collected regarding indications for use, factors precluding its use and radiological technique used.

Results: A total of 336(64%) responses were received – 11 of which were excluded due to incomplete answers. 139 urologists(43%) never used biopsy, whereas 111(35%) always performed biopsy in such cases. 75 consultants (23%) requested biopsy only in certain circumstances. The main indications included mass in solitary kidney, bilateral renal masses, past history of non-renal cancer, suspected lymphoma and medically unfit patients. The reasons precluding its use included risk of false negative result, risk of tumour seeding and lack of appropriate evidence base for its use. Ultrasound was mentioned by majority as the imaging of choice to guide the biopsy.

Conclusion: The survey shows a wide and varied practice amongst urologists in the use of percutaneous biopsy for the management of indeterminate renal masses. A stronger evidence base is needed to guide best practice.

POSTER 9:

FUNCTIONAL IMAGING OF THE KIDNEY: CT FINDINGS

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Aim of Work: To show CT findings in the most frequent and rare kidney alterations by means of the normal or abnormal contrast medium transit.

Patients & Methods: On the basis of CT findings, the onset and type of parenchymogram, nephrogram and pyelogram and the presence of renal or peri-renal pathology were analyzed. Pyelogram was assessed as delayed or absent; Nephrogram and Pyelogram were assessed as increased or reduced. Furthermore, we identified some additional characteristic patterns, expression of qualitative or focal abnormalities of the nephrogram.

Results: The most frequent causes of delayed or absent paenchymogram, qualitative or quantitative nephrogram alterations (striated, segmental decreased or prolonged and rim nephrogram)and increased or decreased pyelogram were particularly analized

Conclusion: Altered Parenchymogram and Nephrogram are expressions of impaired contrast material delivery, transit and excretion by the kidney: resulting CT findings are then strictly related to the inner physiopathological mechanisms residing behind each condition associated with renal disfunction. Even if some of these findings have not been completely elucidated yet, knowing how those mechanisms show up through the different phases and appearances of renal enhancement allows correct interpretation and correlation of subsequent ct patterns to the variety of renal diseases, resulting in an important and useful diagnostic tool.

POSTER 10:

THE ROLE OF CT UROGRAPHY IN THE EVALUATION OF RENAL INFECTIONS

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Aim of Work: To demonstrate the effectiveness of CT Urography in the diagnosis of renal infections.

Patients & Methods: Patients with renal infections investigated with CT Urography were reviewed. Examples of various infections of the kidneys diagnosed by CTU are presented.

Results: CT Urography provided a comprehensive imaging of the urinary tract and was highly sensitive in the early diagnosis and characterization of renal infections. CTU provided precise anatomic information and was particularly useful in identifying complications of renal infections.

Conclusion: CTU is an effective technique for the assessment of renal infections particularly when complications are suspected.

POSTER 11:

LOCALIZATION OF PROSTATE CANCER AT 3T MR IMAGING WITH PHASE ARRAY COIL

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Aim of Work: 1. To suggest optimal parameters of T2-weighed images (T2WI), dynamic contrast-enhanced images (DCEI), diffusion-weighted images (DWI), and spectroscopy (MRS) for prostate cancer at 3T MRI with phase array coil.

2. To find out characteristic 3T MR imaging features of prostate cancer at T2WI, DCEI, DWI, and MRS.

3. To compare T2WI, DCEI, DWI, and MRS in the localization of the prostate cancer.

Patients & Methods: 35 patients with histologically-proven prostate cancer underwent T2WI, DCEI, DWI, and MRS at 3T MRI using phase array coil prior to radical prostatectomy. We obtained optimal parameters and characteristic imaging features of T2WI, DCEI, DWI, and MRS performed at 3T MR unit. These imaging sequences were also compared for the localization of the prostate cancer.

Results: 3T MRI using a phase-array coil could provide a good imaging quality for the determination of preoperative stage and a high diagnostic accuracy for prostate cancer, which was compatible to 1.5T MRI using an endorectal coil.

Conclusion: Phase-arrayed 3T MR imaging has a potential for replacing endorectal 1.5T MRI and is highly recommended in patients with anal or rectal stenosis, or patients who could not tolerate the discomfort with insertion of an endorectal coil.

POSTER 12:

THE ROLE OF TRANSRECTAL ULTRASOUND (TRUS) IN THE PREDICTION OF PROSTATE CANCER: ARTIFICIAL NEURAL NETWORK ANALYSIS

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Aim of Work: To evaluate the diagnostic performance of an artificial neural network (ANN) model with and without transrectal ultrasound (TRUS) data.

Patients & Methods: 684 consecutive patients who had undergone TRUS guided prostate biopsy from May 2003 to January 2005 were enrolled. We constructed two ANN models. One (ANN_1) incorporated patient age, digital rectal examination (DRE), prostate specific antigen (PSA), prostate specific antigen density (PSAD), transitional zone volume (TZ), and PSA density in the transitional zone (PSATZ) as input data, whilst the other (ANN_2) was constructed using the above and TRUS findings as input data. The performances of these two ANN models according to PSA levels (group A; 0-4 ng/ml, group B; 4-10 ng/ml, and group C; over 10 ng/ml) were evaluated using receiver operating characteristic (ROC) analysis.

Results: Of the 684 patients who underwent prostate biopsy,

214 (31.3%) were confirmed to have prostate cancer, of 137 patients with positive DRE results, 60 (43.8%) were confirmed to have prostate

cancer, and of 131 patients with positive TRUS findings, 93 (71%) were

confirmed to have prostate cancer. In group A,B,C, the areas under the curve (AUC) for ANN_1 were 0.738, 0.753, and 0.774; AUCs for ANN_2 were 0.859, 0.797, and 0.894, respectively. In all groups, ANN_2 showed better accuracy than ANN_1 ($p<0.05$).

Conclusion: According to ROC analysis, ANN with TRUS findings was found to be more accurate than ANN without. We conclude that TRUS findings should be included as an input data component in ANN models used to diagnose prostate cancer.

POSTER 13:

UNUSUAL TUMOR AND TUMOR-LIKE LESIONS INVOLVING PROSTATE: RADIOLOGIC-PATHOLOGIC FINDINGS

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Aim of Work: To evaluate the various radiologic findings and pathologic findings of prostate tumor or tumor-mimicking lesions

Patients & Methods: From 1990 to 2005, pathologic reports and radiologic images were searched about the patient who has unusual

prostate lesions. Unusual tumors or tumor-like lesions in the prostate raise questions concerning their histogenesis; moreover, they may have prognoses that are quite unlike those of prostatic adenocarcinoma.

Several unusual neoplasms involving prostate have been described and

characterized in recent years.

Results: They include mucinous cystadenocarcinoma, neuroendocrine cancer, lymphoma, spindle cell neoplasm, squamous cell carcinoma, transitional cell carcinoma, and benign prostatic hyperplasia (BPH) mimicking malignancy. In addition, infectious conditions such as tuberculosis and stages of prostatic abscess can also mimic prostate tumors. Transrectal ultrasound (TRUS), MR, CT and available pathologic images of unusual tumors and tumor-like lesions are demonstrated in this poster presentation.

Conclusion: Radiologic findings overlap, and they have limited roles in the diagnoses of these entities. However, knowledge of these variable unusual tumors and tumor-like conditions is helpful when making accurate radiologic diagnoses, which have important clinical implications for treatment and prognosis.

POSTER 14:

MR PELVIS ANATOMY OF MALE WITH SPECIAL REFERENCE TO PROSTATECTOMY

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Aim of Work: The objective of this exhibition is that to investigate the male pelvic anatomy in MR image with special reference to prostatectomy.

Patients & Methods: From May 2003 to February 2006, 213 patients underwent prostatectomy due to prostate cancer. All patients underwent prostate MR before surgery.MR images are reviewed and important anatomical landmarks including dorsal vein complex, puboprostatic ligaments, membranous urethra dimension and gross appearance of prostate in T1-weighted axial, T2-weighted axial, T2-weighted coronal, and T2-weighted sagittal images were analyzed.

Results: Various MR images about important surgical landmarks in prostatectomy and various pelvic muscles, will be illustrated.

Conclusion: Understanding of male pelvic and periprostatic anatomy pertinent to urological surgery may be helpful in making surgical planning and successful performance of prostatectomy.

POSTER 15:

OVARIAN ECTOPIC PREGNANCY: EVALUATION BY TRANSABDOMINAL COLOR DOPPLER US IN THE EMERGENCY WARD

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Aim of Work: To evaluate the diagnostic value of color-Doppler US and the spectral patterns of pulsed Doppler in ovary ectopic pregnancies in the emergency ward.

Patients & Methods: Eleven patients with suspected ectopic pregnancy were examined in the emergency ward from January 1994 to March 2005. Initial examination by transabdominal sonography of the pelvis was followed by pulsed color Doppler imaging of the ovary and of any suspected latero-uterine abnormal vascularity. The resistive index (RI) of blood flow in the ovarian arteries was measured.

Results: Five peripheral hypervascularizations, four irregular hypervascularizations and two avascular ectopic pregnancies in the ovary were found with color Doppler imaging. The pulsed Doppler spectrum revealed a low-impedance flow in 9 patients (RI<0,60) and a

high-impedance flow in 2 patients (RI>0,80-1). One corpus luteum cyst was misdiagnosed as ectopic pregnancy. The ectopic pregnancy was seen on the same side as the corpus luteum in 7 of 10 cases.

Conclusion: The abnormal implantation and ovarian trophoblast invasion in ectopic pregnancy can cause more marked blood flow changes in the adjacent supplying vessels than in the main ovarian arteries and it can facilitate the diagnosis of ectopic gestation in the ovary in the emergency ward.

POSTER 16:

PELVIC FISTULAS

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Aim of Work: To illustrate the spectrum of imaging features of fistulas between the bladder and other organs of the pelvis.

Patients & Methods: 13 cases of fistulas were examined using intravenous urography, cystography, barium enema, US, CT and MR, depending on the case. The underlying disease was tumour in 5 cases, Crohn's disease in 3 cases, diverticulitis in 3 cases and radiation in 2 cases.

Results: In the conventional radiography methods that involved contrast agents, the fistulous tract frequently failed to fill, mainly because many fistulas were small, tortuous and obliquely oriented. Ultrasound revealed the part of fistula in the urine bladder in all cases. CT proved superior in detecting the fistulous tract, and it also provided additional information regarding the etiology of the fistula and the extent of extraluminal disease. Rapid, heavily T2-weighted MR imaging also proved useful in the evaluation of occult fistulas.

Conclusion: Although a history of passing urine, feces, foul smelling air or discharge through an unfamiliar orifice usually indicates the presence of an intrapelvic fistula, actual demonstration of the fistulous tract and identification of its underlying cause may prove rather difficult and usually requires more than one imaging method.

POSTER 17:

FDG PET IMAGING OF BENIGN AND MALIGNANT OVARIAN PATHOLOGY: CORRELATION WITH US, CT, AND MRI.

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Aim of Work: 1. To demonstrate spectrum of FDG PET images of various ovarian pathology correlated with US, CT, and MRI. 2. To be familiar with FDG PET images of ovarian masses. 3. To discuss the key points helping the radiologists to increase diagnostic accuracy by correlation of FDG PET with US, CT, and MRI.

Conclusion: Ovarian cancer is the second most common gynecologic malignancy and has the highest mortality rate of the cancer of the female reproductive system. FDG positron emission

tomography (PET) has been mainly used to diagnosis malignancies. Increased FDG PET suggests increased metabolic activity and it is a clue to the malignancy. However, there are many sources of false positives and negatives for PET. We will demonstrate not only benign conditions which show increased FDG uptake, such as functional ovarian cyst, tubo-ovarian abscess, actinomyocosis, fibrothecoma, etc, but also various malignancies which show decreased FDG uptake. To increase the diagnostic accuracy, correlation with other imaging modality and clinical information is very important. Finally, we will discuss the key points helping the radiologists to increase diagnostic accuracy by correlation of FDG PET with US, CT, and MRI.

POSTER 18:

CORRELATION BETWEEN PROSTATE CANCER GRADE (GLEASON SCORE) AND VASCULARITY IN COLOR DOPPLER IMAGING

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Aim of Work: To study the relationship between the amount of prostate cancer-associated vascularity as seen on color Doppler imaging and the tumor grade.

Patients & Methods: Transrectal color Doppler imaging of the prostate was performed in 23 patients with prostate cancer. Color flow signal/total pixel ratios (SPRs) of selected images were calculated using the ratio of the number of pixels showing color Doppler signals to the total number of pixels within the lesion. All the patients underwent prostatic biopsy guided by transrectal ultrasound. Gleason's score were determined from the biopsy specimens.

Results: The mean SPR for the tumor grade(Gleason score)in the well (Gleason grade 2-4), moderately (Gleason grade 5-7) and poorly differentiated cancers (Gleason grade 8-10) groups were 0.15+/-0.25, 0.16+/-0.27 and 0.20+/-0.35 respectively.

Conclusion: In our study; the amount of prostate cancer associated vascularity detected by transrectal color Doppler imaging correlated well with the degree of differentiation of the tumor grade.

Keywords:

Transrectal ultrasonography, color Doppler ultrasonography, prostate cancer, tumor grade, Gleason score.

POSTER 19:

COMPARISON OF DIFFERENT FLOW RATE FOR MULTIDETECTOR ROW COMPUTED TOMOGRAPHY ANGIOGRAPHY OF RENAL ARTERY BRANCHES.

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Aim of Work: The aims of this work was to investigate the diagnostic performance and the effect of different flow rate in the multidetector row computed tomography angiography (mdCTA) imaging of renal artery and its branches.

Patients & Methods: We studied retrospectively 60 patients (35 males; 25 females, mean age: 65 years) that underwent CTA. All examinations were performed with a four detector row CT scanner and in every patients we used iopromide 370 mg\\ml as contrast medium. Patients were divided in 4 equal groups:

1) 130 ml\\s at 3 ml\\sec

2) 130 ml\\s at 4 ml\\sec

3) 130 ml\\s at 5 ml\\sec

4) 130 ml\\s at 6 ml sec

The image quality of main renal artery and their first-order to third-order branches was scored as 0 for no visualization; 1 only first-order branches visualization; 2 first-order and second-order branches visualization and 3 for first order to third order branches visualization. In the imaging study, we used axial images, MIP, MPR and VR post-processing reconstruction. Two radiologists reviewed CT images in consensus.

Results: All main renal arteries had optimal visualization (120\\120). If we consider the first-order to third-order branches visualization results, we observed an overall value of 31\\90, 36\\90,43\\90 and 55\\90 for groups 1-4. There was so a statistical difference between group 4 and group 1 ($p<0.001$), group 2 ($p<0.002$) and group 3 ($p<0.05$).

Conclusion: Results of our study show that to achieve diagnostic image quality in the renal artery and in its branches is useful the use of the high injection rates, in particular the use of 6 ml\\sec flow rates displays better results.

POSTER 20:

MULTI-DETECTOR-ROW SPIRAL CT ANGIOGRAPHY DIAGNOSTIC SENSITIVITY IN EVALUATION OF RENAL ARTERY STENOSIS: COMPARISON BETWEEN MULTIPLE RECONSTRUCTION TECHNIQUES.

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Aim of Work: The aim of this study was to asses the sensitivity and the diagnostic efficacy of Multi-detector-row spiral CT angiography (MDCTA) in diagnosis of renal artery stenosis (RAS) and to evaluate the various types of reconstruction modalities and their efficacy.

Patients & Methods: We studied 21 patients (9 males; 12 females, mean age: 57 years) that underwent to CTA for suspected RAS. Patients were studied by using a multi-detector-row CT. CT scans were obtained after intravenous bolus administration of 110-140 mL of non-ionic contrast material using a 3-6 mL/sec flow rate. We assessed every patient by using axial scans, multiplanar reconstruction (MPR), maximum intensity projection (MIP) and volume rendering (VR) techniques. For every patients and for each reconstruction modalitites, the image quality of main renal artery was scored as 0 for bad quality; 1 for poor quality; 2 for good quality 3 for excellent quality images. Two radiologists

reviewed CT images in consensus

Results: Overall number of renal arteries studied were 42, and we detected 16 RAS. Sensitivity to define the presence of RAS by using MPR, MIP and VR was 68,7%, 75%, and 100%. Quality images obtained an overall value of 91\\126, 102\\126, and 109\\126 for MPR, MIP and VR respectively. Our data underlined a statistical difference between MPR images and VR images ($p<0.001$). Moreover we noticed that the images classified as excellent were obtained from vessel with a 300 Hounsfield units or higher

Conclusion: MDCTA is an optimal technique to assess renal artery stenosis. Reformatting techniques provided an high visual impact,

and in our study VR showed the best diagnostic images.

POSTER 21:

MULTI-DETECTOR-ROW SPIRAL CT ANGIOGRAPHY DIAGNOSTIC SENSITIVITY IN EVALUATION OF RENAL ARTERY STENOSIS: COMPARISON BETWEEN CTA AND ECD RESULTS.

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Aim of Work: The aim of this study was to compare the role and the diagnostic efficacy of multi-detector-row spiral CT angiography (MDCTA) in the study of patients with renal artery stenosis (RAS) through the comparison with the Color Doppler US

Patients & Methods: 21 patients (9 males; 12 females, mean age: 57 years) for a total of 42 renal arteries were analysed by using MDCT angiography, studied at first through Color Doppler US. The following features were analysed: presence or absence of stenosis, stenosis position (ostial, proximal, central, distal, braches), degree of the

stenosis, the composition of the plaque, course anomalies. CT scans were obtained after intravenous bolus administration of 110-140 mL of non-ionic contrast material using a 3-6 mL/sec flow rate. We assessed every patient by using axial scans, multiplanar reconstruction (MPR), maximum intensity projection (MIP) and volume rendering (VR) techniques

Results: mdCTA found 16 RAS, clearly superior to 9 detected by the Color Doppler US. The highest number of RAS was detected in the ostial localization. The highest number of stenosis found themselves in the ostial localization ($p<0.01$).

Conclusion: MDCTA is an highly accurate technique to asses renal artery stenosis. Our data underlined that the site where the radiologist has to look for detect RAS is in ostial position.

POSTER 22:

MALIGNANT MIXED MULLERIAN TUMORS OF THE FEMALE GENITAL TRACT: MR-PATHOLOGIC CORRELATION

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Aim of Work: To describe the clinical and histopathologic appearance and MR findings of the Malignant Mixed Mullerian Tumors (MMMTs) of the female genital tract and correlate between these MR features and the histopathologic findings

Patients & Methods: During the past 2 years in our hospital, we retrospectively reviewed preoperative MRI of 4 patients with pathologically proven MMMTs: 2 uterine body, 1 cervix, and 1 ovarian origin. Their ages range from 37 to 70 years. None had received prior pelvic irradiation. Three patients underwent total abdominal hysterectomy and bilateral salpingo-oophorectomy and one patient underwent tumor excision.

Results: The maximal diameter of four tumors ranged from 6.5 to 12.5 cm. On MRI, two uterine MMMTs showed uterine enlargement, distention of the endometrial cavity, ill-defined, large, heterogeneous mass with myometrial invasion. In case of cervical MMMT, large heterogeneous mass was noted with multiple iliac lymphadenopathy, but invasion into adjacent organ or metastasis was not seen. Ovarian MMMT showed a lobulated, well-enhancing solid mass with multiple septa. There was no significant ascites in all cases. Grossly, MMMTs revealed brownish or grayish appearance with multifocal hemorrhage and necrosis. On microscopic examination, all MMMTs demonstrated both epithelial and sarcomatous elements. Epithelial components were well-differentiated or poorly differentiated endometrial carcinoma with or without glandular components. Sarcomatous components were cartilage differentiation in all cases.

Conclusion: MMMTs can occur in the uterine cervix and ovary as well as uterine body. Most are large in size and very aggressive. MMMTs of sites other than cervix usually reveal a fatal disease.

POSTER 23:

THE GENITAL ORGANS DISEASES AT THE OUTPATIENT EMERGENCY DEPARTMENT AND THE RELIABILITY OF ULTRASONOGRAPHY IN EVALUATING THE NECESSITY FOR AN URGENT HOSPITALIZATION.

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Aim of Work: The aim of this work is to investigate the reliability of U/S examination in the evaluation of patients with genital organs diseases. Pathologic conditions which, according to their severity, quite often can properly be treated without hospitalization although occasionally an immediate surgical treatment is required.

Patients & Methods: Materials: The present study includes 186 individuals (18-74years old) admitted at the Outpatient Emergency Department during 2005.Methods: All the above persons underwent a gray-scale and color Doppler U/S examination in order to estimate the echomorphology (echo structure and pattern) and vascularity of the genital organs and the adjacent tissues.

Results: The U/S examination revealed normal

sonographic findings in 49 cases (26%) and pathologic sonographic findings in

137 cases (74%)including:

•Torsion (4 cases)

•Trauma (3 cases)

•Malignancy (1 case)

•Inflammatory disease (129 cases)

Among the individuals with pathologic findings was suggested

Hospitalization for:

♣ Immediate surgical treatment in the 8 cases (5,8%) with torsion, trauma and malignancy

♣ Appropriate therapeutic approach and prompt management in 5 cases (3,6%) with inflammatory disease

Conclusion: Conclusion:Ultrasonography is a simple, cost-effective, harmless and non-invasive reliable method for evaluating the genitals. A valuable first line imaging modality for the appropriate therapeutic approach and prompt management of the patients.

POSTER 24:

THE LOWER PELVIS PAIN AT THE EMERGENCY OUTPATIENT DEPARTMENT. THE RELIABILITY OF THE U/S EXAMINATION IN DIAGNOSIS AND THE ESTIMATION OF THE NECESSITY FOR URGENT HOSPITALIZATION.

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Aim of Work: Purpose: The aim of this study is to evaluate the U/S reliability in diagnosing and estimating the severity of the lower

pelvis pain.

Patients & Methods: Materials: It is a prospective study of the admissions at the Emergency Department of our Hospital during 2000-2005. The present study includes 410 women aged 16-48 years (mean value

27,2 years) and 441 men aged 18-74 years (mean value 37,2 years).

Methods: The above individuals underwent a gray-scale and color Doppler U/S examination in order to estimate the echomorphology and

vascularity of the pelvic structures.

Results: Results: Although the lower pelvis pain is one of the more common causes for a visit to the Emergencies it does not always require urgent hospitalization. The overall sonographic findings of this study were:

♣ Definitely diagnostic in 94% of the cases (71% of the initial and 79% of the repeated).

♣ Positively pathologic in 37% of the cases (36% of the initial and 41% of the repeated).

The overall hospitalization was 19% (11% of cases with initially definitely positive pathologic U/S and 6% of cases with repeated indefinitely positive pathologic U/S).

Conclusion: Conclusion: Ultrasonography is a reliable first line imagining modality for the diagnosis of lower pelvic pain. A useful

and valuable examination for the appropriate manipulations and therapeutic management assisting in the decision for the patients'

hospitalization. Especially in countries with isolated widespread small communities supported by peripheral Health Care Centers.

POSTER 25:

ALTERNATIVE FINDINGS ON LOW DOSE CT KUB IN PATIENTS PRESENTING WITH SUSPECTED URETERIC CALCULI

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Aim of Work: Ureteric calculi are the main consideration in the majority of patients presenting with acute flank pain. Unenhanced spiral CT has become the imaging modality of choice in these patients not only because of its unrivalled ability to identify ureteric stones but also because of its potential to identify other renal and non-renal

pathologies. This study examined the clinical incidence of noncalculus

renal and non renal pathology in patients presenting with acute flank pain with a provisional clinical diagnosis of ureteric colic.

Patients & Methods: We retrospectively reviewed 242 patients who underwent CT KUB from Jan 2005 to Dec 2005 for suspected renal colic. We excluded patients with a known renal disease or previously diagnosed renal stones.

Results: 178 patients were included in the study after applying the exclusion criteria. Renal stones were identified in 45% of patients. Other pathologies were present in 27 cases (15%), which were thought likely to account for the patient's symptoms in 16 (9%) and were thought to be incidental findings in 11 (6%) Alternative renal pathologies included pyelonephritis, haemorrhagic renal cyst, renal cell carcinoma and transitional cell carcinoma. Non-renal pathologies included appendicitis, sigmoid diverticular disease, hepatobiliary abnormality, vascular abnormality, pleural effusion and gynaecological pathology

Conclusion: Non calculus renal and non renal pathologies can often be identified on unenhanced low dose CT performed for suspected renal colic. A careful search for these alternative diagnoses should be made in all cases and particularly when the examination dos not identify a ureteric calculus.

POSTER 26:

3D RECONSTRUCTIONS IMPROVE DETECTION OF TRANSPLANT RENAL ARTERY STENOSIS.

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Aim of Work: To evaluate the benefit of 3D reconstructions of patients with transplant renal artery stenosis (TRAS) or iliac artery stenosis undergoing 3D rotational angiography (3D-RA).

Patients & Methods: 3D-RA was consecutively carried out on 57 patients with suspicion of TRAS or iliac artery stenosis. The angiographic images obtained after the rotational run were compared to the 3D reconstructions in the patients with stenoses, and the examinations in which the 3D

reconstructions gave a better profile of the stenosis were noted. The stenoses were when possible also verified with pressure measurement.

Results: 28/57 (49%) patients had significant stenoses. Totally 35 stenoses including 28 TRAS and 7 iliac artery stenoses were revealed. Twenty-one TRAS (75%) were verified by pressure measurement. The 3D reconstructions made a better profile of the stenoses in 12 (43%) out of TRAS and 1 of 3 stenoses in the common iliac artery.

Conclusion: The 3D reconstructions made it possible to profile the transplant renal artery anastomosis and stenoses in the course of the artery more frequently than the angiographic images.

POSTER 27:

IMAGING OF RENAL LEIOMYOMAS

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Aim of Work: Renal leiomyomas are rare benign tumors of the kidney that arise from smooth muscle cells of the capsule, pelvis and blood vessels. Although small leiomyomas are relatively common at autopsy (up to 5%), there are relatively few reports of the imaging characteristics of these lesions.

Patients & Methods: We reviewed the imaging findings observed in 4 pts (2f, 2 m; age range 47-68) with pathologically proven renal leiomyomas; all lesions were discovered during imaging studies performed for non-renal indications. All pts underwent CT (one only after contrast); one had als MRI.

Results: Lesions ranged in size from 1.5 to 7 cm, and were located in the left kidney in 3 cases. Three were on the renal surface, adherent to the capsule, without invasion of renal parenchyma. One was within the renal cortex. All appeared as homogeneous solid nodules, slightly hyperdense on non contrast-enhanced images, and enhancing less than

the adjacent renal parenchima after contrast injection. The lesion

imaged with MRI was ipointense to the kidney on T1-weighted images and

isointense on T2. Enhancement after contrast was lower than adjacent renal parenchyma. Heterogeneities were seen within the mass.

Conclusion: A renal leiomyoma has to be considered in the differential when a solid lesion in encountered on the renal surface, without invasion of renal parenchyma.

POSTER 28:

MUSCULOSKELETAS ULTRASOUND IN CHRONIC KIDNEY DISEASES

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Aim of Work: To provide an overview of the US findings in the most common musculoskeletal lesions in chronic kidney diseases.

Patients & Methods: This presentation will use schematic drawings and US images to illustrate the etiopathogenesis and findings ofvmusculoskeletal disorders in patients with chronic kidney diseases for which US examinations are indicated.

Results: It will include: Dialysis Related Amyloidosis (DRA)with particular emphasis on carpal tunnel syndrome, flexor tendons deposits (amyloid hand) and shoulder pain; soft tissue and periarticular calcifications; crystal deposition arthritis (gout, pseudogout, calcium

oxalate crystal deposits, arthropathy associated with hydrohyapatite

crystals); tendon tears, including spontaneous tendon ruptures; infections (cellutitis and abscesses, septic bursitis, osteomyelitis); bleeding and ischemic conditions (hematomas and muscle infarctions);

musculoskeletal disorders in renal transplantation. For all of these conditions the most important etiopathogenetic factors will be discussed.

Conclusion: The exhibit will depict the US findings of soft tissue diseases affecting patients with chronic renal diseases with etiopathogenetic correlation. It will be a guide to make radiologists aware of these multiple pathologic entities which may be evaluated with US.

POSTER 29:

A REVIEW OF NON-CONTRAST CT (NCCT) VS INTRAVENOUS PYELOGRAM (IVP) FOR THE INVESTIGATION OF SUSPECTED URETERIC COLIC

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Aim of Work: To review the recent literature comparing the use of NCCT vs IVP in the diagnosis of urinary tract calculi.

Patients & Methods: We reviewed the current literature which compared NCCT with IVP as the primary diagnostic imaging modality for patients presenting with suspected ureteric colic. We reviewed the accuracy, the advantages and disadvantages, and the impact on management of each imaging modality.

Results: Advantages of NCCT include specificity and sensitivity between 96-100%, no use of contrast compared to IVP (making it safe for patients with renal impairment and diabetic patients on metformin), rapid scanning time, and extra-urinary causes of colic-like symptoms sometimes detectable. However, disadvantages include higher dose of radiation, lack of information on excretory function, and a higher cost per procedure. Furthermore, CT facility may not be available in all

institutions or may not be available on a 24-hour basis.

Conclusion: NCCT is superior to IVP and has a high diagnostic accuracy. The higher cost of NCCT per procedure is offset by its clear advantages. On the basis of our review, we recommend the routine use of NCCT, where it is available, for the investigation of suspected ureteric colic. However in certain cases there is still an important role for the use of IVP.

POSTER 30:

EXPERIENCE OF NON-CONTRAST CT (NCCT) FOR THE EMERGENCY DEPARTMENT INVESTIGATION OF SUSPECTED URETERIC COLIC IN A SINGLE IRISH INSTITUTION

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Aim of Work: We examined the use of NCCT in the investigation of suspected urinary tract stones in the Emergency Department setting.

Patients & Methods: Over 6 months, 125 NCCTs were performed patients who presented to the Emergency Department with clinically suggestive ureteric colic. Data was collected prospectively and examined for the rate of identification of calculi, other urological and extra-urological pathology.

Results: Calculi were identified in 64 patients (51%), 43 patients (34%) had normal scans and other pathology were identified in 18

patients (15%). 33/64 patients (52%) with stones required acute hospital admission, 31/64 (48%) were managed conservatively and reviewed in the outpatients. Non-calculus renal pathology was identified in 7 patients (cysts, tumour, haematoma and pyelonephritis). Extra-urological pathology was identified in 11 patients (gallbladder disease, liver cyst, chronic pancreatitis, sigmoid diverticulitis, small bowel lymphoma, uterine fibroid, ovarian cyst).

Conclusion: NCCT is highly accurate for the diagnosis of calculus disease of the urinary tract and has the added advantage over IVP at being able to detect extra-urological pathology. NCCT demonstrates radiolucent stones that could be missed on IVP. NCCT is quick with no preparation required, provides rapid and accurate diagnosis and is therefore, cost effective. Because NCCT does not involve intravenous contrast, it avoids the risk of contrast reactions and anaphylaxis, is safe for patients with renal impairment and for diabetic patients on metformin.

POSTER 31:

NON-TUMOROUS CONDITIONS OF OVARY AND ADNEXA, MIMICKING MALIGNANCY ON MR IMAGING

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Aim of Work: To illustrate and discuss the non-tumorous conditions of ovary and adnexa mimicking neoplasm on MR imaging, emphasis on diagnostic pitfalls.

Patients & Methods: Retrospective study included atypical endometriosis, tubovarian abscess caused by unusual organisms, ovarian

hyperstimulation syndrome, massive ovarian edema and retained surgical

sponge.

Results: Atypical manifestation of endometriosis, such as solid endometriosis, advanced or ruptured endometriotic cysts associated

with markedly elevated tumor markers and unusually large sized cyst,

present as tumors. Chronic inflammatory masses caused by unusual organisms can manifest ate as tumors. Some kinds of ovarian torsion can mimic ovarian or tubal neoplasm. Ovarian hyperstimulation syndrome, and retained surgical sponges may confused with tumors.

Conclusion: MR imaging has been proved to be useful for the assessment of ovarian masses. However, some kinds of non-tumorous conditions of ovary and adnexa often misclassified on MR imaging that initially could misdirect the correct diagnosis and the appropriate medical treatment.

POSTER 32:

A REVIEW OF NON CONTRAST ABDOMINAL CT SCANS (CT-KUB) FOR SUSPECTED URETERIC CALCULI, WITH PARTICULAR REFERENCE TO THE UTILITY OF THE SCOUT IMAGE.

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Aim of Work: To evaluate the indications, patient characteristics and findings of non contrast CTs performed for possible ureteric calculi.

Patients & Methods: All CT-KUB studies performed at our institution over a three month period for the investigation of suspected renal colic were retrospectively evaluated. The patient characteristics and

CT findings were analysed.

Results: 194 CT-KUB studies were performed. 53% patients were male, 47% female. The mean age was 44 years.55% of CT-KUBs were reported as abnormal. 30% revealed ureteric calculi. 18% revealed renal calculi only. 3% showed findings suggestive of recent passage of a stone. Other significant findings not relating to the renal tract were identified in 4%. Presence of ureteric dilatation and peri-ureteric fat stranding was seen in 86% of cases with ureteric calculi. The calculus was visible on the scout film in 43% of cases.

Conclusion: Non contrast CT has rapidly become the investigation of choice for suspected ureteric calculi. Ureteric calculi were identified in 30% of the scans performed at our institution, which is

comparable to the figures quoted in the literature. The visibility of calculi on the scout film influenced whether follow-up imaging was carried out with CT or by plain radiographs.

POSTER 33:

HAEMORRHAGIC COMPLICATIONS ASSOCIATED WITH PERCUTANEOUS NEPHROLITHOTOMY (PCNL)

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Aim of Work: To assess the degree of blood loss in patients during PCNL and to identify possible predisposing risk factors for increased blood loss.

Patients & Methods: 65 PCNLs were performed on 54 patients over a 2 year period. A 30 French track was created in all patients using a hydrostatic balloon. Multiple tracks were required in 7 (10.8%) cases all of which were two track procedures. 3 of these were planned two tract procedures, 3 as a result suboptimal first track and 1 with single track in each kidney for bilateral renal calculi.The mean fall in haemoglobin and hematocrit, frequency of post-op transfusion and the occurrence of post operative sepsis were recorded.

Results: Mean patient age was 51 years: 48% were males and 52% females.The mean fall in haemoglobin was 1.58 g/dl and hematocrit 0.05. Five (7.7%) patients experienced a fall in haemoglobin over 3g/dl and four (6.2%) required post-op transfusion. No patient required a haemostatic procedure.Two track PCNLs showed a mean haemoglobin drop of 1.37 g/dl as compared to 1.67g/dl for single punctures.18 (28%) of the PCNLs were performed on patients with spinal cord pathology. There was no statistically significant difference in haemoglobin drop when compared with non spinal injury patients ($p = 0.158$), however there was an increased incidence of post-procedure urological sepsis in this subgroup.

Conclusion: The mean fall in haemoglobin observed in our series is comparable to published data. Two track PCNLs were not associated with an increased mean drop in haemoglobin.

POSTER 34:

THE DIAGNOSTIC PANORAMA IN PATIENTS WITH GROSS HEMATURIA EXAMINED WITH CT

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Aim of Work: Over the last decade the radiologic evaluation of patients with gross hematuria has changed rapidly. CT has replaced excretory urography as the initial modality. Malignancy of the urinary tract is often the cause of gross hematuria. The aim was to investigate the diagnostic panorama in patients with gross hematuria after the introduction of a more sensitive diagnostic technique.

Patients & Methods: Retrospectively we studied all patients with gross hematuria referred for CT of the urinary tract during a six months period (September 2005 – March 2006). Our routine investigation of gross hematuria is CT and cystoscopi. The final diagnoses of the patients were evaluated.

Results: 87 patients wer included in the study. More than one third, 36%, of the patients were found to have a malignancy of the urinary tract. 65% of these had bladder cancer, 9% prostate cancer, 9% renal cell carcinoma and 6% had transitional cell carcinoma. One patient had cancer in both the prostate and the urinary bladder and one patient had cancer in both the kidney and the urinary bladder. In 23% of the patient no cause of hematuria was found. In the rest of the patients, 41%, a non-malignant reason like infection, urolithiasis or benign enlarged prostate was found.

Conclusion: In approximately one third of patients with gross hematuria the cause was a malignancy in the urinary tract which is in accordance with the findings in older studies.

POSTER 35:

ACCESSORY RENAL ARTERIES: ARE THESE CORRELATED WITH HYPERTENSION? AN IMAGING STUDY BY USING CTA TECHNIQUE

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Aim of Work: It is well known that renal artery stenosis may produce hypertension and this situation is called renal vascular hypertension (RVH). The aim of this study was to asses, by using Multi-detector-row spiral CT angiography (MDCTA), if is present a relationship between accessory renal arteries stenosis and hypertension.

Patients & Methods: We studied retrospectively 65 patients (41 males; 24 females, mean age: 54 years) that underwent to CTA to study abdomen vasculature and we previously excluded from this analysis patients that underwent CTA for suspected renal artery stenosis (RAS). Patients were studied by using a four-detector-row CT and scans were obtained after intravenous bolus administration of 110-140 mL of non-ionic contrast material using a 3-6 mL/sec flow rate. In a second step we compare, by using statistical assessment, data relatively to hypertension with data relatively to accessory arteries stenosis. Two radiologists reviewed CT images in consensus.

Results: Overall number of accessory renal arteries detected were 35. Stenosis in the renal artery was detected in 12 cases. We observed the presence of a statistical difference between patients with accessory renal arteries with stenosis and patients with accessory renal arteries without stenosis ($p<0.05$).

Conclusion: Accessory renal arteries stenosis, detected by using MDCTA is an important pathological sign that radiologist has to be evaluate and assess because of its statistical correlation with hypertension.

POSTER 36:

COMPARISON OF PAIN SCORES BETWEEN THE TWO INJECTION METHODS OF LOCAL ANESTHESIA DURING THE TRANSRECTAL ULTRASONOGRAPHY-GUIDED PROSTATE BIOPSY

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Aim of Work: To compare the effectiveness of two methods of injecting lidocaine during the transrectal ultrasonography-guided prostate biopsy by evaluating pain control.

Patients & Methods: One-hundred patients (mean age 64.8 years) were included in the study. The patients were randomly assigned to two groups. Patients were examined in left lateral decubitus position with an 8.5MHz transrectal probe. Ten ml of 1% lidocaine was injected

bilaterally at the junction of the seminal vesicle and prostate in Group 1 and into the Denonvillier's fascia in Group 2. After local anesthesia was administered, the prostate biopsy was routinely performed. Pain scores, in the form of a visual analog scale (VAS) and immediate and delayed complication rates were evaluated between groups.

Results: The mean VAS score showed no significant difference between the groups (Group 1: 3.4 and Group 2: 2.8, $p=0.062$). The difference of delayed complication rates was not significant between groups. Hematuria, hemospermia, and blood via rectum were noted in patients 21, 4, 9 of Group 1 and patients 18, 3, 13 in Group 2 ($p=0.340$, 0.622,

0.424), respectively. However, two patients in only Group 1 complained of some symmptoms immediately after local anesthesia: one complained of tinnitus and one of mild dizziness. These symptoms occurred probably from the inadvertent intravasation of lidocaine.

Conclusion: There was no significant difference in pain control and complication rates between the two injection methods of lidocaine.

POSTER 37:

IS THERE A DOCTOR'S DELAY IN DIAGNOSING PYOHYDRONEPHROSIS CAUSING LATE DRAINAGE TREATMENT?

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Aim of Work: Pyohydronephrosis due to obstruction is an uncommon but serious and sometimes life-threatening condition. Treatment is urgent, the obstruction has to be relieved as soon as possible. Pyohydronephrosis can be confused with other conditions, i.e. pyelonephrits, which may delay effective treatment. The aim of the study was to investigate the degree of doctors delay when diagnosing obstructed pyohydronephrosis.

Patients & Methods: 53 patients diagnosed and treated for obstructed pyohydronephrosis from 1997 to 2002 were included in a retrospective study.

Results: 38 (72%) of the patients were correctly diagnosed when admitted to the hospital. Further 7 patients were correctly diagnosed within 24 hours. A radiologic examination confirmed the diagnosis in all 45 patients and 32 patients were treated with nephrostomy within 24 hours. All 45 patients had fever, 41 (91%) had flank pain and 33 (73%) had a history of previous stone disease. In 8 patients the final diagnosis was delayed with 2-6 days. Five of these patients had signs of obstruction and infection when admitted to hospital. Three patients, with a diagnostic delay of 3, 3 and 6 days respectively, had no signs of obstruction, two of these patients had a simultaneous diagnosis of

psychiatric disease.

Conclusion: Most patients with obstructed pyohydronephrosis were diagnosed and treated within reasonable time. The diagnosis may be obscured by a psychiatric diagnosis.

POSTER 38:

THE LIFE TIME OF TRANSPLANTED KIDNEY: CROSS-SECTIONAL IMAGING FINDINGS

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Aim of Work: After renal transplantaion, various complications occur from immediate postoperative phase to chronic phase. We will illustrate multimodality cross-sectional imaging findings of normal and complications in relation to the time frame after renal transplantation.

Patients & Methods: We retrospectively reviewed medical records and imaging findings of 512 patients performed renal transplantation from 1996 to 1996. Normal findings and complications were included in this study.

Results: It is important to keep in mind following conditions at immediate post operative state; acute rejection, acute tubular necrosis, cyclosporine toxicity, perinephric fluid collection, hematoma, renal arterial thrombosis and ureteral necrosis. The late complications include chronic rejection, infectious conditions involving kidney and extrarenal organs. It is well recognized that an increased incidence of malignancy is a late complication of organ transplantation. Especially, incidence of lymphoproliferative disorders is much increased. Occasionally mass-like proliferation of fat or fibrous tissue in renal sinus of transplanted kidney mimics tumorous condition.

Conclusion: A working knowledge of the life time of transplanted kidney and its multimodality imaging findings makes proper diagnosis and management of complications following renal transplantation.

POSTER 39:

LATE MULTIPLE METASTASES TO PANCREAS, ADRENAL AND THYROID GLAND FROM RENAL CELL CARCINOMA- A CASE REPORT

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Renal cell carcinoma (RCC) is known for its capacity to behave in an unpredictable fashion. Frequent sites of metastases are lung, liver, brain, contralateral kidney and bone. RCC can however metastasize to virtually any organ including thyroid, pancreas, skeletal muscle and soft tissue, by the venous or lymphatic route. These less common sites of metastases may be difficult to detect either radiologically or clinically and the risk of metastasis persist for many years. Metastatic tumours in the pancreas is a rare event. Pancreatic metastases are usually associated with widespread metastatic disease. The truly metastatic tumours to the pancreas usually arise from lung, breast, skin, colon, stomach, ovary or kidney.

We report on a case of multiple pancreatic lesions, along with metastatic lesions in the adrenal and the thyroid gland 6 years after resection of a RCC.

POSTER 40:

COMPUTED TOMOGRAPHY: SAFETY OF INTRAVENOUS APPLICATION OF IODINATED CONTRAST MEDIA IN PATIENTS WITH PHAEOCHROMOCYTOMA

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Aim of Work: To evaluate the safety of iv-application of standard iodinated contrast-media (CM) in patients who underwent unenhanced (UE) and contrast-enhanced (CE) CT imaging for characterization of adrenal mass that histopathologically proved to be a phaeochromocytoma.

Patients & Methods: Between 06/2001 and 03/2006, 21 patients were included in this study (10 m/11f, 57,6 a). All patients underwent UE- and CE-single or multislice-spiral-CT. The protocol included a 20min.delayed series after iv.-injection of 120cc iodinated CM. In 15/21 patients phaeochromocytoma was biochemically proven before the patient

underwent CT examination. In these patients the blood pressure (RR) was evaluated before, immediately after and 4 hours after the CT scan. Assays of plasma and urine catecholamines (noradrenaline, adrenaline and dopamine) were evaluated before and after iv-contrast-injection. One patient was ?-and ?-Adrenergic blocked and one patient received antihistamines. 3 patients showed no hormonal activity. All patients were carefully monitored for immediate and delayed adverse events following CM-injection.

Results: There was no significant increase in RR after iv-injection of CM in patients with biochemically verified phaeochromocytoma at the time of CT examination. Mean RR before iv.contrast-injection varied from 140-210/ 85-110 mmHG. No significant increase in plasma and urine catecholamines was observed in these patients. Mean plasma catecholamines varied from 285-3027 ?g/dl (noradrenaline) and 50-112?g/dl (adrenaline). Mean urine catecholamines varied from 116-2134?g/dl (noradrenaline) and 184-499?g/dl (adrenaline). No contrast related minor or major immediate or delayed adverse events were observed patients.

Conclusion: Iv-injection of iodinated CM proved to be safe in patients with phaeochromocytoma not being on? - and?-Adrenergic blockade during CT examination.

POSTER 41:

SPONTANEOUS RUPTURE OF UPPER URINARY TRACT FOLLOWING AIRTRAVEL: 2 CASE REPORTS

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Aim of Work: Spontaneous rupture of renal pelvis is a recognised albeit uncommon occurrence associated with hydronephrosis, renal calculi and ureteric strictures. It is considered serious due to the potential for urinoma formation and sepsis. We present two recent cases of renal pelvic rupture following long haul airflight.

Patients & Methods: Case 1: 59 year old male presented with severe right loin pain following a transatlantic flight. Previous laparoscopic appendicectomy but no renal disease, examination revealed nothing. KUB showed no stone, IVU demonstrated delayed excretion on right side with extravastion from renal pelvis but no calculus confirmed on contrast CT. Patient settled with conservative management.

Results: Case 2: 58 year old male presented with left loin/groin pain following 8 hour flight. No significant past history, on examination patient tender at left renal angle but not septic. KUB indicated calculus at VUJ, IVU confirmed calculus with peripelvic extravasation of contrast. Patient settled with conservative management, calculus had passed at 2 week KUB

Conclusion: These 2 cases indicate a possible association between spontaneous pelvic rupture and travelling at high altitude. It is known that air in body cavities expands by 25% at 8000 feet (in accordance with Boyle's law of gases) and if inadequately vented this can lead to pain/tissue damage. Extravasation occurs in acute renal colic when there is rapid rise of intraureteric pressure to as high as 80-100mmHg. We postulate that expansion of intra abdominal air volume at high altitude/low pressure coupled with ileus associated with renal colic impinges on an obstructed pelviureteric system increasing likelihood of rupture

POSTER 42:

SPONTANEOUS UPPER URINARY TRACT EXTRAVASATION ON INTRAVENOUS UROGRAPHY AT A TERTIARY REFERRAL CENTRE

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Aim of Work: Spontaneous rupture of the upper urinary tract is a potentially serious condition primarily diagnosed by extravasation on intravenous urogram. Reported incidence of upper tract extravasation on IVU varies over a range 1 – 17%. We aim to assess the incidence of extravasation at a tertiary referral centre for stone disease

Patients & Methods: The radiology reports of all patients undergoing IVU for all indications between 1997 – 2006 at this institution were retrospectively reviewed for upper tract extravasation/leakage of contrast.

Results: Over 9 ¼ years 7036 IVUs were performed with 10 (0.14%) being reported as indicating contrast extravasation from the upper urinary tract. Leakage occurred at renal pelvis (9)and ureter (1). 4 of these extravasations were secondary to stones

Conclusion: Where a tertiary referral centre might be expected to have a high incidence of spontaneous upper tract extravasation actual incidence at this centre is < 0.5%, below that of other reported studies.

POSTER 43

CROSSED TESTICULAR ECTOPIA AND MULTIPLE TESTES DETECTED PREOPEATIVELY BY SONOGRAPHY.

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Crossed testicular ectopia (CTE) is a rare genitourinary anomaly in which both the testes migrate towards the same hemiscrotum. Only 35 cases have been reported in the world literature so far and all were diagnosed on laparoscopic exploration/surgery for undescended testis.

To our knowledge, no case of CTE has been preoperatively diagnosed using the available imaging techniques. Ultrasound and new imaging In particular MRI including can be obtained before a laparoscopic exploration. This will be useful for preoperative planning, and plan corrective surgery or orchidectomy as appropriate.

We present a case of these rare genitourinary anomaly. A 30 year old man was referred as right undescended testis and on sonography was diagnosed at CTE with undescended testis located in the left inguinal canal. This was confirmed by laproscopy (surgical images depict this) and histology as agenetic testis. An accidental finding on sonographic examination of normally sited left testis revealed an intratesticular mass which proved to be a seminoma. Further laparoscopic exploration on the right side was fruitless with no testis found in the right groin or abdomen. To our knowledge this is the first case report diagnosed preoperatively, by sonography. A case of polyorchidism (three testes) will also be presented.

A review of literature of crossed testicular ectopia and unusual sites of presentation of true testicular ectopia would be presented in the poster. The role of imaging techniques including ultrasound, CT and MRI will be described with images on above cases.

POSTER 44:

THE 2 AND 3D CT RECONSTRUCTION IN THE EVALUATION OF THE UROTHELIAL NEOPLASTIC LESIONS.

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Aim of Work: to evaluate the diagnostic accuracy of the 2 and 3D reconstruction in the evaluation of the neoplastic lesion in the urinary excretory system.

Patients & Methods: between March 2005 and February 2006 25 patients, with hematuria without flank pain and postive ultrasound findings for urothelial tumor, were evaluated with 16 Multidetector CT multiphasic examination after iv injection of diuretic, using specific protocol acquisition. All examinations were integrated with 2 and 3D reconstructions: MPR, Curved Plane, MIP, Virtual Endoscopy, Volume Rendering using an indipendent workstation.

Results: in 18/25 cases the urothelial neoplastic lesion were detected with surgery confirmation; 3/25 cases were negative, in 4/25 cases were identified small uretheral stones. In all 18 cases the 2 and 3D reconstructions confirmed the lesion (stenotic or endoluminal finding of the lesion) with good helpful in the local staging and optimal diagnostic accuracy.

Conclusion: The 2 and 3D reconstruction may help the surgery planning with good spatial definition of the lesion.

POSTER 45:

ROLE OF MULTIDETECTOR CT ANGIOGRAPHY IN ASSESSMENT OF NORMAL AND ABNORMAL RENAL VASCULATURE

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Aim of Work: The aim of this study to evaluate MDCTA in assessment of normal and abnormal renal vasculature.

Patients & Methods: The study was conducted in the period between August 2004 and July 2005 for 100 patrents. Theis ages ranged from 2-89yeras old.

** The study include 5 groups:- 1)* Living donor group (10caese) 2)* Renal trauma group (10cases) 3)*Renovascular group (20cases) 4)*Renal masses (20cases) 5)* PUJO group (10 cases).

- All were subjected to CTA multiphasic scanning followed by post processing techninques, the diagnosis was confirmed either by operative detalis or histopathological examination.

Results: The MD CTA seems to be superior in preoperative evaluation of renal vasculature in living donors with specificity and sensitivity 100% and 100% respectively.* In 10% of cases with renal trauma, 90% were managed conservatively as the renal pedicle is intact by CTA.* Renovascular abnormalities were noted in 20% of patients CTA was the high accurate tool in delineating its type.e.g aneurysm, AVM, nutcracker disease.* In 40% of patients with renal mass CTA was helpful in deciding Suitable treatment options especially in patient with tumor vascular extension and small masses.

Conclusion: As multidetector row CT scan can provide large compact volume data with multiphasic fast scanning that allow high accurate imaging for renal (normal & abnormal) vasculature.MDCT is considerded as non invasive technique.

POSTER 46:

ENDORECTAL MRI IN THE STAGING OF PROSTATE CARCINOMA WITH HISTOLOGICAL CORRELATION

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Aim of Work: To pictorially depict and describe the role of endorectal magnetic resonance imaging (MRI) in the evaluation and staging of prostate cancer.

Patients & Methods: We interrogated the database at our institution, the National Centre for prostate cancer, to detect patients who had undergone endorectal MRI as part of their prostate cancer work up. Subsequently, we cross referenced this cohort with our pathology database to obtain correlating histology. Overall, 109 patients were identified over the previous 2 years who underwent endorectal MRI. Of these, histological correlation was available in 53 patients. These formed our subgroup from which we selected a variety of cases to demonstrate and describe the range of findings on endorectal MRI that occur in prostate cancer, in tandem with their histological correlation.

Results: Within the selected subgroup, based on histological diagnosis; 6 patients had stage T1 tumours, 19 patients had T2, 24 patients had T3 and 4 patients had T4 disease. MRI slightly undercalled T3 tumours, but there was good correlation with T4 disease. Positive lymphadenopathy was present in 19 cases with a significant overcall on endorectal MRI compared to histology. Involvement of the seminal vesicles was found in 12 cases and 9 cases involved the neurovascular bundle.

Conclusion: Endorectal MRI allows for excellent visualization of zonal anatomy of the prostate, as well as visualization of the neurovascular bundle and seminal vesicles allowing for accurate preoperative staging of prostate cancer. In this pictorial review, we demonstrate the range of findings in various stages of prostate cancer in conjunction with their histological correlation.

POSTER 47:

URO-RADIOLOGICAL INTERVENTIONS- INDICATION, OUTCOME, CONTROVERSIES AND COMPLICATION.

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Aim of Work: Uroradiological intervention have progressed over recent years in all areas from image guided biopsy/ diagnosis, relieving obstructions via percutaneous nephrostomy, balloon dilation and stenting (PUJ Obstructions, renal tract obstruction from renal stone disease, renal and non-renal malignant obstructions, Benign Prosthetic Hypertrophy) to radiological guided treatment of Reno-vascular disease, varicocele embolisation, renal cell carcinoma treatment and palliation with embolisation and radiofrequency ablation.Our aim is to provide an educational and pictorial review of these old and new uro-radiological procedures. We will discuss the intricate anatomy and technique, indications, contraindications, complications and results (radiological and clinical) of these procedures (described above).

Patients & Methods: Through our institutional experience and a literature review in this pictorial exhibit, we will perform an in depth analysis of these procedures (stents, drainage systems, embolisation and ablations).

Results: Minimally invasive low morbidity uro-radiological procedures have been a major advance. The expansion and growth of this novel spectrum of procedures consequently now plays a significant role in every day urology patient care.

Conclusion: In this educational exhibit we will provide a thorough informative and concise guide of the numerous options and indeed complication's in this expanding field.

POSTER 48:

TRANSCATHETERIAL EMBOLIZATION OF PELVIC ARTERIOVENOUS MALFORMATIONS

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Aim of Work: Pelvic arteriovenous malformations are rare lesions, usually seen in women aged 30-50 years old and produce massive uterine bleeding. We present our modest experience on healing two cases of pelvic AVMs by selective transcatheterial embolization.

Patients & Methods: Case 1:A 34 year old woman presented pain in the lower abdomen and excessive bleeding, several months after a surgical excision of an AVM originating

from the left internal iliac artery. Digital angiography showed the AVM supplied by the inferior mesenteric artery, the right internal iliac artery, the thyroid and the circumflex arteries. We proceeded in transcatheterial embolization of the distal part of the inferior mesenteric artery, the right internal iliac artery and the circumflex arteries with Contour particles, Gelfoam and metallic coils.

CASE 2:A 78 year old man presented heavy hematuria after a surgical ligation of the right internal iliac artery and an iliac femoral by-pass. Digital angiography demonstrated a huge pelvic AVM supplied by branches of the inferior mesenteric artery and the left internal iliac artery and drained via a large venous formation to the inferior vena cava. Selective transcatheterial embolization of the internal iliac artery's branches was performed, using Contour particles, to occlude the main feeders.

Results: In both cases, post embolization angiographies showed feeding arteries compromised and the lesions devascularized. The patient's clinical status was improved. In a follow-up of two years for the 1st case and five months for the 2nd case, no recurrence was observed. We had no major complications.

Conclusion: Selective transcatheterial embolization proved to be an effective treatment producing long-term therapephtic results.

POSTER 49:

CT FEATURES OF METASTATIC TUMOR OF URINARY BLADDER

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Aim of Work: Urinary bladder is one of the sites for a hematogenous or seeded metastasis. If metastasis occurs, involved bladder can be confused with other inflammatory or neoplastic conditions. The purpose of this study was to find out the characteristic CT findings of metastatic tumor of urinary bladder.

Patients & Methods: CT scans of 13 patients with metastatic tumor of urinary bladder were reviewed. We evaluated the patterns of bladder abnormality, perivesical infiltration, ascites, peritoneal carcinomatosis, and hydronephrosis.

Results: The primary tumors of all 13 patients were gastric adenocarcinomas. Bladder metastasis was diagnosed by cystoscopic biopsy in 11 patients and by integrated information in the other 2 patients. The cell types on bladder biopsies were adenocarcinomas in 10 patients and adenocarcinoma with signet-ring cell component in 1. On the CT scans, twelve patients showed focal or diffuse bladder wall thickening and the remaining one patient showed normal appearing bladder. Of the 12 patients with thickened bladder wall, the thickening involved the entire circumference of bladder in 5 patients, over half of the circumference in 6, and below half in 1. Other findings included perivesical infiltration in 11 patients, ascites in 8, peritoneal carcinomatosis in 7, and hydronephrosis in 11.

Conclusion: Metastatic adenocarcinoma of urinary bladder showed focal or diffuse bladder wall thickening rather than polypoid mass on the CT scans. Metastatic bladder cancer could be included in the differential diagnosis when CT shows diffuse bladder wall thickening, especially in patients with gastric cancer.

POSTER 50:

GENITOURINARY TRACT LYMPHOMA-A REVIEW

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Aim of Work: Genitourinary tract lymphomatous involvement is extremely rare. It is usually seen in advanced disease and is rarely involved at presentation (<5%). It accounts for < 1% of all renal tract tumours. Our purpose if to provide an education review with pathological correlation of genitourinary tract lymphoma. To provide an educational exhibit of the radiological imaging finding's, distribution and classification with pathological correlation, of the rare extra-nodal, solid organ involvement of lymphoma. Illustrate the characteristics appearances and discuss differentials were appropriate, in particular differentiating it from other neoplasm's.

Patients & Methods: Through our Institutional experience and a review of literature we will provide a case by case pictoral review of the various presenting imaging features (Ultrasound/CT/MRI/PET), classification, consequences and guises of lymphoma involving the genitourinary tract. Each organ has a number of distinct and sometimes classical patterns of involvement, the kidney in particular

Results: True primary genitourinary lymphoma is rare, since there is normally very little lymphoid tissue in the GU tract. Consequently, secondary involvement is much commoner than primary. Secondary involvement is commoner in NHL than HD and the testicles are the organs most frequently involved, followed by the kidneys and perirenal spaces

Conclusion: Through this review we hope to provide an informative concise guide.

POSTER 51:

PEARLS AND PITFALLS IN IMAGING PELVI-URETERIC JUNCTION (PUJ) OBSTRUCTION.

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Aim of Work: Review the clinical, pathological and imaging manifestations of PUJ Obstruction. To diagnose PUJ obstruction, both anatomic and functional studies are necessary. As no single investigation is without fault, we will discuss the associated imaging difficulties and dilemmas encountered (false positive and negative results, imaging limitations). Provide a concise review of the possible diagnostic and management options (conservative and interventional) of this dynamic process.

Patients & Methods: Complications of PUJ Obstruction can have serious outcomes should they go untreated. The major morbidity is progressive renal injury due to relative ischemia from the compensatory response of decreased renal blood flow and GFR. Long-term squealae include glomerular sclerosis, proteinuria, hypertension and chronic renal failure. Timely and accurate diagnosis is therefore paramount.

Results: We will provide a pictoral and educational exhibit of the radiological appearances of this condition on a variety of imaging techniques, from Intra-Venous and Retrograde Pyelography, DTPA Renography, Ultrasound, non-contrast and contrast enhanced CT, MRI and Angiography. Highlighting the specific sources of difficulty in each e.g. the effect of obstruction on assessment of DTPA Renogram's, false positive

IVP results due to dilated, non-obstructed systems that are slow to drain, value of delayed films revealing an intermittent obstruction and in CT, erroneous results as a result of dilated collecting systems without true functional obstruction. We will illustrate the value of each particular imaging technique. in the arrival at a confident diagnosis.

Conclusion: Awareness and early identification allows for appropriate management and significantly reduced patient morbidity. We provide an interesting, informative and concise radiological guide.

POSTER 52:

RADIOLOGICAL FINDINGS OF RARE TUMORS OF THE OVARY

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Aim of Work: To present the radiological findings of rare tumors of the ovary.

Patients & Methods: Revision of the radiological exams of uncommon and rare tumors (25 cases) with histological confirmed diagnosis.We established a threshold of 10% or less of incidence for rare and uncommon tumors.A variety of rare benign and malignant neoplasms will be illustrated by ultrasound, CT and MR findings.

Results: In this presentation we describe the main imaging findings of rare epithelial cell tumors namely transitional cell tumors, as well as rare germ cell tumors such as immature and monodermal teratomas, dysgerminoma, yolk sac tumor and embryonal carcinoma. Sex cord-stromal tumors, particularly fibroma, fibrosarcoma, granulosa cell tumor, sclerosing stromal tumor, Sertoli-Leydig and Leydig cells tumors, and steroid cell tumor are illustrated too.Finally, we also included in our work other tumors like metastases, Burkitt lymphoma, leiomyosarcoma, mesothelioma and ovarian tumor of probable Wolffian origin.

Conclusion: Although these tumors are rare or uncommon, they show several characteristic imaging features that, in the right clinical setting, can play an important role in narrowing the differential diagnosis and in helping to establish the final diagnosis.

POSTER 53:

FUNCTIONAL MR IMAGING OF PROSTATE CANCER

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Aim of Work: Endorectal MR imaging has been widely used for pretreatment work-up of prostate cancer. However, undeniable limitations still remain because this modality is not highly specific for accurate cancer localization. Furthermore, this modality is not useful for detecting cancer tissue in the transitional zone and for differentiating cancer tissue from biopsy-related hemorrhage and inflammation. In order to overcome these limitations of endorectal MR imaging, various functional imaging modalities including MR spectroscopy, diffusion-weighted imaging and dynamic contrast-enhanced MR imaging, have been introduced. In this exhibition, we will demonstrate functional MR imaging findings of prostate cancer and discuss the advantage of functional MR imaging over endorectal MR imaging.

Patients & Methods: Compare to usefulness of various functional imaging modalities of prostate using our institute.

Results: Adventages and limitations of each functional prostatic MR imagings are exhibited.

Conclusion: Combined variable functional MR imagings will be increasing of accuracy for detecting and determining stage of prostatic cancer.

POSTER 54:

THE ROLE OF THE RADIOLOGIST IN THE EVALUATION AND TREATMENT OF COMPLICATED HORSESHOE KIDNEYS.

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Aim of Work: Horseshoe kidney is the most common renal fusion anomaly. The purpose of this pictorial review is to provide a comprehensive overview of the radiological findings of complicated horseshoe kidneys and the role of the modern radiologist in evaluating and treating these complications.

Patients & Methods: We retrospectively reviewed the urological and radiological databanks of two university affiliated institutions for the previous 7 years, to identify patients who underwent imaging and treatment for complications of horseshoe kidneys

Results: In total 123 patients were identified who underwent imaging or radiological treatment related to horseshoe kidney complications. These patients underwent imaging with either one or a combination of ultrasound, CT, MRI, nuclear medicine and intravenous urography. Complications encountered included stone disease, trauma, obstruction (especially PUJ obstruction), cystic dysplastic disease, benign and malignant tumors, renal artery stenosis, infection and reflux disease. 23 patients were treated by interventional radiology procedures including percutaneous nephrolithotomy, percutaneous nephrostomy, renal tumor embolisation, renal artery stenting and drainage of para renal abscesses.

Conclusion: In this review, we comprehensively depict a wide range of pathologies that may occur with a horseshoe kidney. The role of modern cross sectional imaging with emerging techniques such as CT and MR is discussed, as well as the role of the interventional radiologist in treating complications of horseshoe kidneys.

POSTER 55:

TRANSRECTAL ULTRASONIC PROSTATIC BIOPSY: MAKING THE WORST THING IN LIFE BETTER

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Aim of Work: Transrectal ultrasound guided prostatic biopsy plays a key role in diagnosing prostate cancer in patients presenting with elevated PSA. Protocols for the procedure vary from sextant approach to and extended biopsy approach of the high-risk peripheral zone (PZ) of the

gland. We are looking at the diagnostic yield of axial or sagital scanning in guiding the anterolateral biopsy of the PZ.

Patients & Methods: Two techniques are practised in our hospital.1)Sagital scanning of the prostate gland with sagital guidance of the biopsy needle into the PZ to obtain 8 cores. The alternative is to scan axially, with 10 biopsies being done in the axial plane. 187 patients notes were reviewed retrospectively looking at the plane of scan and biopsy and number of cores.

Results: It was found that scanning and biopsy in the axial plane yielded 50% more cancers and positive PIN findings than scan and biopsy in the sagital plane. An analysis of the axial technique also showed that although a the core sample traversed through more PZ on the left that on the right gland, no difference was found in lateralisation detection of malignant cells.

Conclusion: As a technique, TRUS biopsy in the axial plane yielded better results as it provided dedicated views of cores through more of the PZ

POSTER 56:

ULTRASOUND STONE VISUALIZATION IN PATIENTS WITHOUT HYDRONEPHROSIS

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Aim of Work: To visualize ureteral stone in various locations with variable ultrasound methods and techniques.

Patients & Methods: Among 320 patients who underwent ultrasound exam under suspicion of urolithiasis, 50 patients without hydronephrosis took further examinations including follow up transabdominal sonography with bladder filling, transrectal or transvaginal sonography, intravenous urography, and computed tomography.

Results: Bladder distention enable visualization of ureteral stones in 37 patients. Two bladder stones were also detected. transrectal ultrasound revealed one urethral stone with two distal ureter stones. Additional CT revealed no more stones in 4 patients but one renal infarction was detected on CT. Intravenous urography revealed one distal ureter stone.

Conclusion: Ultrasound is a valuable diagnostic tool in urolithiasis and proper preparation of patients with variable US techniques can raise the diagnostic accuracy.

POSTER 57:

CT OF RENAL AND URETERAL TUBERCULOSIS

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Aim of Work: To illust radiologic findings of urinary tract tuberculosis on the emphasis of CT findings.

Patients & Methods: Urine AFB positive patients with radiologic studies were reviewed.Ultrasound, intravenous urography, and CT scans were reviewed.

Results: Hydronephrosis, asymmetric calyceal dilatations, long segmental ureteral thickening, multisegmental involvements are visualized on intravenous urography, CT and CT urography. CT showed additional tuberculosis findings.

Conclusion: CT with CT urography can provide diagnostic images of urinary tuberculosis.

POSTER 58:

POUCH OF DOUGLAS (CUL-DE-SAC) ABNORMALITIES-IMAGING FINDINGS

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Aim of Work: To evaluate the role of imaging in patients with cul-de-sac abnormalitiesTo illustrate the spectrum cul-de-sac pathologies To describe the clinical background

Patients & Methods: Cul-de-sac is the most dependent part of the peritoneal recess. As a result abnormalities of adjacent pelvic organs as well abnormalities of other abdominal organs may extend to this area. We will present the spectrum of abnormalities of the cul –de-sac, using a multimodality approach including ultrasound, multi- detector CT and MRI.

Results: Imaging findings with the use of ultrasound,CT and MRI are discussed. Prevalence and clinical aspects are also reviewed. Certain features wich can be used by the radiologist in order to establish the correct diagnosis are presented. Abnormalities of the cul-de-sac wich will be presented include metastases, pseudomyxoma peritonei, endometreosis, fibroids,adjacent pelvic organs tumours and some rare abnormalities.

Conclusion: Modern imaging modalities play very important role in detection and characterization of cul-de-sac abnormalities.

POSTER 59:

DIAGNOSIS OF ADRENAL LESIONS WITH MSCT

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Aim of Work: To evaluate the role of CT in patients with adrenal masses

To illustrate the spectrum of the adrenal pathologyTo describe the clinical background as well as the role of biochemical screening

Patients & Methods: The detection of adrenal masses has increased with the use of multislice CT. Frequently the radiologist is confronted with incidentally detected adrenal lesions.MSCT has become the study of choice in differentiation of benign adenomas from malignant lesions.

Results: CT appearance of pathologies found in patients with adrenal lesions IS discussed. Prevalence and clinical aspects are also reviewed.

Conclusion: MSCT has a very important role in detection and characterization of adrenal lesions.Certain features can be used by the radiologist in order to establish the correct diagnosis.

POSTER 60:

CHARACTERIZATION OF RENAL MASSES WITH MULTISLICE CT

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Aim of Work: To evaluate the role of multislice CT in diagnosis of both benignand malignant renal masses.

Patients & Methods: Multislice CT has proved valuable for detecting, localizing ang characterizing renal mass lesions.This is very important in order to establish a treatment strategy.

Results: Imaging findings of different renal lesions are discussed. Renal masses can be cystic or solid. The cystic renal masses include benign simple or multilocular renal cysts and polycystic disease. The solid renal tumours include either malignancies (renal cell carcinoma, nephroblastoma, lymphoma, metastases and transitional cell carcinoma) or benign lesionsas angiomyolipomas and oncocytomas.

Conclusion: Multislice CT plays a very important role in characterization of both benign and malignant renal masses.

POSTER 61:

COMPARISON OF CT VIRTUAL CYSTOSCOPY AND CONVENTIONAL CYSTOSCOPY FOR URINARY BLADDER TUMORS

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Aim of Work: The purpose of this study was to investigate the value of contrast material-filled CT virtual cystoscopy in the detection of bladder tumors.

Patients & Methods: Thirty-three consecutive patients (25 male and 8 female; range age, 51-82 years; mean age ± SD, 65 ± 7 years) who had painless hematuria and suspected to have bladder neoplasm prospectively evaluated with virtual cystoscopy. After the intravenous injection of contrast medium, the contrast material-filled bladder was examined with single detector helical computed tomography (CT) scan with 2-mm slice thichness, pitch:1, 120 kV, 130 mA. Sourch CT data were transferred to a workstation for interactive navigation using surface rendering algorithm. All patients also underwent conventional cystoscopy. The results of virtual cystoscopy were compared with the findings of conventional cystoscopy.

Results: Seventy-five of 78 bladder tumors detected with conventional cystoscopy in 28 patients were also shown on virtual images. Five patients had a normal appearance on both conventional cystoscopy and virtual cystoscopy. Four lesions were false-positive. We had seven false-negative cases with smaller than 0.5 cm lesions. On virtual cystoscopy, seven of the 12 lesions 0.5 cm or smaller in diameter could be identified. We found the following diagnostic values for the idendification of bladder lesions on virtual cystoscopy: sensitivity, 94%; spesificity, 90%; positive predictive value, 87%; negative predictive value, 93%; and accuracy 93%.

Conclusion: Contrast material-filled CT virtual cystoscopy is a noninvasive technique which is used succesfully for detection of bladder tumors larger than 0.5 cm.

POSTER 62:

A CASE OF TUBERCULOSIS OF THE PROSTATE AND KIDNEY: US, CT AND MRI FINDINGS

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Aim of Work: The genitourinary system is the most common site of extrapulmonary tuberculous infection. The diagnosis is difficult and often delayed. We present a case of tuberculosis of the prostate and kidney with its US, CT, and MRI findings.

Patients & Methods: A 35-year-old man was admitted to our hospital with the complaints of hematuria, weight loss, fever, and cough.

Results: On digital rectal examination, the prostate was found to be a normal size and slightly hard. Transrectal US showed hypoechoic lesions in the peripheral zone. T2-weighted MRI demonstrated relatively low signal intensity in the same zone. Transrectal ultrasound guided systematic biopsies of the prostate were performed and specimens were diagnosed histopathologically as tuberculous prostatitis with epithelioid granuloma and Langhans' type giant cells. In addition, low attenuation parenchymal masses within the kidney and multiple para-aortic lymph nodes with low-attenuation were shown on CT.

Conclusion: Tuberculosis of the prostate is an rare condition and transrectal ultrasound seemed to be useful in detecting histopathological changes with tuberculosis in the prostate.

POSTER 63:

PRIMARY BILATERAL ADRENAL NON-HODGKIN'S LYMPHOMA: RADIOLOGIC FINDINGS

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Aim of Work: The adrenal localization of a primary non-Hodgkin lymphoma (NHL) is rare. Bilateral adrenal involvement is seen in 50% of patients. We present the case of a 62-year-old male with bilateral adrenal NHL without adrenal insufficiency.

Patients & Methods: Computed tomography (CT), and magnetic resonance imaging (MRI) examinations were performed.

Results: There was abdominal pain and weight loss in the patient. In physical abdominal examination, there were bilateral palpable masses. Routine investigations including complete hemogram, serum chemistry, urine analysis, chest radiograph and electrocardiogram were normal. Bilateral adrenal tumors (10x8 cm) were detected by CT scan and ultrasonography without any hormonal abnormalities. On MRI, the adrenal tumors were low signal intensity on T1-weighted images, and were heterogeneous

high signal intensity on T2-weighted images, with minimal progressive enhancement after administration of contrast material. On chemical shift MRI, there was no decrease in signal intensity on out-of-phase images. The diagnosis was suggestive of bilateral primary non-functioning adrenal tumors because there was no tumor except adrenals with the detailed examinations. Tru-cut biopsy performed and the pathological diagnosis

was malignant lymphoma (high grade, B cell type). The patient was treated with six cycles of cyclophosphamide, adriamycin, vincristine and prednisolone. However, masses were not complete regression.

Conclusion: Primary adrenal lymphoma, although a rare entity, needs to be suspected in patients without features of primary adrenal insufficiency who have evidence of bilateral adrenal masses on imaging.

POSTER 64:

RADIOFREQUENCY ABLATION IN RENAL CELL CARCINOMA IN PATIENTS WITH SOLITARY KIDNEY

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Aim of Work: To present our experience in RF ablation of Renal Cell Carcinoma in patients with solitary kidney, who are not ideal surgical candidates due to comorbid conditions.

Patients & Methods: Over a 3-year period, from September 2002 to August 2005, 18 patients underwent CT-guided RF ablation in our department, for the management of their renal cell carcinomas (RCCs). All 18 patients had a solitary kidney. We treated tumors with no radiological or laboratory evidence of tumor spread beyond the kidney (stage I or II). Those patients were either high risk surgical candidates for partial nephrectomy or refused surgery. Twenty three RFA sessions were performed totally, under local anesthesia. The RFA system used was with expandable needle electrode [RITA Medical Systems (Mountain View, CA, USA)]. The mean ablation time was 15 minutes (11- 18 min).

Results: Nine/18 tumors (50%) had a diameter from 2 to 4cm. All these 9 tumors did not indicate any sign of enhancement in the tumor area on the 1st month follow-up (technical success, 100%). The diameter in 6/18 tumors ranged between 4-5cm. Four of these 6 tumors showed no enhancement in the area of tumor on the 1st month follow-up (66,7 %). The diameter in cases of three tumors was >5cm (5-7cm). One/3 tumors showed no enhancement in the area of tumor on the 1st month follow-up (33,3%). One/18 tumors, by the renal sinus, showed local recurrence 6 months after RFA and required a 2nd session. This tumor, one year after the 2nd session of RFA, showed new recurrence (recurrent disease, 5,6%), together with a metastatic lesion at the liver. No major complications were observed. In two RFA sessions (2/23, 8,7%), a self- limited subcupsular hematoma was noticed, without hematuria.

Conclusion: In cases of patients with solitary kidney and early stage RCC or serious comorbid illness, the use of CT-guided RFA is an acceptable, well tolerated alternative, for the management of located renal tumors.

POSTER 65:

CT-GUIDED PERCUTANEOUS BIOPSY IN SOLID ADRENAL MASSES

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Aim of Work: To determine the diagnostic value of percutaneous core needle biopsy (CNB) in adrenal masses.

Patients & Methods: From 1/1/ 2000 to 31/1/2005 in our institution 41 patients were proceeded in core needle biopsy of adrenal lesions with. Percutaneous CT-guided CNBs were performed under local anesthesia with an automated biopsy needle gun of 18 gauge and length 10-15 cm. One to three specimens were received in all patients.

Results: A specific diagnosis was made in 36 (87.8%) lesionsThe final pathologic diagnoses were in 17(47,22%) patients metastatic disease (7 from lung carcinoma, 2 from renal cell carcinoma, 2 from prostate carcinoma, in 3 from breast carcinoma, 1 from melanoma and 2 from GI tract carcinoma), in 5(13,8%) cortical carcinoma, in 5(13,9%)

neuroendocrine tumors, and in 9(25%) inflammation. The rest five 5 (12,2%) had necrotic or inadequate specimens. We have no complications

Conclusion: CNB using an automated biopsy gun has a great diagnostic accuracy in the adrenal masses

POSTER 66:

RADIOFREQUENCY ABLATION IN A PAINFUL PERINEAL METASTASIS: A CASE REPORT

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Aim of Work: To report a case of painful perineal metastasis from urinary bladder carcinoma in a 73 -year old female patient treated with CT-guided Radiofrequency Thermal Ablation (RFA).

Patients & Methods: We report a case of painful perineal metastasis from urinary bladder carcinoma in a 73 -year old female patient, treated with CT-guided RFA. After the clinical examination, a dual-phase abdominal CT revealed a soft tissue mass in the perineal fat adjacent to the right ischium, with no bone involvement. A core needle biopsy (CNB) of this pelvic lesion under CT guidance was performed, and the

histological result revealed "metastasis from bladder carcinoma". Since the patient refused any other kind of treatment (surgery, radiation) we proceeded to a CT-guided RFA of the lesion. We used an electrosurgical generator, ELECTROTOM HiTT® 106 (BERCHTOLD Holding GmbH Ludwigstaler Strasse 25 Postfach 4052 D-78505 Tuttlingen) and HiTT (Highfrequency induced thermotherapy) needle applicator. RFA energy (50 W), was applied for 10min. No complications occurred during the procedure.

Results: She had immediately relief of her pain symptoms. The follow up in one and six months showed total necrosis of the mass. One year after, the patient has no pain and her subjective quality of life has been approved.

Conclusion: We believe that RFA treatment of painful metastatic disease is a promising minimally invasive low cost method that can provide palliation

POSTER 67:

FITZ-HUGH-CURTIS SYNDROME: INCIDENCE AND LABORATORY CHANGE AND RADIOLOGIC FINDINGS

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Aim of Work: To aim of our study was to report our experience about radiologic findings and incidence and change of liver enzyme of Fitz-Hugh-Curtis syndrome

Patients & Methods: CT images and medical records were reviewed retrospectively in 163 patients during the 18 months in whom a diagnosis of pelvic inflammatory disease had been made. The incidence, CT findings, and change of liver enzyme were evaluated.

Results: Fitz-Hugh-Curtis syndrome was detected in 32(19.6%) of 163 patients. In all 32 patinets, polymerase chain reaction Chlamydia trachomatis from cervical secretion. Amoung 32 patients, 26 patients(81.3%) were presented pleuritic right quadrant pain, and 1 patient(3.1%) was showed elevated liver enzyme. Varing degree of loculated perihepatic ascites and pelvic inflammatory change were also visualized.

Conclusion: Fitz-Hugh-Curtis syndrome was common. CT was useful to help diagnosis of FHCS, especially in young women with right upper quadrant pain with PID.

POSTER 68:

APPROACH TO THE ROLE OF TV ULTRASONIC CYSTIC ASPIRATION FOR THE POOR SURGICAL CANDIDATE

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Aim of Work: Transvaginal Cyst aspiration of ovarian cysts has been shown to have a about a 40% recurrence rate. However, we have looked at this procedure in a number of clinical settings where it played an essential role in the management of symptomatic patients.

Patients & Methods: Five clinical cases are reviewed, where the patient underwent ultrasonic guided transvaginal cyst aspiration. These included poor surgical / anesthetic candidates with malignances; post extensive abdominal surgery presenting with pelvic cyst and post infectious cysts. A retrospective review was done of the episodes of transvaginal cyst aspirations looking at the reason for aspiration, success at aspiration

of cyst to dryness and the clinical relief given to the patient. Any recurrent need for aspiration was also noted.

Results: The patients considered were either surgical or anesthetic risks, had previous extensive abdominopelvic surgery due to inflammatory or congenital problems. They were all satisfied with the results of the procedure, were willing to come again although only 40% needed repeat drainage. Complications occurred in one

Conclusion: Transvaginal cyst aspiration in the poor surgical candidate is appreciated as a safe patient friendly procedure that can be offered on an outpatient basis with minimal complications, discomfort and disruption of patient quality of life

POSTER 69:

IMAGING IN UROGENITAL EMERGENCIES

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SCIENTIFIC EXHIBIT

Aim of Work:

1) Familiarize the audience with the most urgent radiological emergencies in the urogenital system.

2) Learn the most appropriate approach for these emergencies and how to reach an appropriate differential diagnosis.

3) Learn the use of the appropriate modality.

4) Identify the radiological signs associated with each of these emergencies.

DISSCUSION:

The use of imaging in Urological emergencies is important to learn and manage.Flank pain/ureteral colic is experienced by 2-3% of the population with a 40-50% recurrence rate at 5 years. CT plays a valuable role in detecting location of the stone and the presence of obstruction.

Urosepsis occurs secondary to pyelonephritis, cystitis, prostatitis, or any other cause of obstruction. Ultrasound plays a valuable role in its diagnosis and intervention by placing a percutaneous nephrostomy catheter.

Ultrasound is utilized in acute renal failure to asses' renal size, parenchymal thickness and presence of obstruction.

CT with or with out cystogram is optimal for blunt abdominal trauma when kidney, ureter or bladder injury is suspected.

Retrograde Urethrogram can be done when a urethral injury is suspected

Ultrasound can easily differentiate orchitis from testicular torsion.

SUMMARY:

The use of imaging in urogenital emergencies is of outmost importance. Examples ofimaging and management will be given.

POSTER 70:

GENITOURINARY TRACT INJURY FOLLOWING ABDOMINAL AND PELVIC TRAUMA: EVALUATION WITH CT

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Aim of Work: In this exhibition, we will demonstrate image findings of various abdominal and pelvic trauma on CT and discuss the clinical impact according to variable image findings.

Patients & Methods: CT plays an important role not only for the detection of abdominal and pelvic injuries but also for their appropriate management.

Results: In order to make the best use of CT the radiologist should be aware of the appearance of various types of genitourinary tract injuries and the findings that indicate surgery or that may warrant repeat CT studies for monitoring of expectant management.

Conclusion: For the purpose of correctly diagnosing and suggesting a guideline for treatment, understanding of image findings of abdominal and pelvic trauma is important.

POSTER 71:

BILATERAL RENAL LYMPHANGIECTASIA ASSOCIATED WITH THORACIC LYMPHANGIECTASIA: RADIOLOGIC FINDINGS

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Aim of Work: Renal lymphangiectasia is a very rare entity. In this disorder, the perirenal space and the renal sinus are filled by multiseptated cystic masses that may demonstrate extrarenal extension and variable symptoms. We present the case of a 18-year-old male with renal lymphangiectasia and diffuse tubular enlargement thoracic duct who presented with abdominal pain.

Patients & Methods: Ultrasonography (US), computed tomography (CT), magnetic resonance imaging (MRI), and MR urography examinations performed on patient are presented.

Results: There was no renal failure and hypertension in the patient. The urinalysis showed neither hematuria nor proteinuria. Abdominal US revealed an enlarged hyperechoic bilateral kidney with multiple perirenal and peripelvic small cysts with thin septations. There was no parenchymal cyst. The CT scan of the abdomen showed fluid collections in the perinephric space bilaterally, surrounding the renal cortex and paraaortic-paracaval areas. On abdominal MRI, the perirenal cysts were hypointense and non-contrast-enhancing on T1-weighted images, and were

hyperintense on T2-weighted images with thin septations. The T2-weighted images also demonstrated thin tubular structures in the paraaortic-paracaval areas consistent with lymphatic dilatation. Thoracic MRI examination showed tubuler lymphatic dilatation which lies through thoracic vertebral column. MRU revealed a renal pelvic dilatation as a ureteropelvic obstruction.

Conclusion: Renal lymphangiectasia is a very rare disease and a treatable cause of renal hypertension, and it may cause renal failure; therefore, its diagnosis is important.

POSTER 72:

RENAL VASCULAR DISEASE: MULTIMODALITY IMAGING, SPECTRUM OF DISEASE, AND INTERVENTION

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Aim of Work: Renal vascular disease, whether congenital or acquired, remains an important cause of morbidity and mortality. It may result in acute sequelae, such as ruptured renal artery aneurysm, or chronic renal dysfunction, leading in many cases to end stage renal disease requiring renal replacement therapy. We aim to demonstrate the spectrum of renal vascular disease, with reference to modern imaging strategies and interventional techniques.

Patients & Methods: We describe our experience of renal vascular disease, correlating clinical presentation, imaging findings and imaging-guided therapies, drawing on departmental archives and individual radiologists image libraries. We have also performed a literature search to establish the current state of the art of diagnostic and management for each clinicopathological entity.

Results: Renal vasculopathy encompasses a variety of pathologic entities, many of which are readily diagnosed and amenable to radiologic intervention. Diabetes continues to rise in prevalence in Western society, leading to increased requirements for renal replacement

therapy, long-term haemodialysis catheter placement, and renal angioplasty and stenting.

Renal artery aneurysms are readily diagnosed at cross-sectional imaging, and may be successfully treated via stent graft placement. Arteriovenous malformations and venous anomalies may lead to both acute complications of urinary tract haemorrhage, and progressive renal dysfunction. Magnetic resonance angiography and multidetector computed tomography offer improved characterisation of renovascular pathology. Modern interventional techniques offer improved prognosis and reduced requirements for haemodialysis.We present our experience of the radiologic management of renal vascular disease, with representative multi-modailty imaging findings.

Conclusion: The radiologist plays a key role in the modern management of renal vascular disease.

POSTER 73:

EFFICACY OF PERIPROSTATIC LOCAL ANESTHESIA BEFORE TRUS GUIDED PROSTATE BIOPSY

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Aim of Work: Although TRUS guided needle biopsy of the prostate, which is the "gold standard" to diagnose prostate cancer, has been accepted as having mild complications a significant degree of discomfort notified by a considerable degree of patients has been reported in the literature. In this study we aimed to assess the efficacy of periprostatic local anesthesia on the level of discomfort associated with transrectal ultrasound-guided needle biopsy of the prostate.

Patients & Methods: A total 981 patients undergoing TRUS-guided prostate biopsy from February 2003 to November 2005 were included to the study. Group 1 (n=610) received 10 cm3 (5 cm3 each side) 2 % lidocaine injected into the periprostatic nerve plexus under TRUS guidance whereas Group 2 (n=371) received no anesthetic agent before the procedure. After the biopsy the patients were asked to express the degree of discomfort they experienced during the whole procedure by using visual anologue scale (VAS).

Results: No significant difference was detected between the two groups for the means of age, prostate volume, total PSA value, PSA density and detection rate of prostate carcinoma ($p>0.05$ for each). The mean VAS score for Group 1 (1.0 ± 1.2) was significantly lower than that of group 2 (4.3 ± 1.7) ($p<0.001$).

Conclusion: Periprostatic nerve blockade is an easy and significantly effective method of anesthesia for TRUS guided prostate biopsy. We strongly recommend the application of periprostatic nerve block as a standard method for the management of the discomfort experienced during the biopsy procedure.

POSTER 74:

THE ROLE OF URETHROGRAPHY FOR THE EVALUATION OF UNCOMMON BENIGN URETHRAL PATHOLOGIES

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Aim of Work: As the investigation of male urethral diseases is performed mainly clinically or by endoscopy, the role of imaging studies has been neglected. Retrograde urethrography has been accepted as the gold standard imaging method for the evaluation of urethral strictures. It is a preferred imaging modality as it is readily available, cost-effective and can give additional information in comparison with the other methods. In this exhibit, we aimed to present the urethrographic findings in uncommon benign pathologies involving the urethra.

Patients & Methods: The retrograde urethrographic imaging procedures comprised the use of a catheter-tip syringe for the administration of the iodinated contrast material under fluoroscopic monitoring.

Results: Retrograde urethrographic examinations of 6 patients are demonstrated; 1 with urethral rupture, 1 with urethrocutaneus fistula and urethral diverticulum, 2 with urethrorectal fistula, 1 with urethral diverticulum and 1 with benign stenosis of the anterior urethra.

Conclusion: Although newer imaging methods, the diagnostic utility of which has not been fully understood yet have been proposed for urethral imaging, urethrography still has a pivotal role for the evaluation of several benign pathologies of the urethra other than the most commonly encountered strictures of the posterior urethra.

POSTER 75:

THE ROLE OF TRUS GUIDED SYSTEMATIC PROSTATE BIOPSY FOR THE DETECTION OF PROSTATE CARCINOMA: A TURKISH EXPERIENCE

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Aim of Work: To evaluate the efficacy of transrectal ultrasound (TRUS) guided systematic prostate biopsy for the detection of prostate carcinoma and to correlate the histopathological findings with common-use clinical parameters.

Patients & Methods: Our records for 1011 patients who underwent TRUS guided biopsy of the prostate were overviewed. Mean patient age was 66.6±8.4. Indications for biopsy were abnormal findings on digital rectal examination (DRE) or TRUS or suspicious levels of PSA. In addition to standard 8 or 12 core sampling of the peripheral zone in first biopsies directed sampling was performed for suspicious areas detected by TRUS. Besides the inner gland was sampled by 4 additional cores in repeat biopsies.

Results: Of 1011 patients evaluated, 263 (26.0%) had adenocarcinoma and 21 (2.1%) had high grade PIN whereas a total of 727 (71.9%) patients had benign prostatic tissue, hyperplasia or prostatitis. The cancer detection rate was significantly associated with age (years: < or =50, versus 50-60, versus 60-70, versus >70), prostate volume (ml; < or =30 versus 30-50, versus >50, versus >100), total PSA value (ng/ml;< or =4 versus 4-10, versus 10-20), ratio of free to

total PSA (< or =0.15 versus >0.15), PSA density (ng/ml/cm3; < or =0.22 versus >0.22) but not with DRE (normal versus abnormal), biopsy sequence (first versus repeat) and number of cores biopsied (8 versus 12).

Conclusion: TRUS guided systematic biopsy provides an efficient sampling of the prostate gland when malignancy is suspected due to certain clinical or laboratory parameters.

POSTER 76:

ROLE OF TRANSRECTAL ULTRASOUND IN MALE INFERTILITY

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Aim of Work: To demonstrate the role of transrectal ultrasound (TRUS) in inferile male.

Patients & Methods: TRUS examination was done for 143 inferile men with low volume azoospermia or oligospermia.

Results: Congenital abnormalities were seen in 20 patients and abstructed lesions were detected in 113 patients. Congenital abnormalities included aplasia (n=9) or hypoplasia (n=11) of the vas deferens, ampulla of vas and seminal vesicles. The obstructed lesions included fibrosis (n=44), calcification (n=27) & calculi (n=13) of the ejaculatory duct and associated cysts (n= 29). The cysts were located in the periurethral region (midline) (n=14), along the ejaculatory duct (n=8) or in the seminal vesicle (n=7).

Conclusion: We concluded that TRUS is the ideal method for evaluating infertile men with low-volume azoospermia. As, it differentiates between surgically correctable distal obstructive lesions from those with non-correctable congenital anomalies. Also, It identify the cause and level of obstruction within the ejaculatory ducts.

POSTER 77:

MR UROGRAPHY OF OBSTRUCTIVE UROPATHY: DIAGNOSTIC VALUE OF THE METHOD IN SELECTED CLINICAL GROUPS

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Aim of Work: To evaluate the role of MRU in the diagnosis of obstructive uropathy in selected clinical groups.

Patients & Methods: Sixty patients with obstructive uropathy underwent static fluid MRU (sMRU), conventional MR sequences, excretory MRU (12 cases).

The degree of the urinary tract dilatation, the level and type of obstruction were estimated.Four groups of pathologies were distinguished: calculi, strictures of ureteropelvic junction (UPJ), benign and malignancy-induced ureterostenosis.Results were compared with IVU, CT, US, clinical and histopathological data.

Results: In patients with urolithiasis sMRU correctly depicted the degree of ureterohydronephrosis in 85%, in cases of UPJ stenosis and malignancy-induced ureterostenosis in 100% and in the group of benign ureterostenosis in 91%.Determination of obstruction level was adequate in 92% of stones and in 100 % of non-calculous ureteral strictures.Completed with conventional MR sequences sMRU depicted tumour or infiltration in 83% cases of malignancy-induced ureterostenosis. In the remaining groups neoplasm was excluded in 91%. Filling defects were verified with IVU/CT to exclude tumours.

Conclusion: MRU is useful technique in assessment of obstructive uropathy, especially that of non-calculous origin. Among different clinical applications MRU is superior in the evaluation of dilated urinary tract in altered anatomical conditions (e.g. ileal neobladder).

POSTER 78:

URINOMAS CAUSED BY URETERAL INJURIES: CT AND MR IMAGES.

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Aim of Work: We report the computed tomographic (CT) and magnetic resonance (MR) features of urinomas caused by ureteral injuries which are often not clinically suspected, causing delay in diagnosis.
Patients & Methods: CT and MR studies of 8 patients with ureteral injury were reviewed. Ureteral injuries were iatrogenic in 6 patients and traumatic in the remaining two. The most common presenting symptoms were severe abdominal pain and fever. Active urine extravasation into a perinephric urinoma is demonstrated by serial post-contrast imaging with CT and MRI showing progressively increased attenuation/signal intensity fluid in communication with the collecting system.
Results: The sites of injury were the proximal ureter in three patients, the middle ureter in three, the distal ureter in two. The urinomas appeared as confined fluid collections in five patients, as free fluid (urinary ascites) in two, and as both in one. Ureteral injuries
were treated surgically in eight patients.
Conclusion: Ureteral injuries after iatrogenic or penetrating trauma often are diagnosed with considerable delay. The presence of ascites or localized fluid collections in symptomatic patients after abdominal surgery or penetrating trauma should raise the possibility of a ureteral injury and prompt CT and MR imaging.

POSTER 79:

SONOGRAPHY OF THE URINARY TRACT NOWADAYS PROVIDES MORE THAN EVER IMPORTANT INFORMATION IN BOYS WITH POSTERIOR URETHRAL VALVES

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Aim of Work: To emphasize the role of sonography in the initial diagnosis, the presurgical investigation and prognosis of boys with posterior urethral valves (PUV).
Patients & Methods: During a 4-year period, 16 infants with PUV, 1-day to 7-month-old, were sonographically examined. In all cases, the final diagnosis of PUV was made with micturating cysteourethrogram (MCU), which remains the imaging diagnostic method of choice.
Results: The sonographic findings included: A) Hydronephrosis and hydroureters, bilateral (n=13), ipsilateral (n=2). MCU revealed the presence of vesicoureteric reflux, bilateral (n=12), ipsilateral (n=2). B) Increased parenchymal echogenicity and loss of corticomedullary differentiation bilaterally (n=14) and coexistent small or tiny peripheral renal cysts (n=9). These findings suggested renal dysplasia, as it was proved by the further laboratory tests. C) Medullary hyperechogenicity around the caliceal margin, attributed to intrarenal reflux (n=5). D) Linear hypoechoic regions converging towards the rounded calyceal margin, due to intratubular stasis or reflux (n=2). E) Crescent-shaped subcapsular urine collections as a result of intrarenal reflux (n=3), F) Ascites and urinoma (n=2), G) Thick-walled trabeculated urinary bladder (n=9), microdiverticula (n=3), H) Posterior urethral dilatation (n=4) J) Fungal balls in the dilated collecting systems (n=2) and intrarenal abscesses (n=1) in 2 infants with renal candidiasis after surgical management of PUV.
Conclusion: Modern high-definition sonographic equipments have widened significantly the spectrum of sonographic findings from the whole urinary tract in infants with PUV. Detailed information are clinically essential and concern the presence and severity of renal dysplasia, the possible complications of vesicoureteric and intrarenal reflux and the severity of urinary bladder outflow obstruction.

POSTER 80:

PATHOLOGIC ENTITIES OF THE UNDESCENDED TESTIS: THE ROLE OF SONOGRAPHY

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Aim of Work: The use of sonography in the investigation, demonstration and follow-up of the undescended testis has been well documented. The purpose of our study is to highlight the role of sonography in the diagnosis of rare but occasionally serious pathologic entities associated to cryptorchism.
Patients & Methods: During a 5-year period, 15 boys, 2-month to 8-year-old, with known or first diagnosed cryptorchism were sonographically examined with abnormal findings related to the undescended testis. The clinical presentation varied (painless/painful, acute/chronic inguinal swelling etc).
Results: The sonographic findings included: 4 cases of microlithiasis of the undescended testis (one of them in both undescended testes of one patient), 2 cases of multiple amorphous calcifications intesticular parenchyma, 2 cases of torsion of undescended testis and one testicular teratoma. In 3 boys, intestinal loops within the ipsilateral inguinal canal were demonstrated (noncarcerated inguinal hernia) and in 3 more cases, funicular hydrocele of the spermatic cord was revealed compressing the undescended testis.
Conclusion: Sonography, with its well-known advantages, performed by a Pediatric Radiologist who is aware of the whole spectrum of pathologic entities related to cryptorchism, can provide essential information arriving at a correct diagnosis and proper management.

POSTER 81:

CONGENITAL URACHAL ANOMALIES: THE CONTRIBUTION OF SONOGRAPHY

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Aim of Work: Although congenital urachal abnormalities are uncommon, their clinical manifestations during childhood are nonspecific causing diagnostic difficulties. The aim of this study is to present the role of sonography in the identification of these entities.
Patients & Methods: During a 4-year-period 13 children, 15-day to 14-year-old were sonographically examined. The clinical presentation varied (umbilical discharge, periumbilical pain, palpable painful or painless mass etc). The sonographic examination included the periumbilical region and the whole abdomen.
Results: The sonographic findings included: 3 cases of patent urachus, 3 cases of urachal sinus, 3 urachal diverticula and 4 urachal cysts. Sonographic findings of superimposed infection coexisted in 3 cases. The various sonographic appearances with embryologic and anatomic correlation are presented and the differential diagnosis is discussed.
Conclusion: The sonogram, which is usually the initial diagnostic study, has a major role in the proper diagnosis of all the four types of urachal abnormalities. Nowadays, high resolution equipments provide superb anatomic detail and guide the selection of subsequent imaging modalities when necessary and the appropriate management. The knowledge of the anatomy, embryology and the differential diagnosis represent essential prerequisites.

POSTER 82:

INGUINAL HERNIA CONTAINING THE UTERUS, FALLOPIAN TUBES AND OVARIES IN A PREMATURE FEMALE INFANT: CASE REPORT

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Aim of Work: It is known that the sliding hernia which contains the ovary with or without the ipsilateral fallopian tube occurs occasionally in female patients. However, the inguinal hernia that contains the uterus and one ovary and fallopian tube is very rare. The purpose of this study was to present the sonographic findings of one case of inguinal hernia that contained the uterus, the fallopian tubes, one ovary and part of the other ovary and to highlight the role of sonography in the correct diagnosis.To our knowledge, analogous case has not reported in the English literature.
Patients & Methods: We present a case of a premature 4-week-old female infant with an asymptomatic palpable left inguinal mass. The sonographic examination of the inguinal area was performed with a high-frequency 5-12 MHz broad band transducer and was supplemented by color Doppler and abdominal sonogram, as well.

Results: The sonographic examination revealed the presence of the body and apex of the uterus, the left ovary and part of the right ovary within the left inguinal canal. The remaining right ovary was depicted intraabdominally adjacent to the left internal inguinal ring. The sonographic examination of the lower pelvis confirmed the absence of uterus and ovaries from their normal position.The sonographic diagnosis was confirmed during surgical correction.
Conclusion: Prompt and proper diagnosis of inguinal hernia containing the ovaries and uterus is of outmost importance for the future fertility of young females. Sonography is the imaging method of choice
for the preoperative diagnosis of inguinal hernia in girls.

POSTER 83:

RADIOLOGICAL SURVEILLANCE FOR SIMPLE INTRATESTICULAR CYSTS: AN 11-YEAR EXPERIENCE

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Aim of work: To evaluate the clinico-radiological findings and outcome of management, of simple intratesticular cysts, reviewing an 11-year experience.
Patients & Methods: From March 1994 to September 2005, 24 men underwent scrotal ultrasound scan and follow up for simple intratesticular cyst. The records were analysed retrospectively for presentation, radiological findings and outcomes of management.
Results: The mean age of our patient population was 64.5 years (range 35-92 years) and median follow up was 32 months (range 6 to 124 months). All 24 patients with simple intratesticular cysts were managed successfully with radiological surveillance. No patient underwent orchidectomy or required enucleation of the cyst. Of the 24 patients, 17 patients (71%) had a simple cyst in the right testis, 6 (25%) had a cyst in the left testis and 1 patient (4%) had bilateral cysts. In 6 cases (25%) the cysts were multiple and the remaining 18 patients (76%) only had a single cyst. The maximum diameter of the cysts was 33mm (Case 8) and the minimum was 1mm, with a median diameter of 6mm. An associated epididymal cyst was found on the ipsilateral side in 7 patients and on the contralateral side in 6 patients.
Conclusions: Simple intratesticular cysts may be managed conservatively with regular ultrasound surveillance by an experienced uroradiologist, without the need for surgical intervention

POSTER 84

RENAL TUMOR MIMICS: REPORT OF 2 UNUSUAL CASES

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We report two cases in which a there was a presumptive diagnosis of malignant renal tumor, but the final diagnosis was benign disease. The first case was of a 84 year-old woman who underwent both sonography and abdominal CT and was found to have a bulging heterogeneous solid focal lesion of the left kidney. Imaging studies were otherwise normal.The patient underwent nephrectomy, and the histologic diagnosis was renal malakoplakia. The histology is identical to that of xanthogranulomatous pyelonephritis, but the focal presentation makes the pre-operative diagnosis very difficult. The second case involved a 61-year-old woman with ESRD and recurrent UTI who presented with chills and high fever; she was found on CT to have renal cysts in the upper pole of the left kidney and a heterogeneous solid enhancing mass in the lower pole. In addition, there were ipsilateral enlarged retroperitoneal lymph nodes at the level of the renal hilus. The patient was suspected of having metastatic primary renal malignancy, and underwent CT-guided core biopsy of the enlarged lymph nodes. Histologic diagnosis was tuberculous adenopathy, and the patient was started on appropriate anti-TB treatment.
The differential diagnosis of renal masses includes malignant and benign tumors, infectious and inflammatory processes, congenital and traumatic conditions. Careful workup including appropriate imaging can help in instituting proper treatment, and avoiding unnecessary surgery.

POSTER 85

URINARY TRACT ABNORMALITIES: INVESTIGATION USING CT UROGRAPHY

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Aim of Work: Multidetector CT is an ideal tool for CT urography. Coronal reformation provides exquisite delineation of the urinary tract free from artefact. The better detection of calculi, renal parenchymal masses and extrinsic lesions means multislice CT now rivals conventional urography in investigating urinary tract abnormalities, albeit at a higher radiation dose.
This paper aims
•To outline patient selection;
•To describe a method of limiting dose without compromising diagnosis;
•To provide a pictorial review of abnormalities demonstrated by CT urography.
Patients & Methods: CT urography is performed on patients with continuing macroscopic hematuria or with atypical cytology following non diagnostic IVU, on patients with abnormal IVU prior to retrograde studies; on patients in whom retrograde ureteroscopy is indicated but contraindicated.The protocol involves performing a pre contrast scan of the urinary tract followed by IV injection of 20mg of frusemide. 75mls of Niopam 300 are injected at time 0mins and then again at 8mins., the patient exercising between the 2 injections. This is followed by a prone KUB scan of the patient.
Results: 36 patients have been scanned over 11 months. 22 of these revealed urinary tract abnormalities, including calculi, simple cysts, cortical scarring, PUJ obstruction, duplex system and VUJ diverticulum, renal cell and transitional cell cancers.
Conclusion: Our CT urography protocol achieves a 3 phase examination- precontrast, cortico-medullary and excretory phases- from a 2 phase scan. This reduces patient dose without compromising the quality or diagnostic value of the examination. Additional lesions including tumours not detected by more conventional imaging have been detected.

POSTER 86

THE USE OF STATIC-DYNAMIC MR UROGRAPHY FOR THE EVALUATION OF CONGENITAL URINARY TRACT DILATATION

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Aim of Work: The aim of this study is to evaluate the use of combined static-dynamic MR urography for the evaluation of congenital urinary tract (UT) dilatation in infants and children.
Patients & Methods: Thirty patients with congenital UT dilatation were prospectively evaluated using combined static-dynamic MR urography. Static MR urography was done using respiratory-triggered, heavily T2-weighted coronal 2D fast pin-echo sequence. Dynamic MR urography was done using a coronal 3D spoiled gradient echo T1-WI (FAME) sequence to cover the kidneys, ureters and bladder within 15 seconds. The 3D dynamic sequence was acquired before the injection of contrast and then continuously for 30 minutes after the injection of a bolous dose of Gd-DTPA (0.2 mmol/kg). An IV bolous of furosemide (0.5 mg/Kg) was given to the patient 15 minutes after contrast injection. The dynamic sequence was used to generate time-intensity curves from the entire renal parenchyma and the entire kidney. Split renal function was calculated from the parenchymal curve. Results of MR urography were compared with those of ultrasonography (US) (n=30), conventional urography (N=5), voiding cystourethrography (N=8), diuretic renal scintigraphy (DRS) (n=14) and surgery (N=8).
Results: MR urography clearly demonstrated uretropelvic junction stenosis (n=18) and non-stenotic dilatation (n=20) in the 38 abnormal kidney-ureter units. MR urography findings were in accordance with US findings in 28 of the abnormal kidney-ureter units and superior to US findings in the remaining 10 kidney-ureter units. For split renal function, dynamic MR urography and DRS showed significant correlation ($P < 0.001$).
Conclusion: Combined static-dynamic MR urography is an excellent tool for the evaluation of congenital UT dilatation in infants and children. It can be used for the calculation of split renal function and urinary excretion in those patients as well.

POSTER 87

HYDATID DISEASE OF THE SEMINAL VESICLES MIMICING URINARY TUMOR: A STUDY OF 2 CASES

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Aim of Work: To study the radiological features of hydatid disease of the seminal vesicles in 2 cases mimicing urinary tumor.
Patients & Methods: Two patients admitted to Menoufyia University hospitals, with the provisional diagnosis of urinary neoplasm.
Results: The radiological features of the 2 cases are described and evaluated.
Conclusion: Hydatid disease of the seminal vesicles is a very rare condition that could mimic a urinary tumor.

POSTER 88

ROLE OF ENDORECTAL MR IMAGING AND MR SPECTROSCOPY IN THE EVALUATION OF PROSTATE CANCER

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Aim of Work: To assess the role of MR imaging and MR spectroscopy for the evaluation of tumor location, local extent (extracapsular extension ECE and/or seminal vesicle invasion SVI), volume, and aggressiveness.
Patients & Methods: Magnetic resonance (MR) imaging and MR spectroscopy of the prostate gland are performed during the same examination with a conventional clinical MR unit. Prostate zonal anatomy and prostate cancer are best depicted on multiplanar T2-weighted MR images. MR imaging and MR spectroscopy are not used as an initial diagnostic tool. Their use in tumor detection is reserved for patients with elevated prostate-specific antigen levels in whom previous biopsy results were negative.
Results: In staging and treatment planning, MR imaging has been shown to have an incremental value additive to the value of clinical nomograms. Furthermore, anatomic and metabolic mapping of the prostate gland with MR spectroscopy offers the possibility of optimizing treatment planning (watchful waiting, surgery, or radiation therapy [intensity-modulated radiation therapy or brachytherapy]), thus further expanding the role of MR imaging in the achievement of patient-specific, individualized treatment.
Conclusion: Endorectal MRI and MR Spectroscopy can help identify tumor sites and depict ECE and SVI with reasonable accuracy in patients with prostate cancer.

POSTER 89

A CASE OF MASSIVE UTERINE BLEEDING DUE TO FIBROID EXPULSION AFTER UTERINE ARTERY EMBOLIZATION:

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A 35-year–old woman presented with menometrorrhagia and bulk-related symptoms. A pelvic ultrasound revealed a uterus measuring 137mm×110mm×84mm, with a single intramural fibroid that measured 66mm×81mm×93mm and was located in the posterior uterine corpus. She underwent uterine artery embolization (UAE) using 500-710 micron polyvinyl-alcohol particles. Seventy days after UAE, the patient developed moderate contractive pelvic pain. In 2 days, she referred to the hospital for a large vaginal mass. Vaginal examination in the emergency room revealed prolapsed fibroid tissue partially adhering to the uterus. Under sterile conditions, the fibroid was attempted to be removed but some tissue still remained attached to the uterus. While the patient was being prepared for hysteroscopy, the tissue (84mm×94mm×72mm) expelled spontaneously with massive uterine bleeding. Urgently, the patient was transferred for emergency

embolization, to stop the bleeding. Re-embolization was performed under conscious sedation and vaginal bleeding stopped by 3 hours after embolization. Follow-up showed complete elimination of menstrual, urinary and bulk-related symptoms. At 18 months, the follow-up ultrasound revealed a normal sized uterus with no evidence of fibroids and a complete resolution of the symptoms. In conclusion, it is essential to warn women undergoing UAE about the possible risk of spontaneous expulsion of fibroids and consequently vaginal bleeding. In addition, a close follow–up is required to prevent possible short–term complications such as hemodynamic disturbances and infection after fibroid expulsion. We recommend that physicians consider the choice of uterine artery re-embolization for uterine bleeding after fibroid expulsion as an alternative treatment for hysterectomy.

POSTER 90

ULTRASOUND VS SURGERY IN THE DIAGNOSIS OF ELYTROCELE.

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Aim of Work: The aim of work: It is to define the elytrocele ultrasound's line between the ultrasound evalutation and the surgery
evidence.

Patients & Methods: We analysed 32 patients (Pts) with II–III grade prolapse in the period between the 01/01/2002 and 01/01/2005, 20 of those patients were already hysterectomised. All 32 patients underwent to a Moskowitz.

Results: In the ultrasound examination we observed 13(65.0%)of the 20 Pts with elytrocele, 3 (25.0%) of the 12 Pts with utero have elytrocele too. In the time of operation of Moskowitz we observed 10 Pts(76.9%), of the 13 Pts identified with elytrocele by ultrasound, with a real elytrocele and 2 Pts (66.6%) of the 3 Pts with elytrocele too. At all 7of the 7 Pts hysterectomised and 9 of the 9 Pts with utero without elytrocele in ultrasound ad operation.The association between the ultrasound and surgery diagnosis has been evaluated by the Kappa of Cohen individually for the women with and without hysterectomy. In add has been evaluated the positive and negative predictive value, and the sensibility and specificity of the ultrasound on the surgery.In the group of hysterectomised women and unhysterectomised women the association between the two diagnosis is high (PtsHyst: K= 0.7; PtsUnHyst: K= 0.75; SenHystPts: 1; SensUnHystPts: 0.667; SpecHystPts: 0.7; SpecUnHystPts: 1; PPVHystPts: 0.769; PPVUnHystPts: 1; NPVHyst Pts: 1; NPVUnHystPts: 0.9).

Conclusion: Ultrasound and surgery have the same diagnosis index for elytrocele, but the studied population is too small to be statistically estimated. Ulterior studies are needed to understand better the ultrasound potential in this pathology.

POSTER 91

ADNEXAL MASSES: ACCURACY OF CHARACTERIZATION WITH MULTIDETECTOR CT AND MR IMAGING

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Aim of Work: To determine the accuracy of multidetector CT on a 16-row CT scanner and magnetic resonance (MR) imaging in the characterization of adnexal masses

Patients & Methods: Preoperative multidetector CT examination of the abdomen and MR imaging of the pelvis was performed in 61 consecutive women with clinically or sonographically detected adnexal masses. The CT examinations were performed on a 16-row CT scanner and the protocol included scanning of the abdomen on the portal phase using a detector collimation of 16 X 0.75 mm and a pitch of 1.2. We used a 1.5-T magnet unit to perform T1-, T2- and fat-suppressed T1-weighted sequences before and after intravenous administration of gadolinium chelate compounds. The accuracy of multidetector CT and MR imaging in the differentiation between

benign and malignant adnexal masses was evaluated, using surgical and histological results as reference.

Results: Multidetector CT and MR imaging demonstrated a sensitivity of 82% and 91%, specificity of 94% and 96%, a positive predictive value of 86% and 96% and a negative predictive value of 93% and 96%,respectively in the characterization of adnexal masses.

Conclusion: Both multidetector CT and MR imaging demonstrated satisfactory results, with MR imaging proving superior in the characterization and differentiation of adnexal masses.

POSTER 92

EXPERIENCES WITH A BI-PHASIC MDCT-UROGRAPHY PROTOCOL

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Aim of Work: To study the benefit of an early and late excretory phase (EP) compared to a single EP concerning upper urinary tract(UUT) opacification in multidetector CT urography (MDCTU).

Patients & Methods: UUT opacification was retrospectively evaluated in 45 bi-phasic 4-row-MDCTU-examinations. UUT was divided into 4 sections: intrarenal collecting system (IRCS), proximal, middle and distal ureter. Two independent readers rated opacification: 1, none, 2, partial, 3, complete. Numbers of segments and percentages of UUTs at each score were calculated for each EP and two EPs combined. Results of a single EP and of combined EPs were compared by wilcoxon matched-pairs signed-ranks.

Results: In total, 75 UUTs were analysed. IRCS and proximal ureter were at least partially opacified in each phase in > 95%. The middle ureter was at least partially opacified in the early and late EP in 85% and 93%, respectively. The distal ureter was opacified in 65% in the early EP and in 78% in the late EP, and not opacified in 34% and 21%, respectively. Combining two EPs, non-opacified segments decreased to
7%. Significant improvement of a single EP as compared to combining two
EPs were found for the middle and distal ureter ($p<0.03$).

Conclusion: Bi-phasic MDCTU substantially improved opacification of the middle and distal ureter. IRCS and proximal ureter are reliably opacified with one EP.

POSTER 93

CT VERSUS MRI IN THE ASSESSMENT OF RENAL MASSES

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Aim of Work: This prospective study was designed to compare between the CT and MRI imaging modalities in the diagnosis and management of different renal masses.

Patients & Methods: Fifty patients presented with renal space occupying lesions other than hydronephrosis or simple renal cysts as detected by abdominal ultrasound were included in this study. All patients were subjected to pre and post contrast CT examination and different MR sequences in two or three planes.

Results: Compared to post-operative data, both enhanced CT and MRI were able to assess and evaluate renal space occupying lesions. However, MRI had higher yield than enhanced CT in assessing the exact intra-renal location of the lesions (97.6%and 85.7%), the size of the lesions (86.8%and52.6%), differentiating cystic from solid lesions(95.2%and 81.0%), determining the presence or absence of enlarged lymph nodes(90.2%and80.5%), evaluation of renal vein thrombosis (95.1%and73.2%) respectively. MRI was found to be the most accurate imaging tool that could exclude infiltration of paraspinous muscles when it was suspected (90.2%) while enhanced CT (80.5%). However both MRI and enhanced CT were found to have the same high yield (97.6%)in assessing extension of the lesions to perinephric space.

Conclusion: Both enhanced CT and MRI have comparable accuracy in evaluating solid renal space-occupying lesions and can be used in evaluating such lesions, yet, MRI has a higher yield of

accuracy and is the preferred imaging tool of evaluation in selective cases when lesions are still questionable, or when the details of the lesions are of critical importance to decide the mode of therapy.

POSTER 94

COMPARATIVE STUDY BETWEEN RETROGRADE URETHROGRAPHY, SONOURETHROGRAPHY AND MR URETHROGRAPHY

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Aim of Work: To compare the urethral stricture parameters that can be detected by retrograde urethrography, sonourethrography and MR urethrography in relation to the actual parameters that are found intr-aoperatively.
Patients and Methods: A total of 18 patients with anterior urethral stricture have been treated by anterior urethroplasty. All patients were subjected to retrograde urethrography, sonourethrography,and MR urethrography. The stricture parameters (site, length, luminal diameter, spongiofibrosis, and anatomical relation of stricture to corpus spongiosum) that are detected radiologicaly are compared together to that are found intr-aoperatively.
Results: The preoperative stricture parameters when compared to operative finding revealed that ; retrograde urethrography has poor correlation while sonourethrography has the advantage in detection of spongiofibrosis and length of stricture segment.MRI appeared to be the method of choice in detection of stricture parameters.
Conclusios: MRI has the advantage to demonstrate the all the important data which couldn'tevaluated by other modalities as regards actual length, periurethral tissue, spongiofibrosis, and the proximal end of the stricture.

POSTER 95

LOCAL STAGING OF ENDOMETRIAL CARCINOMA: ROLE OF MULTIDETECTOR CT

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Aim of Work: The aim of this study was to evaluate the diagnostic performance of multidetector CT on a 16-row CT scanner in local staging of endometrial carcinoma
Patients & Methods: Thirteen consecutive patients with newly diagnosed endometrial carcinoma were included in this prospective study. All patients underwent multidetector CT and surgery. The CT protocol included scanning of the abdomen on the portal phase using a detector collimation of 16 X 0.75 mm and a pitch of 1.2. Multiplanar reformatted images in the transverse, sagittal and oblique planes were evaluated to assess the depth of myometrial invasion and cervical involvement. CT findings were compared with surgicopathologic results
Results: The sensitivity, specificity, positive predictive value and negative predictive value in evaluating the depth of myometrial invasion were 89%, 75%, 89% and 75% and those for cervical infiltration were 57%, 83%, 80% and 62%, respectively. These results were satisfactory compared with those reported for single-detector row CT scanners (sensitivity of 83%, specificity of 25% in assessing myometrial invasion and sensitivity of 42%, specificity of 70% for cervical involvement).
Conclusion: Multidetector CT on a 16-row CT scanner improved the diagnostic performance of CT in local staging of endometrial carcinoma

POSTER 96

DOES MRI URETHROGRAPHY HAVE IMPACT ON ENDOSCOPIC MANAGEMENT OF ANTERIOR URETHRAL STRICTURE?

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Aim of Work: The aim of this work is to evaluate the efficacy of visual internal urethrotomy in management of anterior urethral stricture based on MRI urethrography.

Patients & Methods: Fifty-one patients (23-57 yrs) mean age (37 yrs) with passable anterior urethral stricture. The stricture sites were penile in 15 patients (29.4 %), bulbous in 19 patients (37.3 %) and bulb membranous in 17 patients (33.3%). MRI urethrography was done for all patients prior to visual internal urethrotomy. Thirty-one patients
had urethrotomy at dorsal position (12 O\\\'clock position), while the other twenty patients had urethrotomy at both ventral (6 O\\\'clock position) and dorsal positions. Patients were scheduled for follow up visit one month after removal of the catheter then every month for the first 6 months and every 3 months for the rest of follow up periodwhich ranged from 12-26 months.

Results: The overall success rate after visual urethrotomy was 76.5 % (39 patients). The success rate with dorsal urethrotomy was 71 %, while after combined ventral and dorsal urethrotomy the success rate was 85 %. Bleeding during urethrotomy occurred for two patients. Perineal extravasation occurred in three patients during ventral urethrotomy.
The success rate is also statistically calculated for each site of stricture.

Conclusion: MRI urethrorography enhanced the success outcome of visual interal urethrotomy by localizing the site of fibrosis. Accordingly, dorsal or dorsal plus ventral urethrotomy based on MRI findings may be of value in attacking the exact site of fibrosis and limiting the need for reurethrotomy or increasing the symptoms free interval.

POSTER 97

UPPER TRACT IMAGING IN PATIENTS PRESENTING WITH HAEMATURIA - THE ROLE OF ULTRASOUND.

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Aim of Work: Optimal imaging of the upper urinary tract in haematuria remains controversial. Many argue that both IVU and renal ultrasound (US) are worthy initial investigations. We report our experience with the use of either IVU or ultrasound alone as the primary investigation in haematuria over an 11 year period.

Patients & Methods: A retrospective casenote study of patients diagnosed with upper urinary tract TCC between 1990 and 2000. Two protocols were used: urine cytology, MSU and cystoscopy with (A) IVU (1990 -1993) or (B) US (1994 – 2000), subsequent IVU only in patients with loin pain, renal calculi, unexplained positive cytology or recurrent haematuria with previous negative investigations.

Results: Forty-seven cases of upper tract TCC were identified with records available for 45 (32 males, 13 females, mean age 69, range 34-87). Protocol (A) was performed in 8 of these patients. Six had an abnormal IVU and 2 had abnormal cytology alone. Using protocol B, over 3000 patients were investigated, 37 diagnosed with upper tract TCC. US showed abnormalities in 29 (78%) and cytology alone in 7 (19%) giving a primary detection rate of 97%. One patient with normal investigations re-presented with haematuria 10 months later and an IVU showed a filling defect (G2 pTa TCC).

Conclusion: Ultrasound combined with urine cytology as first linevinvestigations led to the detection of 36 out of 37 (97%) upper tract TCC in this retrospective analysis. The greater sensitivity of US over IVU in detecting renal masses suggests US should be the primary imaging modality in patients with haematuria. The routine use of IVU will diagnose very few additional upper tract tumours.

POSTER 98

IMAGING SPECTRUM OF PAPILLARY RENAL CELL CARCINOMA BY CT AND MRI

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Papillary RCC is the second most common carcinoma of the renal parenchyma after clear cell RCC and known to be biologically not as aggressive as clear cell RCC and thus carry a better prognosis. Typical papillary RCC demonstrates low stage, hypovascularity showing gradual or prolonged enhancement on dynamic CT and MRI, and low signal intensity on T2W MRI. However, several reports in the literature have demonstrated a subset of patients with papillary RCC that have a more aggressive biology and advanced stage at presentation. Our imaging experiences with CT and MRI support this that some papillary RCC is more invasive showing intratumoral bleeding, renal vein thrombosis, lymphnode metastasis and distant metastasis at presentation. This difference on imaging may be in some part due to pathological difference of papillary RCC between two pathological groups of patients.

This educational exhibit will show the imaging spectrum of papillary RCC from low grade and low stage cases to high grade and high stage cases.

POSTER 99

THE DIFFERENTIATION BETWEEN RENAL CELL CARCINOMA AND ANGIOMYOLIPOMA WITH NO VISIBLE FAT AT UNENHANCED CT

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The differentiation between renal cell carcinoma (RCC) and angiomyolipoma is important, since the treatment for these two diseases is different from each other.

Most angiomyolipomas can be diagnosed by identifying fat component of the mass at unenhanced CT. However, some AMLs do not contain fat attenuation at unenhanced CT. This CT appearance caused by AMLs with minimal fat (type A), AMLs with diffuse scattered distribution of fat cells (type B), and AMLs with hemorrhage. Type A consists mostly of smooth muscle and results in hyperattenuating mass. Type B, when volume averaged with neighboring smooth-muscle cells, result in iso- or hypoattenuating masses

AML shows different imaging findings dependent on the amount of fat included in the tumor, while ach subtype of RCC shows different imaging findings. We demonstrate the various imaging findings of RCC and AML, and discuss the possibility and limitation of the differentiation between these two tumors.

POSTER 100

LOW DOSE CT UROGRAPHY: HOW FAR CAN THE RADIATION DOSE BE REDUCED? A PROSPECTIVE STUDY.

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Aim of Work: To investigate how far the radiation dose can be reduced at the unenhanced and excretory phase scans of CT Urography.

Patients & Methods: A dose escalation study was designed to investigate how far the effective mAs can be reduced. Each patient was his own control as the scans with lowered effective mAs were performed as

additional scans at clinical CT Urography investigations.The scans with lowered effective mAs were first compared to scans performed at standard effective mAs settings. Then the low dose scans were judged together with the corticomedullary scans (performed at standard effective mAs settings, mean 110 mAs).If three low dose scans were judged inadequate, the study continued to a higher dose level, i.e. higher effective mAs. The study ended when 20 approved low dose examinations were included in each group (unenhanced and excretory groups).

Results: 20 patients were included in the unenhanced group at an effective mAs of 20 mAs. Seven patients were included in the excretory group at an effective mAs of 20 mAs but 3 of these examinations were judged inadequate. The excretory group continued to the higher dose level, effective mAs 40 mAs. Here 20 patients were included.

Conclusion: This study shows it is feasible to perform the unenhanced scan at an effective mAs of 20 mAs (CTDI(volume) 1.3 mGy) and the excretory phase scan at 40 mAs (CTDI(volume) of 2.6 mGy) without losing important information if the scans are judged together with a corticomedullary scan at normal settings.

POSTER 101

DETECTION OF EXTRA-CAPSULAR EXTENSION OF PROSTATE CANCER: USEFULNESS OF DYNAMIC CONTRAST-ENHANCED MRI

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Aim of Work: To assess usefulness and efficacy of dynamic contrast-enhanced (DCE) MRI in addition to axial T2-weighted images for the detection of extra-capsular extension (ECE) of prostate cancer.
Patients & Methods: The study was designed as a retrospective independent reading of MR images (high-field 1,5T system) by two general radiologists (A and B) with experience in prostate imaging of 2 and 1 years, respectively. Total of 27 patients with prostate cancer diagnosed by transrectal ultrasound-guided multifocal biopsy were referred for endorectal MR imaging from September 2006 to November 2006. All studies were performed 3-5 weeks after biopsy and 1-6 weeks before radical prostatectomy (22 cases operated). Histological analysis of resected prostates (with Indian ink capsule staining) revealed 9 cases of ECE. Study material consisted of two digital sets of anonymized images including (1) axial T2-weighted images and (2) combination of T2-weighted images with DCE images. Two radiologists (blinded to the patients' clinical and personal data) were asked to assess ECE on all randomly presented sets of images.
Results: When only axial T2-weighted images were assessed diagnostic accuracy of MRI for detection of ECE was 0.77 and 0.59 for radiologist A and B, respectively. Combined protocol allowed radiologist A to achieve accuracy of 0.86 and radiologist B – 0.77. Sensitivity for detection of ECE rose from 0.78 to 0.89 for radiologist A and from 0.55
to 0.78 for radiologist B. Inter-observer agreement on the presence of ECE according to combined protocol was substantial (kappa=0.73).
Conclusion: According to our preliminary data addition of DCE images improves detection of ECE, especially by a less experienced reader.

POSTER 102

ENHANCEMENT AND WASHOUT CHARACTERISTICS OF PHEOCHROMOCYTOMAS ON MRI

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Aim of Work: To evaluate the enhancement and washout pattern of pheochromocytomas on CE dynamic MR imaging.
Patients & Methods: Between Jan. 1995 and March 2006 45 patients (27f/18m, mean age 48 yrs, range 27-74 yrs) with 48 histologically proven pheochromocytomas were included in this study. All patients underwent MR imaging on a 1,5 Tesla unit. MR protocol included T2w axial and coronal images, CSI, T1w SE, unenhanced and CE dynamic series.Before 1999 the latest CE series was performed 7 min p. i. (21 pat.). Since 1999 a 20 min delayed series was routinely done in all patients (24 pat.).The maximum percentage of gadolinium enhancement was calculated by comparing the highest SI of the adrenal mass on CE images with that on unenhanced images as follows: [(SI A max – SI a pre)/SI A pre] * 100. The maximum percentage washout of gadolinium was calculated as the relative decrease in the maximum SI of the mass to that seen on the final image 7 min, respectively 20 min after contrast injection. [(SI A max – SI A final)/ SI A max] * 100.
Results: The maximum percentage of gadolinium enhancement ranged between 11.7% and 293.7% with a mean percentage of 152.7%. The maximum percentage of gadolinium washout ranged between 9.6% and 41% with a mean percentage of 25.3% in patients without a delayed series. When a delayed series was available, the maximum percentage of gadolinium washout ranged between 6.5% and 67,3% with a mean percentage of 36.9%.

Conclusion: This data show various enhancement patterns and washout characteristics of pheochromocytomas on MR imaging.

POSTER 103

ROLE OF MR RENOGRAPHY IN THE EVALUATION OF ACUTE RENAL GRAFT COMPLICATIONS

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Aim of Work: The aim of this study is to evaluate the role and accuracy of MR renography in the evaluation of acute renal graft complications.
Patients & Methods: This study included 15 patients (9 male & 6 females with an age range of 27- 43 years & mean age of 37 years) with acute renal graft complications. All patients were examined with axial T1- weighted spin-echo & axial T2-weighted fast spin-echo images. This was followed by dynamic MR renography which was acquired using a coronal 3 D spoiled gradient echo T1- WI (FAME) sequence to cover the entire renal graft within 15 seconds. The 3 D dynamic sequence was first acquired before the injection of contrast, during the injection of a bolous dose of Gd-DTPA (0.03 m mol/kg), continuously for the following 4 minutes after the injection of contrast and then it was repeated once every minute for the next 25 minutes. MR renography images were evaluated subjectively as well as objectively by drawing a time-enhancement curves for the entire renal parenchyma (perfusion) and the renal pelvis (contrast excretion). Results were compared with those of renal scintigraphy (n=7) and biopsy (n=15).
Results: The MR renography results were concordant with the biopsy results in 84% of the cases and with the renal scintigraphy results in 95% of cases. In patients with acute tubular necrosis (ATN) (n=9), MR renography revealed normal renal perfusion curve with failure of contrast excretion while in patients with acute rejection (AR) (n=6) the MR renogram revealed very poor renal perfusion with low amplitude flat parenchymal enhancement curve and failure of contrast excretion. MR renography was found to be 95% sensitive and 88% specific for the diagnosis of ATN and 85% sensitive and 84% specific for the diagnosis of AR.
Conclusion: MR renography is a promising modality that showed a good overall accuracy in the diagnosis of acute renal graft complications. Further larger studies are required before this tool could be used to replace renal scintigraphy in this respect.

POSTER 104

COMPARISON OF PROSTATE CANCER STAGING PERFORMANCE BETWEEN HIGH-FREQUENCY GRAY-SCALE TRANSRECTAL ULTRASOUND AND T2-WEIGHTED MRI AT 3T WITH A BODY ARRAY OR ENDORECTAL COIL

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Aim of Work: To compare the prostate cancer staging performances of high-frequency grey-scale transrectal ultrasound (TRUS) and T2-weighted MRI at 3 tesla (T) with a body array or endorectal coil.
Patients & Methods: From June 2004 to August 2005, 30 consecutive patients with clinically localized prostate cancer (mean age: 60 years, mean PSA: 6.30 ng/ml) were scheduled to undergo TRUS and 3T MRI prior to radical prostatectomy.With a biplanar 10-MHz endorectal probe, axial grey-scale TRUS images were obtained. At 3T, T2-weighted fast-spin echo images in three planes were acquired first with a body array coil (TR/TE 3700/124 ms) and subsequently with an endorectal coil (TR/TE 5000/153 ms). Two readers independently read all imaging. Radiologist 1 (R1) had four years of experience in endorectal prostate MRI but no TRUS experience. Radiologist 2 (R2) had two years of experience in both. Disease stage was scored as stage T2 or T3 on a 5-

point probability scale. Whole-mount section histopathology was the standard of reference. Areas under the ROC curves were determined. P<0.05 was statistically significant.
Results: The AUCs of R1 for TRUS, body array coil, and endorectal coil MRI were 0.49, 0.67, and 0.93, respectively. For R2, these were 0.85, 0.54, and 0.97, respectively. Endorectal MRI was significantly better than TRUS for R1 and body array coil MRI for R2. TRUS was significantly better than body array coil MRI for R2.
Conclusion: Endorectal MRI at 3T obtained the highest accuracy in both readers. If this technique is not available, high-frequency TRUS is an alternative only in experienced TRUS readers.

POSTER 105:

MR IMAGING OF PROSTATE CANCER

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Aim of Work: To evaluate the role of MRI with the use of transrectal coil in men with prostate cancerTo illustrate the spectrum of the disease as well as the advantages of this methodTo describe the best indications and approval criteria for MRI To raise the awareness of the pathological correlate of MR appearances encountered in the pre-operative staging of prostatic carcinoma.
Patients & Methods: Several advances in the imaging of prostate cancer have been made in recent yearsProstate cancer is the most commonly diagnosed non cutaneous cancer in males. Diagnosis is made by a combination of clinical examination, elevated prostate specific antigen and transrectal prostate biopsy. However, consensus is lacking concerning recommendations for prostate cancer screening. There are several reasons for the controversy surrounding screening tests for prostate cancer.The recently reported accuracy of Mri detection of extracapsular extension (82%) and seminal vesicle invasion (97%) and MRI high specificity (>90%) in excluding extracapsular tumors, far exceed the reported values for either TRUS or CT.A literature review suggests patients with moderate risk of extracapsular extension benefit most from endorectal MRI evaluation.The role of MRI nowadays has extended to every aspect of patient management.
Results: The examination was performed at SIEMENS SONATA MAESTRO 1,5 TESLA with use of endorectal coil.
We will present our experience in our hospital.
Conclusion: Owing to multiplanar capability and excellent tissue contrast, MR is the best imaging modality in demonstrating the anatomy of the gland as well as staging prostate cancer.

