| Time  | room A  2nd level | room B  2nd level | room C  2nd level | room E1 entr. level | room E2 entr. level | room F1 entr. level | room F2 entr. level | room G lower level |
|-------|------------------|------------------|------------------|---------------------|---------------------|---------------------|---------------------|------------------|
| 08:30 |                  |                  |                  |                     |                     |                     |                     |                  |
| 09:00 |                  |                  |                  |                     |                     |                     |                     |                  |
| 09:00 | CC 1616          | RC 1610          | CC 1617          | RC 1601             | RC 1602             | RC 1604             | WS 1611             | RC 1607          |
| 09:30 |                  |                  |                  |                     |                     |                     |                     |                  |
| 10:00 |                  |                  |                  |                     |                     |                     |                     |                  |
| 10:30 |                  |                  |                  |                     |                     |                     |                     |                  |
| 11:00 | SA 17            |                  |                  |                     |                     |                     |                     |                  |
| 11:30 |                  |                  |                  |                     |                     |                     |                     |                  |
| 12:00 |                  |                  |                  |                     |                     |                     |                     |                  |
| 12:30 |                  |                  |                  |                     |                     |                     |                     |                  |
| 13:00 | Image Interpretation/ Cases-of-the-Day/ EURORAD Awards |                  |                  |                     |                     |                     |                     |                  |
| 13:30 |                  |                  |                  |                     |                     |                     |                     |                  |
| 14:00 |                  |                  |                  |                     |                     |                     |                     |                  |
| 14:30 |                  |                  |                  |                     |                     |                     |                     |                  |
| 15:00 |                  |                  |                  |                     |                     |                     |                     |                  |
| 15:30 |                  |                  |                  |                     |                     |                     |                     |                  |
| 16:00 |                  |                  |                  |                     |                     |                     |                     |                  |
| 16:30 |                  |                  |                  |                     |                     |                     |                     |                  |
| 17:00 |                  |                  |                  |                     |                     |                     |                     |                  |
| 17:30 |                  |                  |                  |                     |                     |                     |                     |                  |
| Time  | room H  | room I  | room K  | room L/M | room N/O | room X  | room Y  |
|-------|---------|---------|---------|----------|----------|---------|---------|
| 08:30 |         |         |         |          |          |         |         |
| 09:00 | RC 1609 | WS 1618 | RC 1612 | RC 1613  | RC 1614  |         |         |
| 09:30 |         |         |         |          |          |         |         |
| 10:00 |         |         |         |          |          |         |         |
| 10:30 |         |         |         |          |          |         |         |
| 11:00 | SS 1709a | SS 1709b | SS 1712 | SS 1713 |         |         |         |
|       | Interventional Radiology Non-vascular intervention (1) (p. 258) | Interventional Radiology Thermal tumor ablation (p. 259) | Pediatric Neuroradiology (p. 261) | Physics in Radiology Digital radiography, virtual radiography and MRI (p. 263) | | | |
| 11:30 | Screening Mammography Interpretation Test | Screening Mammography Interpretation Test | Screening Mammography Interpretation Test | | | | |
| 12:00 |         |         |         |          |          |         |         |
| 12:30 |         |         |         |          |          |         |         |
| 13:00 |         |         |         |          |          |         |         |
| 13:30 |         |         |         |          |          |         |         |
| 14:00 |         |         |         |          |          |         |         |
| 14:30 | Screening Mammography Interpretation Test | Screening Mammography Interpretation Test | Screening Mammography Interpretation Test | | | | |
| 15:00 |         |         |         |          |          |         |         |
| 15:30 |         |         |         |          |          |         |         |
| 16:00 |         |         |         |          |          |         |         |
| 16:30 | RC 1906 | WS 1913 | RC 1912 |          |          |         |         |
| 17:00 |         |         |         |          |          |         |         |
| 17:30 |         |         |         |          |          |         |         |
**Musculoskeletal SS 1710 Ultrasound**

**Chairpersons:** V.N. Cassar-Pullicino (Oswestry/GB) G. Rizzatto (Gorizia/IT)

**1006 10:30**

Comparison of ultrasound findings and operative findings in acute ruptures of the Achilles tendon

S. Verhaeghen, E. Geusens, H. Janzing, Leuven/BE

**Introduction:** First we did a retrospective study about findings in acute achillestendonruptures during US and operation. We searched for possible reasons which could explain the differences (partial/subtotal/complete rupture). After 1 year we did a second study of new patients and improved our number of correct diagnoses.

**Material and methods:** First we reviewed the US and operation records of 55 patients. Conclusions were made. Secondly we reviewed the US and operation records of 17 new patients.

**Results:** There were differences between the number of partial, subtotal and complete ruptures on US and during operation. In the first study 56% of diagnoses on US were correct and the entity of partial (2/55) and subtotal (2/55) rupture was far less common than presumed: 51/55 were complete ruptures. After comparing the findings during US and operation some conclusions were made. So we could improve the number of correct diagnoses on US with more than 25%.

**Conclusion:** 1) The image of a partially ruptured achilles tendon can be partially explained by the presence of an intact plantaris longus tendon; 2) even with the impression of some remaining achillaeotendontibers, the diagnosis of a complete rupture must be made; 3) passive flexion and extension of the foot can help in defining a partial rupture from a complete one.

**1007 10:40**

Color Doppler US evaluation of degenerative and inflammatory lesions of Achilles tendon in renal transplant patients

F. Di Gregorio, M. Costantini, A.M. De Gaetano, V. Tancioni, G. Nanni; Rome/IT

**Purpose:** Principal causes of tendon lesions were secondary hyperparathyroidism and medical therapy (corticosterone, azatoprinn, cyclosporine). To evaluate the different vascular alterations of acute and chronic degenerative and inflammatory lesions of Achilles tendon.

**Methods and materials:** 50 renal transplant patients underwent ultrasound examination of the Achilles tendon. This study was performed with a 8-12 MHz multifrequency linear probe (Power Vision 6000). Tendon and peritendon vascularization were examined by color Doppler US.

**Results:** A higher incidence of degenerative and inflammatory lesions was observed in renal transplant patients. Tendon and peritendon vascularization increase was observed in acute inflammation. Pen and intra-lesion vascularization was observed in recent degenerative lesion. Vascularization increase not observed in chronic tendon lesions.

**Conclusion:** Color Doppler US allow to distinguish inflammatory and degenerative acute lesions from chronic tendon disease. Color Doppler US showed minimal inflammatory alteration in negative US examination of Achilles tendon of symmetric patients.

**1008 10:50**

Diagnostic ultrasound as an essential screening procedure in detection of non-radiopaque foreign bodies in the musculoskeletal system

A.K. Nath, A.U. Sethu; Muscat/OM

**Purpose:** To evaluate the use of ultrasoundography in non-radiopaque foreign bodies in the musculoskeletal system.

**Methods and materials:** Sonography was performed in 50 patients presenting with definite history of foreign body injuries. All patients underwent low KV plain radiography of the affected area and sonography of the affected and contralateral normal area. The technique of scanning using a Toshiba Ultrasound Model SSA-90a with 7.5 MHz phased linear array transducer is described. Surgery was done in all patients. Size and depth of the foreign bodies were noted both on sonography and surgery and results compared. Pitfalls, difficult situations and possible solutions will be discussed.

**Results:** No foreign bodies were detected on plain X-ray. 46 patients showed sonographic evidence and 49 patients evidence of foreign bodies at surgery. One patient showed no evidence of a foreign body at all. Sonographically foreign bodies were visualized as hyperchoic foci. Correct size and depth on sonography were found in 46 and 40 cases respectively. Additional findings were comet-tail artifacts and acoustic shadows. 41 date thorns and 5 pieces of wood were found.

**Conclusions:** Ultrasoundography has proved to be useful in diagnosis, precise localization and pre-operative assessment of non-radiopaque foreign bodies of the musculoskeletal system.

**1009 11:00**

Dynamic ultrasonography in evaluation of muscular trauma

A.K. Nath, R. Bouras; Muscat/OM

**Purpose:** Role of dynamic ultrasonography in muscular trauma.

**Methods and materials:** 50 male football players of age group 20 to 30 years, presenting with clinical muscular trauma in thigh and calf region, were evaluated in this study. Dynamic ultrasonography of both the affected and contralateral normal part, using a 7.5 MHz phased array linear transducer, in sagittal, coronal and angulated axis was performed, both without contraction and with contraction of the muscles. Needle aspiration of suspected hematomas was performed for diagnosis and treatment. All muscle tears and hematomas were studied and followed after 72 hours, till complete healing.

**Results:** 46 of the total 50 patients had muscle tears and/or hematomas in the thigh and calf region. 4 patients had no abnormality. 32 patients had clear-cut muscle tears appearing as echogenic retracted portions surrounded by hematomas, ranging from highly reflective masses to completely hypoechoic areas, which were observed on follow up. Remaining 14 patients had partial tears appearing as doubtful hypoechoic focal swellings which bunches up into pseudotumour pattern on voluntary contraction of the muscle. Healed tears appeared as highly reflective scar tissue.

**Conclusions:** (1) Ultrasonography is very useful in diagnosis, management and follow up of muscle tears and hematomas. (2) Dynamic ultrasonography is essential for diagnosis of partial tears.

**1010 11:10**

The efficacy of an echo-contrast agent in ultrasound power Doppler evaluation of synovitis: Comparison with magnetic resonance imaging with and without contrast medium

N. Magarelli, G. Guglielmi, L. Di Matteo, G. Mattioli, P.A. Mattei, L. Bonomo; Chieti/IT

**Purpose:** To determine the efficacy of an echo-contrast agent (CA) in ultrasound power Doppler (UPD) evaluation of synovitis by comparison with Magnetic Resonance Imaging (MRI) with and without contrast medium (CM).

**Method and materials:** A total of 28 patients with clinical history, laboratory tests and radiographic findings suggestive of articular inflammatory disease of various joints, after giving their informed written consent, underwent UPD (ATL 3000 HDI) using a multi-frequency linear probe (5-12 MHz) before and after intravenous injection of 2.5 g of CA (300 mg/ml suspension). The first eighteen patients were studied to determine if it was possible to see the CA in joint and, if so, its characteristics. Ten patients were then studied with MRI with and without CM. All studies were performed within a seven day period. The images were interpreted by three expert radiologists.

**Results:** In all cases, there was an increased visualization of vascular spots and the duration of enhancement (approximately 5 min) was sufficient for diagnostic purposes (vascular blooming was negligible). In the second group, the MRI results confirmed the UPD results in all cases.

**Conclusion:** The characteristics of UPD with CA imply that it could be an efficient tool in the diagnostic work-up of synovitis.

**1011 withdrawn by author**
1012 11:20

The value of ultrasonography in the diagnosis of traumatic ligamentous and meniscal lesions of the knee
M.H. Baghini, F. Mojtahed Jaberi, M.R. Abedini; Shiraz/IR

Purpose: To determine the role of ultrasonography in the diagnosis of traumatic meniscal and ligamentous injuries of the knee.

Methods and materials: Twenty-five patients suffering from knee trauma with impression of meniscal and/or ligamentous tear were selected and preoperative ultrasonography of the knee was performed using a high resolution ultrasound unit (Aloka SSD-1700, with 7.5 MHz linear and 5 MHz convex transducers). The radiologist was blinded to the clinical diagnosis. Sonographic diagnosis was compared with final diagnosis at arthroscopy or arthroscopy.

Results: The sensitivity of ultrasonography in the diagnosis of a tear of the medial meniscus was 93% and of the lateral meniscus 77.7%. The specificity was 77.7% and 93.7% for medial and lateral menisci respectively. The overall accuracy of ultrasonography in the diagnosis of meniscal tear was 86% for both menisci. The positive predictive value was 88% for each meniscus. The negative predictive values were 67.5% and 68.5% for medial and lateral menisci respectively. Of the total 5 cases of Anterior Cruciate Ligament (ACL) injuries, one case of acute ACL tear was diagnosed by ultrasonography, but ultrasonography was negative in the other 4 cases (80%) who had chronic or subacute ACL injuries.

Conclusion: Ultrasonography is an easy, inexpensive, dynamic imaging modality in the evaluation of traumatic meniscal injuries and acute ACL injury of the knee.

1013 11:30

Is there any role for a radiologist in evaluating the nutritional status of ICU patients?
A.N. Chalazonitis, M. Moukas, G. Tsimtselis, A. Patsalides, N. Batakis, P. Behrakis; Athens/GR

Introduction: Malnutrition manifests frequently as imbalance in body composition and provokes an inappropriate, reduction in lean body mass, visceral cell mass or both. Critically ill and severely injured patients are at higher risk for developing malnutrition. However, an absolutely reliable and consistent method for nutritional status estimation has not been developed yet.

Purpose: The aim of our study was to provide an objective, reliable, repeatable and accurate method for nutritional status evaluation by estimating muscular mass and amount of subcutaneous fat in patients of Intensive Care Unit (ICU).

Patients and methods: Forty three patients, 16 females (mean age 61.6±8 years) and 27 males (mean age 50.7±9 years) were studied. All patients were included in our study undergoing surgical procedures. From the 43 patients we selected 7 patients with diabetes mellitus (DM). All patients were supported by parenteral nutrition with 1800-2400 kcaL/day intake by the same ultrasonographer. A 10 MHz frequency high resolution transducer was held longitudinally to the biceps brachialis muscle in the place of maximum thickness. The thickness of the biceps brachialis muscle as well as subcutaneous fat were recorded. Serum Albumin levels as well as serum Creatine Phosphokinase levels were also recorded twice.

Results: Our patients were divided into two groups (A and B) according to serum Albumin (Ab) levels. In group A we observed decreased Ab levels (36.6 to 27.96 U/L p < 0.0001) as well as decreased subcutaneous fat (0.44 to 0.27 cm p < 0.01) thickness and biceps brachialis thickness (2.53 to 1.99 cm p < 0.0001). In group B we observed increased Ab levels (29.08 to 34.32 U/L p < 0.0001) and subcutaneous fat thickness (0.35 to 0.54 cm; p < 0.01) with a decrease in biceps brachialis thickness (2.47 to 2.02 cm pNS). In both groups Creatine Phosphokinase levels were significantly (p < 0.0001) increased.

Conclusion: From our observational study, it is clear that there is correlation (positive or negative) between nutritional serum assays (Ab, CPK) and ultrasonographic methods that intend to estimate body composition. Ultrasonographic measurements, while having all the advantages of the anthropometric measurements, can also overcome their inherent errors. We believe that future is even more promising in the evaluation of nutritional status in critical ill patients with ultrasonography.

1014 11:35

Ultrasound contrast media in evaluation of juvenile arthritis
A.K. Kapenko. O. Dumanovskaya, St. Petersburg/RU

Purpose: To evaluate the US features of arthritis activity in various affected joints in earlier and later stage of juvenile rheumatoid arthritis (JRA) and juvenile chronic polyarthritis (JCPA) and to determine the effectiveness of general and local treatment of affected joint by usage of ultrasound contrast media of second generation in children 3-18 years of age.

Materials and methods: 52 patients (and about 320 joints) with late trauma, clinical features of JRA, JCPA were examined by US. In 8 patients there were no laboratory data of arthritis activity. All joints were examined by gray-scale US, color Doppler mapping, power Doppler on an Acuson 128 XP unit with 7.5 MHz linear probe as screening. Then we used US contrast media injection of Levovist (Schering, Germany) in proper age dosage and examination was performed by previous scheme during 10 min. In 4 cases we examined affected joints before and after treatment of the active process. Gd enhanced (Magnevist) MRI control examinations were performed.

Results: In patients with previous trauma (12 cases) and joint effusion no signs of proliferative inflammation were determined by sonography and color Doppler regimes; no reaction to Levovist injection was seen. By routine sonography in all cases (40) of arthritis we evaluated their typical signs; joint effusion. synovial thickening, pannus, low amount of color signals or none of them from synovium and joint capsule. After contrast injection of Levovist in 36 cases (186) of affected joints (hip, knee, ankle etc.) great amount of color Doppler signals, especially in power Doppler regime, of thickened proliferative inflamed synovium, joint capsule were detected. No contrast enhancement in color Doppler images was seen in opposite joints if there were no clinical activity in spite of joint effusion detection. In 4 JRA cases after local intraarticular treatment on postcontrast images diminishing of active inflammation was established. Sonographic findings of active synovitis were correlated with control MRI-enhanced examinations.

Conclusion: US contrast media administration is a very sensitive and useful method in evaluation of local joint activity in children with JRA and JCPA. This method could be used instead of MRI.

1015 11:40

Osteomyelitis: Various imaging methods and their significance
V. Zavadovskaja, S. Velitchko, O. Kilina; Tomsk/RU

Purpose: To demonstrate the significance and the sequence of using various imaging methods and their optimal combination in diagnosis of osteomyelitis.

Materials and method: Our experience is based on a study of 165 pts with suspected osteomyelitis, age ranging from 16 to 88 years. 124 X-rays, 114 3-phase scintigraphies, 52 9Ga- and 39 11In-scintigraphies, 73 ultrasoноographies (US) and 23 computer tomographies (CT) were performed. In 49 cases morphologi­cal tests were undertaken.

Results: Plain radiography remains the basic diagnostic method for osteomyelitis being the only technique with a typical pattern for this disease. In all other cases, X-ray must be simultaneously followed by US and 9Ga- or 11In-scintigraphy. US showed supra- and subperiostal pus collection and superficial bone destruction. 9Ga- and 11In-scintigraphy had equally effectiveness and high specificity for the indication of bone abscess and detection of an acute inflammatory focus in a relapse of chronic processes. In these circumstances 3-phase scintigraphy is unnecessary. The role of CT consists of revealing sequesters in chronic osteomyelitis for planning sequestrectomy.

Conclusion: Simultaneous application of X-ray, US, 9Ga- or 11In-scintigraphy is a reliable and high-performance diagnostic complex in early detection of osteomyelitis in various inflammatory phases, including the atypical forms of bone abscesses.
10:10-12:00

GI Tract

SS 1701a

GI tract - esophagus

Chairpersons:
O. Ekberg (Malmö/SE)
N. Elmas (Izmir/TR)

1016 10:30

Videofluoroscopic assessment of swallowing disorders in collagen disease

E. Schober, G. Strasser, A. Stadler, E. Eisenhuber, P. Pokieker, W. Schima; Vienna/AT

Purpose: Patients suffering from scleroderma (SD), polydermatomyositis (PM) or mixed connective-tissue disease (MCTD) frequently develop swallowing disorders, which may affect the esophageal as well as the oropharyngeal phase of deglutition. From a large series of videofluoroscopic swallowing studies we evaluated frequency and distribution of different functional abnormalities in all groups of collagen disease.

Methods and materials: From 1989 to 1998 we prospectively studied 184 patients (SD n = 118, PDM n = 36, MCTD n = 30) with proven collagen disease (asymptomatic SD n = 59, PDM = 10, MCTD = 16). All videofluoroscopic swallowing studies were performed and evaluated in a standardized fashion.

Results: Perfect normal deglutition was relatively rare (PDM 18 %, SD 11 %, MCTD 7 %). In the PDM group we found the highest incidence of pharyngeal disorders (PDM 64 %, MCTD 57 %, SD 48 %) with a markedly higher risk for laryngeal penetration or aspiration (PDM 39 %, MCTD 23 %, SD 17 %) and with a markedly higher percentage of pharyngeal weakness (PDM 39 %, SD 25 %, MCTD 23 %). Esophageal motor disorders were common in all groups (SD 86 %, MCTD 80 %, PDM 73 %).

Conclusion: The relatively high incidence of disorders of the pharyngeal phase of deglutition justifies routinely videofluoroscopic swallowing studies in all groups of collagen disease. Even in asymptomatic patients.

1017 10:40

Impaired oesophageal motility in systemic sclerosis (SSc) and mixed connective tissue disease (MCTD): Diagnostic yield of videofluoroscopy compared with the yield of manometry

H. Hovorka, M. Memarzadeh, J. Lenglinger, P. Pokieker, W. Schima, E. Schober, G. Stacher; Vienna/AT

Purpose: An impaired contractile force of the smooth muscle oesophagus and a low resting pressure of the lower oesophageal sphincter (LOS) prevail in many patients with SSc and MCTD. In some, striated muscle oesophagus and pharynx may be affected as well. For the detection of such impairments, fluoroscopy and manometry are used. Comparisons of their diagnostic yield, however, were carried out in small numbers of patients only. This study aimed at determining, in consecutive patients with SSc and MCTD as defined by American Rheumatism Association criteria, the yield of videofluoroscopy in comparison to that of manometry.

Methods: 39 patients (5 limited, 30 diffuse cutaneous SSc, 4 MCTD; age 19-74 years; disease duration 1-40 years) participated. Manometry was carried out using a probe with 5 strain-gauge pressure transducers spaced at 3 cm intervals. Resting pressure and relaxation of LOS and contractile responses of the oesophageal body to 5 ml water swallows were recorded. Videofluoroscopy assessed oropharyngeal and oesophageal bolus transport in supine and upright positions as well as appearance of oesophagus and oesophagogastric junction.

Results: Manometrically, a complete amotility of the distal oesophageal body was found in 12 patients; on fluoroscopy, 11 of the 12 had slow bolus transport supine and of these 6 a wide oesophagus and 1 a wide gastroesophageal junction, whereas no abnormality was revealed in the remaining 1. Another 10 patients had low contraction amplitudes (< 30 mmHg) in the aboral 2 thirds of the oesophagus, and of the 10 also a hypotensive LOS (< 12 mmHg); fluoroscopically, all of them had slow supine bolus transport but none a wide oesophagus or oesophagogastric junction; a lower oesophageal stricture was seen in 5 of these patients. In 5 of the 39 patients impaired motility was found upon manometry only, in 3 on fluoroscopy only and in 5 on neither procedure.

Conclusion: Clinically, manometry and videofluoroscopy are equally suited to detect oesophageal hypomotility, although quantitative information can be obtained only manometrically.

1018 10:50

Swallowing abnormalities in multiple sclerosis: Correlation between videofluoroscopy and subjective symptoms

W. Wiesner, S. G. Wetzelf, M.M. Hoshi, U. Witte, E.W. Radu, W. Steinbrich; Basel/CH

Purpose: To evaluate swallowing abnormalities in multiple sclerosis (MS) - patients with and without symptoms indicating impaired deglutition and to correlate symptoms with findings of videofluoroscopy.

Methods and materials: Videofluoroscopies of 18 MS patients were blindly reviewed. 4 patients complained about dysphagia. 6 patients suffered from mild intermittent difficulties in deglutition. 8 patients had no symptoms regarding deglutition.

Results: Videofluoroscopic diagnoses were: delayed laryngeal elevation (n = 16), undercoating of the epiglottis (n = 7), laryngeal penetration (n = 3), aspiration (n = 4), pooling in the sinus pinniforms (n = 4), weak pharyngeal contraction (n = 3), early closure of the upper esophageal sphincter (n = 1) and weak tongue base with pooling in the valleculae epiglotticae (n = 10). All patients with dysphagia showed aspiration. All patients with intermittent difficulties in swallowing showed undercoating and/or laryngeal penetration. Only two of 8 asymptomatic patients showed a normal deglutition.

Conclusion: Impaired deglutition in MS patients seems to be much more frequent than believed to and may easily be overlooked as long as the patient does not aspirate. Swallowing abnormalities should be actively sought in MS patients, because even asymptomatic patients may show already a significantly impaired deglutition under fluoroscopy.

1019 11:00

Double pharyngeosophageal bars: Associated symptoms, videofluoroscopic findings and diagnoses

P. Pokieker, E. Mayrari, M. Memarzadehgi, M. Danzer, B. Partik; Vienna/AT

Purpose: Double bars (Dbp) at the level of the pharyngosoesophageal segment may occur as a videofluoroscopic finding in swallowing studies. We investigated these patients for their symptoms, videofluoroscopic findings, diagnoses and follow up.

Patients and methods: Between 1995 and 1999, Dbp were found in 22 of 1990 patients, referred for swallowing studies. We reviewed the dynamic studies and the charts, questionnaires had been sent out for follow up.

Results: Symptoms -73 % dysphagia, 45 % additionally with suspicion of aspiration. Dbp occur more often with than without dysphagia. Always Dbp was found in combination with other functional abnormalities, mainly of the pharyngeal contractors and the esophagus. There is no specific disease in association with Dbp. The presence of Dbp does not predict the clinical course.

1020 11:10

Coincidence of eradication of helicobacter and globus pharyngis

A.C. Wittge-Hanning, C.E.M. Hanning; Munich/DE

Aim of the study was to investigate the cause of globus pharyngis frequently seen in patients after a combined proton-pump-inhibitor and antibiotic therapy.

Method: The examination was performed by means of videofluoroscopy at a frame rate of 25 images/s in order to analyze the complexe motor events in deglutition occurring in only 0.7 s.

Patients: In our 342 patients examined for a globus sensation with videofluoroscopy in the years 1998-1999 we could find in 114 of them the typical anamnesis of an onset of complaints following an eradication therapy.

Results: The typical radiologic findings in this subgroup of an provoked globus sensation was a delayed (62 %) or incomplete (2 %) and/or apremature (48 %) closure of the upper esophageal sphincter (UES). The dysfunction of the UES was accompanied by an esophageal motility disorder due to reflux. A hialtal hernia could be seen in 74 % of our patients, of which 49 % even presented a Schatzki's ring.

Conclusion: Globus sensation following an eradication therapy is shown to present the radiologic features of a reflux-induced dysfunction of the UES. We believe, that the GE-Reflux is due to a loss of buffer-function of the helicobacter of the stomach. Furthermore the omission of proton-pump-inhibitor after the therapy interval facilitates the GE-reflux in preexisting lower esophageal sphincter insufficiencies.
**1021 11:20**

**Prediction of postoperative tumor recurrence in patients with esophageal cancer: Analysis of pre-operative CT findings**

Y. H. Loo, Y. H. Oh, E. Y. Kang, K. M. Moon, H. Y. Seol, N. J. Lee. Seoul/KR

**Purpose:** To define significant preoperative CT findings for prediction of postoperative recurrence in patients with esophageal cancer.

**Methods and materials:** This study included 30 patients (28 M, 2 F) with esophageal carcinoma. Tumor recurrences were regarded as soft tissue mass around anatomosis, mediastinal & upper abdomen significant lymph node enlargements and distant metastasis. They were classified into two groups according to presence or absence of recurrence. Their preoperative CT findings were focused on location and characteristics including length, thickness, obliteration of outline and mediastinal & upper abdominal lymph node enlargements.

**Results:** 16 patients had tumor recurrence and 14 patients didn’t. Each means length and thickness with and without recurrence were 5.6 cm/1 cm and 3.5 cm/1.5 cm. The numbers according to location of tumor were middle 5, lower 11 cases with recurrence and upper 1, middle 6, lower 7 cases without recurrence. Mediastinal & upper abdomen lymph node enlargements were 11 cases in group with recurrence and 3 cases without recurrence. Obliteration of outline was 5 cases with recurrence and 1 case without recurrence.

**Conclusion:** Mediastinal and upper abdomen lymph node enlargements and obliteration of tumor outline would be the most helpful to predict postoperative recurrence in preoperative CT.

---

**1022 11:30**

**Postoperative evaluation in stomach tube interposition for esophageal carcinoma**

A.Z. Ginja: Rotterdam/NL

**Purpose:** An intact anastomosis is of vital importance before instituting oral feeding after esophagus surgery. The purpose of this study was to evaluate the incidence of anastomoses related complications in the early postoperative period after stomach tube interposition for mid and distal esophageus carcinoma.

**Methods and materials:** A total of 254 low osmolality water soluble contrast swallowed were carried out in 197 (153 male and 44 female) patients with stomach tube interposition in the last four years. All patients were examined around the 8th day after surgery. Thirty two (13%) patients were examined repeatedly. Results: The results of the 254 contrast swallows showed: Mediastinal leakage in 56 (22%), aspiration in 54 (21%), fistula to bronchus/trachea in 5 (2%), fistula to skin in 10 (4%), narrow anastomosis in 22 (9%).

**Conclusion:** Anastomotic leakage and aspiration was found in a significant proportion of patients in the early postoperative period. In 13 % the leakage was significantly large requiring repeated examinations. A contrast evaluation of the stomach tube anastomosis in the early postoperative phase is essential in order to detect aspiration and define the state of anastomosis before instituting oral feeding.

---

**1023 11:35**

**Videocinematography in complications after surgery of the abdomen and the esophagus**

K.F. Linnau, P. Pokiezer, M. Hörmann, S. Kreuzer, R.W. Prokesch, T.H. Hellich; Vienna/AT

**Purpose:** To evaluate the benefit of videocinematography in examinations in patients after esophageal or abdominal surgery.

**Patients and methods:** Over a time period of two months (June to August 1998) 126 consecutive fluoroscopic examinations in postoperative patients (110, 61 female, 49 male, mean age 51 ±22, range 1-91) a were recorded on video. In addition to the standard spot film documentation (optional digital or film/filter examination protocols were not altered. The examinations performed were: bowel follow through (BFT = 10), bowel enema (BE = 19), T-drain cholangiography (TC = 17), fillings of fistulas (FF = 14), esophagus (ES = 57), follow up after gastric banding (GB = 3), cystography (CG = 4), position of tubes and lines (TL = 2). Two radiologists scored the examinations in consent regarding the following questions: a) In which case was videocinematography helpful to answer the clinical question? (0 … no contribution, 1 … some, 2 … major) b) Was the demonstration of the video to the referring clinician of help? (0 … no contribution, 1 … some, 2 … major).

**Results:** In about 25 % of all examinations videocinematography contributed to the radiological diagnosis. In about 12 % of the examinations videocinematography was used in clinical consultations.

**Conclusion:** Video-recording of the standard fluoroscopic examinations performed after abdominal or esophageal surgery can be helpful in the interpretation of the examination. In some cases interdisciplinary communication is supported by videocinematography.

---

**1024 11:40**

**Simultaneous ultrasonographic monitoring of the antrum and proximal stomach in gastroesophageal reflux disease: Altered intragastric distribution of a test meal**

D.L. DumiTrascu1, J. Bamber2, M. Wienenbeck2; Genoa/IT, 2Augsburg/DE

**Purpose:** Disturbed gastric motility is involved in the pathogenesis of gastroesophageal reflux disease (GERD). We looked for the simultaneous changes of the proximal and distal segments of the stomach in GERD using a noninvasive ultrasonographic technique.

**Methods:** Subjects: 15 patients with GERD diagnosed by symptoms and ambulatory pH-monitoring and 15 matched healthy controls. Protocol: Emptying of the antrum (method of Bolondi et al 1985) and of the proximal stomach (method of Gilja et al 1995) were recorded simultaneously at 0, 15, 30, 45 and 60 min after a test meal (250 ml, 250 kcal). Percentual gastric retention in the proximal and distal stomach was computed at each measurement time.

**Results:** Gastric retention in the proximal stomach is increased in GERD compared to controls at 15 min (107±22.5 % vs. 80±6 %) (p = 0.02) and remains higher at later points of measurement, not significantly. Gastric retention in antrum is similar to controls at 15 and 30 min, significantly reduced at 45 min (21±14 % vs. 36±18 %, p = 0.03) and marginally decreased at 60 min (p = 0.07).

**Conclusion:** Large early postprandial corpus and small late postprandial antrum suggest altered intragastric distribution of a test meal in GERD, as assessed by this ultrasonographic investigation.

**Acknowledgment:** This study was supported by the Alexander von Humboldt Fdn., Bonn

---

**1025 11:50**

**Does glucagon exert a hypertonic effect on the pyloric sphincter? A radiological approach**

L. Doglioni, G. Cittadini Jr., E. De Cicco, A. Gallo, V. Giasotto, G. Cittadini; Genova/IT

**Purpose:** To assess whether the prolonged isolated visualisation of the stomach after glucagon-induced hypotonia during double-contrast barium study can be due to hypertonic effect on the pylorus.

**Method and materials:** Four groups of 42 pairs of subjects received GlucaGen® 0.1 (geG-10 group), 0.25 (geG-25), 0.5 mg (geG-50), or Buscopan® 20 mg i.v. (CG). After effervescent powders and barium administration one patient turned supine-prone to the right (pylorus-down), the other to the left (pylorus-up). A standard radiographic sequence was taken. Patients in whom the pylorus was overpassed at 2 minutes (first radiographic projection) and the projections in which only the stomach was visualised, were determined.

**Results:** The pylorus was overpassed in 73.8 % and 52.4 %, 83.3 % and 83.3 % of right-turning and left-turning subjects respectively. Gastric retention in the proximal stomach is increased in Buscopan treated subjects.

**Conclusion:** The pylorus was overpassed in 73.8 % of right-turning and 42.9 % of left-turning subjects (geG-10); 52.4 % and 19 % (geG-25); 69 % and 30.9 % (geG-50); 83.3 % and 47.6 % (CG). Global P values were 0.018 and 0.028, respectively; the difference geG-25 vs CG was significant (P < 0.005 and 0.01). The examination time was prolonged in left-turning patients.

**Conclusions:** Glucagon at 0.25 mg dose seems to induce a significant hypertonic effect on the pylorus 2 minutes after i.v. injection; 0.15 mg is probably too low to induce a hypertonic effect, while 0.55 mg is probably too high and induces a generalised hypotonic effect. Gastric hypokinesia is significantly greater in Glucagon than in Buscopan treated subjects.
SS 1701b
Abdomen - bile ducts/MRCP

Chairpersons: A. Adam (London/GB)
C. D. Becker (Geneva/CH)

1026 10:30
A prospective comparison of magnetic resonance pancreatography (MRP) with endoscopic retrograde pancreatography (ERP) in the evaluation of patients with suspected pancreaticobiliary disease. Preliminary results
K. Hellerhoff, H. Helmerberger, T. Rosch, T. Rull, T. Leban, P. Gerhardt, Munich/DE

Purpose: To determine the diagnostic accuracy of MRP compared with ERP in the detection of pancreatic pathology and normal variants.

Methods: 113 patients scheduled for ERCP were prospectively studied with MRCP. In 54 cases ERP was available for comparison. MRCP examinations were performed within five hours before ERCP. MR cholangiopancreatograms were acquired at 1.5 T using breath-hold T2-weighted single shot TSE, breath-hold coronal 2D multi slice TSE and coronal 3D TSE with respiratory triggering.

Results: ERP demonstrated normal findings in 23, normal variants in 7, chronic pancreatitis in 19, duct litiathis in 7 and strictures in 17 cases. MRP correctly demonstrated 23 of 23 normal cases. 6 of 7 normal variants were detected by MRP. MRP correctly demonstrated 17 of 19 cases of chronic pancreatitis with one false positive and two false negative findings of early disease (sensitivity 90%, specificity 97%).

Eight cases of duct litiathis were correctly detected by MRP. One case of pancreaticolithiasis was missed by ERP, but confirmed by pancreatic resection. One false positive finding was proved as dominant stenosis in ERP (sens. 100%, spec. 98%).

16 of 17 strictures were detected by MRP without false positives (sens. 94%, spec. 100%). There was overall good agreement concerning the dignity of stenosis: in accordance to ERP, MRP enabled correct differentiation in 12 cases of benign and four cases of malignant stricture.

Conclusion: MRP can provide comparable diagnostic information to diagnostic ERP and should obviate invasive examination in many patients.

1027 10:40
MRCP of duodenal and paraduodenal "bubbles": Utility of oral negative contrast agent
G. M. Catagnini, A. Guerini, C. Biasiutti, N. Pagnotta, G. Misiani, C. Procacci, Verona/IT

Purpose: To evaluate how the use of a negative orally administered contrast agent enables to correctly characterize duodenal or paraduodenal cystic masses.

Methods and materials: A MRCP examination was carried out for suspected bilio-pancreatic disease in 167 patients admitted to the hospital for analogous clinical symptoms (intermittent upper abdominal pain, nausea and vomiting). Among these, five patients with a cystic mass at the level of the second portion of the duodenum were identified. Heavily T2-weighted FSE (HASTE) sequences were performed in different planes before and after oral administration of 100 ml of superparamagnetic contrast agent (Lumirem, Guerbet Laboratories, France). The contrast enhancement was assessed comparing the pre- and postcontrast images of each examination on the basis of signal intensity in the stomach and duodenum. All the patients underwent surgical confirmation of the diagnosis.

Results: A duodenal duplication cyst, an intraluminal duodenal diverticulum, a paravaterian duodenal diverticulum, a cystic dysotrophy of the duodenal wall and a cholelodeal cyst were all correctly diagnosed. The greatest yield to the diagnosis was achieved demonstrating whether or not a communication between the cystic lesion and the duodenal lumen was present. In fact, following administration of Lumirem, an almost complete signal void was obtained within both the duodenum and its diverticula. In case of noncommunicating cystic lesions, the administration of Lumirem improved the imaging quality, enabling the differential diagnosis.

Conclusion: The administration of a negative oral contrast agent improves the imaging quality and the diagnostic yield of MRCP in the presence of duodenal or paraduodenal cystic masses.
Results: Patients suffered from neoplasms (n = 48), chronic pancreatitis (n = 55), postoperative complications (cholecystectomy, liver transplantation (n = 12), as well as strictures (n = 56). MRCP was aquired in a diagnostic quality in 165 of 170 patients (97 %). Sensitivity of MRC/MPR were 92.8 % and 86.5 %, specificity 84.5 % and 77 %. Filling defects of the pancreatic duct system were statistically significant for tumorous infiltrations compared to dilatated ducts in chronic pancreatitis (p < 0.05). Hilar cholangiocarcinomas were differentiated with high diagnostic accuracy due to significant filling defects from cholangitis (more irregular strictured dilated ducts). Contrast-enhanced breathhold-MRPC showed statistically significant improved image quality (p < 0.05).

Conclusion: MRCP is a useful noninvasive method for the examination of the hepatobiliary tree correlating well with ERC/P, histopathologic, and clinical findings.

1031 11:15
Diagnostic imaging of Katskin tumors: Comparison of unenhanced and contrast-enhanced MR-cholangiography, MRI, and ERC
R.M. Hammerst"ngl', W.V. Schwarz', J.O. Balzer', R.E. Hintze'. W.O. Bechtserii, I.J. Vogl'. 'Frankfurt am Main/DE, 'Berlin/DE

Purpose: To prospectively compare unenhanced and oral contrast-enhanced magnetic resonance cholangiography (MRC) and magnetic resonance imaging (MRI) with endoscopic retrograde cholangiography (ERC) in the diagnosis of Katskin tumors of the biliary tree (hilar cholangio-carcinomas).

Methods and materials: 67 patients with clinically suspected Katskin tumors were prospectively investigated using a 1.5 T scanner (Gyroscan ACS-NT; Philips). Patients underwent MRC with a heavily T2-weighted non-breathhold respiratory-triggered inversion recovery sequence unenhanced and contrast-enhanced (negative oral contrast agent: 300 ml Liurex), MRI was obtained using conventional and fat suppressed T2w-TSE as well as T1w-SE/GRE sequences unenhanced and gadolinium-enhanced (Magnevist: 0.1 mmol/kg bw). All patients underwent ERC/PTC within 24 hours.

Results: Histopathological findings and clinical follow-up revealed the diagnosis of Katskin tumors (n = 35), obliterative cholangitis (n = 13), Caroli syndrome (n = 11), cholangitis (n = 2), and other malignant tumors (n = 6). Contrast-enhanced MRI allowed the depiction of tumorous involvement due to pathological contrast enhancement of the concerned bile ducts in 94 %. MRC demonstrated the location and extension of the tumor in 33 of 35 cases correctly (sensitivity: 94 %, specificity: 100 %, diagnostic accuracy: 95 %). Oral contrast-enhanced MRC sequences improved image quality with a delineation of tumorous inliltrations compared to dilated ducts and gallbladder (Magnevist: 0.1 mmol/kg bw). All patients underwent ERC/ PTC within 24 hours.

Conclusion: MRC in combination with contrast-enhanced MRI is a reliable diagnostic method for the pretherapeutic staging of Katskin tumors. Image quality is improved using an oral administered negative contrast agent.

1032 11:25
Detection of bile duct stones: Comparison of US, CT, MRCP, and ERC
D. Pickuth, S.H. Heywang-Kobrunner, R.P. Spielmann. Halte/DE

Purpose: To compare ultrasonography (US), unenhanced spiral computed tomography (CT), magnetic resonance cholangiopancreatography (MRCP), and endoscopic retrograde cholangiopancreatography (ERC) in the detection of common bile duct stones.

Methods and materials: Over a period of two years, 82 patients with clinically suspected choledocholithiasis underwent US, CT, and MRCP immediately before undergoing ERCP. US/CT/MRCP scans and ERC images were evaluated for the presence of bile duct stones, ampullary stones, and extrahepatic biliary dilatation.

Results: US/CT/MRCP depicted common bile duct stones in 23/24 of 27 patients found to have stones at ERC. Five patients had stones impacted at the ampulla, two/all of which were detected with US/CT/MRCP. US/CT/MRCP had a sensitivity of 82 %/86 %/96 % and a specificity of 98 %/98 %/100 % in the diagnosis of choledocholithiasis.

Conclusion: MRCP is an accurate, noninvasive alternative to ERC in the detection of common bile duct stones and may reduce the number of unnecessary, diagnostic ERCs. MRCP can be performed in a rapid fashion without instrumentation and avoids the complications of ERC which include pancreatitis, sepsis, perforation, and haemorrhage. US and CT are less useful for evaluating suspected common bile duct stones and are only recommended when MRCP is not available.
1036 10:30
Comparison of the diagnostic quality of MRM, mammography and breast ultrasound: Retrospective study based on 412 histologically verified clinical cases.

K. Schmitt, T. Boehm, M. Fleck, W.A. Kaiser; Jena/DE

Objective: To compare the impact of mammography (MA), breast ultrasound (US) and Magnetic Resonance Mammography (MRM) solitary and in combination with each other on the diagnostic management of suspicious breast alterations.

Materials and methods: 412 consecutive clinical cases during 1995 - 1998 with 240 breast cancers (inclusion of 42 cases of in-situ carcinoma) and 172 benign lesions were evaluated preoperatively using breast ultrasound (HD1 5000 ATL, Bothell, WA, USA, 7.5 MHz; Siemens Versa pro, Siemens AG Erlangen, Germany, 7.5 MHz), mammography (GE Senographe DMR, GE), and dynamic contrast enhanced MRM (1.5 T Philips Gyroscan, double surface breast coil, TR/TE/FD: 96/5/80° 0.1 mg/kg Gd-DTPA). Histological findings were classified into 3 groups: 1) inconspicuous 2) benign lesions 3) cancer. The results of the imaging techniques were classified into 5 groups: 1) inconspicuous 2) benign lesion 3) further diagnostic assessment needed 4) suspicious 5) malignant

Sensitivity, specificity, positive and negative predictive value and total accuracy were determined. Kappa statistics were calculated for comparison of the imaging techniques to histologic diagnosis and comparatively between the imaging methods for determination of mutual dependence.

Results: The following results were determined:

| Test | Sensitivity | Specificity | PPV | NPV | Accuracy |
|------|-------------|-------------|-----|-----|----------|
| MRM  | 90.8/93.9   | 66.9        | 83,9/90.6 | 83,9/93.8 |
| MA   | 90.0/90.0   | 48.3        | 77,8/82.2 | 78.5/77.6 |
| US   | 86.7/92.4   | 68         | 78,5/88.6 | 82.6/84.1 |
| MA and US | 81.3/86.4 | 75         | 74,6/82.7 | 82.4/84.1 |
| MRM and MA | 82.1/85.9 | 73.3    | 74,6/81.8 | 82.8/83.3 |
| MRM, MA and US | 82.5/86.4 | 72.7    | 48.8/92.2 | 82.6/83.3 |

Kappa indices for MRM, mammography, ultrasound in comparison with histology were: 0.5 (moderate), 0.4 (moderate), 0.3 (poor) respectively.

Conclusion: Statistical parameters of diagnostic quality for mammography, breast ultrasound and MRM were determined in a large group of patients with histologically verified diagnosis. The best specificity was achieved using mammography with additional ultrasound. MRM reached the best results in sensitivity and diagnostic accuracy. The achieved Sensitivity is to 7% higher in all diagnostic methods if patients with non-invasive carcinoma are excluded. That shows that in-situ carcinomas are difficult to verify in all imaging methods.

1037 10:40
Effect of changing dimension and position of the region of interest (ROI) on sensitivity and specificity of breast MR Gd-enhanced intensity/time curves using fast low-angle shot (FLASH) 2D and 3D techniques.

G. Rescinito, E. Poggi, A. Iozzelli, F. Sardanelli; Genova/IT

Purpose: To assess the effect of changing dimension and position of the ROI on Gd-enhanced intensity/time curves using 2D and 3D techniques.

Methods and materials: Fifty-four breast lesions (histology/cytology: 33 carcinomas and 21 benignations, 0.5-8.5 cm in diameter) were studied at 1.5 T with dynamic MR using 2D FLASH technique (TR/TE = 280.8/50 ms, FA 70°; coronal or axial planes; resolution, in-plane 1.4x1.4 mm, through-the-plane 2.5x2 mm; 1 pre- and 6-6 post-contrast measurements (0.1 mmol/kg Gadodiamide) to cover 8 minutes after contrast intravenous injection. Other 48 breast lesions (30 carcinomas and 18 benignations, 0.5-5.5 cm) were studied with 3D FLASH technique with similar technical parameters used with the 2D technique except for TR/TE (8 1/4 ms) and FA (25°). Postprocessing of the two groups of examinations was performed with: a circular 0.1 cm² ROI on the maximal enhancing area (MEA); a circular (CIRC) ROI as largest as possible within the lesion; an irregular (IR) ROI contouring the lesion. The curves were classified as malignant (early enhancement >90%), benign (50%), or uncertain (51-89%). For sensitivity and specificity calculation, the uncertain curves were considered as positive.

Results: The sensitivity was: ROI on MEA, 100% (2D technique) and 100% (3D technique); CIRC ROI, 91% and 97%; IR ROI, 82% and 86%, respectively. The specificity was: 71% and 61%, 86% and 77%, 90% and 83% respectively. The uncertain curves were: 9/4 (74%) and 2/48 (4%), 9/4 (74%) and 74 (15%), 16/54 (33%) and 6/48 (13%), respectively.

Conclusion: Resting on the only criterion of the early enhancement, the performance of the curvess are clearly influenced by the ROI type. Probably due to the more T1-weighting (shorter TR and TE) of the 3D sequence, with a more linear relationship between the enhancement and the real tissue contrast concentration, the sensitivity of the 3D technique seems to be less influenced (with a lower number of uncertain curves) than that of the 2D technique by the dimension and position of the ROI. On the contrary, the specificity of the 3D technique seems to be more influenced by dimension and position of the ROI. In clinical practice, only integrating all the MR data (morphology; early enhancement, late enhancement and shape of the curve; centripetal/centrifugal enhancement) with the pre-test information (physical examination, mammography, ultrasound) can rightly guide in interpreting the intensity/time curves.

1038 10:50
Iron oxide enhanced intravenous MR-lymphography in patients with suspected breast cancer: Results of a clinical phase III trial

S. H. T. Hewawatte, H. Robertsson, M. Taupitz, B. Hamm, F. Wallis, F. Thibault; R. Gilles, A. A. Tardivon; Halie/DE, Berlin/DE, Paris/FR

Purpose: This phase III multicenter study evaluated Sinerem® as an intravenously injected contrast medium for MR imaging (MRI) of lymph nodes in patients with suspected breast carcinoma.

Method/materials: Thirty-five female patients were recruited of which thirty were considered for efficacy analysis. All patients were scheduled to undergo breast surgery and axillary lymphadenectomy within 10 days of the MRI examination. A plain MRI examination of the axilla was performed prior to an intravenous infusion of Sinerem. The contrast medium was infused intravenously over 30 minutes at a dose of 2.6 mgFe/kg. Patients underwent a second MRI 24 to 36 hours following the infusion. MRI was performed at 1.0 or 1.5 T. Each patient was examined with the following three sequences pre and post Sinerem: axial T1w SE, axial T2w SE or T2w fast SE, axial or coronal conventional T2w GRE or T2w 3D-PSIF. Lymph node assessment was based on lymph node size for plain MRI and on signal variations for Sinerem-enhanced MRI. The results were correlated with histopathologic findings.

Results: A total of 234 lymph nodes were detected by plain MRI, while 244 nodes were detected following Sinerem registered administration and 501 lymph nodes were removed at surgery. A node-by-node correlation between MRI findings and histopathology could be done for 144 lymph nodes. The majority of lymph nodes that could not be correlated were smaller than 9 mm along their short axis. With respect to the patient taken as a whole and regarding the patient on-site evaluation, plain MRI and Sinerem-enhanced MRI showed 79/9 true positive, 12/15 true negative, 7/5 false positive and 4/1 false negative results, respectively. Considering as non metastatic a lymph node with a short axis of 10 mm or less on plain MRI or showing a signal decrease in at least one sequence on Sinerem-enhanced MRI, plain MRI and Sinerem-enhanced MRI showed a sensitivity of 50% and 64%, and a specificity of 75% and 94% for the detection of metastatic lymph node involvement, respectively. Four patients experienced non-serious adverse events; all recovered favorably without treatment.

Conclusions: Sinerem-enhanced MRI performed better than plain MRI based on size criteria in identifying metastatic involvement of axillary lymph nodes.

1039 11:00
Diagnostic accuracy of MR mammography in patients with breast implants

R.A. Rubik-Huch, D. Erfmann, C. Meur, B. Seilert, B. Manneme. Zurich/CH

Purpose: To prospectively evaluate the diagnostic accuracy of MRI for detecting implant complications in patients with breast augmentation or reconstruction.

Method and materials: In 25/110 consecutive patients with breast implants undergoing MR mammography, implants (n = 41) were surgically removed within 5 months following MRI; these patients were thus included in our study. T2w FSE and dynamic contrast-enhanced T1w 3D GRE sequences were performed. Hypointense curvilinear lines ("inguine sign"), interruption of the fibrous capsule and the presence of siliconomas were indicative of rupture. Malignancy was suspected if early and focal contrast enhancement occurred.
Results: At surgery, rupture was diagnosed in 15/41 implants. MRI was false neg. in 2 cases describing radial folds only. MRI was correctly neg. in 23/26 cases, but overdiagnosed intracapsular in 1, extracapsular rupture in 2 cases. Sensitivity of MRI for detection of implant rupture was 86.7 %, specificity 88.5 %. Early and focal contrast enhancement indicative of malignancy was seen in 2 cases. Recurrent carcinoma was confirmed in one case, while fibromatosis was diagnosed in the other case.

Conclusion: MRI is an accurate method for the evaluation of patients with breast implants.

1040 11:10
MR imaging of response to neoadjuvant chemo-brachotherapy in breast cancer
A. Hlawatsch1, A. Terike1, R.P. Kuner1, G. Hoffmann2, N. Zamboglou1, M. Theelen1 'Mannz/DE- Wiesbaden/DE- 'Offenbach/DE
Purpose: To evaluate if (1) neoadjuvant interstitial radiotherapy interferes with MR imaging. (2) MR can predict the size of the remaining tumor after therapy. (3) MR can give prognostic information after initial therapy.
Methods and materials: 14 patients enrolled in a preoperative tumor-reduction protocol (4 cycles of EC chemotherapy combined with interstitial radiotherapy) were examined by dynamic contrast enhanced MR mammography (1.5 T; resolution 93 s, 1.9 mm, 0.1 mmol/kg Gd-DTPA), before therapy, after two cycles of chemotherapy, after radiotherapy and the third cycle, and after completion of therapy. MR findings were evaluated for (1) artificial enhancement after radiotherapy, (2) correlation of enhancement after therapy with histology and (2) changes in enhancement dynamics after the first cycles.
Results: (1) 54 % of patients had diffuse enhancement that occurred after radiotherapy but vanished before the end of therapy. (2) 4 patients had complete histologic remissions after therapy. 3 had dispersed single tumor cells. 7 had residual tumor. While MR could not differentiate between complete remission and single tumor cells, it accurately predicted the diameter of residual tumor, except for one case that showed false-positive enhancement. (3) MR dynamics after the first cycles of chemotherapy could not predict overall response.
Conclusions: MR is an accurate tool in assessing tumor response after neoadjuvant chemo-brachotherapy. Negative effects from radiotherapy are only transient.

1041 11:20
Are there advantages of a weakly protein interacting Gd-chelate (Gadobenate Dimeglumine - Gd-BOPTA) in comparison with Gd-DTPA for MR mammography?
M.V. Knopp1, J. Radeleff1, F. Floemer2, H. Junkermann2, F. Seebass3, A. Noe3, I. Salerio3, G. van Kack4 'Heidelberg/DE- 'Milan/IT
Purpose: To analyze the properties of a new class of Gd-chelate available for MR-Mammography characterized by reversible weak protein interaction.
Methods: As part of a Phase II Trial, using a dynamic sequence over 5 minutes, three different doses (0.05, 0.1 and 0.2 mmol/kg of gadobenate dimeglumine (Gd-BOPTA, MultiHance, Bracco, Milano) were evaluated in comparison with the standard dose (0.1 mmol/kg) of Gd-DTPA (Magnavist, Schering, Berlin) for MR-Mammography in 32 patients with histological confirmation. The quantitative evaluation was done using ROI derived data and qualitative by blinded reader analysis.
Results: Quantitative analysis reveals a fairly linear dose response. The best score for confidence in tumor detection was found with Gd-BOPTA at 0.1 mmol/kg bw. The highest dose reveals a substantial increase in unspcific breast parenchymal uptake. Comparing the 0.1 mmol/kg doses of Gd-BOPTA and Gd-DTPA, a significant (p < 0.04) better confidence in tumor detection was found for Gd-BOPTA in the blinded reads, corresponding with higher contrast uptake, which seems to be due to the higher relaxivity.
Conclusion: The weakly protein interacting chelate, Gd-BOPTA, seems to demonstrate preferential properties for tumor detection in MR-Mammography. The most effective dose appears to be 0.1 mmol/kg in this group. Higher doses seem to be disadvantageous due to increased unspecific contrast enhancement in the surrounding breast tissue. These initial findings warrant further studies to utilize the agent dependent features for improving MR-Mammography.

1042 11:30
MRI of the breast: Correlation between enhancement patterns (EP) and microvessel density (MVD) in malignant lesions
R. Ambrosini1, R. Fossaceca1, M. Muzi1, D. Angelucci1, A. Carriero1, Chiari/IT
Purpose: To correlate different MR EP in malignant lesions of the breast to MVD, evaluated using immuno-histo-chemical assays.
Materials and method: The inclusion criteria were: mammographic indications of a malignancy and informed consent of the patient. The exclusion criteria were any contraindication to the MR examination or to the paramagnetic contrast medium. 20 patients (mean age 58.9 yrs) were studied using a superconductive 1.5 T magnet, a bilateral dedicated phased array coil and a 3D GE T1w technique, performed prior and five times after automated injection of contrast medium (Gd-DTPA, 0.1 mmol/kg, 2 ml). The enhancement curve (Silt) was also calculated. All patients underwent surgery. Immunohisto-chemical assays (CD31, FVIII-Ag) were performed on post-operative tissue sample. MR images were evaluated by two radiologists.
Results: The histological examinations indicated 20 malignant neoplasms. MVD was correlated to different EP: in P2 there were 29 central vascular structures (CMVD) and 19 peripheral (PMVD), mean of 24. In P4b the CMVD was 28.2 and the PMVD was 36.6, mean of 32.4. In P4c CMVD was 32.4 and PMVD was 22.7, mean 27.5.
Conclusions: Our results are encouraging, but a greater number of cases is required to affirm a new role for MRI in malignant breast lesions.

1043 11:40
Value of T2-weighted perfusion imaging in benign lesions and lesions suspected for malignancy at mammography
A. Förster1, T. Kittern1, V. Hietschold1, H. Platzbecker1, Dresden/DE
Purpose: Evaluation of usefulness of dynamic T1-weighted contrast-enhanced breast MRI followed by T2-weighted perfusion imaging of the breast in differentiation benign from malignant breast lesions.
Methods and materials: In the interim about 15 adult women with a benign or malignant lesion by conventional imaging were examined using T2-weighted conventional imaging in coronal view (TR 5.500 ms; TE 20 ms; TA 4:07 min) and T1-weighted dynamic contrast-enhanced imaging in coronal view (FLASH 3D; 64 partitions; TR 8.1 ms; TE 4.0 ms; flip angle 20°) before and for 10 min after intravenous administration of 0.15 mmol/kg Gd-DTPA (temp. res. 60 s). After this a T2-weighted perfusion imaging was performed (TR 50 ms; TE 35 ms; flip 30°) before and for 90 s after intravenous administration of 0.15 mmol/kg Gd-DTPA was performed. Contrast-agent dynamics in early and late phase was considered for diagnosis, proven by biopsy or follow-up.
Results: The perfusion imaging can directly measured after a T1-weighted dynamic contrast-enhanced imaging.
Normal breast parenchyma in younger women shows in more than 60 % one or more rapid enhancing lesions. Most of the mammographically benign lesions enhanced significantly. No or only minor perfusion effect were documented in these benign fibroadenomas or mastopathia. We found a susceptibility-mediated signal intensity loss in carcinomas with a strong enhancement on T1-weighted images.
Conclusion: MR imaging may provide valuable additional information in suspected findings in mammography. There are problems in differentiation of rapidly enhancing benign lesions e.g. juvenile fibroadenomas and (higher grade) mastopathy from malignancies. Here first-pass perfusion imaging proves worth with the correct dividing into benign and malignant lesions.

1044 11:50
Dynamic MRI of breast cancer: Are morphological feature and time-signal intensity curve of the lesion correlated with the histopathological findings?
G. Cerone1, E. Di Cesare1, M.A. Cioccioc1, A. Chiomonti1, C. Masciocchi1, L' Aquila/IT
Purpose: To establish a possible correlation between MRI evaluation and histopathological findings of breast cancer.
Methods and materials: Thirty-four patients with proven or highly suspected breast cancer underwent MR examination of the breast and subsequently surgery was performed. We used a 1.5 T unit (GE Signa Horizon) and a dedicated phased-array double breast coil. A M3D/FSQGR T1-w sequence (TR 8.9, TE 4.2, FA 40. 256x160) was obtained in the coronal plane: one pre- and seven post-contrast scans were performed. Post-processing included subtraction of images and MIP algorithm. For each enhancing lesion the morphological feature (shape; borders) of the lesion and the time-signal intensity curve were examined.
Results: Between 21 patients with histological diagnosis of ductal invasive carcinoma, 18 showed a single mass with irregular borders and a signal intensity-time course classified as plateau, only in 3 cases a slow continuous increase of the enhancement after the maximum pick was evident. In all 3 patients with histological diagnosis of medullary carcinoma the curve demonstrated an early wash-out of contrast medium. Four/tive ductal in situ carcinoma showed an initial plateau followed by a slow increase of the enhancement; in 1/5 a monophasic
curve was present. In the remaining 4 cases (lobular invasive carcinoma), MR examination showed a regional enhancement with indefinite borders and a curve classified as plateau (1 case) and as monophasic (3 cases).

**Conclusion:** On the basis of our results we believe that a correlation between MR evaluation and tumoral histotype may be present.

### 10:30 – 12:00

#### Room F1

**Chest SS 1704**

**Smoker’s lung and related diseases**

**Chairpersons:**

M.-F. Carette (Paris/FR)

T. Franquet (Barcelona/ES)

### 10:45

*Morphologic effects of cigarette smoking in healthy adult volunteers: A 5 year longitudinal HRCT study with functional correlations*

M. Rémy-Jardin, A. Sobaszek, J. Rémy, C. Boullenguez, I. Mastora, R. Matran, P. Frimat, J.L. Edme, Lilie/FR

**Purpose:** To evaluate the morphological and functional changes induced by smoking habits in a population of healthy subjects.

**Method and materials:** 113 asymptomatic volunteers underwent a sequential evaluation with HRCT and pulmonary function tests (PFTs) over a mean period of 5.5 years (range: 4.5-7.5 years).

**Results:** At T0, a significantly higher frequency of HRCT abnormalities and functional alterations at the level of small airways were observed among smokers (n = 66) compared with nonsmokers (n = 34) and exsmokers (n = 13). Between T0 and T1, continuing smokers (n = 56) showed a significant increase in ground glass opacities and emphysema with continued functional degradation. Among the 10 subjects who stopped smoking between T0 and T1, a lower frequency of ground glass opacities and abnormal bronchial wall thickening was found together with a worsening of small airway disease. Patients with abnormal HRCT scans at T0 (n = 57) had a significantly more rapid decline in lung function than those with a normal (n = 32) or near normal (n = 24) CT scan. No correlations were found between HRCT abnormalities and functional parameters at T0 except between abnormal bronchial wall thickening and flow rates at low lung volumes.

**Conclusions:** HRCT allows detection of early changes induced by cigarette smoking, linked with impairment of ventilatory lung function over time.

### 10:46

**Patchy air-trapping on expiratory high resolution CT of the lung: A frequent finding in healthy smokers and non-smokers**

W.F. De Wever, E. Nijs, E. Heindyckx, H. De Raeve, J.A. Verschakelen;

Leuven/BE

**Introduction:** Focal areas of air-trapping on expiratory HRCT have been described in healthy volunteers (Eur Rad, 8, 1391). Studies using a semiquantitative scoring system proposed by Stern et al. (JNM Rad, 29: 564) found air-trapping scores of up to six on an maximum of 24 in subjects with no known disease.

**Purpose:** To examine the presence and estimating the extent of air-trapping in a large group of healthy volunteers using HRCT.

**Methods:** Ninety seven subjects (mean age 54 yrs, male-female ratio 51/46) entered the study. Sixty three were life time nonsmokers, 34 were current smokers (mean packyears 22.9). Both groups had no known disease and had normal pulmonary function tests. Extent of air-trapping was estimated for each lung by comparing in- and expiratory HRCT scans at three levels (aortic arch, canna and above the diaphragm). For each level a 4 point scale was used and numbers were summarized. In this way air-trapping score could range from 0 to 24 (JNM Rad, 29: 564).

**Results:** Seventy three % of the smokers and 79 % of the nonsmokers had an air-trapping score of 1 or more. These figures were respectively 33 and 31 % when a score of 3 or more was considered. Only 6 % of the nonsmokers, but still 18 % of the smokers had an air-trapping score of 5 or more. Maximum scores in the nonsmokers and smokers groups were respectively 11 and 14.

**Conclusions:** Focal areas of air-trapping are frequently seen in healthy people with normal pulmonary function tests. Smokers show more air-trapping than non-smokers. 94 % of the nonsmokers and 82 % of the smokers have an air-trapping score of less than 5.

### 10:47

**Correlation of smoking history and lung volumes with 1H MRI in healthy volunteers**

K. Markstaller, D. Günther, B. Eberle, J. Hast, J. Lill, N. Weier, H.U. Kauczor; Mann/GE

**Purpose:** To compare observations of localized signal defects in healthy smokers and non-smokers by 1H-MRI. To describe relationships between parameters of lung function, volume of inspired 1H and signal-to-noise ratio (SNR).

**Material and methods:** With Ethics Committee approval and informed consent, ten healthy volunteers (five smokers, five non-smokers) underwent 1H-MRI in a 1.5 T scanner using a two-dimensional FLASH sequence at 30 V transmitter amplitude (TR/TE/ν = 11 ms/4.2 ms/c 10^-7). Known amounts of 1H were inhaled from a gas delivery device and imaged during breath-hold. Image evaluation was performed using a prospectively defined "defect-index" score. SNR of all images were correlated with localization, 1H volumes and static lung volumes.

**Results:** In smokers a "defect-index" of 1.1 (0.8-6.0; median, range) and in non-smokers a "defect-index" of 0.4 (0.1-0.8) was found. Intraindividually, an antero-posterior gradient of SNR was observed. SNR correlated with the estimated amount of hyperpolarization administered (r = 0.77), but not with static lung volumes.

**Conclusion:** 1H-MRI represents a sensitive method to detect regional abnormalities in the distribution of ventilation in otherwise healthy smokers with normal pulmonary function tests.

### 10:48

**Expiratory HRCT in healthy smokers: Evaluation of 250 asymptomatic volunteers and correlations with pulmonary function tests**

I. Mastora, M. Rémy-Jardin, A. Sobaszek, J. Rémy, C. Boullenguez, R. Matran, D. Frimat, A. Duhamel, J.L. Edme, Lilie/FR

**Purpose:** Analyse regional alterations in lung attenuation on expiratory CT scans in healthy smokers.

**Method and materials:** 250 asymptomatic volunteers (133 females; 117 males; mean age: 39 yr), including 144 smokers (mean consumption: 18 pack-years), 47 ex-smokers (mean consumption: 14 pack-years) and 59 nonsmokers, underwent inspiratory and expiratory HRCT and pulmonary function tests (PFTs).

**Results:** Multifocal air trapping was observed in 155 subjects (62 %) with a significantly higher frequency among smokers (n = 91; 63 %) and exsmokers (n = 33; 70 %) compared to nonsmokers (n = 31; 53 %) (p less than 0.05). Three patterns of air trapping were observed: (a) lobular (smokers: 74 %; exsmokers: 73 %; nonsmokers: 84 %); (b) subsegmental (smokers: 24 %; exsmokers: 27 %; nonsmokers: 16 %; p less than 0.05); (c) segmental (smokers: 2 %). Presence of air trapping was associated with functional anomalies at the level of small airways in 9 % of the study group (smokers: 12 %; exsmokers: 3 %; nonsmokers: 6 %). The strongest correlation between CT abnormalities and functional alterations was between inspiratory CT features of bronchiolitis and air flow at low lung volumes.

**Conclusions:** Presence of lobular air trapping on expiratory scans does not reflect functional impairment at the level of small airways in healthy smokers.
**Results:** The group of smokers demonstrated proliferative lung changes such as PBT (peribronchial thickening), GGA (ground glass attenuation) and ILT (interlobar thickening). This cluster of pathological signs, i.e. the triad of PBT, GGA, and ILT was found in more than 85% of long term smokers, and under 15% in non-smokers. The non-smoker group showed in aged patients the prevalence of emphysema (EMP) and rarefication of lung vasculature (RAR). A significant correlation between the frequency of the cluster of PBT, GGA, ILT and nicotine dosage, as well as the length of smoking was found as well.

**Conclusions:** Our study demonstrated that long-term cigarette smoking is a precancerous impairment of lung structure and function.

**1050 11:20**

*Screening for early lung cancer with low-dose computed tomography of the chest: Results of baseline examinations in 919 asymptomatic smokers*

S. Diederich, D. Womanns, H. Lenzen, M. Semik, M. Thomas, N. Roos, P.E. Peters, W.L. Hendel, Munster/DE

**Purpose:** To assess the feasibility of low-dose CT screening for lung cancer in a high risk population. A simple algorithm was used to direct invasive procedures in detected pulmonary nodules.

**Methods:** 919 asymptomatic volunteers with a cigarette consumption of ≥ 20 pack years underwent unenhanced low-dose CT of the chest and additional low-dose thin-section- or 3-month follow-up CT of soft tissue density (STD) pulmonary nodules. Biopsy was performed of STD nodules ≥ 10 mm or of smaller lesions with documented growth.

**Results:** A total of 898 STD nodules was detected in 45% (415/919) individuals screened. 32 were ≥ 10 mm and 6 were < 10 mm with documented growth at short term follow-up. Biopsy was performed of 16 lesions in 13 individuals of which 3 showed benign lesions and 13 showed lung cancer (8: stage I, 2: stage II, 2: stage IIIa, 1: stage IIIb). All tumors were resectable.

**Conclusions:** Low-dose CT screening for lung cancer in a high risk population using a simple algorithm based on size and density of detected nodules resulted in detection of 13 asymptomatic, resectable tumors with a high proportion of early tumor stages. Only three invasive procedures were performed for benign lesions.

**1051 11:30**

*CT guided percutaneous needle biopsy of Intra-thoracic lesions: Outcome of 122 cases*

J. Kumaradevan, M. Train, D. Murray, T. Tibballs, A. Watkinson; London/GB

**Purpose:** To evaluate the influence of location of intra-thoracic lesions, and method of percutaneous tissue sampling, with respect to diagnostic yield and post-procedure complications.

**Materials and Methods:** Retrospective analysis of 122 consecutive cases of CT guided percutaneous trans-thoracic biopsies. Peripheral biopsies were performed in 109 (89%) cases vs. 11 (9%) mediastinal biopsies. Fine needle aspiration (FNA), (21-21 G), was used in 67 (55%) cases vs. 55 (45%) core biopsies (18-21 G cutting needles).

**Results:** Of 109 peripheral biopsies, diagnostic tissue was obtained in 76 (70%) cases, with 22 (20%) pneumothoraces (6 treated), and 10 (9%) haemorrhages. In 13 mediastinal biopsies, diagnostic yield was obtained in 10 (77%) cases, with 1 (8%) pneumothorax (drained) and no haemorrhages. Of the 67 FNA samples, diagnostic tissue was obtained in 44 (66%) cases, with 14 (21%) pneumo-thoraces (5 needed treatment), and 6 (9%) haemorrhages. The 55 core biopsies yielded diagnostic tissue in 44 (80%) cases, with 9 (16%) pneumothoraces (2 treated), and 4 (7%) haemorrhages. There was no post-procedure mortality.

**Conclusions:** All complications occurred after sampling peripheral lesions. Core biopsies gave a greater diagnostic yield than FNA, 80% vs. 66%, with a reduced complication rate, 24% vs. 30%.

**1052 11:40**

*The discriminatory value of HRCT in obstructive lung disease*

S.J. Copeley, A.U. Wells, M.B. Rubens, J. Cleverley, N.L. Muller, D.M. Hansell, *London/GB, Vancouver/CA*

**Purpose:** To evaluate the accuracy of HRCT in differentiating between causes of obstructive lung disease.

**Methods and materials:** The CT scans of 86 patients (25 centriobular emphysema, 18 obliterative bronchiolitis, 15 n-1 antitrypsin deficiency, 11 asthma and 19 normal) were assessed independently by two observers. The most likely diagnosis and confidence rating (confident versus uncertain) was recorded. A second choice diagnosis was stated when the first choice diagnosis was uncertain.

**Results:** In 79% of cases the first choice diagnosis was correct and in 98% of cases the correct diagnosis was either first or second choice. A confident diagnosis was made in 64% and was correct in 82% of cases. For first choice CT observations the overall accuracy was 78%, negative predictive value 79% and positive predictive value 79%. The commonest difficulties were in discriminating asthma from normal cases and panacinar from centriobular emphysema.

**Conclusion:** HRCT is accurate in distinguishing between diseases causing airflow obstruction.
1055 10:40
T2 weighted imaging of the brain: Comparison of lesion detection with 4 pulse sequences
A.H. Karantanas1, E. Bakratsi1, K. Velesiotoy1, N. Papanikolaou2; ’Larissa/GR, 2Irkiko/GR
Purpose: To compare the diagnostic value of 4 T2-weighted sequences in unselected brain 1.0-T MRI examinations.
Methods & materials: MR imaging was performed in 20 patients because of various neurologic symptoms. The final diagnosis was multiple sclerosis (6), tumor (1), various benign lesions (7) and normal (6). The protocol comprised 4 T2-weighted sequences: T2-spin echo, T2-TSE, T2-GRASE and T2-Turbo-FLAIR (CSF = 0). In an analysis by consensus by two readers, a qualitative analysis was performed on lesion conspicuity. The quantitative analysis included the calculation of the contrast of the lesion with respect to white matter (CRI-wm) and CSF (CRI-csf) and contrast-to-noise ratio with respect to white matter (CNRwm) and CSF (CNRcsf). Number of lesions was also recorded on each sequence. Statistical analysis was performed with t- and Mann Whitney Rank Sum test.
Results: No difference was found between the sequences on the CRI-wm. FLAIR images showed significantly better CRI-csf and CNRcsf (p < 0.001) but the worst CNRwm (p < 0.013). No significant difference was shown on lesion conspicuity. FLAIR revealed 73 lesions, T2-spin echo 65, T2-GRASE 59 and T2-TSE 55.
Conclusion: The “black” CSF T2-FLAIR sequence, is the most valuable one in unselected brain 1.0-T MR imaging of the brain.

1056 10:45
Epilepsy MR protocol: Comparison between Turbo Inversion recovery and 3D-T1 turbo field echo pulse sequences
A.H. Karantanas1, K. Velesiotoy1, N. Papanikolaou2; Larissa/GR, Iraklio/GR
Purpose: The principal role of MRI in epilepsy is to locate and define any anatomic epileptogenic lesions. Two sequences with inherent anatomic demonstration were compared: the Turbo Inversion Recovery (TIR) and the 3D Turbo Field Echo (TFE).
Methods & materials: Forty-one patients were examined with a 1 T scanner. The quantitative analysis included the signal to noise ratio of grey matter (SNRgm), SNR of white matter (SNRwm), the contrast to noise ratio of the white matter with respect to the CSF (CNR), the relative contrast between the white and grey matter (ReCon) and the number of detected lesions. The qualitative analysis estimated the conspicuity of the detected lesions. The acquisition times for the pulse sequences were 8 min 38 s for TIR and 4 min 40 s for TFE.
Results: TFE showed the highest SNRwm, SNRwm and the highest CNR (p < 0.001). TIR showed the highest ReCon (p < 0.001). TFE detected 18 lesions and TIR 14. The conspicuity of the lesions was higher with TFE but not significantly.
Conclusion: Although TIR shows the highest ReCon between the grey and white matter, the 3D TFE detected more epileptogenic lesions, mainly heterotopias, because of better anatomical display. The ability for multiplanar reconstructions allow the TFE sequence to replace the TIR in imaging epilepsy.

1057 10:55
Evolution of cerebellum. Medical image techniques lead to phylogenetic interpretations of sensomotoric interpretation and cognition
H. Saadler1, G.W. Weber1, W. Recheis1, K. Schaefer1, D. zur Nedden2; 1Vienna/AT, 2Innsbruck/AT
Purpose: Understanding the joint role of prefrontal cortices and neocerebellum in the light of advanced medical image studies in higher cognitive and linguistic functions in the evolution towards Homo Sapiens based on virtual endocasts of fossils (2000 - 200 kya).
Methods & materials: CT-scans and stereolithographic reconstructions were made of some skulls of key fossils of hominids and compared with modern humans.
Results: Some of our ancestors display an unusual morphology of the anterior as well as of the posterior cranial fossae showing a wide space between the cerebellar hemispheres corresponding to the obviously retracted inferior vermis, a part of the palaeocerebellum. In modern humans this space is occupied by medial extension of both hemispheres of the posterior lobe, which are part of the neocerebellum. Interestingly the Neanderthal of Monte Circeo displays more modern conditions! We also found an unusual morphology of the frontal lobes in some fossils.
Conclusion: We discuss the hypotheses of syn-evolution of prefrontal cortex and cerebellum in our ancestors based on the joint role of prefrontal cortices and neocerebellum. The new understanding of the communication between cerebellum and prefrontal cortex will help paleoanthropologists to interpret shape and function of the brain by using virtual endocasts of our fossil ancestors.

1058 11:05
Magnetization transfer MR imaging is more close to histopathology than conventional MR imaging in intracranial tuberculosis
R.K. Gupta1, N. Husain1, M.K. Kathuna2, S. Dutta2, R.K.S. Rathore1, M. Husain1; 1Lucknow/IN, 2Kanpur/IN
Purpose: Magnetization transfer (MT) MR imaging helps in better tissue characterization of intracranial tuberculosis compared to conventional MR imaging. The purpose of this study was to correlate different components of tuberculosis seen on histopathology with MT and conventional spin echo (SE) MR imaging and to see which of the two correlates better with histopathology.
Materials and methods: Six patients with suspected large intracranial tuberculosis not responding to specific treatment were taken up for the study. MR imaging was performed with a 1.5 T superconducting system with a circularly polarized head coil. Conventional SE MR imaging was performed with proton density, T2 and T1 weighted sequences. MT T1 weighted imaging was performed with identical parameters as for T1 except for an additional off resonance pulse. Different images were evaluated for size, and different components of tuberculosis as seen on histopathology that was excised intact as a single mass.
Results: Tuberculomas appeared hypointense on T2 weighted images with perifocal edema, isointense to slightly hyperintense on T1 and hyperintense with peripheral hyperintense rim on T1 weighted images. There were hyperintense strands visible on T2 and MT T1 images, which were not visible on T1 weighted images in two patients. The hyperintense strands and rim seen on MT T1 images was composed of cellular infiltrate. Langhans giant cells, noncaseating granulomas and giosis while hypointense core showed solid caseation. The peripheral cellular rim was clearly discernable on MT T1 imaging, inseparable from edema on T2 and barely visible on T1 images in all cases. The thickness of the rim on postcontrast MT T1 images was comparable to the rim seen on pre-contrast MT T1 images. The size of the tuberculomas was comparable to surgical specimens on pre and post contrast MT T1 images and was smaller on T2 weighted images.
Conclusion: The outer hypointense rim along with strands are due to cellular granuloma and gliosis and is best seen on pre-contrast MT T1 imaging while hypointense core is due to solid caseation. MT T1 imaging shows best correlation for cellular and necrotic components of tuberculoma on histopathology.

1059 11:15
Correlation of volumetric MR analysis of cerebellar lesions and dual qualitative-quantitative nested PCR for detection of JC virus in cerebrospinal fluid: High potential for evaluation and monitoring of progressive multifocal leucoencephalopathy in AIDS
A. Lung, A. Sanz, L. Muñoz, P. Miralles, D. Garcia De Viedma, C. Benito; Madrid/ES
Purpose: To describe the results of a prospective trial comparing the level of JC virus in CSF using PCR and the volumetric MR analysis of the brain lesions in AIDS patients receiving HAART.
Material & methods: Five consecutive AIDS patients diagnosed of progressive multifocal leucoencephalopathy (PML) began to receive HAART. A new form of dual qualitative-quantitative (competitive) nested PCR was used to quantify the DNA (genomes) of the JC virus. All the patients were evaluated by MR, and a volumetric measurement of all the brain lesions was performed using a workstation. An evocative correlation between the JC virus level, the volumetric analysis and the immunological conditions was established.
Results: One patient was excluded because she did not follow the treatment. The other four patients showed a good correlation between the clinical response and the JC virus quantification and the volume of the brain lesions. After establish HAART all the patients did show an improvement in their immunological condition, and it does not seem to influence in the PML evolution. To our knowledge this is the first description of volumetric MR analysis as a predictive factor in this pathology.
Conclusions: The volumetric MR analysis of the PML lesions seems to predict the response to HAART.
Clinical and MRI findings in SLE patients with CNS involvement

J. Wałęcki, M. Bekiesinska-Figatowska, B. Bogusz, L. Rudnicka, S. Sierakowska, Warsaw/PL, T. Bialystok/PL

Purpose: The purpose of our study was to assess the utility of MRI in detection and differentiation between chronic and new ischemic lesions in patients with neuro psychiatric symptoms in course of the systemic lupus erythematosus (SLE).

Methods and materials: Our material consists of 25 SLE patients (21 females, 4 males), aged 34 - 66 years. Clinical findings include headache, seizures, hemiparesis, hemiplegia, aphasia, ataxia, sensory and visual deficits, depression and psychosis. MRI was carried out at a 1.5 T unit. SE and FSE sequences and diffusion-weighted imaging (DWI) with apparent diffusion coefficient (ADC) mapping were performed.

Results: MRI confirmed CNS involvement in all patients. Big ischemic lesions in the region of MCA supply were detected in 3 cases. Focal lesions were found in all patients. Conventional sequences (SE, FSE) allowed precise evaluation of the time and extent of infarct in 18 patients. In 7 cases differentiation of new lesions and extent of infarct was impossible on DWI.

Conclusion: Diffusion-weighted imaging with ADC mapping allows more accurate detection and characterisation of ischemic lesions than conventional MRI in SLE patients with CNS involvement, thus influencing their therapy.

Differential diagnosis of central nervous system sarcoidosis

D. Pickuth, S.H. Heywang-Köbrunner, R.P. Spielmann, Halle/DE

Purpose: The aim of this study was to evaluate the role of magnetic resonance imaging (MRI) in the diagnosis of patients with neurosarcoidosis and to determine which neuroradiological differential diagnoses should be considered.

Methods and materials: The MRI brain scans of 22 patients with sarcoidosis were retrospectively reviewed, along with the clinical information that was provided in the request form. All patients had signs and symptoms referable to the head and were examined with gadolinium enhancement.

Results: (cerebral) nerve paralysis was the most common clinical manifestation identified in 10 patients. A wide spectrum of MR findings was noted: Periventricular and white matter lesions on T2W spin echo images, mimicking multiple sclerosis (10 patients); multiple supratentorial and infratentorial brain lesions, mimicking metastases (8 patients); solitary intraaxial mass, mimicking high grade astrocytoma (2 patients); solitary extraaxial mass, mimicking meningioma (1 patient); leptomeningeal enhancement (6 patients).

Conclusion: Neurological involvement is a significant cause of morbidity and mortality in patients with sarcoidosis. MRI shows a wide spectrum of brain abnormalities associated with neurosarcoidosis. The differential diagnosis of cerebral neurosarcoidosis includes in the main multiple sclerosis, metastases, lymphoma, glioma and cerebral tuberculosis; the differential diagnosis of meningeal neurosarcoidosis includes bacterial, tuberculous, and sarcoidotic meningitis, leukaemic infiltration, plasmocytoma and idiopathic hypertrophic pachymeningitis.

Brain neurotoxic lesions in rats: Recognition and monitoring by means of commercial magnetic resonance 1.5 T scanner

A. Tartaro, P. De Matteo, P. Di Iorio, R. Antonazzo, S. Comani, F. Caciagli, Chieti/IT

In this study we evaluated whether a commercial MRI scanner could be effectively used to detect rat brain neurotoxic lesions. Male Sprague-Dawley rats were unilaterally injected with NMDA (200 nmol/µl) in striatum or hippocampus. A neuroprotective drug, AIT-082, (400 nmol/µl) was co-injected with the excitotoxin NMDA. The induced lesions were monitored from two to nine days after the injection, by using a commercial MRI scanner (Vision, Siemens), operating at 1.5 Tesla. A linear polarized wrap around surface coil was used to obtain T2 TSE brain images. Six 3 mm thick transverse slices were acquired in less than 8 min (TR 7400 ms; TE 115 ms; matrix 483×1024; FOVs 200-250 mm). Finally, MRI findings were compared with histology (cresyl violet). The NMDA-induced lesions were identified as hypointensities that gradually decreased. The MRI lesions were compared to diseased areas as shown by histology (loss of neurons and gliosis). AIT-082 caused a significant reduction of the lesions extent, preventing neuronal damage.

In conclusion: MRI (1.5 T) appeared an useful, noninvasive technique to evaluate experimental neurotoxic damage, as well as acute focal lesions in clinical practice.
Materials and methods: During a three-year-period 1524 patients, 835 males (aged from 16 to 93 years, mean 60.5 years) and 689 females (aged from 14 to 91 years, mean 58.7 years) after a hospital visit, were referred from the Urologic Department to our unit in order to have an upper abdominal ultrasonographic examination. Patients with known renal tumors were excluded from the study. All renal masses except these with ultrasonographic characteristics of a simple cyst or an anatomical variation (such as hypertrophied Berlin’s column) were considered as “renal tumor.”

Results: We overall identified 27 renal tumors, an incidence of 2%. All patients were further investigated by either FNAC or open biopsy and their final diagnosis was confirmed by cytology or histology. Eighteen patients (12 male and 6 female, aged 55 to 74 years) had an adenocarcinoma measuring from 2.5 to 5.5 cm. A 29 year old man presented with adenoma that was surgically removed. Finally, 8 patients (4 male and 4 female) presented with angiomyolipoma.

Conclusions: Renal tumors appear to be quite common among Urologic Department’s patients having a routine upper abdominal scan. Ultrasonography can be considered as the ideal screening tool for renal masses. A prospective study including all patients having an upper abdominal scan is valuable.

1066 10:45
Angiosonography versus triphasic helical CT in the diagnosis of renal cell carcinoma
A. Hocqumyth. O. Reichelt. M. Fleck. W.A. Kaiser; Jena/DE

Purpose: To evaluate the diagnostic potential of contrast-enhanced ultrasound depicting vasculisation pattern and computer-based calculation of the first-pas effect of contrast agent vs. depiction of renal cell carcinoma by tri-phasic helical CT.

Methods and materials: 30 patients with surgically proven renal cell carcinoma underwent sonographical examination, using B-mode and Power Doppler before and after i.v.-administration of ultrasound-contrast-agent. After definition of tumor-extend by B-mode the enhancement after administration within the lesion and a reference area of unaffected renal cortex was recorded online using a dedicated software. Postprocessing included the calculation of the enhancement, i.e. nete and gradient within the suspected tumor and the reference area. These results were compared to the depiction of the tumor in helical CT: slice/table feed/ increment 5/8/5 mm (Somatom Plus 4, Siemens, Erlangen, Germany), delay 25 and 65 s after injection of 2 ml/kg bodyweight iodine contrast media (Optiray 300, Mallinckrodt, St. Louis, MS).

Results: Using B-mode-sonography the extend of renal cell carcinoma was not exactly delineable, presenting mainly as an isoechogenic mass. In Power-mode after administration of contrast agent the tumor didn’t show any perfusion (2/30) or reduced perfusion (9/30) in comparison to the cortical reference area. This feature correlates well with the hypovascualarisation as demonstrated on CT. Enhancement after administration of contrast agent was markedly reduced within the tumor compared to the not affected cortex.

Conclusion: These first results show a potential of ultrasound in diagnosing renal cell carcinoma, if combined with administration of ultrasound contrast agent and the use of Power-Doppler and calculation of enhancement. Further studies are necessary to clarify the question if this method can potentially be used in the work-up of suspicious renal masses.

1068 11:00
Multislice CT for pre-surgical planning in the resection of renal cell carcinoma
U.J. Schönegg. M. Frimberger. B. von Rüeckmann, R. Bruning, T. Heimberger, A. Wobker; C.R. Becker, M.F. Reiser; Munich/DE

Purpose: To evaluate the use of thin-collimation multislice CT (MSC) for a comprehensive preoperative diagnosis in patients with renal cell carcinoma (RCC).

Material and methods: 30 patients with RCC preoperatively underwent digital subtraction angiography and MSC (Siemens V2). The MSC scan protocol consisted in a pre-contrast scan followed by arterial phase acquisition with 4x1-mm collimation and parenchymal phase acquisition with 4x2.5-mm collimation. Both contrast acquisitions were performed with 500 ms rotation and pitch 6. Reconstructed slice thicknesses were 1.25 mm (arterial), 3 mm (parenchymal) and 5 mm (pre-contrast, arterial and parenchymal) to allow for both, volume-rendered 3D and 2D image interpretation.

Results: Our MSC scan protocol allows for excellent and consistent arterial enhancement with optimal contrast use. Despite of the high acquisition speed, the high spatial resolution enables clear and consistent identification of small vessels (i.e. segmental arteries). This way, the relationship of the tumour to the vessels, the collecting system and the central sinus fat can be determined, as a prerequisite for successful complete and tissue-sparing resection.

Conclusions: The high speed and spatial resolution of MSC allow for an excellent evaluation of vascular and parenchymal anatomy. Thus, MSC is a valuable guidance tool for pre-surgical planning in patients with RCC.

1069 11:10
Percutaneous MR-guided cryotherapy of the kidney
J. Tackle, G.B. Adam, H. Borchers, S. Großkortenhaus, E. Manegold, R.W. Günther; Aachen/DE

Purpose: To evaluate the feasibility of percutaneous cryotherapy of the kidney under MR guidance and to correlate the results with MR follow-up and histology.

Methods and material: 6 adult foxhounds underwent percutaneous cryotherapy of the lower pole of the right kidney using an MR-compatible cryotherapy system with a sharp 3 mm cryoprobe (CryoHist®) under general anesthesia. Planning, monitoring and follow-up was performed using a short-bore high field system (Philips ACS NT 1.5 T) with ultrafast and conventional MR-sequences. 1.2 and 3 months after the intervention, the animals were sacrificed and the kidneys were histologically evaluated.

Results: All animals recovered completely after the intervention. The extension of the ice formation during cryotherapy was on average 2.5±4 cm. No bleeding complications occurred during or after the intervention. The MR appearance of the cryolesion was typical in routine MR sequences. The size of the cryolesions corresponded well with the initial ice volume 2-4 weeks after the intervention and decreased in further follow-up controls. Histologically, the lesions consisted of coagulation necrosis with a surrounding rim of granulation tissue.
Conclusion: MR-guided percutaneous cryotherapy of the kidney is possible and effective. A clinical application of this technique seems to be possible in the near future.

1070 11:20
Spiral CT in the study of diabetic kidney
A. Scardapane, A.A. Stabile Ianora, M. Midiri, R. Vinciguerra, A. Rotondo, G. Angelelli
Purpose: We aimed to assess whether any morphometric or densitometric alteration were detectable in the kidneys of type 2 diabetic patients.
Methods and materials: We have retrospectively evaluated 40 diabetic patients and 20 non diabetic patients. CT scans were achieved by Picker CT 2000 using triphasic helical technique. All the CT scans were analyzed using the Multplanar Reconstruction software. We classified diabetic patients as either nephropathic or non nephropathic based on laboratoristic signs of renal disease. Then we classified the patients into three groups based on the duration of diabetes (0-5 yrs, 5-10 yrs, >10 yrs).
Results: Both the renal dimensions in the axial section and the cortical density in the arterial phase scans resulted significantly lower in the nephropathic group. We also assessed that the longer was the duration of diabetes the lower were both the dimensions of the axial section of the kidneys and the cortical density in the arterial phase scans.
Conclusion: The assessment of the renal dimensions in the axial section and the cortical density in the arterial phase can be an useful index of early diabetic nephropathy. Further studies are needed to use these findings in the clinical practice.

1071 11:25
Post-traumatic renal cysts rupture: CT findings
M. Scialpi, A. Rotondo, M. Midiri, A. Di Maggio, F. Boccuzzi, G. Angelelli, Taranto/IT, Ban/IT
Purpose: To assess the incidence and computed tomographic (CT) findings of renal cyst rupture in post-traumatic patients.
Methods and materials: CT examinations of 87 patients with clinical evidence of renal trauma were reviewed. The incidence and CT findings of renal cyst rupture was assessed. All patients with renal cyst rupture had clinical and follow-up proved diagnosis by means of US, CT or MR imaging. The patients were aged 32-66 (mean age: 54.7 years).
Results: Seven out of 67 patients (9.6%) had CT findings of renal cyst rupture secondary to blunt abdominal trauma in 6 and post-biopsy in 1. The patients had multiple monolateral cysts (n = 3), polycystic kidneys (n = 2), bilateral cysts (n = 1). CT showed intracystic bleeding (n = 2), and cysts with ill-defined edges with effusion spread along perinephric space and interfascial planes (n = 5).
Conclusion: Renal cyst rupture occurs in 9.6% on CT images after renal trauma. Knowledge of CT findings is helpful in diagnosis and in the differentiation from other renal diseases with interfascial and perinephric effusion.

1072 11:30
Acute flank pain: Comparison of unenhanced low dose helical CT and intravenous urography in suspected renal colic
T. Meagher, V.P. Sukumar; Oxford/GB
Purpose: To compare unenhanced helical CT with reduced exposure factors & intravenous urography in the evaluation of patients who present with acute flank pain with suspected obstructing ureteral calculi.
Methods & material: Over 7 month interval, 50 patients with acute flank pain suspected of renal colic were imaged with unenhanced low dose helical CT using modified protocol followed by excretory urography who presented to the Accident & Emergency department at 4 different sites (Stoke Mandeville Hospital: Aylesbury, Princess Margaret Hospital: Swindon, Northampton General Hospital: Northampton & Conquest Hospital: Hastings). The scan factors were 120 kV, 130 mA, slice thickness of 5 mm & pitch of 1.5 with reconstituting interval of 3 mm. Average estimated doses were 3 mSv for CT studies and 4 mSv for IVU studies. The results were interpreted by a radiologist without the knowledge of the IVU findings, which was performed in 6 hours of the CT scan. Later unblinded reading of both the results were compared with each other.
Results: Forty four patients with urologic calculi were demonstrated on both unenhanced spiral CT and IVU. Five had stones which were depicted on unenhanced CT only. CT was unable to differentiate IVU calculus from a phlebothromb on one study. One patient had a bowel mass presenting as an acute flank pain.
Conclusion: New detector technology allows renal tract CT studies to be performed with low radiation doses while maintaining diagnostic accuracy published in previous studies.

1073 11:35
Cost-effectiveness of CT-urography (CTU) versus intravenous urography (IVU) in acute flank pain
J.C. Hellund, T.V. Pedersen, H.J. Noreng, R. Wanta, J.T. Geitung; Oslo/Norw
Purpose: To implement CTU, and while doing this, get a cost-effectiveness analysis of time, radiation and diagnostic impact.
Methods and materials: 13 patients with the clinical diagnosis of acute flank pain, suspected urolithiasis were included. We did CTU (10/1 slice) prior to IVU. IVU was performed within 4 hours after the CTU. On each patient the data concerning time consumption and radiation dosages were obtained. Every set of images was examined by to separate radiologists, followed later by a consensus interpretation.
Results: Time consumption on CTU was notably smaller than on IVU, the average times being 15'46" and 63'46" respectively. The equivalent doses calculated from the average dose parameters for the two examinations were approximately 2.0 mSv and 9.0 mSv, the latter representing IVU. When evaluating the radiological accuracy of CTU vs. IVU, we found that CTU is equivalent to IVU.
Conclusion: Even with such small number of patients (n = 13), the difference in time is significant, indicating CTU cost-effectiveness. The higher radiation dose observed on CTU is found to be acceptable. We recommend IVU to be replaced by CTU in the diagnosis of acute flank pain, as it is diagnostic reliable and cost-effective.

1074 11:40
Measurement of glomerular filtration rate by multiphasic spiral computed tomography
N. Hackstein, M.F. Pullue, W.S. Rau; Gießen/DE
Objective: We present a new method (hereinafter called "CT-clearance") to measure glomerular filtration rate of each kidney (diffenential renal function) by performing multiphasic helical CT of the kidneys.
Methods: CT-clearance was in a group of 29 patients. Spiral CT of the kidneys was performed unenhanced and about 30 s and 100 s after administration of 120 ml. Single kidney clearance was calculated according to the PatlEk plot method for dynamic single slice CT, adapted for volume data sets. As reference, serum-clearance was calculated by application of a modified one-exponential slope model. Information on the relative kidney function was gained by renal scintigraphy with "Tc-MAG-3" or "Tc-DMSA.
Results: Linear regression analysis revealed a correlation coefficient of the CT-clearance with the serum-clearance of r = 0.77 with CT (ml/min) = 16.4 + 1.02 x CI (serum). Linear regression of the relative single kidney function of the right kidney (rKf) provided a correlation coefficient r = 0.895 with rKf (CI) = 18.6 + 0.578 x rKf (scintigraphy).
Conclusion: CT-clearance is able to calculate single kidney glomerular filtration rate.

1075 11:50
Utility of chemical-shift MR imaging in differentiating adenomas from malignant adrenal masses and comparison with CT: A prospective study of 109 masses
B. Cabezudo, R. Rodriguez, A.M. Peinador, M. Jorquera, J. Ferrerós, J. Arrazola, R. Méndez, A. Sáiz, C. Fernández; Madrid/ES
Purpose: To assess the value of chemical-shift MR imaging for differentiating adenomas from malignant adrenal masses, and to compare MRI with CT.
Methods/materials: 109 homogeneous adrenal masses discovered with CT in 86 patients without endocrine disease were studied with chemical-shift MRI. Fifty-five patients had a known malignant tumour. Two radiologists interpreted the CT scans and another two the MR images. Qualitative and quantitative analysis were performed. On CT, we considered lesion size and attenuation values. On MRI, we measured signal intensity in out-of-phase and in-phase images, in adrenal lesions, liver and spleen. Adrenal/arterial, adrenal/liver and adrenal/spleen ratios were calculated. Masses were classified as benign, malignant or indeterminate. Final diagnosis was obtained by histology or follow-up (at least 12 months).
Results: 96 masses were adenomas and 13, metastases. On qualitative/quantitative CT, 79 %/89 % sensitivity and 62 %/85 specificity were obtained, respectively. On qualitative/quantitative MRI, 95 %/97 % sensitivity and 92 %/100 % specificity were obtained, respectively. ROC curve areas for CT attenuation and for MR adrenal/adrenal, adrenal/spleen and adrenal/liver ratios were 0.92, 0.98, 0.94 and 0.94, respectively.

Conclusions: Sensitivity and specificity were higher when quantitative measurements were considered. Chemical-shift MR imaging was better than CT for differentiating adrenal adenoma vs. metastases. Adrenal/adrenal MR signal intensity ratio was the most predictive quantitative variable.

This work was supported by a FIS grant nr. 96/166.

10:30-12:00 Room H

Interventional Radiology

SS 1709a

Non-vascular intervention (1)

Chairpersons:
F.G. Joffre (Toulouse/FR)
E. Salomonowitz (St. Pölten/AT)

1076 10:30

Treatment of tracheobronchial stenoses with metallic stents

F.K. Wacker, G. Höftgen, A. Sahun, W. Golder, K.-J. Wolf. Berlin/DE

Purpose: To evaluate the feasibility and complication rate of balloon expandable metallic stents in the palliative treatment of malignant tracheobronchial stenoses. Methods: We implanted 46 Palmaz stents in 22 patients (mean age 62 y). 17 patients had bronchial carcinomas, 5 non-pulmonary tumors involving the airways. All patients had an advanced tumor stage, the leading clinical symptoms were dyspnoe, persistent cough, or postobstructive pneumonia. 15 stents were implanted in the trachea, 13 in the main and 18 in the lobar bronchi. After visualizing the stenoses bronchoscopically, all stents were introduced under radiographic control. Lung function tests and control bronchoscopy were performed one week after implantation and at any time if there was a respiratory problem.

Results: The stents could be implanted successfully in all patients. In 20/22 patients clinical conditions improved immediately. Lung function tests revealed only minor improvements. During follow up stent compression (n = 9) and encrustment (n = 8) were the most common complications. 16 patients had to be readmitted for endoscopic management necessitating 26 recanalizing interventions (dilatation, laser dilatation, restenting). 21 patients died, in no case the stents could be related to death.

Conclusion: Balloon expandable metallic stents led to a fast relief of symptoms in the palliative management of tracheobronchial stenoses. The high reintervention rate indicates, that studies using stents with different biomechanical characteristics such as higher recoil force and covered meshes are warranted.

1077 10:40

Percutaneous treatment of benign biliary strictures: Long term results (13 years follow-up)

M. Bezzi, V. Cantisani, A. Zolotovkis, F.M. Salvatori, A. Spinelli, P. Rossi. Rome/IT

Purpose: To assess the long-term therapeutic efficacy of interventional radiologic techniques in the management of benign biliary strictures.

Material and methods: Benign biliary strictures were treated percutaneously in 219 patients over a 13-year period (patients’ age 18-76 years, average age 57 years). Strictures were post-operative in 92 % of cases and inflammatory in 8 % of cases. Treatment included stricture dilation with balloon catheters in all cases, stone removal in 70 cases and placement of metallic stents in 29 patients. Patency was assessed by life-table analysis. Mean follow-up was 5.7 years (range 1-13 years).

Results: Primary patency rates were 75 % at 5 years and 55 % at 12 years. Secondary patency rates were 80 % at 5 years and 12 years. Secondary patency was obtained by repeated dilations or placement of metallic stents. Success rate was higher in patients with Bismuth type I-II strictures (82 %) than in patients with Bismuth type III-IV strictures (61 %) (p < 0.05). The rate of major complications (5.5 %) was not superior to that reported for percutaneous biliary drainage, with a 30-day mortality rate of 0.6 %.

Conclusions: Benign biliary strictures can be effectively managed by percutaneous dilatation. Long-term follow-up is mandatory, since stricture may recur even after 5-7 years. In case of recurrence, satisfactory secondary patency can be obtained by less invasive procedures. The therapeutic results of this series are comparable to those of the surgical series with similar length of follow-up.

1078 10:50

The role of percutaneous cholangioscopy in the management of patients with biliary disease

A.A. Hatzidakis, G. Alexandrakis, D. Tsetis, J. Petinarakis, H. Kouroumalis, N. Gourtsoyiannis. Iraklion/GR

Purpose: To study the role of percutaneous cholangioscopy in the management of patients with biliary disease.

Material and methods: During the last 3 years, 25 percutaneous cholangioscopies were performed in 21 patients with intrahepatic biliary (n = 8), common bile duct (n = 15) and gallbladder (n = 2) disease. Seven had known and 3 suspected lithiasis, 6 benign strictures and in 4 malignancy was to be excluded. In 5 cases the result of balloon dilatation was controlled and in 2 cases the correct position of the metallic stents was checked. In 5 electrolydraulic lithotripsey was performed and in 3 stones were pushed to the duodenum.

Results: Stone-extraction, dissolution or removal was successful in 6 out of 8 cases, while in two others, stones were not discovered. In one patient with iatrogenic structure of the CBD, the guidewire passage was possible only with endoscopic guidance. In 3 out of 4 patients the diagnosis of malignancy was confirmed by direct mass-inspection, while in the fourth no tumor was found. In six patients with benign strictures the result of balloon dilatation was endoscopically controlled, and therefore no further intervention was necessary. No complications were noted.

Conclusions: Percutaneous cholangioscopy is a very useful tool in the management of patients with biliary disease. It's role may be appreciated in: (1) defining the diagnosis, (2) performing complex interventional procedures, and/or (3) making or changing therapeutic decisions.

1079 11:00

Nitinol stents for palliative treatment of malignant obstructive jaundice. A comparison between nitinol Ultraflex and Symphony stents

A.A. Hatzidakis, D. Tsetis, G. Chiloverakis, J. Petinarakis, K. Kalbakis, S. Ageiki, N. Gourtsoyiannis, Iraklion/GR

Purpose: To evaluate the performance of self-expandable Nitinol Ultraflex and Symphony biliary stents for the palliative treatment of malignant obstructive jaundice.

Material and methods: During the last 30 months, in the diagnostic approach of 100 patients with obstructive jaundice, PTC was performed, followed in 5 cases by an external and in 95 cases by an external-internal drainage. In 29 patients, 40 Diamond Ultra-flex biliary stents and in 20 patients, 25 Symphony stents, were used. Three were used to distend an obstructed biliodigestive anastomosis and two for a stented jejunal loop.

Results: Stone-extraction, dissolution or removal was successful in 82 % for Ultraflex and in 90 % for Symphony. In 12 out of 25 Symphony stents, distention with the help of a balloon was necessary, 2-3 days after stent placement, because of inadequate initial stent expansion. The 30-days mortality was 20 %. No major complications were noted. Average patency was 5.1 months (153 days) and average survival 5.3 months (162 days), without any statistically significant differences between both groups. These data are comparable with published data concerning other types of stents.

Conclusions: The Nitinol Diamond Ultraflex and Symphony biliary stents are comparable to the other percutaneously inserted self-expandable metallic stents. The construction of Symphony should be the percutaneous alternative of the endoscopical Ultraflex stent. Although the material is the same, Symphony stent has a much lower distensibility, so that in many cases, subsequent balloon angioplasty is necessary.

1080 11:10

Reconstitution of interrupted biliary and urinary tracts: A percutaneous-endoscopic approach

F. Farnelli, G. Bonomo, M. Rossi, F.M. Salvatori, G. Marcelli, P. Rossi. Rome/IT

Purpose: To describe the technique and evaluate the results of combined radiologic-endoscopic inverventions in the re-establishment of interrupted biliary ducts and ureters continuity.
Methods and materials: Complete transection of biliary tract in 9 patients, and of ureter in 3 patients were evaluated by radiological techniques for possible percutaneous treatment. Traumatic interruption of the biliary tree manifests either with acute symptoms related to the bile leak or with progressive jaundice due to bile duct obstruction. Biliary damages were secondary to trauma in two cases, to laparotomic and laparoscopic surgical complications in seven cases. Ureter transections were atherogenic damages consequent to open pelvic surgery in two cases and to endoscopic lithotripsy in one case. In most cases a "rendez-vous" technique was used to retrieve a guidewire crossing the interrupted tract and dilatation and stenting were performed.

Results: The drainage will stop the leak and acute symptoms. Two patients completely healed from the biliary drainage with catheter removing and live have not yet completed the treatment while have catheter (3) and prosthesis (2) on site. Two patients underwent to surgery. The damaged ureter tracts were stented and the endoprostheses was removed after 2 and 11 weeks in two cases. The other patient died after 8 months for metastatic disease.

Conclusions: The radiological-endoscopic approach is often the only therapeutic option in those patients with complete interruption of the biliary urinary tract. It permits to delay surgery after acute symptoms or to resolve problems without surgery.

---

1081 11:20
Female tubal sterilization using microcoil insertion by selective tubal catheterization in rabbits

C.J. Kim, K.T. Hong, Y.H. Kim, I.H. Cha, W.H. Suh; Seoul/KR

Purpose: To investigate the efficacy of transcervical tubal occlusion using Tomado P microcoil insertion by selective tubal catheterization for nonsurgical female sterilization in rabbit.

Methods & Materials: The microcoil was placed unilaterally into fallopian tubes of 12 female rabbits after selective tubal catheterization. Controlateral uterus and fallopian tube served as internal control. After 8 rabbits were bred, the sterilization effect of inserted microcoil was confirmed at autopsy, comparing with control. Postmortem histopathologic examination of fallopian tubes at microcoil site was performed.

Results: Seven of 8 rabbits became pregnant. None of the rabbits had embryos on the microcoil side. Seven rabbits had a average 4.3 embryos on control side. One rabbit failed to become pregnant on either side. There was no displacement of inserted microcoil in all 8 rabbits. The gross specimens showed that fallopian tubal lumen was completely occluded and focially rolled up at microcoil site. Histopathologic examination revealed epithelial proliferation and minimal inflammatory response at fallopian tube. There was no hemorrhage or peritoneal adhesion.

Conclusion: Fallopian tubal occlusion using microcoil insertion by selective tubal catheterization was an effective technique for nonsurgical female sterilization in this experimental study.

---

1082 11:30
Single session alcohol sclerotherapy in symptomatic benign hepatic cysts. The results of sclerotherapy with a reduced exposure time to alcohol

T.B. Larsen, A. Horn; Bergen/NO

Purpose: To evaluate the efficacy of sclerotherapy performed with a reduced time of exposure of the cyst wall to alcohol.

Materials and methods: Alcohol sclerotheraphy was performed in 31 cysts. The maximum volume of 96 ml was 10 % of the cyst volume, never exceeding 100 ml. The time of exposure to alcohol was 20 minutes in 12 and 10 minutes in 19 cysts. 10 cysts in 9 patients (F:M 8/1, age 44-75, mean 60.9) had a time of observation considered sufficient for evaluation of the results. 12.2 - 67.1. mean 28.1 months.

Results: The initial cyst volume was 2700-300, mean 1331 ml. The final volume was 523-0, mean 77 ml - a reduction of volume of 73-100, mean 94.2 %.

Conclusion: In all 10 cysts in 9 patients treated with a time of exposure to alcohol of maximum 10 minutes satisfactory sclerosis was achieved.

---

1083 11:40
Percutaneous gastrostomy in patients who fail or are unsuitable for endoscopic gastrostomy: Technical considerations, results and complications

F. Thornton, J. Varghese, P. Haslam, F. McGrath, F. Keeling, M.J. Lee; Dublin/IE

Purpose: Percutaneous endoscopic gastrostomy (PEG) is not possible or fails in some patients. We studied the use of percutaneous radiological gastrostomy (PRG) in these selected patients.

Methods and materials: 40 patients (M:F, 25:15, mean age 64, range 18-93) in whom PEG failed or was not possible, underwent PRG. PEG failure was due to suboptimal transillumination in 22 of 40 (obesity in 3, high subcostal stomach due to motor nerve in 8, anatomical variation in 8 and miscellaneous in 3) upper GI tract obstruction or other pathology in 14 of 40 (esophageal stricture in 10 and altered upper GI anatomy in 4) and advanced cardio-respiratory decompensation precluding endoscopy in 4 of 40. T-fastener gastrostomy was used in all patients and 14-18 Fr catheters inserted.

Results: PRG was successful in 39 of 40 patients (97.5 %). In the 16 patients with high subcostal stomach, intercostal tube placement was required in 3/16 and cephalad angulation under the costal margin in 8/16 patients. CT guidance was required in the 4 patients with altered upper GI anatomy and PRG failed in one patient despite CT guidance. Major complications included inadvertent placement of the tube in the peritoneal cavity in one patient with a high subcostal stomach but the tube was removed the next day without feeding, hemorrhage at the gastrostomy site in one patient which was treated successfully with balloon tamponade, and deep wound infection requiring tube removal in one. Minor complications included superficial wound infection in 6 patients, successfully treated with topical antibiotics.

Conclusion: PRG is often technically more difficult after failed PEG. CT guidance, intercostal and angled subcostal tube placement may be required.

---

1084 11:50
Percutaneous radiological guided gastrostomy

R.H. Kuyt, M. Oudkerk; Rotterdam/NL

Purpose: Report of our experience with PRG.

Material and methods: In 12 months, 80 PRG’s were performed. A safe area for identification is used with ultrasound. A 5 Fr catheter is introduced through the nose in the stomach under fluoroscopy or after direct puncture of the stomach under US guidance. The stomach is inflated under fluoroscopy and anchored at the abdominal wall. The percutaneous gastrostomy is introduced under fluoroscopy. After the first 10 patients two modifications are introduced: application of a spasmolytic drug and two anchors in stead of one. After 2 months replacement is performed, usually by a tailored short gastrostomy tube.

Results: Of 55 de novo PRG’s 47 were uncomplicated. In 8 cases contact with the stomach was lost, two because of anchor-suture rupture, four because of fausse route after proper anchor placement and two by stomach contraction during the procedure. In these 8 cases CT assistance was required. Late complications: balloon desuHlation caused by tube rupture, in 4 cases; - abscess formation in one case; - bleeding from varices in one case. These complications resulted in slightly prolonged hospitalisation. At replacement no complications were encountered.

Conclusions: PRG is a safe procedure, to be preferred over endoscopically guided gastrostomy.
Results: Median power output was 150 W (70-200), median treatment time was 1335 s (600-5400) and median power deposition 218 kJ (70-707). Median volume of necrosis was 73.5 cc (4-389). Correlation between total power in and necrosis was 0.67. Treatment at powers > 100 W generally necessitated heavier IV sedation and preferably general anaesthesia. 69% of tumours were completely ablated on follow up CT scans at 18 hours post procedure. Ablation of margins of normal liver was consistently achieved in lesions not contiguous large vessels. Conclusions: Many of the technical limitations of thermal ablation have been solved. The latest RF technology can achieve substantial volumes of necrosis including surgical margins.

1086 10:40
Percutaneous treatment of small hepatocellular carcinoma in cirrhosis: Radio-frequency thermal ablation versus ethanol injection. A prospective, randomized trial (final report)
D. Coni, R. Lenoci, S. Rossi, F. Garbagnati, H. P. Aliagaer, F. Donati, L. Crocetti, G. Granati, C. Bartolozzi; Pisa/IT
Purpose: To compare the effectiveness of radio-frequency (RF) thermal ablation versus percutaneous ethanol injection (PEI) in the treatment of small hepatocellular carcinoma (HCC) in patients with liver cirrhosis.
Material and methods: Eighty patients with either single or multiple (up to three) nodular-type HCC lesions 3 cm or less in diameter were randomly assigned to either RF ablation (n = 40) or PEI (n = 40). All patients had Child-Pugh class A or B liver cirrhosis. RF treatment was performed by using 17-G cooled-tip electrode needles or 15-G expandable electrode needles with four retractable lateral exit jacksicks on the tip. PEI was performed by using 22-G multiple-side-hole needles. Therapeutic response was assessed by dual-phase spiral CT. Follow-up period ranged 9-24 months (mean: 16.3±5.1 months; median: 15 months) and included repeated spiral CT studies at 4-month intervals.
Results: Overall, 115 HCC lesions 1.0-3.0 cm in diameter (mean: 2.2±0.6 cm) were treated with RF ablation (n = 54) or PEI (n = 61). No major complication occurred. Complete tumor response was shown by spiral CT in 49 (91%) of 54 lesions treated by RF ablation, and in 52 (85%) of 61 treated by PEI (p = 0.1). The average number of sessions needed to achieve tumor ablation was 1.3±0.5 for RF treatment, and 3.3±1.1 for PEI (p = 0.01). Local recurrence (i.e., recurrence within or around a tumor considered to have undergone complete response) occurred in 2 (4%) of 49 lesions treated with RF ablation, and in 9 (17%) of 52 lesions treated with PEI (p = 0.05). Therefore, long-term tumor control was achieved in 47 (87%) of 54 lesions treated by RF ablation, and in 43 (70%) of 61 lesions treated by PEI (p = 0.05).
Conclusion: Percutaneous ablation of small HCC can be safely achieved with either RF treatment or PEI. RF thermal ablation, however, requires a lower number of treatment sessions, and allows a more effective long-term tumor control. RF should be considered the treatment of choice for percutaneous ablation of small HCC in cirrhosis.

1087 10:50
Large unresectable hepatocellular carcinoma: Percutaneous radio-frequency thermal ablation after occlusion of tumor blood supply
R. Lenoci, S. Rossi, F. Garbagnati, H. P. Aliagaer, D. Cioni, F. Donati, A. Paolocci, C. Bartolozzi; Pisa/IT
Purpose: To evaluate the effectiveness of percutaneous radio-frequency (RF) thermal ablation after occlusion of tumor arterial blood supply in the treatment of large, unresectable hepatocellular carcinoma (HCC).
Materials and methods: Eighty cirrhotic patients with single HCC 3.5-8.5 cm in diameter (mean: 4.7 cm) underwent RF ablation after angiographically-assisted occlusion of tumor arterial blood supply by balloon catheter (n = 55) or gelfoam embolization (n = 25). RF treatment was performed by using a 50-W generator and a 15-G expandable electrode needles with four retractable lateral exit jacksicks on the tip (RITA Medical Systems, Mountain View, CA). A single-session, multi-step ablation technique was used by creating 3-8 thermal lesions with 1-2 needle insertion, depending on the size of the tumor. Total RF procedure time ranged 24-64 minutes (mean: 35 minutes). Findings at dual-phase spiral CT obtained 2-5 days after treatment were used to establish the outcome of therapy.
Results: Dual-phase spiral CT showed a non-enhancing area reproducing HCC nodule shape, suggesting complete tumor response, in 74 of 80 patients (92.5%). In the remaining six patients, complete response was achieved after a second RF treatment session. No major complications occurred. After RF ablation, 78 of 80 patients were followed up for 3-32 months (mean: 16.9 months) with spiral CT studies performed at 3-month intervals. Local tumor recurrence was demonstrated in 11 (14.1%) of 78 lesions, whereas the remaining 67 lesions (85.9%) showed progressive reduction in size with no sign of recurrence.
Conclusions: RF thermal ablation after occlusion of tumor arterial supply results in a large volume of necrosis selectively involving HCC tissue and sparing surrounding non-tumoral parenchyma. This technique shows promise for single-session ablation of large, unresectable HCC.

1088 11:00
Complications of radiofrequency and laser ablation of liver metastases: Incidence and management
W.R. Lees, A.R. Gillams: London/GB
Purpose: To establish the incidence, cause and appropriate management of complications of thermal ablation treatment.
Methods and materials: Since Jan 1995, 296 liver metastases were treated in 77 patients at 340 treatment sessions by laser and 153 lesions were treated in 56 patients at 101 sessions using cooled tip electrode radiofrequency. Results: Abscesses formed in 4 cases. 2 secondary to cholangitis or diverticulitis, 1 as a fistula to colon. All four required percutaneous drainage and long term antibiotics. One sterile granulomatous mass resolved spontaneously. One patient with stented biliary obstruction developed a biliary-pleural fistula when the stent blocked. Track seeding was seen in 7 patients, treated by surgical excision-radiotherapy. Small subcapsular haematomas were seen in 30 %. Larger haematomas requiring IV fluids were seen in 2. Right basal effusions and small volume basal consolidation were universal and clinically insignificant. 1 large effusion and 4, 30% pneumothoraces were seen, 3 required needle aspiration. Distal segmental infarction was unusual and clinically insignificant. Severe postprocedure pain was experienced in c. 15 % requiring NSAIDS or steroids combined with analgesia. 5 % experienced mild chronic pain.
Conclusions: Major morbidity after thermal ablation of liver metastases is uncommon. The trend to more aggressive treatment has been accompanied by more complications.
Results: Together with lower impedance and higher power output, the lesion size in Group C (5.0±0.4 cm) and C' (6.0±1.0 cm) were significantly larger (P< 0.01) than that in group A (3.8±1.0 cm) and A’ (2.6±0.4 cm), and Group B (3.5±0.7 cm) and Group B’ (2.5±0.2 cm).

Conclusion: With a single puncture in one session, the present design of "expandable-wet" electrode allows significantly enlarged lesion size in RF tissue ablation.

1091 11:30
Radiofrequency liver tissue ablation with a "cooled-wet" electrode: In vivo results in the swine
Y. Miao, Y. Ni, J. Vaninbrouck, J. Yu, G. Marchal. Leuven/BE

Purpose: To test whether "cooled-wet" electrode mediated radiofrequency ablation (RFA) can enlarge lesion size during in vivo experiment.

Methods and materials: Under general anesthesia and laparotomy, 72 RFA lesions were created in 12 pigs using a novel "cooled-wet" electrode that combines internal cooling perfusion and hypertonic saline interstitial infusion. Both power control mode (Group A: cooled-only, B: wet-only and C: cooled-wet) at 90 W and manual control mode (Group D: cooled-only, E: wet-only and F: cooled-wet) were compared for impedance, current and lesion size. MRI was performed for measurement of lesion size.

Results: Together with lower impedance and higher power output, the lesion size in group C (4.5±0.6 cm) and F (6.1±0.8 cm) were significantly larger (P< 0.01) than that in group A (2.4±0.5 cm), B (3.1±1.0 cm), D (3.3±0.6 cm) and E (3.5±0.9 cm).

Conclusion: The present in vivo RFA experiment demonstrated that using the current monopolar "cooled-wet" electrode could efficiently increase the lesion size within a single session. This confirms the results of our previous ex vivo studies.

1092 11:40
Radio-frequency thermal ablation after occlusion of tumor draining vessels: A new therapeutic approach for liver malignancies (work-in-progress)
R. Lencioni, S. Rossi, F. Garbagnati, H.P. Allgaier, D. Cioni, F. Donati. M. Moretti, C. Bartolozzi. Pisa/IT

Purpose: To evaluate feasibility, safety, and effectiveness of radio-frequency (RF) thermal ablation of unresectable liver malignancies performed during balloon catheter occlusion of the hepatic veins.

Materials and methods: To date, 13 patients (nine males and four females) aged 44-76 years old (mean 58.4 years old) with 13 unresectable malignant liver nodules (four hepatocellular carcinomas, one metastasis from breast cancer and eight from colorectal cancer) were included in a pilot clinical study. Tumor nodule diameter ranged 4.1-7.2 cm (mean 5.1 cm). RF procedure was performed during balloon catheter occlusion of the hepatic veins, using a 50-W generator and 15-G expandable electrode needles (RITA Medical Systems, Mountain View, CA). A simple-sesion, multi-step ablation technique was used by creating 3-5 thermal lesions with 1-2 needle insertion, depending on the size of the tumor. Total RF procedure time ranged 24-48 minutes (mean 34 minutes). Findings at dual-phase spiral CT obtained 2-5 days after treatment were used to establish the outcome of therapy.

Results: No complication occurred. Impedance values detected during RF ablation ranged 30-35.2 (mean. 32.1). These values were significantly lower than those previously reported for conventional RF ablation, as a result of increased tissue conductivity caused by stagnant blood flow within the tumor. On dual-phase spiral CT a non-enhancing area of coagulation necrosis replacing tumor nodules and suggesting complete tumor response was showed in 11 of 13 patients (84.6%). In the remaining two patients, complete response was achieved after a second RF treatment session performed without balloon catheter occlusion of the hepatic veins. No case of local recurrence was observed after a 4-8 months follow-up period.

Conclusion: Preliminary results of this pilot clinical trial showed that RF ablation performed during balloon catheter occlusion of the hepatic veins results in a large volume of necrosis, thus enabling single-session treatment of large liver malignancies.

1093 11:50
Percutaneous radiofrequency thermal ablation (PRTA) of liver lesions
M. Rossi, D. Pepino, S. Perotti, L. Giglio, M. Pierleoni, P. Rossi. Rome/IT

Purpose: To assess the efficacy of PRTA in the treatment of liver lesions.

Methods and materials: Hyperthermia was locally induced in 51 liver lesions trough radiofrequency electrode percutaneously inserted under US guidance. Lesion diameters were 2.5 cm (mean 2.8 cm) for metastases, 1.7 cm (mean 3.2 cm) for HCC each lesion underwent 13-17 minutes exposition, reaching a final temperature of 60-80 °C. Lesions 3 cm received multiple treatment at different sites. 18 Gauge cooled-tip needles were used in most cases. In 3 cases a 3-needles "cluster" array was used and Multiple hooks (RITA) in 2 cases. MR and Spiral-CT follow-up was performed at 1-3-6-12 months.

Results: Complete necrosis was obtained in 18/23 (78 %) metastases and in 23/25 (92 %) HCCs one month after treatment. 6 months follow-up demonstrated complete necrosis respectively in 6/10 (60 %) metastases and in 14/17 (83 %) HCCs. After 12 months only 4 metastases were controlled and in none we observed complete necrosis. all the HCCs lesions controlled (4) showed complete necrosis. Local recurrence at 6 months was 40 % for metastases and 17 % for HCCs. New lesions developed elsewhere in 14 % and 12 % respectively for metastases and HCCs in 3-10 months. Three patients died at 1-4 months.

Conclusions: PRTA seems to be a safe and effective treatment for primary and secondery liver lesions. It does not prevent from further local treatments. Lesions 3 cm require use of the three-needles "cluster" array to obtain a "safety halo" of necrosis.

10:30–12:00
Room K

Pediatric

SS 1712
Neuroradiology

Chairpersons:
S. Beno (Marburg/DE)
P.P. Kramer (Utrecht/NL)

1094 10:30
MR-evaluation of fetal brain development: Useful or "‘lart pour l’art’"?
D.M. Prayer, W. Blacher, S. Kuhle. Vienna/AT

Aim: To investigate the impact of MR-information about fetal brain-development on further management of the pregnancy and the infant during/after birth respectively.

Patients and methods: 10 patients (21st - 38th week of pregnancy) in whom routine sonography stayed unclear, recelved MR examinations. A 1.5 T superconducting system was used with a body wrap-around coil, T2-weighted single-shot-sequences (15-19 seconds acquisition-time), in 3 section-planes, and 4 mm slice-thickness.

Results: MR showed malformation-syndromes (2), arachnoidal cysts (2), aqueduct stenosis (3), twin-twin transfusion syndrome (1), and appropriate state of brain-development (2). These results confirmed suspected sonographical findings in 7 cases (containing additional information in 5), corrected sonography in 1 case, and was able to show the stage of brain-development in all 10 cases. After MR-examination pregnancy was terminated (3x), sonographical controls were performed with higher frequency than usual until birth (3x), pregnancy was continued under regular conditions (4x) Postnatal MR-controls, available in 4 cases, confirmed the prenatal MR-results.

Conclusion: MR of fetal brain-development may help to answer following questions:
1. whether a fetal brain pathology would be consistent with life,
2. what degree of impairment would have to be expected,
3. which complications could appear during birth, and
4. whether postnatal or even antenatal surgery has to be planned.

1095 10:40
Safety and efficacy of MultiHance(r) in MR imaging of pediatric CNS. Comparison with Magnevist®
A. La Noce. C. Baldi. L. D' Incertl. I. Salerio. M.A . Kirchin. G. Pirovano. A. Spinazzl. Milan/IT

Purpose: To evaluate the safety and efficacy of MultiHance® versus Magnevist® -enhanced MRI in pediatric patients.

Methods: Patients aged 6 months to 17 years with known or suspected CNS disease were intravenously administered 0.1 mmol/kg MultiHance® (N = 85) or Magnevist® (N = 89). MR images were acquired before (T1+T2wSE) and after (T1wSE) contrast agent injection.
Blinded off-site assessment of images was performed primarily to determine, using a four-point scale, the proportion of patients with an increase in diagnostic information from unenhanced to enhanced MRI, and secondarily a) the change from unenhanced to enhanced MRI in the number of lesions detected, and b) confidence in lesion detection and diagnosis. Physical examination, vital signs, laboratory investigations and incidence of adverse events comprised the safety assessment.

**Results:** No significant differences between the study agents were found for any endpoint. In 21-34% of patients given MultiHance® the level of diagnostic information was greater for the combined assessment of unenhanced and enhanced images than for unenhanced images alone. The greatest number of lesions, 92-97% of which had a confidence score of “definite”, were detected during the combined assessment. MultiHance® provided an increase in diagnostic confidence for 68-87% of patients. Adverse events were reported for 13% (MultiHance®) and 15% (Magnevist®) of patients. No clinically significant trends in vital signs and laboratory parameters were observed.

**Conclusion:** MultiHance® and Magnevist® exhibit comparable efficacy and safety for pediatric CNS imaging.

**1096 10:50**

Radiology of non-CNS primitive neuroectodermal tumours (PNET): Diagnostic features and correlation with outcome

E.A. Dick, K. McHugh; London/GB

**Purpose:** To document the various radiological features of non-CNS PNETs before and after treatment.

**Methods:** 26 children with PNETs have been treated at our institution since 1990. We obtained full radiological and clinical follow-up in 20 of these patients (10 male, 10 female). The median age at presentation was 1 year. All imaging modalities were reviewed with particular attention to CT and MR.

**Results:** There were five main sites of tumour location: Head and Neck (4 patients), Scapula/Axilla (2), Chest (8), Abdomen (3), and Spinal/Paraspinal (3). CT was performed at diagnosis or in follow-up in 17 patients and MRI in 14. Average size of PNETs was 4 cm diameter at presentation. Calcification was rare (n = 1). Tumours tended to displace adjacent soft tissue structures such as vessels and bronchi, rather than invade them. Bony invasion and destruction was seen in 5/17 on CT. Metastases were seen to the lung (n = 1), pleura (n = 2), spinal canal (n = 3), lymph nodes (n = 1) and skin (n = 1). Tumours of the scapulae or paraspinal region had better survival.

**Conclusion:** Imaging characteristics of non-neuronal PNETs are presented.

- Tumour calcification is uncommon.
- PNETs tend to displace rather than encase adjacent structures.
- Bony invasion occurs in 29%.
- Multiple metastatic sites exist.
- Scapular or paraspinal tumours sites more favourable.

**1097 11:00**

Metastatic brain lesions in children with Ewing’s sarcoma

A. Abramovych, O. Shchurovskyy, Z. Stadnyk, Lviv/UA

**Purpose:** According to literature, brain metastases (BM) are very rare in children with Ewing’s Sarcoma (ES). The aim of this study is to show the frequency of BM in patients with ES, as well as its dependency on the location of the primary lesion.

**Methods and materials:** The review of 16 children (10 boys and 6 girls) with ES treated in our hospital from 1993 until 1999 was completed. The age of the children ranged from 3 to 17 years (median age: 11 years). Primary lesion was centrally located in 7 cases (pelvis 6, rib 1) and peripherally located in 9 cases (femur 4, tibia 2, iloula 2, humerus 1).

**Results:** 8 patients had 15 metastases of different locations, where metastatic involvement of the brain occurred in 5 children (33% of all metastases). BM more often occur in cases of central, especially pelvic location of the primary lesions (in 4 children of 6) than in cases of peripherally located primary tumor (1 BM from tibia), but this difference is not statistically significant (chi2 = 2.01, p = 0.18). All BM were identified by imaging modality, 3 were histologically proven. At the time BM were diagnosed all patients had some CNS symptoms: headache (n = 3), headache and hemiparesis (n = 2). Two patients developed subependymal giant cell astrocytomas in the right frontal horn with obstructive hydrocephalus. The posterior fossa was involved in 3 patients with gross, gyrmform calcifications. Cerebellar atrophy with enlarged 4th ventricle was also observed. Cortical tubers were disclosed by MR in all patients. CT discovered calcified intrapararchymal tubers in 5 patients. One child showed an unusual hyperdense, tumor-like tuber. Eight patients had mild to moderate brain atrophy and only one had massive brain atrophy.

**Conclusion:** It is our opinion that medical professionals must be more aware of the possibility of BM in patients with ES (especially in cases of central ES) and should conduct the appropriate diagnostic procedures to exclude it.

**1098 11:10**

Granulocytic sarcoma in childhood leukemia. Atypical imaging features

M. Herrera Savall, L. Muntauer, A. Mas, M. Morey, J. Mestre, M. Guiberale, Palma de Mallorca/ES

**Purpose:** Granulocytic sarcoma (GS) is also known as a chloroma. It is a mass of malignant precursor cells in an extramedullary location. The lesion develops in about 5% of adults and 13% children with acute myelogenous leukemia (AML) and seldom in acute lymphogenous leukemia (ALL). The lesion is identified before or at the time of diagnosis. There is a strong predilection for subcutaneous tissues, face, bone and peripheral involvement.

**Material and methods:** Four patients from our institutions and a review from the literature provide the basis of our conclusions on the appearance of GS. Of the four patients with GS all had CT and/or MR scans. The diagnosis was based on clinical presentations, response of chemotherapy and one case was pathologically proved.

**Results:** Two patients with MLA had focal masses in parasinal sinuses and orbit, one with ALL were parameningeal and orbit involvement and one with ALL had delayed-onset perineural spread to diencephalon (16 years after remission).

**Conclusions:** Face involvement was the most common site of envolvement of four patients with GS. In leukemic patients with atypical endocrine manifestations and a focal mass in the diencephalon GS should be included in the differential diagnosis.

**1099 11:15**

Reliability of optical nerve sonography in pediatric patients with increased intracranial pressure (ICP)

F. Speckamp, M. Scharf, D. Draile, J. Moritz, G. Alzen; Gießen/DE

**Purpose:** According to previous studies B-Mode-Sonography is a method to detect ICP. The objective of this paper is to confirm the efficacy of this method in paediatric patients with suspected ICP and to enhance the reliability using high frequency ultrasound.

**Methods & materials:** The investigation was carried out using a 9 MHz linear array probe (Sonoline Elegra, Siemens). The results were related to alternative methods, such as CT, MRI and especially EEG. Sonographic criteria comprised the possibility to discriminate the optical nerve and the nerval sheath and to detect their diameter.

**Results:** Applied to 265 patients (155 male, 110 female, average age 7 years) the achieved results showed for 251 patients without ICP an average diameter of 3.5 mm (5.6 mm including the nerval sheath). Patients with ICP (n = 14) exhibited an average total diameter of 7.7 mm (optical nerve and nerval sheath). In these patients the demarcation of the nerval sheath was impaired because of ist hypoechoegenicity.

**Conclusion:** Our results confirm the reliability and the diagnostic advantage of this method in comparison with current techniques.

**1100 11:25**

Tuberous sclerosis. The spectrum of neuroimaging

H. Schulman, Z. Sorer, Y. Shelef; Beer-Sheva/IL

**Purpose:** Tuberous sclerosis (T.S.) is an autosomal dominant inherited syndrome, also known as Bourneville’s disease. It occurs in 1:29,000 to 100,000 people. The classical clinical triad consists of adenoma sebaceum, mental retardation and epilepsy. The aim of our study was to analyze the neuroimaging, including cranial CT scans and MR examinations.

**Materials and methods:** In the past 13 years, between 1986 and 1999, 9 children aged between one month and 18 years had a clinical diagnosis of T.S. We retrospectively reviewed their cranial CT scans, performed at various ages. MR examinations were available in 8 patients.

**Results:** All patients had subependymal hamartomas - the first calcifications were noted at the age of 5 months. Two patients developed subependymal giant cell astrocytomas in the right frontal horn with obstructive hydrocephalus. The posterior fossa was involved in three patients with gross, gyrmform calcifications. Cerebellar atrophy with enlarged 4th ventricle was also observed. Cortical tubers were disclosed by MR in all patients. CT discovered calcified intrapararchymal tubers in 5 patients. One child showed an unusual hyperdense, tumor-like tuber. Eight patients had mild to moderate brain atrophy and only one had massive brain atrophy.

**Conclusion:** TS is a relatively rare disease. In our serie, we had a 30% of posterior fossa lesions (while 10-15% have been reported in the literature). The transformation in giant cell astrocytoma was in keeping with the 2-26% already
Investigation of metabolic changes in the brain of patients with anorexia nervosa by phosphorus-31 magnetic resonance spectroscopy

R.R. Raznny, D. Maul, U.J. Gerhard, W.A. Kaiser; Jena/DE

Purpose: To investigate the brain of patients with anorexia nervosa and to look for metabolic alterations during rest and during a cognitive stimulation.

Method and materials: 9 anorectic and 9 healthy age matched control females. Anorectic females were investigated at the beginning and at the end of their medical treatment.

Results: In comparison with controls the spectra of anorectic females showed higher ratios between PCr (phosphocreatine) and Pi (inorganic phosphate) in the first investigation. During cognitive stimulation a decrease of the relative Pi density was observed only in the case anorectic females in the first investigation. Increased PCr/Pi ratios were observed for controls and for anorectic females in the second investigation but not in the first investigation.

Conclusion: Differences in the PCr/Pi ratio indicate alterations in the energy metabolism possibly as a consequence of nutritional deficiency. Changes in the Pi density during a cognitive stimulation can be a consequence of decreased GPC (glycerophosphorylcholine) concentrations by an increased requirement of choline.

Endoscopic third ventriculostomies in the under 1's: Magnetic resonance imaging pre- and post-operatively

A.M. Sharman, C. Mallucci, M. Palaniappan; Liverpool/GB

Purpose: To determine whether it is possible to select patients with obstructive hydrocephalus in the under 1 age group for endoscopic third ventriculostomy (ETV) using pre-operative T2 weighted turbo spin (T2W-TSE) sagittal sequence MR scanning; and to assess ventriculostomy patency using post-operative T2W-TSE MR scanning.

Patients and methods: A retrospective review of MR scans and clinical notes of 11 patients under 1 year of age who had ETV was performed. The post-operative flow scans were divided into the presence or absence of the flow-related signal changes.

Results: In 6 of the 11 patients, ETV was successful (54.5 %) ie. no VP shunt or revision of the ETV was required. 9 patients had post-operative T2W-TSE MR scans - 8 of these MR scans correlated to the clinical situation (89 %). The remaining scan showed a CSF flow void but the ETV failed at 3 weeks.

Conclusion: MR scanning using T2W-TSE to select suitable candidates for ETV pre-operatively improves the success rate from < 40 % to 54.5 %. Post-operatively it is a good predictor of whether the ETV has been successful or not.

CT of the paranasal sinuses in children: Standard CT in comparison with spiral CT

D. Zedeben, D.H. Szolar, G. Stoffles, E. Scranton, R. Fetter; Graz/AT

Purpose: To compare standard CT with spiral CT concerning image quality, scan time and radiation dose.

Methods and materials: Cononal CT of the sinuses were performed in 50 children with recurrent or chronic sinuses before and after functional endoscopic sinus surgery. Twelve children were investigated by standard CT (protocol A), 20 children by spiral CT pitch 1.0 (protocol II) and 18 children by spiral CT pitch 1.5 (protocol III). Additionally, multiplanar two-dimensional reconstructions were obtained. A subjective score of I to III (excellent to non-diagnostic) for image quality was assigned. The scan time was determined and the radiation dose was estimated by calculating the total milli-ampere-seconds.

Results: All protocols showed excellent to diagnostic image quality (Score I or II). All 2D-reconstructions with spiral CT-technique were of diagnostic quality (score II). In comparison to standard CT, spiral CT pitch 1.5 reduced scan time from 4 minutes to 40 seconds. The radiation dose was reduced to 30 %.

Conclusion: Spiral CT with a higher pitch 1.5 offers excellent to diagnostic image quality. Furthermore it results in a reduction of scan time and radiation dose.

Clinical experience with a new digital radiography system based on a flat panel detector

S. Haagens, A. Schmidt, J. Freyenschmidt; Bremen/DE

Purpose: To give an overview about our clinical experience with a new digital radiography system and report on studies concerning the image quality and improvements in postprocessing. Studies about dose reduction are in-progress.

Methods and materials: The system with a flat-panel-detector based on amorphous silicon (Tixell Pixum 4600) is in clinical testing since 5/98. Until now (9/99) about 1500 X-ray examinations have been performed. Larger series of images the postprocessing parameters have been checked and optimized several times. Current studies in follow-up-examinations and urograms will prove if a dose reduction of 25 % and 50 % is achievable in clinical routine without impairing the diagnostic image quality.

Results: The bone-detail-resolution with the digital system is at least comparable to that with screen-film-combinations. Image latitude and soft tissue rendition are superior. In the beginning a moderate edge enhancement was used, which is now replaced by a particular contrast enhancement of small details. This technique offers a considerable lower image noise but comparable detail resolution. Preliminary results are promising that a 25 % dose reduction can be achieved in urograms without deterioration of image quality.

Conclusions: The digital flat-panel-detector offers an excellent image quality that has further improved with a new postprocessing technique.

Image performance and workflow analysis of a digital radiography system based on a large area flat panel X-ray detector

M. Spehr; Forchheim/DE

Purpose: To evaluate the image performance of a digital radiographic system under laboratory and clinical environments and to analyse the expected positive impact on the workflow in the radiology department.

Methods and materials: A 43 x 43 cm² flat panel X-ray detector based on an active matrix of amorphous silicon photodiodes and a Cesium Iodide (Csl) scintillator was integrated into a new digital thorax and a Bucky table system. Laboratory evaluations of basic image quality parameters (DOE, MTF) were performed and compared to state of the art systems. In parallel, this new technology was evaluated under clinical conditions and compared to conventional radiography (screen film). The workflow in the radiologic department was analysed and compared for the digital and the analog systems, respectively.

Results: The measurement results of DOE and MTF for the flat panel detector proved to be superior to conventional screen-film systems. The analysis of chest and skeletal images taken with the digital system were judged equally well or better than images taken with the conventional system at the same dose (equivalent to 400 speed). The potential of dose reduction with the new system was evaluated by reducing the applied dose. The workflow analysis in the radiology department indicates a substantial improvement for the digital system versus the conventional routine.

Conclusions: Digital radiography based on a large size amorphous silicon X-ray detector provides excellent image quality, quantitatively described by DOE and MTF. This technology has the potential to not only replace the conventional techniques but also reduce the applied dose. The detector provides the missing link to render the radiological department fully digital, improve the workflow and considerably cut examination times.
Comparison of flat panel direct radiography and storage phosphor plates: The influence of dose on low-contrast resolution

M. Uffmann, C.M. Schaefer-Prokop, M. Prokop, P. Wunderbaldinger, E. Eisenhuber, C.J. Herold, Vienne/AT

Purpose: New types of direct radiography equipment based on amorphous silicon and flat panel technology promise a high spatial and contrast resolution for skeletal radiology. We simulated the scatter conditions of typical skeletal examinations and quantitatively compared the detection of low contrast objects with a new flat panel detector and the most recent generation of storage phosphor plates (ST V) at various exposure doses.

Methods & materials: A contrast-detail test object (Leeds TO 16) was superimposed by acrylic glass of varying thickness in order to simulate exposure conditions of the elbow, knee and pelvis. Depending on the thickness of the simulated soft tissue layer (5, 10 and 20 cm), tube voltage was increased from 50 kVp to 70 kVp and 90 kVp. The images were acquired with a flat panel detector (Trixell Philips) and storage phosphor plates (ST V, Fuji) at 5 exposure doses corresponding to a 100 and a 1600 speed system. Similar processing modes were used. Five readers evaluated a total of 192 films for threshold contrast of 12 lesion sizes.

Results: The number of detected lesions increased linearly with the logarithm of dose (R2 > 0.83). For a given number of visible lesions, the direct detector system required on the average 45% less dose than the ST V plates when 20 cm acrylic glass was superimposed. The potential dose reduction was less with decreasing simulated soft tissue thickness and lower kVp (36% at 10 cm and 17% at 5 cm).

Conclusion: Direct detector radiography provides improved low-contrast resolution compared to storage phosphor plates. The differences of dose requirements increase with stronger scatter and higher kVp. Therefore dose reduction with the flat panel detector may be more substantial in radiographs of the axial skeleton than of the extremities.

Low-contrast detail visibility with five different conventional and digital radiography systems

A. Böhm, I. Maack, U. Netzel, Hamburg/DE

Purpose: The aim of this study was to comparatively evaluate five different X-ray imaging systems with respect to low-contrast detectability.

Methods & materials: The systems included in this study were two screen-film systems (speed classes 200 and 400), a digital storage phosphor system, a digital selenium-based system with electrometer scanning and an indirect-type flat-panel detector system. A contrast-detail phantom (CDRAD) was used which consists of a PMMA plate with an array of drilled holes of varying diameter and depth. Images of the phantom were acquired with all systems at a set of exactly matched exposures. The digital images were processed in a way to approximate the density and contrast appearance of the conventional film images when printed on laser film. Six observers evaluated a total number of 46 films with respect to the threshold contrast for each detail size. Contrast-detail curves were constructed from the results and intra- and interobserver variations were analyzed.

Results: The overall results show that all digital imaging systems are equal or better in low-contrast detection capability than the conventional film-screen systems. Whereas the advantage is only marginal for the storage phosphor images compared to the speed 400 screen-film system, images from the newer digital systems (selenium detector and flat-panel detector) show a marked improvement in contrast detectability for any given exposure level. Alternatively, this fact can be used to reach the same detail visibility at a reduced dose level.

Conclusion: The high detective quantum efficiency of modern digital radiography systems results in an improved detail visibility.

Usefulness of the S-value to monitor exposure dose in digital radiography: Results of a phantom study

M. Coulthwaite-Wimmer, M. Prokop, C.M. Schaefer-Prokop, Vienna/AT

Purpose: To evaluate the usefulness of the S-value (sensitivity) in Fuji based digital systems to indicate skin entrance exposure dose in daily clinical practice.

Material and methods: We exposed antropomorphic phantoms of the chest and the foot using storage phosphor radiography. For constant exposure parameters, cassette size (18x24 cm and 35x43 cm), collimation (full and half cassette format), angulation of the phantom (±20° deviation from ap projection) and the position of the phantom were varied. Images were read out with automatic signal normalization (auto mode). In order to be able to correlate variations of the S-value to skin entrance exposure doses, phantom images were obtained with exposures ranging from 50% to 200% of a 250 speed dose level.

Results: There was a near linear relationship between exposure dose and S-value under otherwise constant conditions. A smaller collimation lead to an increase of the S-value of between 10 and 50% dependent on object and cassette format. Positioning the object in the center of the image plate yielded more reliable S-values as compared to peripheral positions. Double exposures with identical parameters after minimal repropositioning of the phantom (±1 cm) resulted in a maximum deviation of the S-value of 15%. Changes of projection angle lead to a maximum deviation of 30%.

Conclusion: The S-value is only a rough estimate of patient exposure. Variations of up to 15% may occur if the patient is slightly repropositioned. Variations of up 50% with changes of collimation and projection angle.

Tomographic image reconstruction using a flat-panel detector system

I. Maack, U. Netzel, T. Vogt, Hamburg/DE

Purpose: To investigate the requirements for and performance of tomosynthetic image reconstruction using a flat-panel detector system.

Methods: An experimental flat-panel detector system, integrated into a Bucky table (Philips Diagnost) was used for the experiments. A series of 49 exposures during a linear tomographic movement of the tube were acquired. The total tomographic angle covered was 60°. From these images 41 tomographic planes with 2 mm distance were reconstructed using standard tomosynthesis backprojection methods. The influence of the number of images used for reconstruction, of the tomographic angle, and of additional image processing was studied.

Results: A high-quality tomographic image set can be obtained by using all images. The image quality is almost preserved when using only each other image When using less than 20 views, artifacts may occur from high contrast objects. Streaking artifacts can be reduced by appropriate image processing.

Conclusions: A digital flat-panel detector system in a Bucky table in combination with a linear tube motion allows to reconstruct tomographic planes from a rather limited number of views. For practical use, the rate of image acquisition must still be increased.

A software simulator for radiological investigations

K. Guergueva-Biliznakova, C. Badea, N. Paillarakis, Z. Koltis, Rio-Patras/GR

Purpose: This paper presents an investigative tool, which is used to simulate the entire radiological imaging process, including the imaged object, imaging modality, operating parameters, beam transport, detector response and absorbed dose. As such, it can be used for a broad range of experimental investigations in radiology.

Materials and methods: The simulator consists of three independent modules, which can function together as an integrated x-ray imaging simulator: (i) The graphical electronic phantom generator module, supporting 3 design approaches based on geometric primitives, 3-D expansion of contours or volumetric design data from tomographic image sequences; (ii) The x-ray spectra generator, simulated using a semimempirical model and selectable parameters for the beam generation; (iii) Beam transport and detector response, using Monte Carlo simulations.

Results: System performance has been assessed against published or measured data. An application concerning the study of image quality and dose in CBCT, under varying conditions using simulated data was implemented. Simulated results show good agreement with published and measured data. Deviations being of the order of 2%.

Discussion and conclusions: The integrated radiographic simulator provides sufficient accuracy and flexibility to allow for its use in a wide range of approaches. While it may be argued that simulator based investigations cannot always lead to conclusive results, such tools are valuable aids for designing experiments and carrying out first level trials, while their use as training tools is expected to be of particular value.

Position accuracy of Interactive scan plane control at an open MR system

T. Vetter, A. Oppelt, Erlangen/DE

Purpose: To determine position accuracy, and analyze the factors of influence at interactive MR scan plane localization using an optical tracking system.

Materials and methods: The accuracy of the new interactive slice positioning and aligning system for the 0.2 T MR scanner MAGNETOM Open Viva (Siemens AG, Erlangen, Germany) has been investigated with dedicated phantoms.
Results: Within a sphere of 20 cm diameter around the center of the magnet the deviation between the adjusted and the actual slice position is less than 1 mm (rms) and 1° (rms). However, at the periphery of the field of view of the MR Scanner (40 cm dsv) considerably larger deviations can occur, depending on the position of the phantom.

Discussion: The intrinsic error of the optical tracking system used with the interactive MR localizer in detecting spatial coordinates is less than 0.35 mm (rms) Hence, the accuracy of interactive scan plane control is strongly influenced by the magnet homogeneity.

Conclusions: When used around the center of the magnet position accuracy of the interactive MR localizer is significantly less than slice thickness. Interventional procedure planning can be simplified and procedure time shortened.

1112 11:50
Qualitative and quantitative assessment of spatial resolution in MRI
C. Fellner, J. Georgi, R. Wulke, F. Fellner, W.A. Kalender, Erlangen/DE

Purpose: To objectively assess the spatial resolution and to compare it with visual evaluation.

Methods and materials: Parallel stacks of plexiglass stripes (strip thickness = strip distance, 0.5 to 2.0 mm) immersed in a water solution of MnCl were used as a resolution phantom. T1-weighted SE sequences with different matrix sizes (150 x 256, 216 x 256, 256 x 256) and TSE sequences with different echo train lengths (ETL ≤ 3, 5, 9) were applied to the phantom and to brain MRI in 5 healthy volunteers. Based on phantom measurements the resolution was assessed visually and the standard deviation was measured in an ROI containing a stack of stripes. For the in-vivo measurements, 2 radiologists evaluated image quality and delineation of cranial nerves (optic, oculomotor, trigeminal nerve).

Results: The phantom results showed decreasing resolution and standard deviation with increasing voxel size in SE sequences and with increasing ETL in TSE sequences. Similar trends were found in the visual evaluation of intracranial nerves. Whereas a minimal increase of voxel size did not influence delineation of cranial nerves, delineation was clearly reduced for TSE sequences, especially with long ETL.

Conclusion: Measuring the standard deviation within a resolution phantom is a more sensitive tool to assess changes in spatial resolution than visual evaluation.

14:00-15:30 Room B
Musculoskeletal
SS 1810
Shoulder/elbow/bone mineral

Chairpersons: J. Spindrich (Prague/CZ)
M. Zanetti (Zürich/CH)

1118 14:00
MR imaging of traumatic shoulder dislocations: Variations of MR imaging findings with surgical correlation
T.K. Wischer', P.F.J.T. Tirman', M.A. Bredella', J.F. Feller', H.M. BoneI', H.K. Genant', San Francisco, CA/US, Stanford, CA/US

Purpose: To describe the variations of pathologies seen on MR imaging studies of the shoulder after traumatic shoulder dislocations and to correlate these findings with the patients age and findings at surgery.

Materials and methods: 168 patients (101 male, 67 female, age range 18-78 years, mean age 45 years) suffering traumatic shoulder dislocations comprised the study group. Age, MRI findings, clinical, and surgical follow-up were recorded. The incidence of abnormalities based upon the patients age at the time of the injury was derived.

Results: Of all patients 95 (57 %) labral injuries, 78 (46 %) rotator cuff tears and 28 (17 %) greater tuberosity fractures were found. In patients above age forty 69 (89 %) tears of the rotator cuff, 15 (16 %) labral injuries and 16 (57 %) fractures of the greater tuberosity were seen. In patients below age forty 80 (84 %) labral injuries, 9 (12 %) tears of the rotator cuff and 12 (43 %) greater tuberosity fracture were recorded. Surgery was performed in 35 (45 %) of patients with rotator cuff tears and in 81 (86 %) of patients with labral injuries confirming the MRI findings.

Conclusion: The variations of pathologies after the patients traumatic shoulder dislocation is age dependent. A high incidence of rotator cuff tears in older patients and high incidence of labrum pathology in younger patients can be observed. Greater tuberosity fractures were not found to be age related.

1119 14:05
The efficacy of abduction and external rotation of the shoulder in MR arthrography in revealing tears of the anterior glenoid labrum
J.A. Choi, M.G. Kim, B. Kim, S. Cha, Seoul/KR

Purpose: To compare the efficacy in revealing tears of the anterior glenoid labrum of oblique axial MR arthograms obtained with patient's shoulder in abduction and external rotation (ABER) position with conventional axial MR arthograms obtained with patient's arm in neutral position and to determine differential features.

Materials & methods: MR arthrography of shoulder was performed in 16 patients with clinical history of recurrent anterior shoulder dislocations, including additional oblique axial sequences in ABER position. Degree of AGL tear or defect was evaluated on both conventional axial and ABER positions, using a scale of grade 1 = equivocal, 2 = probably tear, diagnosed when subtle increased signal intensity was not clearly visible in labrum, was 3 = definite tear/defect, when definite contrast extension in labrum or deficient labrum was present. Scores were averaged for each imaging sequence and student t-test was performed to compare the efficacy between conventional axial and ABER position imaging sequences.

Results: Out of 16 cases, 10 showed grade 3 on both sequences, 4 revealed grade 2 on axal but 3 on ABER position scans, one case had grade 2 on both sequences. one scored grade 1 on axal but 3 on ABER position scan. The average was 2.6 for axial scans and 2.9 for ABER position. The difference between axial and ABER position scans was statistically significant (p < 0.05).

Conclusion: MR arthograms with patient's shoulder in ABER position are more efficient than conventional axial scans in revealing the degree of tear or defect of AGL. When equivocal features are seen on conventional axial MR arthograms, oblique axial imaging sequence should be obtained with patient's shoulder in ABER position.

1120
withdrawn by author

1121 14:15
MR-arthrography of the shoulder using a combined contrast media on the basis of Gd-DOTA and lobitridol. Qualitative and quantitative analysis of the results in 224 patients
K.E. Leupi-Skibinski, K.U. Wente, C.A. von Weymarn, J.M. Fröhlich, C.L. Zollikofer, Winterthur/CH

Purpose: To evaluate a combined contrast agent on the basis of Gd-DOTA and lobitridol containing 150 mg/ml iodine and 3,125 mmol Gd-DOTA for MR-arthrography.

Methods and materials: 224 patients underwent MR arthrography of the shoulder, using a T1wSE (TR 500, TE 15), a T2wTSE (TR 3000, TE 90, TI 14) and a T1w3DGRF (TR 23, TE 14, flip 27). In 15 patients additional CT scans were performed. In 80 patients a qualitative contrast to noise-analysis for different joint components was performed. The qualitative evaluation of film documented images of all 224 patients was performed by two experienced readers. The results were grouped as: A-excellent, B-sufficient, C-insufficient.

Results: The quantitative analysis demonstrated good contrast to noise ratios in T1wSE and T2wTSE. In the T1wGRF the cartilage differentiation was best. The qualitative analysis demonstrated sufficient contrast level (A or B) in 94 % of T1wSE, 98 % of T2wTSE and 93 % of T1wGRF.

In about 18 % we noticed poor contrast in the T1wSE despite the use of a fixed CM and sufficient capsule distention. In this group the diffusion of Gd outside the capsule is much faster than usually. CT-contrast was sufficient if imaged within 1 hour p.i.

Conclusions: A well equilibrated mixture of Gd-DOTA and lobitridol provides a number of advantages for a more tailored diagnostic procedure with the possible combination of MR, CT and arthographic information.
Purpose: To evaluate the accuracy of intraarticular gadopentetate dimeglumine enhanced MR arthrography in patients with suspected anterior glenohumeral instability (SAGHI).

Methods and materials: Thirty patients with SAGHI underwent MR imaging before and after intraarticular injection of gadolinium-saline solution (dilution 1:250). Imaging studies were performed on a 1.5 T scanner. Unenhanced T2-weighted TSE images with fat suppression, and T1-weighted fat-suppressed images after intraarticular injection of gadolinium were obtained. Anterior osseous and labral (Bankart) lesions, superior labral lesions with anterior and posterior extension (SLAP), rotator cuff tears and glenohumeral ligaments (GHLs) were identified. Our gold standard were either arthroscopy or open surgery.

Results: Diagnostic accuracy for both Bankart and SLAP lesions was 90%. Partial rotator cuff tears were revealed with an accuracy of 87%. For GHLs MR imaging findings and arthroscopy correlated in 90%.

Conclusion: MR arthrography shows labral tears in any location but is particularly helpful in detection of SLAP lesions and improves diagnostic conspicuity for partial articular surface rotator cuff tears.

Ultrasonography of the shoulder and steroid injection: When and where
P. Bagnolesi, A. Cilotti, V. Zampa, D. Carafoli, A. Celandroni, C. Bartolozzi; Pisa/IT

Purpose: To determine if ultrasonography of the shoulder is effective in selecting the patients to submit to steroid injection.

Materials and methods: Within a case-population of 100 symptomatic patients submitted to sonography of the shoulder, 57 showed clinical and sonographic signs which contraindicated steroid injection. All these patients were submitted to MRI.

Results: In the 57 patients excluded from injections, US showed the following: impingement syndrome (35 cases), bone detachment (5), postero-superior impingement (3), chronic entheseopathies (4), gleno-humeral dislocation (8), bicipital rupture (2). In the 43 patients submitted to injection 17 presented remission of symptoms, the 5 with calcifications and 4 rheumatic patients showed improvement. 17 showed no improvement. The MRI performed in the last cases showed: partial tear of the cuff (6 cases), labral tear (9), postero-superior and coraco-humeral impingement (2).

Conclusion: Whenever injections have to be performed US guidance is the choice to make.

Adhesive capsulitis of the shoulder: MR arthrography
T. I. Han, H. J. Kim, K. W. Lee, S. T. Kwon; Taegon/KR

Purpose: To evaluate the MR arthrographic findings in patients presenting with the clinical syndrome of adhesive capsulitis and patients in whom intra-articular injection volume is limited by a small joint capacity.

Materials and methods: Ten patients included in the study had adhesive capsulitis diagnosed by clinical syndrome and arthrography. The resulting scans were then retrospectively reviewed with specific attention to the thickness of the joint capsule, volume of the axillary recess, diameter of the biceps tendon sheath, thickness of the coraco-humeral ligament, presence of extra-articular contrast extravasation, and filling of the subcoracoid bursa. The volume of the axillary recess was calculated using the formula for elliptical volume. $V = \frac{0.52}{2}$ (length x width x height).

Results: Mean capsular thickness was 4.3 mm. Mean axillary recess volume was 1.21 cm³. The mean diameter of the biceps tendon sheath was 8 mm. Mean coraco-humeral ligament thickness was 2.5 mm. Extra-articular contrast extravasation was noted in seven patients. Opacification of the subcoracoid bursa was observed in three patients.

Conclusion: MR arthrographic findings of the adhesive capsulitis are capsular thickening, small axillary recess volume, extra-articular contrast extravasation, and filling of the subcoracoid bursa.

HRCT differentiation of osteochondritis dissecans versus osteoarthritis of the elbow joint
A R. Meister, L. Nemeth, E K Mako, M. Posgay, T. Kakosy, K. Karfanger; Budapest/HU

Purpose: Our purpose was to find specific morphological changes related to osteochondritis dissecans (OD) versus osteoarthritis (OA).

Method: Plain film radiography and high resolution computed tomography (HRCT) of patients with painful elbow were compared in occupational vibration exposed workers (OEW) versus a control group of patients with elbow disorders of other origin.

Results: HRCT visualized loose bodies inside of joint space in cases of vibration related OD, even when the plain film was negative. The subchondral bone showed demarcation of dissects only in the OEW group. Typical sclerotic reaction was detected on the rim of dissects. A narrowed joint space was not observed. No osteophytes were detected. In the control OA group extensive subchondral sclerosis occurred, and irregular narrowing of the joint space was evident. Osteophytes (reactive new bone formation) was a typical finding.

Conclusions: Osteochondritis dissecans has to be recompensated by the law, if related to occupational vibration exposure. HRCT helps to prove or exclude OD, and to prevent progression by early detection. The diagnosis can influence the outcome, if eliminating the exposition.

Rheumatoid arthritis of the shoulder joint: Synovial inflammation or joint effusion? Evaluation with power Doppler sonography pre and post contrast and contrast enhanced MRI
G. Wamper, K. Vollert, W. Buecklein, J. Schalm, K. Bohndorf, Augsburg/DE

Purpose: To evaluate patients with clinical active rheumatoid arthritis (RA) of the shoulder joint for joint effusion and synovitis using power Doppler (PD) sonography pre and post contrast and contrast enhanced MRI.

Methods and materials: 23 shoulders of 23 patients (mean age 64 years) with known RA were evaluated by PD pre and post contrast (Levosist®) and by contrast enhanced (Omniscan®) MRI using T2-TSE and T1 fat-sat SE-sequences. Changes in the subacromial-defted bursa, biceps tendon, rotator cuff, axillary pouch and gleno-humeral joint were recorded and the degree of vascular signal in PD was compared with findings at MRI. PD was carried out by an experienced radiologist and the questionnaire prospectively answered. The MRI was evaluated by 2 readers in consensus.

Results: Both PD and MRI revealed joint effusion in 14 shoulders (61 %) with differences in the topographic classification. Synovial inflammation to a various extent and location was seen in all patients using MRI. PD alone showed synovial inflammation in 10 shoulders (43 %) and post contrast in 12 cases (52 %), respectively.

Conclusion: Contrary to previous results in the literature PD is not able to identify reliably synovitis and to distinguish synovial inflammation from effusion taking MRI as a „gold standard”

Quantitative ultrasound and dual X-ray absorptiometry for discriminating vertebral fracture osteoporotic subjects from controls
C. V Albanece, V. Ruschioni, R. Passarelo; Rome/IT

Purpose: Comparison of quantitative ultrasound (QUS) and dual X-ray absorptiometry (DXA) in discriminating vertebral fractured subjects from controls.

Materials and methods: We evaluated 783 postmenopausal women (mean age: 59±7.9 years), divided in osteoporotic (N = 197, T score -2.5 SD) osteopenic (N = 319, T score between -1.0 and -2.5 SD) and normal (N = 267, T score +1.0 SD). We referred consecutively for DXA (Hologic QDR 2000plus). Bone mineral density (BMD) was measured at lumbar spine (L2-L4) and femoral neck (Neck). Vertebral fractures (VF) in osteoporotic women were diagnosed using morphometric X-ray absorptiometry. We used QUS device that measured US amplitude dependent speed of sound (AD-SoS) in the distal metaphysis of the first phalanx of the last four fingers of non dominant hand (DBM Sonic 1200, IGEA, Italy).

Results: The values of AD-SoS were correlated negatively with age in postmenopausal women (p < 0.0001) and years since menopause (p < 0.0001). In the women with VFs (N = 52) AD-SoS was significantly better than DXA-measured L2-L4 BMD and as the DXA-measured femoral neck BMD in the discrimination of VFs patients versus controls. QUS whose also able to discriminate between normals versus osteopenic women (p < 0.0005) and between osteoporotic versus osteopenic women (p < 0.0001).
Conclusions: AD-Sos ultrasound measurement of phalanges demonstrates an adequate sensitivity to discriminate between normals, osteopenic and osteoporotic patients and to detect patients with VFs. QUS is practical and low cost tool that could be used to screening osteoporosis in order to detect women who require X-ray absorptiometry.

1128 15:10
Diagnostic agreement of image-guided quantitative ultrasound of the calcaneus with dual X-ray absorptiometry of the spine and femur
C. Krestan, S. Gramp, A. Resch-Holeczie, C.B. Henk, H. Imhof, H. Resch; Vienna/AT
Purpose: To evaluate the diagnostic agreement between image guided quantitative ultrasound (QUS) of the calcaneus and dual X-ray absorptiometry of the spine and femur for revealing osteoporosis.
Methods: In 488 female patients (55 years old±12) bone mineral density measurements of the bone mineral density measurements of the lumbar spine (posterior-anterior, L1-L4) and the femoral neck (OQR 4500. Hologic Inc., Waltham, MA, USA) as well as QUS (broadband attenuation) of the calcaneus (DTU-one. Osteometer. Denmark) were performed.
The presence of osteoporosis is defined, according to the World Health Organization criteria, as a T-score lower than -2.5. The percentage of patients below the threshold was calculated for each imaging technique. The diagnostic agreement in identifying individuals as osteoporotic was assessed using Kappa scores.
Results: 28% of the patients were classified as osteoporotic by quantitative sonography, 27% by dual X-ray absorptiometry of the spine, and 16.5% by the different regions of interest revealed on femoral dual X-ray absorptiometry. Kappa analysis showed the diagnostic agreement among QUS and DXA to be generally poor (Kappa score: 0.31 - 0.56).
Conclusion: There is considerable diagnostic disagreement between image-guided quantitative sonography and dual X-ray absorptiometry. It is in the same range as reported recently in comparisons of DXA and non-image-guided QUS. The choice of imaging technique will still influence those patients who will be diagnosed as osteoporotic.

14:00–15:30 Room C
GI Tract
SS 1801a
GI tract - postoperative/miscellaneous
Chairpersons:
G. van Kaack (Heidelberg/DE)
K.-J. Wolf (Berlin/DE)
1129 14:00
Radiological evaluation of upper GI tract perforation and postoperative complications
A.Z. Ginja; Rotterdam/NL
Perforation or leakage outside the GIT is a serious event which needs an immediate diagnosis as to the localisation and extent in order to institute adequate treatment planning.
Major causes of perforation or leakage from upper GIT are:
- Spontaneous
- Boeheave syndrome
- Mallory-Weiss syndrome
- Iatrogenic
- Endoscopic
- Diagnostie
- Prosthetic tube insertion
- Bougienage
- Laser resection
- Myotomy
- Foreign body
- Trauma
- Postoperative
Iatrogenic and postoperative leakage in our experience are the most common causes of perforation or leakage accounting for almost 90% of the cases.
Radiological examination
Rapid filming device such as video recording as well as spot views are necessary for recording abnormalities.
Results: Four patients had a gastric leak: 1 symptomatic leak was seen only by CT; two were seen at 7 and 10 days postoperatively. 1 had a gastro-gastric fistula visible at 1 month. Eight subjects had dilatation of proximal gastric pouch, one with severe stomal stenosis. Gastroesophageal reflux was seen in 8. Asymptomatic pouch diverticula were encountered in 10 cases. Weight loss was always satisfactory; there was no correlation between solid meal emptying times and duration of satiation, emptying times and weight loss, and duration of satiation and weight loss.

Discussion: Radiography can image complications of VGB. However, barium studies cannot detect consistently early leaks, and CT is needed in these cases. Radiography can also provide functional evaluation, showing that factors other than delayed emptying and satiety times are involved in weight control after VGB. Further follow-up is needed to elucidate the possible clinical significance of the pseudodiverticular images seen in some of our cases.

Band erosion in patients with adjustable silicone gastric banding for morbid obesity: Radiological findings

Purpose: We describe the radiographic findings in patients with erosion of the band into the gastric lumen, a relatively rare, severe, late complication of adjustable silicone gastric banding (ASGB) for morbid obesity which has been recently brought to clinical attention in series with long follow-up.

Materials and methods: We reviewed the radiographic findings in 4 patients with ASGB who had surgically proven gastric band erosion into the stomach. Three had a band erosion shortly before band removal: one a plain abdominal film only. Imaging was correlated to clinical history, presenting symptoms and previous radiographic studies.

Results: Two patients had a normally closed band: it was displaced caudally in comparison with previous films, and barium was not flowing through its lumen only. Barium was seen crossing the erosion and continuing its course into the stomach. The other two had an open band. One had the band at the duodenal-jejunal junction, with the connection to the subcutaneous port running along the course of the duodenum. The other had an open band within the stomach which could not be located on both plain films and barium studies. Patients had vomiting, unexplained weight gain, or loss of sense of satiety; none had acute symptoms.

Conclusions: Radiologists need to be familiar with complications of ASGB. Band erosion into the gastric lumen is a severe, possibly life-threatening problem which needs band removal and has to be properly recognized.

CT assessment in the evaluation of abdominal fistulae versus sinography

Purpose: To verify whether the increase of mucosal coating induced by magnesium ions during double-contrast barium enema (DCBE) is specifically due to an increase of the barium suspension viscosity.

Method and materials: 161 patients subjected to the same intestinal preparation were randomised in three groups of 23 pairs (i.e., 138 patients) plus a control group (i.e., 23 patients). DCBE was performed with standard technique using a barium suspension to which MgSO4 or Na2SO4 were extemporarily added so to obtain specific values of dynamic viscosity: 320 cPs (group-1), 2500 cPs (group-2) and 3000 cPs (group-3). The basic viscosity of the barium suspension (control group) was 280 cPs. Three radiologists evaluated on an ordinal scale mucosal coating and free fluid.

Results: In each group mucosal coating was more effective (P < 0.001) in the magnesium- than in the sodium-member of the pairs, notwithstanding the equal viscosity of the barium suspension. The best mucosal coating and the lowest free fluid were obtained in group-2.

Conclusions: The better coating of the mucosa obtained in presence of Mg-ions is not due simply to an increase of the barium suspension viscosity, but an interaction of Mg-ions with the polysaccharide additives of the barium suspension should be considered.

CT pneumocolon

Purpose: Prospective comparison of CT pneumocolon with colonoscopy for detecting colorectal cancers.

Materials and methods: 200 consecutive patients (mean age 71 years, 59% female) with colorectal symptoms underwent CT pneumocolon (collimation 8 mm, reconstruction 4 mm, supine abdomen and pelvis, prone pelvis, intravenous contrast) immediately followed by colonoscopy. CT examinations were assessed by two radiologists (using a workstation for 2D scrolling on soft-tissue and lung windows) who were blinded to the colonoscopy results.

Results: Colonoscopy detected 12 colorectal cancers. CT detected all 12 of these cancers as well as 3 more colorectal cancers in patients in whom initial colonoscopy failed. There were 2 false positives on CT. CT also detected metastases in 4 patients and ascites in one. Colon CT had a sensitivity, specificity and accuracy of 100%.

Conclusion: CT pneumocolon

Prospective study comparing CT pneumocolon and colonoscopy for detecting colorectal cancers

Materials and methods: 200 consecutive patients (mean age 71 years, 59% female) with colorectal symptoms underwent CT pneumocolon (collimation 8 mm, reconstruction 4 mm, supine abdomen and pelvis, prone pelvis, intravenous contrast) immediately followed by colonoscopy. CT examinations were assessed by two radiologists (using a workstation for 2D scrolling on soft-tissue and lung windows) who were blinded to the colonoscopy results.

Results: Colonoscopy detected 12 colorectal cancers. CT detected all 12 of these cancers as well as 3 more colorectal cancers in patients in whom initial colonoscopy failed. There were 2 false positives on CT. CT also detected metastases in 4 patients and ascites in one. Colon CT had a sensitivity, specificity and accuracy of 100%.

Conclusion: CT pneumocolon

High resolution sonography (HRS) in the detection and diagnosis of gastrointestinal stromal tumors

Purpose: The term “gastrointestinal stromal tumors” (GIST) define a histopathological concept comprising a group of rare and undifferentiated tumors. High resolution sonography (HRS) as become an important diagnosis tool to evaluate gastrointestinal tract. We evaluate the role of HRS to diagnose these tumors.

Method/materials: Over a 14 months period we detected sonographically 17 cases (10 males, 7 females) of unsuspected GIST. All cases were diagnosed sonographically and confirmed with barium, endoscopy or CT. 14 cases were operated surgery. We analyze sonographic findings and also made a correlation with other diagnosis modalities. The studies were performed with HRS equipment; exams were started with a 3.5 MHz sectorial-probe; a detailed evaluation was performed over the lesion with a 7.5-10 MHz HR linear-probe. Doppler evaluation of tumor vascularity was made in 14 cases.

Results: The tumors were localized in stomach (n = 7), duodenum (n = 5) and small bowel (n = 5). The majority of cases appeared as a solitary well defined, hypoechoic depending gut wall mass with an average of 7 cm (range 2-20 cm)
and a predominant exophytic or endophytic growth. The hyper eosinophilic submucosal layer appeared preserved in 8 cases. Tumor necrosis was present in 5 cases. Periarterial involvement was observed in 3 cases and ulceration was detected in 4 cases. Color Doppler examination revealed a moderate to hypervascular nature in 60 % of cases.

Conclusions: HR sonography plays an important role as initial imaging method to detect and stage GIST. Sonographic findings and an appropriated clinical setting suggest GIST, indicating the diagnosis algorithm and helping in differential diagnosis.

1137 15:10
Emergency radiology of esophagus
E. Testenopaggi, G. Starnou, A. Attard, C. Antinopoulos; Athens/GR
Purpose: Esophageal examination with barium or water-soluble contrast media is often used in the evaluation of esophageal emergencies. The purpose of our study is to show the most common and uncommon findings of esophageal emergent conditions.

Method/Materials: 192 patients with complaints of the esophagus were examined in the emergency radiology unit, the period from March 1998 to March 1999. The ages of the patients ranged from 18 to 79 years. The most common complaints were swallowing of foreign body during meal, swallowing of caustics, aspiration during swallowing, retrosternal chest pain after previous endoscopic procedure of the upper gastrointestinal tract. Plain radiographs of the chest and cervical region were performed before the contrast examination of the esophagus. Barium was the most common contrast media that was used. Gastrographin and iopamidol were also used.

Results: 74 esophageal examinations were normal. 68 had a foreign body in the esophagus (49 had a small fish bone or chicken bone embedded in the upper part of esophagus. 17 had stuck food in the middle or lower part of esophagus and two psychiatric patients had swallowed a toothbrush and a stone which remained in the esophagus). 5 cases were iatrogenic perforations of the esophagus after endoscopy, 35 had tracheoesophageal fistula due to infiltration of esophagus by lung cancer and 10 had ingested erosive materials. Foreign bodies, pneumomediastinum, subcutaneous emphysema, enter of contrast media in mediastinum and bronchial tree were depicted.

Conclusions: The radiologist must always be alert with different esophageal emergent conditions, since the immediate diagnosis of them is very important for the proper and correct management of them.

1138 15:20
"Colonomegaly" in acromegaly
T.D. Mills, M.J. Veysey, C. Reynolds, A. Sharma, P. Jenkins, G. Besser; London/GB
Purpose: Patients with acromegaly have a higher incidence of colorectal neoplasia than matched controls. One possible pathogenic mechanism is the trophic effects of growth hormone (GH) on the colonic mucosa. However, little is known about the effects of excess GH on colon size. The aim of this study was to see if patients with acromegaly have longer colons and to relate colon length to the duration of the disease and the total exposure to GH.

Method: We carried out a retrospective analysis of double-contrast barium enema studies from 14 patients with acromegaly (age range 41-74 yr: 8 women) and 14 matched non-acromegalic controls. A mapping wheel was used to measure total and segmental colon lengths from these enema films. In the acromegalic, the measurements were related to the duration of disease and the total tissue exposure to GH.

Results: Acromegalis were found to have significantly longer colons when compared to controls (171±7.5 cm vs 137±5.0; p = 0.005, respectively). This increase in total colon length was due mainly to a 65 % increase in the mean length of the sigmoid colon (49±2.3 cm vs 29±3.1; p = 0.001, respectively). In the acromegalic, there was a significant linear relationship between colon length and the total tissue exposure to GH (r = 0.75, p = 0.01), but not duration of disease.

Conclusions: Acromegaly is associated with "colonomegaly", the clinical significance of this finding, in relation to the pathogenesis of colorectal neoplasia, remains to be determined.

14:00-15:30 Room E1
Abdominal Viscera (Solid Organs)
SS 1801b
Abdomen - CT/US
Chairpersons: F. Caseiro-Alves (Coimbra/PT) C. Gimenez (Rosano/AR)

1139 14:00
Timing of the hepatic arterial and portal venous phase in contrast-enhanced CT of the liver
T.R. Bader, A.M. Herne, R.W. Prokesch, F. Grabenwöger; Vienna/AT
Purpose: To define normal values of the timing of the hepatic arterial phase (HAP) and portal venous phase (PVP) at contrast-enhanced CT.

Materials and methods: 24 healthy volunteers (16 men, 8 women; age 32-81±11 years) were examined with dynamic single-section CT. Scanning was performed at a single level comprising the liver, aorta, and portal vein. A series of 25 scans was obtained over a period of 88 s (1 baseline scan followed by 16 scans every 2 s and 8 scans every 7 s) beginning with the injection of a bolus of contrast agent (40 ml, 10 ml/s). Contrast enhancement in the liver, aorta, and portal vein was measured with ROIs and time-density curves were obtained. These data were processed with a pharmacodynamic fitting program (TopFit®) and the duration of the HAP was calculated. The onset of the HAP and PVP were assessed as lag-times referring to the beginning of enhancement in the abdominal aorta.

Results: The median onset of the HAP and PVP was 4.9 s and 12.6 s, respectively. After the aorta. The median duration of the HAP was 8.2 s.

Conclusion: At biphasic CT of the liver, timing of the HAP is critical. Its short duration does not allow imaging of the entire liver during this phase using single-detector CT scanners.

1140 14:10
Helical CT of the abdomen: Value of a real-time bolus-triggering technique using dorsal digital veins of the foot as an alternative intravenous access
R. Kickuth, J. Kirchner, U. Lauffer, D. liermann; Herne/DE
Purpose: Peripheral intravenous injection of contrast material is usually performed in the antecubital fossa. Our objective was to assess the usefulness of a real-time bolus-triggering technique in helical abdominal CT using dorsal digital veins of the foot as an alternative intravenous access.

Material and methods: We prospectively evaluated 15 patients (mean weight, 80.7±14.5 kg; range, 55-95 kg) in which intravenous access in the antecubital fossa was not possible. The patients received 120 ml of nonionic contrast media at a rate of 2.0 ml/s using dorsal digital veins of the foot. CT studies during arterial and portal venous phases were performed using a Somatom Plus 4 Power scanner and the commercially available CARE Bolus software (Siemens Corp., Forchheim, Germany). We used an abdominal aortic enhancement treshold of 100 Hounsfield units (HU) over baseline to investigate the duration and peak of aortic enhancement and to determine the average of individual mean liver enhancement.

Results: In 12 of 15 patients the aortic enhancement treshold was reached after a mean trigger time of 62.3±16.6 s (range, 42-90 s, including 30 seconds before starting bolus-triggering) with a mean peak aortic enhancement of 99.2±15.2 HU (range, 76.0-129.9 HU). The average of individual mean hepatic enhancement of all 15 patients was 82.7±6.8 HU (range, 70-97 HU). All patients were successfully scanned, but in 3 patients scanning had to be started manually because the preselected treshold value was not achieved.

Conclusion: Using dorsal digital veins of the foot the optimal intravenous administration of contrast material can be obtained by means of real-time bolus-triggering technique.

1141 14:20
Image quality of abdominal MPRs obtained with a multidetector CT in comparison with a standard spiral scanner
C. Hong, R. Bruning, U.J. Schoepf, C.R. Becker, M.F. Reiser; Munich/DE
Purpose: To evaluate the subjective quality of multiplanar reconstruction (MPR) of biphasic multistatic liver CT in a prospective comparison against a state of the art single row CT.
Materials and methods: Forty-five consecutive patients referred for a biphasic liver CT were imaged with a multidetector-row spiral CT scanner (MDCT) with 4±1 or 4±2.5-mm collimation, and 1-mm increment. Additional 20 biphasic liver scans were performed with 8-mm collimation and 4-mm increment on a conventional spiral CT scanner as the gold standard. All data sets were reformatted by MPR with 8-mm thickness in coronal and sagittal planes. All MPRs were interpreted in a blinded fashion by two radiologists in consensus. The subjective rating included: overall impression, contrast, subjective signal/noise ratio, artifact, and a subjective rating of liver, diaphragm, pancreas, spleen, bile duct and vessels on a rating scale of 1 to 5 (5 = optimal).

Results: The subjective rating of the overall impression reached a mean of 4.35 and 4.30 using the MDCT with 4±1 and 4±2.5 mm collimation, respectively and a mean of 2.60 with the thick collimation standard CT (p < 0.01). MPR images of the 1-mm MDCT also clearly demonstrated major anatomical structures of the liver (4.52 vs. 2.95) and provided higher resolution (4.04 vs. 2.30), superior contrast (4.26 vs. 3.90), higher signal/noise (4.02 vs. 3.85), and less artifacts (4.70 vs. 4.35), when compared with the standard CT. In addition, MPR images resulted in a mean of 3.64; 4.40; 3.88; 3.69; and 3.71 for the bile duct, diaphragm, spleen, pancreas, and abdominal vessels, respectively.

Conclusion: MPR based on thin collimation MDCT is clearly superior to those from single-row conventional spiral CT. These MPRs allow excellent visualization of abdominal organs.

1142 14:30

Gallbladder opacification on unenhanced CT in intensive care unit patients undergoing enteral nutrition

N. Gandolfi, O. Serrato, D. Venerucci, N.G. Gandolfi, G. Serafini, L.E. Derchi, "Pietra Ligure/IT. Genoa/IT

Purpose: We recently encountered a few patients undergoing enteral nutrition (EN) in intensive care unit (ICU) who presented high density gallbladders on unenhanced CT studies. This paper wants to evaluate frequency and possible causes of this finding.

Methods and materials: We analyzed the gallbladder CT density of 46 abdominal CT studies in 34 ICU patients (23 m, 11 f; age 16-86) undergoing EN in the last 14 months. Patients were always examined before and after contrast medium injection. Gallbladder opacification was defined on unenhanced scan when the CT value of bile was higher than 30 HU. In vitro CT studies of EN suspensions used as well were carried out, as well as analysis of their components.

Results: In vitro studies showed the EN suspension to be relatively radio-opaque, with H.U. from 97.5 to 286. Mineral composition includes iron (1.1 mg/dl), zinc (1.1 mg/dl), manganese (0.22 mg/dl) and iodine (12 mg/dl). Unenhanced CT showed gallbladder opacification in 5/34 (14.7 ± 4%) patients; it had CT value higher than 100 HU in three cases, and lower than 12 hours in none. None had pathologic changes of hepatobiliary and renal function. Four patients received EN for 12 ± 15 hours before CT; the remaining one had EN for less than 12 hours.

Conclusion: EN suspensions used in ICU contain relatively high concentrations of iodine. We believe opacification of gallbladder can be due to its biliary excretion and the capability of gallbladder wall to concentrate it.

1143 14:40

Helical CT-cholangiography in bile duct injury

H-P. Dinkel, R. Moll, P. Frühwald, J. Knüpfer, M. Fieger, H-J. Gassel, G. Schindler, Würzburg/DE

Purpose: To evaluate the usefulness of helical CT-cholangiography (HCTCA) or helical CT after biliary contrast in detection, exclusion, and characterization of bile duct injuries.

Methods: In a 3-year period we consecutively performed 13 HCTCA exams for diagnosis of suspected traumatic bile duct lesions or bilomas. The examination included an unenhanced CT followed by drip infusion of ioxitrolate (1-2 ml/kg) over 30 min and a thinly collimated spiral-CT (3 mm, pitch 1-1.5) with overlapping image reconstruction and SSD and MIP reformation.

Results: In 2 cases of severe liver laceration bile duct lesions could be ruled out. Active leakage was ruled out in 1 patient with an older bilia in the gallbladder bed after laparoscopic cholecystectomy. 4 cases active biliom with diffuse parenchymal wall leakage were detected. In three cases patients with leakage from segmental or main bile ducts were identified and localized. In one patient a duodenal stump insufficiently after a gastric Billroth II resection was detected by the presence of opacified bile in a fistula. In 1 patient after chronic leakage following cholecystectomy a severe bile duct stricture could be demonstrated.

Conclusions: HCTCA is a valuable tool in the diagnosis of lesions which are related to bile duct injuries and bilomas.
after beginning of complex therapy. In the group treated only conservatively improvement was seen only 8-9 days after the start of treatment and only in 27 (75 %) patients.

Conclusions: US and CT are highly effective methods for diagnosis of LAA. US- and CT-guided percutaneous aspiration procedures performed along with specific conservative treatment significantly improve the results of therapy and decrease duration of patient’s stay at the hospital.

Kaposi’s sarcoma in AIDS: CT patterns of visceral involvement

G. Zuccolo1, G. Tognini1, F. Ferrozzi1, M. Rossì1, P. Bassì1; 1Parma/IT, 2Milan/IT

Purpose: The aim of our study was to describe CT findings of visceral involvement in Kaposi’s sarcoma.

Materials and methods: We retrospectively reviewed CT scans of 70 patients with Kaposi’s sarcoma between 1986 and 1998. (68 males, 2 females, mean age 36 years). 46 homosexual, 15 homosexual and intravenous drug user (IVDU), 7 cutaneous involvement. The sarcoma involved the nodes (< 100/mm2), all the sarcomas were pathologically proved. 70/70 patients showed cutaneous involvement. The sarcoma involved the nodes (4/70), spleen (2/70), liver (3/70), pancreas (1/70), stomach (3/70), rectum (3/70) colon (1/100), muscle (2/70), lung (12/70).

Results: The nodes showed hypervascular patterns, the stomach, the rectum and the colon showed an aspecific thickening of the wall. The lungs showed bilateral peribroncho-vascular infiltrating patterns with irregular contour and also bilateral micronodules, mediastinal adenomegalias and pleural effusion. The liver showed the classical perivascular distribution associated with nodular lesions with delayed enhancement.

Conclusion: CT proved useful in assessing the localization, extension and visceral involvement of Kaposi’s sarcoma; the hypervascular aspects of the lesions and the perivascular distribution allow the characterization.

Gadolinium-enhanced peripheral MRA and duplex ultrasound for assessment of arterial interventions

T. Leiner, M.M.H.C. Verhulst, K.Y. Ho, P.J.E.H. Kilselaar, J.M.A. van Engelschoven. Maastricht/NL

Purpose: To determine if contrast-enhanced peripheral MRA (CE-MRA) can be a reliable alternative to duplex ultrasound (DU) to assess restenosis in patients who underwent stent placement or arterial bypass grafting (ABG) for intermittent claudication.

Subjects and methods: 19 patients (9 with intermittent claudication) with 31 interventions (16 stents [7 Wall, 8 Palmaz] and 15 ABG underwent CE-MRA and DU of interventions. The MRA protocol was carried out on a 1.5 T PowerTrak 6000 system (Philips) and consisted of a 3-station floating table approach during injection of 35 ml of gadolinium (Magnevist/Omniscan) with an MR injector (MedRad Spectris). For DU an Aloka 2000 scanner with various probes/frequencies was used. Grade of stenosis was classified with DU and CE-MRA in interventions if present and compared to X-ray angiography when carried out.

Results: Patency of all 16 stents could not be reliably evaluated due to susceptibility artifacts on CE-MRA. DU evaluated stent patency correctly in 4/5 X-ray angiographically confirmed cases. CE-MRA evaluated ABG patency correctly in 4/9 X-ray angiographically confirmed cases vs. 2/4 for DU.

Conclusions: Palmaz and Wall stents cannot be reliably evaluated with CE-MRA but can be reliably evaluated with DU. Arterial bypass grafts can be reliably imaged with CE peripheral MRA in stead of DU.

Micro Imaging and flow measurements inside an active MRI-stent

R. Wetzel1, M. Busch1, R.M. Seibel1; Berlin/DE, Mulheim/DE

Purpose: The diagnostic inside a stent necessitates invasive procedures. That was the intention to develop a MRI-Stent which:

1. creates the possibility for measurements inside a stent with the non invasive MRI-System
2. can be used as a micro imaging coil which transfer the image data by inductive coupling to the MRI-System.

Materials and methods: The MRI-Stent was elaborated as a resonant circuit whose resonance frequency had to be adjusted to the Larmor frequency from the used 1.5 T MR-Scanner. After implantation in a rabbit aorta the measurements were executed with EKG-triggered standard angiography sequences.

Results: The resonant circuit of the MRI-Stent amplifies the excitation pulse of the protons which increase the MR-Signal. With the used standard flash-3D-sequence we made MR-images and flow measurements from the inner stent lumen of the rabbit aorta.

Conclusion: The MR-images from the MRI-Stent can differentiate between blood and narrowing plaques. Our current work serves the aim to use the MRI-Stent as a micro imaging coil which allows better resolution. That enables very detailed diagnosis of the plaques composition and the vessel structure around the stent area.

3D-CE MRA of endovascular covered stents (Hemobahn) in patients with peripheral arterial occlusive disease (PAOD)

K.U. Juergens, P. Reimer, T. Vestring, B. Tornbach, W.L. Heindel. Münster/DE

Purpose: To evaluate the MR compatibility, the precision of lumen measurements, and to study perigraft reactions following treatment of patients with PAOD by means of endovascular covered stents.

Materials and methods: In-vivo MR imaging of endovascular covered stents (Hemobahn) was performed to study the MR compatibility and artifacts. A total of 10 patients was studied by MRI (FS T1-w and PD-T2-w SE) and 3D-CE MRA (0.2 mmol/lb Gd-DTPA) before and after implantation of endovascular covered stents (Hemobahn; 60 mm by MR imaging. The stent/vessel borders could be defined precisely. Perigraft reactions were detected by MR imaging demonstrating edema and contrast enhancement corresponding to clinical postimplantation symptoms. Post-interventionally, clinical symptoms responded to anti-inflammatory medication.

Conclusion: 3D-CE MRA provides a diagnostically useful work-up of endovascular covered stents (Hemobahn). MR imaging demonstrates perigraft reactions possibly correlating to a clinically present postimplantation syndrome.
**Evaluation of artifact sizes for 21 MR-compatible stents on MR images**

**Purpose:** To measure the artifact sizes of MR-compatible plain and covered stents in order to assess their potential for diagnostic follow up with MR-angiography.

**Materials and methods:** 21 MR-compatible stents were positioned in a phantom filled with aqueous gadolinium solution. Coronal and axial spoiled 3D-gradient echo sequences were performed with the stents positioned at varying angulations to the main magnetic field B0. Histograms of the stent signal intensity were created orthogonally to the stent axis. This allowed window width and center independent measurements of artifact sizes.

**Results:** The Cragg, Corvita, Passager, Wall- : Joe self-x, Strecner nitinol, Memotherm II and ZA stent allowed good visualization of the lumen. The Memotherm I, the Smart and the Perflox stent showed a prominent reduction of the inner lumen. The lumen of the Joe stent, Palmaz, Sinus and Symphomy were completely obscured. Some stents show increasing artifacts when angulated to B0.

**Conclusion:** Direct evaluation of stent patency by MR-angiography is for some stents impossible because of their large artifacts. These depend on the type of stent and additionally on the stent orientation to B0. Most stents made of Nitinol and Cobalt alloys show potential for diagnostic follow up with MR-angiography.

**Magnetic resonance angiography (MRA) of coronary artery stents with three-dimensional navigator echo and two-dimensional breath-hold cine gradient-echo techniques**

**Purpose:** To evaluate coronary artery stents with MRA using three-dimensional navigator echo and two-dimensional breath-hold cine gradient echo techniques.

**Materials and methods:** Fifty-one patients underwent MRA with 3D-NE and 2D-GE techniques 6-60 days after placement of 60 stents on 30 left anterior descending (LAD), 16 right, 7 left circumflex, 1 left main coronary arteries. Exercise ECG test (EET) had been performed 1-7 days before MRA. 3D-NE was a fat-sat non-velocity-compensated, ECG- and respiratory-triggered GE sequence. 2D-GE was a breath-hold k-space segmented sequence. For both, presence of flow-related high signal before, inside, and after the stent was considered as patency sign.

**Results:** Stents were recognised as signal void. Of the two patients with positive EET, one presented high signal before the stent with distal flow turbulence at both sequences and high signal inside at 3D-NE only, suggesting dysfunction [Conventional Contrast Angiography (CCA): 60 % stenosis]; one, with 2 sequential stents on the LAD, presented lack of signal inside and after the stents at both sequences suggesting occlusion (CCA: 99 % stenosis). For the 57 remaining stents in 49 patients with negative EET, patency was suggested with MRA due to the high signal before and after the stent at both sequences.

**Conclusion:** Notwithstanding study limitations (lack of CCA control in asymptomatic patients, no direct evaluation of stent restenosis), MRA offers a promising noninvasive evaluation of coronary stents with both sequences.

**Multidetector spiral CT angiography versus contrast enhanced MR angiography in the evaluation of patients with peripheral arterial disease**

**Purpose:** To compare multidetector spiral CT Angiography (CTA) with contrast enhanced MR angiography (MRA) in the evaluation of patients with peripheral arterial disease.

**Material and methods:** Twenty-three patients with peripheral arterial disease were examined with multidetector spiral CT (Somatom Volume Zoom, Siemens) after bolus administration of 60-100 ml of nonionic contrast agent at 3-4 ml/s. Four 2 mm thick slices per rotation were acquired (rotation time: 0.5 seconds) from the distal aorta down to the ankles (volume coverage: 120 cm); scanning time varied from 25 to 30 seconds, according to patients height. In all patients catheter angiography was also performed within 72 hours from CTA. Images were reconstructed using volume rendering algorithm on two different dedicated consoles (Virtual, Siemens, and Vitra, Vital Images).

**Results:** 80 ml/s of contrast agent at 4 ml/s proved to be the optimal contrast agent dosage for this purpose. In all cases images were considered diagnostic, free of disturbing artifacts. Good correlation with DSA, regarding degree of stenosis, was obtained: CTA provided superior information in patients with aneurysm and ulcerated plaques in demonstrating parietal thrombus and plaque morphology.

**Conclusion:** Multidetector spiral CTA is the latest technical innovation in non invasive vascular imaging, but already proves to be very effective, fast and well tolerated by patients.

**Floating-table MR-angiography: Technical aspects and first results**

**Purpose:** To evaluate contrast-enhanced floating-table MR-angiography (MRA) in patients with lower limb arterial occlusive disease.

**Material and methods:** Using a Magnetom Harmony 1.0 T (Siemens) we performed floating-table MRA's in 35 patients. Double-dose Gd-DTPA (Magnevist: 0.2 mmol/kg body weight) were applied using an automatic injector (Spectris: Medrad Co.). Matrix size was 190x512. Circulation time was verified with test bolus technique prior to MRA.

**Results:** We performed 42 MRA's in 35 patients. Image quality was good or excellent in 79 %, content in 18 % and poor in 3 % using a score system. Compared to X-ray-angiography and intraoperative results MRA as a minimally invasive procedure was as good as conventional angiography with respect to the main arterial branches.

**Conclusion:** MRA in floating table technique allows show the arteries of the lower limb with only one contrast medium application via a peripheral vein. It could replace a lot of conventional angiographies in the future.
Conclusions: Step-translation DSA provides high-quality imaging, although motion artifacts or poorly collateralized stenoses in patients with symptomatic disease often require additional series limiting the possible effects on radiation exposure and amounts of contrast media.

14:00-15:30 Room F1

Chest

SS 1804

Imaging and function of the respiratory system

Chairpersons:
H.-U. Kauczor (Mainz/DE)
J.A. Verschakelen (Leuven/BEL)

1158 14:00

Oxygen enhanced MR ventilation imaging of the lung: A study on signal characteristics using inversion recovery RARE

J. Vaninbroeck, H. Bosmans, J.A. Verschakelen, J. Bogaert, G. Marchal. Leuven/BEL

Purpose: The purpose of this study was (1) to estimate and explain the contribution of acquisition parameters on the variability of the signals in the lung and (2) to propose an optimal acquisition method for oxygen enhanced MR ventilation imaging.

Methods and materials: In 5 volunteers ventilation imaging was performed with IR-reordered RARE. Different parameters were assessed during breathing of room air and pure oxygen: inversion time, ventilatory gating and cardiac triggering. Data were analyzed with statistical parametric mapping. Oxygen was delivered through a face mask. Arterial and venous flow quantification was performed and correlated with series of cardiac triggered acquisitions. The influence of lung inflation on lung signal intensity was examined.

Results: Our data suggest that:

(1) the acquisitions are reproducible
(2) series of ECG triggered acquisitions show signal variations possibly related with pulmonary flow
(3) signal intensity of lung parenchyma is gravity and lung volume dependent
(4) the use of ventilatory gating assures minimal signal variation of lung parenchyma and minimal misregistration after postprocessing

Conclusion: Ventilatory gating assures optimal acquisition for ventilation imaging. ECG triggered IR RARE acquisition is a promising technique for totally non-invasive perfusion imaging.

1159 14:10

Demonstration of pulmonary ventilation in MR imaging of the lung: Initial results with a gadolinium-DTPA aerosol

P. Hasse, G.B. Adam, J.G. Pfeffer, J. Tacke, S. Karaagac, M. Barker, R.W. Gunther, Aachen/DE

Purpose: To investigate the feasibility of assessing lung ventilation with aerosolized Gd-DTPA.

Methods and materials: Six experimental procedures were carried out in a domestic pig model. The mechanically ventilated pigs were aerosolized with an aqueous formulation of Gd-DTPA. The contrast agent aerosol (average particle size 1.3 μm) was generated by a large volume nebulizer. Imaging was performed on a 1.5 T MR imager (Philips Gyroscan ACS-N) using a T1-weighted turbo spin echo sequence in a single breath-hold employing a specially designed synergy surface coil. Pulmonary signal intensities before and after ventilation were measured in peripheral portions of both lungs.

Results: Immediately after ventilation with aerosolized Gd-DTPA, the signal intensity in both lungs increased significantly in all animals with values up to 214 % above baseline (mean 116±45 %). Parenchymal enhancement was readily visualized in all six cases.

Conclusion: Definition of pulmonary ventilation using gadolinium based contrast agents has been demonstrated before. However, earlier studies were usually performed on rats. The presented data indicate, that Gd-DTPA in aerosolized form can be used to demonstrate pulmonary ventilation in large animals with lung volumes comparable to man, implicating a potential for clinical applications.

1160 14:20

Differences in dynamic changes between augmented ventilation and controlled mechanical ventilation using respirator triggered EBCT

W. Recheis, A. Kleinassser, A. Lückinger, A. Schuster, T. Frede, C.H. Hoermann, D. zur Nedden, Innsbruck/AT

Purpose: To evaluate the differences of dynamic changes between augmented ventilation (spontaneous ventilation of the patient supported by the respirator) and controlled mechanical ventilation in patients with severe acute respiratory distress syndrome (ARDS).

Methods: A personal computer was connected via an analog-digital converter to a respirator and the EBCT. Thus the analog pressure and volume signals delivered by the respirator were digitally recorded and the EBCT could be triggered at the incidence of inspiration and expiration.

In the 50 ms scan mode with 8 mm collimation, 40 slices could be acquired. We centered the CT at a level 1 cm above the diaphragm in order to determine the changes in lung density, time-dependent, during mechanical controlled and augmented ventilation. The table position remained unchanged throughout the data acquisition.

Results: The dynamics of the non-aerated lung regions remained almost unchanged throughout the protocol. In contrary to mechanical ventilation, augmented ventilation shows nearly no variations in the poorly inflated areas. This is due to a more efficient distribution of spontaneous (augmented) ventilation compared to mechanical ventilation.

Conclusion: This method allows further insights into the dynamic differences of the lung’s biomechanics comparing augmented ventilation to controlled mechanical ventilation.

1161 14:30

Computed tomography of the trachea: Paired inspiratory/expiratory spiral-CT and cine-CT during respiration

C.P. Heufel, B. Halmer, M. Thelen, H.U. Kauczor. Mainz/DE

Purpose: For treatment planning in tracheomalacia, determination of the severity and localisation of the most affected level is necessary. Additional collapse has to be identified.

Methods: Seventeen patients with suspected or bronchoscopically detected tracheal stenosis or collapse underwent paired inspiratory and expiratory spiral-CT. Additionally, cine-CT (temporal increment 100 ms) was performed during continuous respiration at the level suspected for collapse. The change of the tracheal cross-sectional diameter during respiration was measured. Both, spiral-CT and cine-CT were compared with bronchoscopy.

Results: A significantly higher tracheal collapse was seen using cine-CT compared to paired spiral-CT (p < 0.002). In addition to bronchoscopy, further information concerning localisation and severity of stenosis as well as collapse were obtained. CT was useful to measure the total length of the stenosis including distal collapse which was not always seen at bronchoscopy (n = 6). Combined intraluminal and extraluminal assessment demonstrated additional compression by struma (n = 2) and partial stabilities of the tracheal wall which were not affected by tumor infiltration. CT-findings influenced the further surgical procedure in 13/17 patients.

Conclusion: Paired spiral-CT detects tracheal stenoses and demonstrates relevant extraluminal compression. Improved evaluation of expiratory collapse and further information of localised tracheal instability is obtained by cine-CT.

1162 14:40

The relationships between structure and function in pleural disease as evaluated by chest radiography and computed tomography

S.J. Copley, A.U. Wells, M.B. Rubens, D.M. Hansell. London/GB

Purpose: To compare correlations between the extent of pleural disease and lung function impairment using chest radiography and two CT systems.

Methods and materials: The extent of pleural thickening and/or plaques was measured in 50 patients using 1) CXR (ILO-based system); 2) a simple subjective CT system; 3) comprehensive subjective CT system; 4) an objective non-automated method; and 5) an objective semi-automated method.

Results: Irrespective of scoring method, the strongest relationship was between the extent of diffuse pleural thickening and TLC or FVC. For FVC, the strongest correlations were with the non-automated system and the simple CT system (r = 0.71; p < 0.0001) and the weakest for the semi-automated method (r = -0.65, p < 0.0005). For TLC similar correlations were observed. Increases in KCO were significantly, but less strikingly associated with severity of pleural thickening (r = 0.42 to r = 0.66; p < 0.005 and r = 0.04 respectively). Controlling for extent of diffuse pleural thickening, there were no independent relationships between pleural plaques and indices of pulmonary function.
Conclusión: Similar strong correlations were observed for all systems making the easily applied CXR and/or simple CT methods of evaluating pleural disease the systems of choice.

1163 14:50
Bronchial stimulation by metacholine and salbutamol in asthmatics: Effects on lung density and bronchial caliber at CT
C. Beigelman, A. Capderou, C. Strauss, M.H. Becquemun, M. Zelter.
P.A. Grenier; Paris/FR

Objective: To evaluate changes in lung density and bronchial caliber induced by bronchial stimulation tests at CT in asthmatics patients.

Material and methods: Six healthy subjects and 12 asthmatics were examined by helical thin-collimation CT at the level of basal bronchi before and after metacholine followed by salbutamol inhalation. CT scans were obtained at pneumotachographically controlled 50 % of vital capacity (VC). Three additional 1 mm collimation scans were performed at full expiration in each series. ROI densities were measured in the anterior, middle and posterior areas of the lung. Surface of bronchi cross-section was segmented and calculated using a specific software.

Results: The lung density in asthmatics (-737±50 HU) was significantly superior than in normal subjects in dependent areas (-843±22 HU). In asthmatics, the bronchial response to metacholine was inhomogeneous with bronchoconstriction or bronchodilatation. Inhalation of salbutamol induced frank bronchial dilatation of all bronchi with final caliber being larger than on the pre-stimulation scans. Multi­focal areas of expiratory air trapping were observed after metacholine in all asthmatics.

Conclusion: Bronchial stimulation tests in asthmatics induce an inhomogeneous response on bronchial caliber with a clear hyperreactivity of the bronchi without change in lung density at 50 % of vital capacity.

1164 15:00
Morphological-physiological relationships in usual interstitial pneumonitis (UIP) and non-specific interstitial pneumonitis (NSIP)
S.R. Desai, A.U. Wells, M.B. Rubens, R.M. Du Bois, A.G. Nicholson.
D.M. Hansell; London/GB

Purpose: To compare computed tomographic (CT) -functional relationships in patients with histologically-proven UIP and NSIP.

Materials and methods: Thin-section CT scans in 24 patients (males = 18; mean age = 54.6±9.1 years) with UIP and 29 patients (males = 9; mean age 47.6±12.2 years) with NSIP were independently reviewed by two radiologists, the extent and severity of CT patterns were quantified. Functional indices were correlated with CT features.

Results: Patients with UIP had more extensive disease on CT (p < 0.0005) but a lower ratio of ground-glass opacification (GGO) to a reticular pattern (p = 0.02): predominant GGO was recorded in 10/29 NSIP patients but 2/24 UIP patients (p = 0.04). In the combined group of UIP and NSIP patients the percent predicted DlCQ correlated most strongly with disease extent on CT (r = -0.78; p < 0.0005) closely followed by TLC (r = -0.63) and FVC (r = -0.62). There were no independent functional differences between UIP and NSIP for a given CT disease extent.

Conclusion: In patients with NSIP there is a greater prevalence of GGO on CT, but there is an overlap in appearance with UIP. Despite reported difference in prognos­sis there were no independent functional differences between UIP and NSIP.

1165 15:10
Radiographic changes and pulmonary functions in Gaucher’s disease following enzyme replacement therapy
O. Goltken, I. Hadas-Halpern, E. Elstein, A. Abrahamov, A. Zimran, E. Kerem.
Jerusalem/IL

Purpose: Pulmonary involvement in Gaucher disease was thought to be confined to later stages of the neuropathic forms; however, we noted more than 50 % abnormal pulmonary tests among patients with the non-neuropathic form. Al­though enzyme replacement improves organomegaly and hematologic param­eters, the effect on pulmonary signs is poorly documented. Our goal was to assess response to therapy in patients with symptomatic respiratory disease.

Methods and materials: We monitored 4 children and 4 adults who presented with lung involvement and have received enzyme therapy for 9-9 years. Follow-up included chest X-ray, high resolution computed tomography (HRCT) scans, pulmo­nary function tests and echocardiography.

Results: There was a non-uniform response to enzyme therapy: 4/4 children evinced improved respiratory compliance but continuous worsening of the reticulonodular pattern on CXR and HRCT. 2/4 adults showed clinical amelioration of lung involvement, but no real change in PFT, CXR or HRCT. Only 1/4 adults showed improvement in pulmonary hypertension.

Conclusions: While only 8 patients, this is the largest series of Gaucher patients with symptomatic lung involvement at presentation, and with the longest follow-up of enzyme therapy. None achieved normalization of radiologi­cal or functional parameters. Nonetheless, the clinical improvement in 4/4 children and in 2/4 of the adults, is noteworthy.

1166 15:20
Lung involvement in primary Sjögren’s syndrome: CT findings and correlation with pulmonary function tests, broncho-atelectave lavage and pathologic findings
B. Taouli, M.W. Brauner, I. Mourey-Gerosa, P.A. Grenier.
‘Paris/FR, ’Bobigny/FR

Purpose: To describe CT findings of lung involvement in primary Sjögren’s syn­drome, and correlate with broncho-atelectave lavage (BAL), pulmonary function tests (PFT) and histopathologic findings.

Methods and materials: The chest CT scans of 35 patients with proven primary Sjögren’s syndrome were retrospectively assessed by 2 observers. BAL, PFT and histologic data were obtained in respectively 20, 32 and 17 patients.

Results: Three main groups of patients were identified in association with PFT, BAL and pathologic data: bronchial/bronchiolar involvement (18), fibrosing alveolitis (7) and lymphocytic interstitial pneumonia (LIP; 5). The most common CT findings were: bronchial wall thickening (17), bronchiectasis/bronchiolitis (12), centrilobular nodules (9), mosaic perfusion (5), expiratory trapping (3) in the first group (p < 0.05). Ground-glass opacity (11), intra-lobular and/or septal thickening (13), architectural distortion and/or honeycombing (7) were identified in the sec­ond and third group (p < 0.05). In fibrosing alveolitis and LIP, restrictive pattern and lowering of diffusing lung capacity were predominant, whereas an obstructive pattern was shown in patients with bronchial involvement (p < 0.05).

Conclusion: The concordance of functional, cytological and radiological data allowed us to classify the patients in 3 main groups: bronchial and/or bronchiolar involvement, fibrosing alveolitis and LIP.

14:00–15:30 Room F2
Neuro

SS 1811
Multiple sclerosis/degenerative brain disorders
Chairpersons:
K. Ensson (Stockholm/SE)
A.D. Goulamios (Athens/GR)

1167 14:00
Serial MRI in relapsing-relmitting multiple sclerosis (MS) with childhood onset. A long-term follow-up of 3 cases
C. Balassi, B. Csapo, G. Bernet, J.C. Szeles, D.M. Prayer.
Vienna/AT

Aim: To demonstrate the MR-evolution of relapsing-relmitting MS and the relation to clinical course in 3 cases with onset under 10 years of age.

Patients and methods: 2 girls, 1 boy, aged 9, 9 1/2, and 10 years at the first MR­study, with proven MS (Poser criteria) and similar therapy underwent 4-14 MR­exams each during 5-8 years observation time. Total number of lesions, number of new and/or active lesions, “black holes”, involvement of corpus callosum, U­fibers, and medulla spinales were related to clinical presentation (Kurtzke scale, EDSS).

Results: Total number of lesions increased in 2 cases, stayed stable in 1. Most new lesions showed signs of activity. The corpus callosum and the cervical spinal cord were involved in all cases. U-fiber involvement was seen in 2 patients with increasing severity, in 1 it decreased. “Black holes” were not found. EDSS was 1.5-3 at onset and 5.5-6.5 at its worst. EDSS score correlated with either the number of new and/or active lesions. Symptom free intervals were observed up to 5 years.

Conclusion: Our observations suggest that MR-presentation of relapsing-relmit­ting MS with childhood onset does not differ from the adult-onset form. However, the absence of “black holes” and long remitting phase are rather unusual.
### 1168 14:10

**Serial enhanced magnetic resonance (MR) imaging of the brain with triple dose of gadolinium before and after autologous hematopoietic stem cell transplantation (AHSCT) in severe secondary progressive multiple sclerosis (SSPSM): Preliminary results**

**C. Lo sacco, R.C. Parodi, F. Gualandi, R. Saccardi, G.L. Mancardi, F. Sardanelli; Genoa/IT**

**Purpose:** To test the effect of AHSCT in treating SSPSM using enhanced serial brain MR examinations with triple dose of Gadolinum (Gd).

**Methods and materials:** A baseline versus treatment design was used. Two female patients afflicted with SSPSM, with 36 (first patient) and 52 (second patient) years of age, both with a disease duration of 6 years and an Expanded Disability Status Scale (EDSS) of 6.5, underwent monthly MR Gd-enhanced examinations for 6 (first patient) or 3 months (second patient) as baseline period. Stem cell mobilization was obtained with cyclophosphamide 4 gr/m²; conditioning with a BEAM regimen (BCNU 300 mg/m²; Etoposide 200 mg/m² and Ara-Cy 200 mg/m² per 4 days; Melphalan 140 mg/m²); then, reinfusion of stem cells was performed. The two patients underwent 2 (first patient) or 3 (second patient) MR examinations timed after mobilization and before conditioning; up until now, the first patient had monthly MR for 6 months after AHSCT, the second one for only 2 months.

**Results:** In the first patient, the number of enhancing lesions was as follows: 4, 4, 3, 7, 8, and 29 (mean 9.2) in the baseline period; 9 and 4 after mobilization and before conditioning; 1, 0, 0, 0, 0, and 0 (mean 0.2) after AHSCT. In the second patient the number of enhancing lesions was as follows: 15, 16, and 27 (mean 19.3) in the baseline period; 9, 4, and 1 after mobilization and before conditioning; 0 after AHSCT. The treatment was well tolerated with early infections treated with antibiotic therapy.

**Conclusion:** In these two cases of SSPSM, characterized by a high disease activity in the baseline period, AHSCT was followed by a strong reduction of the number of enhancing lesions already after the intense immunosuppression obtained with cyclophosphamide and confirmed after stem cell transplantation. A third female SSPSM patient with 32 years of age, 10 years of disease duration, and an EDSS of 6.5 entered the study and showed a mean of 11.4 enhancing lesions in 4 monthly MR baseline examinations.

### 1169 14:15

**Effect of subsequent single doses of gadolinium (Gd) on lesion enhancement in brain magnetic resonance (MR) of multiple sclerosis (MS)**

**C. Losacco, E. Rosso, G.L. Mancardi, F. Sardanelli; Genoa/IT**

**Purpose:** To test the possibility of increasing number and conspicuity of enhancing lesions in MS patients using subsequent doses of Gd.

**Methods and materials:** Ten patients with relapsing-remitting MS (7) or secondary-progressive (3) MS (4 m. 6 f, mean age 38.8) underwent the following brain MR protocol at 1.5 T: (0) long-line venous access; (1) 24 T1-weighted spin-echo paraxial slices (thickness 5 mm, gap 10 %; TR/TE = 792/17 ms; pixel 0.96 mm²; 1 excitation; time 23+5); (2) intravenous injection of 0.1 mmol/kg (single dose, SD) of Gadodiamide (Omniscan, Nycomed) followed by a 5-minute waiting time; (3) scan as in point 1; (4) contrast injection as in point 2 to obtain a fractionated triple dose (FTD); (5) scan as in point 1; (6) contrast injection as in point 2 to obtain a fractionated triple dose (FTD); (7) scan as in point 1. The total number of enhancing lesions (TNEL) was counted, their area and contrast-to-noise ratio (CNR) were blindly measured, slice by slice. The fraction of patients with at least one enhancing lesion (active patients, AP) was also considered. Friedman and Wilcoxon tests were used.

**Results:** With SD, TNEL was 6 (range 0-3), with a total enhancing area (TEA) of 3.2 cm² and a mean CNR of 13.5: with the FDD, 13.5, 3.3, and 16.2, with the FTD, 22, 7.0, and 24.3, respectively. Global significant differences among SD, FDD, and FTD were found for TNEL (P = .0008), TEA (P = .0021), and CNR (P = .0136). In the direct comparisons for TNEL, only a trend towards the significance was found between SD and FDD (P = .0679), while a significance was reached between SD and FDD (P = .0117) and between FDD and FTD (P = .0180); for TEA, a significance was reached between SD and FDD (P = .0431) and SD and FDD (P = .0077), and FDD and FTD (P = .0117); for CNR, only a trend toward the significance was found between SD and FDD (P = .0630), while a significance was reached between SD and FTD (P = .0197) as well as FDD and FTD (P = .0284). The fractions of AP were 4/10 (SD), 7/10 (FDD), and 9/10 (FTD).

**Conclusion:** Subsequent contrast injections of Gd determine an additional effect on the number of enhancing lesions in the brain of MS patients, increasing TEA and CNR and reaching an AP fraction of 90 % with the FTD. In clinical practice, when an MS patient shows no enhancing lesion after SD of Gd, one or two subsequent doses should be injected. Considering a time window of 5-25 minutes after contrast injection, these results support also the general hypothesis that triple dose perform better than single and double dose in studying disease activity in MS patients.

### 1170 14:25

**Value of different magnetic resonance imaging techniques in predicting the patterns of cognitive impairment in early phase of relapsing-remitting multiple sclerosis**

**R. Zivadinov, M. Uknjar, R. Moretti, M. Zorzon, L. Monti Bragadin, F. Zanier, G. Cazzato; Tnest/IT**

**Purpose:** The objective of current exploratory study was to establish which (MRI) parameter is the best predictor of cognitive impairment.

**Material and methods:** We tested 63 relapsing-remitting patients with clinically definite MS, disease duration 1-10 years and Expanded Disability Status Scale ≥ 5.0. The neuropsychological performances, the psychological functioning, the neurologic impairment and disability have been assessed. Patients also underwent UD/T2- and T1-weighted, and magnetization transfer imaging brain MRI. Post imaging analysis comprised quantification of global and regional lesion loads, brain atrophy scores and measures, and normal appearing white matter magnetization transfer ratios. The relationship between cognitive impairment and MRI abnormalities was investigated by partial correlation and stepwise multiple regression analysis excluding the effects of age, education, depression and anxiety.

**Results:** Overall cognitive impairment correlated with NAWM MTR total (r = -0.38, p = 0.003) and with NAWM MTR frontal (r = -0.46, p = 0.0001). Multiple regression analysis revealed that global and regional BA scores and NAWM MTRs predicted the best neuropsychological variables exploring the frontal lobe function.

**Conclusion:** Our data suggest that in relapsing-remitting patients with low disability score and short disease duration the overall cognitive impairment probably relies more on microscopic changes in NAWM and parenchymal atrophy than on extent of disease burden in the brain.

### 1171 14:35

**Olfactory dysfunction and extent of white matter abnormalities in multiple sclerosis: A clinical and MRI study**

**R. Zivadinov, M. Uknjar, M. Zorzon, L. Monti Bragadin, R. De Masi, D. Nasuelli, R. Moretti, F. Zanier, G. Cazzato; Tnest/IT**

**Purpose:** To evaluate by using conventional and non-conventional (Magnetization Transfer Imaging) MR techniques relation between smell loss and the extent of white matter abnormalities.

**Material and methods:** We tested the odor identification ability of 25 patients with definite MS by using the Cross Cultural Smell Identification Test. We measured also the lesion load on T2-weighted images in the inferior-frontal and temporal lobes and calculated the Magnetization Transfer Ratios in the normal-appearing white matter of the same regions. Therefore, we looked for correlations between measures of lesion load and smell test scores.

**Results:** The olfactory function of seven patients (28 %) was not in the normal range. A robust correlation was demonstrated between MR measures of lesion load and smell loss in men only. When all patients have been considered, no significant correlation was found.

**Conclusion:** Our findings confirm the results of a previous study which showed a correlation between smell loss and the number of plaques in the brain regions involved in olfaction and support the theory that the extent and severity of MRI abnormalities in specific brain regions are related with the presence of selective neurologic and neuropsychologic impairment.

### 1172 14:45

**Detection of lactate with the help of 'H MR spectroscopic imaging (MRSI) within multiple sclerosis lesions during acute exacerbation**

**M.F.H. Schoneke, T. Berger, C. Wolf, F. Desenhammer, T. Gasse, C. Kremser, S.R. Felber; Innsbruck/AT**

**Purpose:** In literature activity of multiple sclerosis (MS) lesions is usually assessed by gadolinium enhancement. However, it remains unclear, if contrast enhancement indicates active demyelination. We used MRSI in order to evaluate biochemical changes in contrast enhancing MS lesions.
**Methods & materials:** Using a whole body MR system (Siemens, Germany) we investigated 14 patients (3 males and 11 females) with relapsing-remitting MS during acute exacerbation and high dose methylprednisolone therapy. In a period of three weeks three MR examinations were performed. The MR protocol comprised conventional contrast enhanced MR imaging (MRI) and MRSI (TR = 1500 ms, TE = 135 ms, slice thickness 15 mm, matrix 16x16, field of view 210 mm). The MRSI plane was positioned at the level of an enhancing MS lesion. Ratios of N-acetylaspartate (NAA), choline (Cho), lactate (Lac) to creatine (Cr) were calculated.

**Results:** We found significantly reduced NAA/Cho ratio (p < 0.05) in enhancing and non enhancing MS lesions in comparison to normal appearing white matter (NAWM). In the time course of NAA/Cho no significant changes were detected. Increased lactate was observed in enhancing and non enhancing MS lesions just as in the NAWM. We did not see significant changes in the time course of lactate.

**Conclusions:** In literature increased lactate was detected in some active MS lesions. The presence of lactate may indicate anaerobic glycolysis due to increased macrophage activity during demyelination. Lactate is well diffusible and spreads out in the surrounding of active MS lesions.

**Methods & materials:** Using a whole body MA system (Siemens, Germany) we investigated 14 patients (3 males and 11 females) with relapsing-remitting MS comprised conventional contrast enhanced MA Imaging (MAI) and MASI. About three weeks three MA examinations were performed. The MA protocol (TA = 1174,5:00) was used. The MASI plane was positioned at the level of an enhancing MS lesion. Lactate was observed in enhancing and non enhancing MS lesions just as in the NAWM. We did not see significant changes in the time course of lactate.

**Results:** In literature increased lactate was detected in some active MS lesions. The presence of lactate may indicate anaerobic glycolysis due to increased macrophage activity during demyelination. Lactate is well diffusible and spreads out in the surrounding of active MS lesions.

**Multiple sclerosis: Comparative evaluation of demyelination foci and edema with 1H MRS**

A.V. Edozdnjakov, St. Petersburg/RU

**Purpose:** To assess the role of 1H MR spectroscopy in evaluation of the demyelination foci.

**Material and methods:** 124 patients with multiple sclerosis (MS) at various stages of the disease were studied. 1H MR spectroscopy of foci with edema was performed at 1.5 T using a multivoxel sequence SWS STEAM 20. The MS foci and edema were studied separately. The content of the following metabolites was evaluated: N-acetyl-aspartate (NAA), choline (Cho), Creatine (Cr), Inositol (Ins) and lipids (Lip).

**Results:** 3156±2 demyelination foci were detected in 124 patients. Metabolite ratios in the area of edema were as follows: NAA/Cho = 2.86; NAA/Cr = 0.72; Cho/Cr = 0.25; NAA/Cho+Cr/Lip = 0.58; Ins/Lip = 0.49; in the foci -NAA/Cho = 3.36; NAA/Cr = 2.79; Cho/Cr = 0.83; NAA/Cho+Cr = 1.52; Ins/Lip = 1.33. Analysis of the data demonstrated that the content of metabolites within the foci was 6-10 times higher than that in the area of edema. During the development of demyelination foci the first change is the increase in the metabolite content in the area of edema and later within the focus itself (decrease in NAA and Cho). Cr is the last metabolite to decrease. The content of Ins increases and lipids appear.

**Conclusion:** MR spectroscopy is useful for determination of the developmental stage of demyelination foci.

**Proton MR spectroscopy of the sex differences in the brain metabolite levels at advanced age, including adjustment for atrophy and white matter lesions**

P.E. Sijens, T. Den Heijer, M.M.B. Breteler, A. Hofman, M. Oudkerk; Rotterdam/NL

**Purpose:** To assess whether sex differences in cerebral atrophy and white matter lesions can explain the differences in brain choline (Cho), creatine (Cr) and N-acetylaspartate (NAA) levels between women and men.

**Materials and methods:** Chemical shift imaging (TR/TE 1500/135 ms) was used for metabolic mapping of an 8x8x2 cm supraventricular transverse brain volume in 540 non-demented elderly persons. The presence and severity of cerebral atrophy and white matter lesions was quantitated from the results of MRI.

**Results:** At 0.01 significance level Cho, Cr and NAA differed between women and men in 14, 14 and 15 of 36 voxels, respectively. Lactate and lipid were observed in, respectively, 25 and 6 % of women and 18 and 2 % of men. Upon adjustment for cerebral atrophy (more frequent in women) and white matter lesions (most frequent in men) the differences in Cho, Cr and NAA persisted in 13, 7 and 12 voxels, respectively.

**Conclusion:** Lactate and lipid are frequently found in the brains of elderly people, with a higher prevalence among women than men of the same age. The sex differences in Cho, Cr and NAA cannot be explained by differences in cerebral atrophy or other aging related phenomena (white matter lesions, lactate, lipid).
Methods and materials: In 59 consecutive patients (M/F correlated with demographic data, hematologic values, indicators of renal function, and the presence of β2-microglobulin prior to their undergoing US-guided renal biopsy. Results: We found no statistically significant correlation between renal RI measurements and the presence of mesangio proliferative, extracapillary, membranoproliferative and endo proliferative GN. The severity of diabetic nephropathy, however, disclosed a positive correlation with the degree of arteriolar sclerosis as measured RI values (r = 0.71). However, RI measurements correlated well with serum creatinine levels (Cr) and creatinine clearance ratios in all patients (Cr, r = 0.81 and 0.84, respectively). In 13 patients hypertension heralded the onset of GN even in the presence of normal RI values.

Conclusion: Unlike in diabetic subjects there seems to be no significant correlation between renal RI measurements and the presence of various GN types. However, RI measurements correlate well with the degree of renal dysfunction, especially Cr. Serial RI measurements in patients with suspected glomerular disease may therefore not obviate the need for early kidney biopsy to establish the diagnosis.

1178 14:10

Long-term effects of antihypertensive treatment with Lisinopril versus Nifedipine on renovascular resistance and urinary albumin excretion in essential hypertension (EH)
C. Martini, R. Pontremoli, F. Viazzi, F. Traverso, G. Defferrari, L. E. Derchi; Genoa/IT

Introduction: We investigated changes in renal vascular resistance and urinary albumin excretion (UA) in patients with essential hypertension (EH) before and during long-term antihypertensive treatment.

Methods: Thirty one patients received antihypertensive treatment with either calcium channel blocker (n = 15 Nifedipine GITS, 90 mg/day) or ACE-inhibitor (n = 16 Lisinopril, 20 mg/day), alone or in association with diuretic. Blood pressure, renal resistive index (RI) and urinary albumin were evaluated at baseline and over 24 months.

Results: Both regimens effectively lowered blood pressure (MAP from 124±12 at baseline to 103±12 mmHg at 24 months in Lisinopril group, and from 122±12 at baseline to 104±11 at 24 months in Nifedipine group. P < 0.01 for both groups).

Despite similar blood pressure reduction, the two regimens showed different specific effects. Lisinopril caused significant reduction of both UA (34±15 at baseline and 9±12 at 24 months, P = 0.01) and renal RI (0.61±0.02 at baseline and 0.56±0.04 at 24 months, P = 0.03), while Nifedipine did not significantly influence UA (36±11.7 at baseline and 31±12 at 24 months, NS) and RI (0.60±0.02 at baseline and 0.59±0.02 at 24 months. NS).

Conclusion: Long-term blood pressure control reduces the severity of organ damage, namely UA, while maintaining renovascular resistance in patients with EH. Different antihypertensive treatments could convey additional specific renal protection beyond blood pressure control. These data could be useful for individualized therapeutic strategies in hypertensive patients at risk.

1179 14:20

Is renal resistive index a normal variable?
V. Gasgoilo, G. Cittadini jr., E. Biggi, E. De Cicco, A. Gallo, G. Cittadini; Genoa/IT

Purpose: To investigate the frequency distribution of renal resistive index (RI) and the correlation to sex, age, blood pressure and pulse rate

Methods and materials: In 200 outpatients (99 males: 101 females) scheduled for ultrasound because of suspected extrarenal pathology, RI was measured by Doppler velocimetry (single ultrasonographer, single machine) at arcuate, interlobar and renal arterial level on both kidneys. In each group skewness and kurtosis were preliminarily tested: then, right vs left kidney, male vs female values were compared. The correlation of RI to age, blood pressure, and pulse rate were investigated.

Results: Positive skewness of RI (P = 0.05) was observed in males at left renal arterial level. No difference between right and left RI was observed (P > 0.62).

The difference between males and females was significant at arcuate level (P = 0.0358). Age was positively correlated to RI values, sometimes to systolic and differential blood pressure, never to diastolic, to pulse rate only in women at renal level.

Conclusions: With the exception of renal artery level, RI can be considered a normally distributed variable. The higher values of RIs in women seem to be attributable to an ontogenetic predisposition of renal vessels to face the higher urinary pressure during pregnancy. In the sampling and comparison of experimental groups attention should be drawn on sex and age ratio.

1180 14:30

Incidence of crossing vessels at the ureteropelvic junction in kidney donors: Assessment of contrast-enhanced color Doppler imaging
A. Schuster, F. Frauschke, G. Janetschek, L. Palwein-Prettner, G. Helew, A. Klauser, D. zur Nedden, G. Bartsch; Innsbruck/AT

Purpose: The goal of our study was to evaluate the incidence of crossing vessels at the ureteropelvic junction (UPJ) in kidney donors by means of contrast-enhanced color Doppler ultrasound (US).

Methods: We investigated 84 kidneys in 42 kidney donors. A microbubble-based contrast agent (Leovist®, Schering, Berlin) was administered using a concentration of 300 mg/ml and an infusion rate of 1 ml/min. The sonographic findings were compared with the findings obtained by computed tomography angiography (CTA).

Results: 11 of 42 kidney donors (26 %) showed crossing vessels at the UPJ. Spectral wave analysis revealed 12 arteries and 2 veins, altogether 14 vessels crossing the UPJ within 1 cm distance. CTA confirmed the sonographic findings in all cases.

Conclusion: Crossing vessels at the UPJ were found in 26 % of asymptomatic kidney donors using contrast enhanced color Doppler US. This technique demonstrated an excellent agreement with the findings in CTA and therefore seems to be very valuable for the detection of such vessels in patients presenting with UPJ obstruction.

1181 14:40

Changes of renal blood flow in nephrophtosis: Assessment by color Doppler imaging and long-term follow-up after nephropyshy
A. Schuster, F. Frauschke, G. Helew, L. Palwein-Prettner, G. Janetschek, G. Bartsch; D. zur Nedden; Innsbruck/AT

Purpose: Using color Doppler imaging (CDI) we found changes of renal blood flow secondary to nephrophtosis by measuring the renal resistive index (RI). Therefore a long-term follow-up was undertaken to investigate whether those Doppler parameter changes are clinically relevant and can be normalized permanently by means of nephropyshy.

Methods: 36 patients with nephrophtosis were examined by CDI and isotope nephrography (ING) before and after laparoscopic nephropyshy. RI was measured. The contralateral kidney served as a control. The pre- and postoperative clinical symptoms, Doppler-parameters and findings in ING were correlated.

Results: Preoperatively, 28 of 36 symptomatic patients showed an abnormal ING and decrease of RI of 0.16±0.06 on the affected side. Postoperatively 19 of these 28 patients became asymptomatic, 3 patients improved essentially, but all patients showed no posture-related changes in RI. 8 of 36 symptomatic patients had preoperatively only an abnormal ING. Postoperatively, 5 of this 8 patients continued to have abnormal scans. 3 patients became asymptomatic. Altogether, the symptoms of 14 patients improved essentially, 22 patients became asymptomatic.

Conclusion: Impairment of renal blood flow due to nephrophtosis can be detected with both CDI and ING. In the long-term follow-up, successful repair correlates better with the findings in CDI than ING.

1182 14:50

Doppler ultrasound of renal vessels in nephrophtosis
T. Kružanova, A. Arabirinsky, A. Khitrova; Moscow/RU

Purpose: Investigation of hemodynamic impairment in renal arteries and veins during nephrophtosis by color flow mapping and pulsed Doppler and algorithms of patient selection for nephropyshy according to Doppler results

Methods and materials: Doppler ultrasonography of renal arteries and veins was performed in 123 healthy persons. 53 hypertensive patients and 94 patients with nephrophtosis.

Results: A "pseudostenotic" effect caused by renal artery extension was detected in 72.9 % of patients with nephrophtosis, in 4.2 % of cases irreversible arterial organic stenosis took place. Nephrophtotic patients were characterized by significantly elevated blood flow velocity (mean Vmax×SD) in distal segments of main renal artery in clinoanastomatic and orthostatic position (117.4±7.2 cm/s and 91.2±3.6 cm/s, respectively) compared with normal persons (89.4±8.1 cm/s and 62.2±3.6, respectively). (P < 0.05). Blood flow velocity in proximal segments of renal arteries and in contralateral renal arteries had normal range. The elevation of
blood flow velocity was most prominent in distal segments of 65 nephropatic patients (pain syndrome: 135.6±5.5 cm/s for clonistasis, 96.2±8.7 cm/s for orthostasis). Sens./Spec./Acc. were 95 %/85 %/90 %, and in 50 hypertensive patients with nephropathy, Sens./Spec./Acc. were 75 %/82 %/90 %. Renal venous stenosis was revealed in 14 nephropatic patients. Venous flow velocity was significantly (P < 0.05) increased during clonistatic and orthostatic testing (main renal vein: 34.2±4.5 cm/s and 29.7±4.7 cm/s, respectively; venous sinuses: 34.6±3.3 cm/s and 27.7±2.8 cm/s, respectively) compared with healthy persons and the contralateral kidney (main renal artery: 22.1±4.5 cm/s for clonistasis and 18.5±0.9 cm/s for orthostasis, venous sinuses: 23.0±3.8 cm/s for clonistasis and 21.2±3.9 cm/s for orthostasis). In 35 patients with nephropathy and hematuria venous flow velocity was as high as 41.2±9.1 cm/s in the main trunk and 38.6±5.7 cm/s in venous sinuses pointing at congestive venous hypertension as a causative agent for nephropatic hematuria (Sens./Spec./Acc. were 93 %/70 %/82 %). Venous flow increase in hypertensive patients was demonstrated in main arteries and venous sinuses of both kidneys only during clonistasis (main trunk: 32.6±6.7 cm/s, venous sinuses: 40.2±10.8 cm/s).

Conclusion: Doppler data must be considered when selecting patients for nephropaxy. Timely correction of nephropathy may prevent the development of organic arterial and venous stenosis.

1183 14:55
Serial duplex Doppler ultrasonography on the prediction of renal allograft dysfunction: A correlation of US profiles with serum-creatinine and histology
M.A. Cruz, S. Takahashi, Y. Narumi, K. Tsuda, T. Kim, T. Murakami, H. Oi, H. Nakamura, Osaka/JP
Purpose: To assess the value of serial pulsatility index on renal vasculature for predicting renal allograft dysfunction.

Materials and methods: Twenty consecutive transplanted renal allograft patients underwent 373 serial US examinations. Pulsatility index (PI) and resistive index (RI) of interlobar, interlobar and segmental arteries were measured in six arteries at each level, three times at week during 5-9 weeks post-transplantation. Relative and absolute PI and RI were calculated. Flow was defined as abnormal when PI or RI increased 10 % more than previous examination. Results were correlated with serum creatinine and histology.

Results: There were 17 acute rejections and 11 nephrotoxicity episodes confirmed by biopsy or clinically. Relative PI elevation of interlobar arteries was the most sensitive criteria to predict dysfunction (sensitivity: 96 %, PPV: 63 %). Relative PI and RI of interlobar and segmental arteries increased at least 2 days before elevation of serum creatinine in acute rejections and 4 days before in nephrotoxicities.

Conclusion: Serial evaluation of PI on renal allograft improved sensitivity and accuracy for predicting dysfunction. Relative PI on interlobar artery elevated earlier than serum creatinine that could be potential criterion for predicting allograft dysfunction.

1184 15:05
Color Doppler US in the evaluation of normally functioning renal grafts from living donors
F.M. Drudi, P. Ricci, E. Iannicelli, R. Di Nardo, R. Passanello, Rome/IT
Purpose: There is a growing interest in noninvasive studies of renal allograft vascularity due to the increasing number of renal transplants. Our aim was to examine the kidneys by Color Doppler US before and after transplant to assess hemodynamic changes and time of graft recovery.

Materials and methods: The same kidneys were studied by Color Doppler US in the evaluation of normally functioning renal grafts from living donors (135.6±5.5 cm/s for clonistasis, 96.2±8.7 cm/s for orthostasis). Sens./Spec./Acc. were 95 %/85 %/90 %, and in 50 hypertensive patients with nephropathy, Sens./Spec./Acc. were 75 %/82 %/90 %. Renal venous stenosis was revealed in 14 nephropatic patients. Venous flow velocity was significantly (P < 0.05) increased during clonistatic and orthostatic testing (main renal vein: 34.2±4.5 cm/s and 29.7±4.7 cm/s, respectively; venous sinuses: 34.6±3.3 cm/s and 27.7±2.8 cm/s, respectively) compared with healthy persons and the contralateral kidney (main renal artery: 22.1±4.5 cm/s for clonistasis and 18.5±0.9 cm/s for orthostasis, venous sinuses: 23.0±3.8 cm/s for clonistasis and 21.2±3.9 cm/s for orthostasis). In 35 patients with nephropathy and hematuria venous flow velocity was as high as 41.2±9.1 cm/s in the main trunk and 38.6±5.7 cm/s in venous sinuses pointing at congestive venous hypertension as a causative agent for nephropatic hematuria (Sens./Spec./Acc. were 93 %/70 %/82 %). Venous flow increase in hypertensive patients was demonstrated in main arteries and venous sinuses of both kidneys only during clonistasis (main trunk: 32.6±6.7 cm/s, venous sinuses: 40.2±10.8 cm/s).

Conclusion: Doppler data must be considered when selecting patients for nephropaxy. Timely correction of nephropathy may prevent the development of organic arterial and venous stenosis.

1185 15:15
Autonomous peristaltic activity of transplant ureters proved by color Doppler mapping of the jet phenomenon
U. Wedegärtner, W. Wiesner, G.M. Bongartz, W. Steinbrich, Basel/CH
Purpose: To evaluate autonomous peristaltic activity of ureters in renal transplants with color Doppler imaging of the jet phenomenon.

Materials and methods: 10 patients with a renal transplant were examined prospectively in order to analyze the jet phenomenon of their ureters. Frequency, duration and velocity of ureteric jets were documented on video for 10 minutes and compared to the findings in native ureters.

Results: Transplanted ureters showed a similar peristaltic activity as native ureters if the transplantation had been performed more than several weeks before. Frequency, duration and velocity of the jet phenomenon of transplanted ureters did not significantly differ from native ureters.

Conclusion: Our findings confirm the presence of an autonomous peristaltic activity of the renal pelvis and of the ureter, which is rather a result of intrinsic nervous stimulation from atypical smooth muscle cells performing a pacemaker function, than of vegetative innervation.

1186 15:20
Renal allografts abnormalities: Evaluation with MR imaging
M.T. Farres, A. Khali, B. Mougenot, K. Akposo, N. Ouah, J.M. Bigot, Paris/FR
Purpose: To assess the efficacy of magnetic resonance imaging (MR) in the evaluation of renal allografts abnormalities.

Materials and methods: Clinical and radiological findings were retrospectively reviewed in 71 renal allografts. The final diagnoses were established by biopsy (n = 41), surgery (n = 4) or clinical follow-up (n = 26).

Results: The evaluation of the renal allograft morphology, the parenchymal opacification, the cortical perfusion, MR angiography and MR urography permitted the diagnosis of normal allografts (n = 29). 10 stenoses of the allograft or the iliac arteries, 13 chronic rejections, 14 acute rejections or tubular necrosis, 2 acute tubular nephritis, 2 ureteral abnormalities and one embolic ischaemia.

Conclusion: MR imaging is often diagnostic in normal and pathologic renal allografts. It can help to planify the tregatement and normal findings may obviate biopsy.

14:00–15:30 Room H
Contrast Media
SS 1806
MR and X-ray contrast agents
Chairpersons: P.A. Rinck (Mons/BE)
W. Steinbrich (Basel/CH)

1187 14:00
Complications after intravenous application of ioxithalamate. Is the use of second generation ionic contrast agents really dangerous?
K. Steinke, W. Wiesner, G.M. Bongartz, W. Steinbrich; Basel/CH
Purpose: To evaluate if the intravenous use of ioxithalamate leads to significantly more and also more severe adverse reactions than the use of non-ionic contrast media.

Materials and methods: 824 consecutive patients aged 5 months to 80 years underwent intravenous urography and/or computed tomography of body and brain using ioxithalamate as intravenous contrast agent. Injection rates were < 3 ml/s. Absolute contraindications for the application of ioxithalamate were pulmonary edema, brain edema, shock, insulin dependent diabetes and an age over 80 years. The adverse reactions were classified into osmotic reactions (heat sensation, nausea with or without vomiting) and into allergic reactions (skin rash, itching, coughing and sneezing, dyspnoea, cardiac arrest, anaphylactic shock).

Results: The overall prevalence of drug reaction was 6.7 % (55 of 825 patients). 5.0 % (41 of 825 patients) were pure osmotic reactions whereas allergic reactions occurred only in 1.7 % (14 of 825 patients). Allergic reactions never exceeded the degree of itching, sneezing, coughing and/or skin rash. Treatment was not necessary in any patient.
Conclusion: Our preliminary results show that the intravenous application of oxithalamic acid in low risk patients may lead to an increased incidence of minor osmotic reactions. The incidence of allergic reactions does not exceed that of non ionic contrast agents and severe allergic reactions are extremely rare.

1188 14:05
Renal tolerance of IV non-ionic contrast media in elderly hospitalized patients with or without renal risk factors
J.P. Louvel, P. Bencteux, F. Ligeois, E. Primard, J. Henry, A. Janvresse; Rouen FR
Purpose: To evaluate the renal tolerance of IV iodinated contrast media injection on elderly patients with or without renal risk factors (RRFs), in order to determine potential high-risk subgroups (HRRSG) of elderly patients.

Materials and methods: During a period of 6 months, CT scans were consecutively performed on 68 hospitalized patients aged over 75 years (mean 83.3±5.3), with IV contrast media (Iobitridol 300) at mean dose of 1.64±0.33 ml/kg. Nine RRF were systematically noted. Creatininemia (Cr) levels were measured 2.4±2.8 days before and 2.8±1.7 days after CT scan, and then Creatininemia Clearance (CrCl) was calculated with the Cockcroft’s curve. A decrease of 25 % CrCl was considered to be a significant contrast nephrotoxicity. A multi-variate analysis of FFR was calculated to determine potential HRRSG.

Results: The mean CrCl variation observed in these patients was +6 %. There was no significant decrease in CrCl on elderly patients with or without renal risk factors (RRFs), in order to determine osmotic reactions. The incidence of allergic reactions doesn’t exceed that of IV contrast media (Iobitridol 300) at mean dose of 1.64±0.33 ml/kg. Nine RRF were systematically noted. Creatininemia (Cr) levels were measured 2.4±2.8 days before and 2.8±1.7 days after CT scan, and then Creatininemia Clearance (CrCl) was calculated with the Cockcroft’s curve. A decrease of 25 % CrCl was considered to be a significant contrast nephrotoxicity. A multi-variate analysis of FFR was calculated to determine potential HRRSG.

Conclusion: A moderate dose of IV non-ionic contrast media can be safely used in elderly patients. Cr should be measured in patients with multiple RRF.

1189 14:15
Fenoldopam: Effect on contrast-induced renal impairment in patients with decreased renal function
D.W. Hugdahl, K.J. Kowalski, Minneapolis, MN/US
Purpose: The use of IV contrast puts patients with decreased renal function at risk of further renal impairment. The drug fenoldopam, which causes the vessels in the kidney to dilate, may prevent or decrease the risk of this radiotransist-induced renal impairment.

Materials and methods: IV fenoldopam is infused 2 hours prior to procedure at a rate of 0.1 mcg/kg/min increased at increments of 0.1 mcg/kg/min every 20 minutes until a rate of 0.5 mcg/kg/min is reached. Blood pressure is monitored continuously and infusion rate adjusted if BP falls below specified parameters. Fenoldopam infusion is maintained at a rate of 0.5 mcg/kg/min during the procedure and up to 4 hours following IV contrast administration.

Results: Pre-Procedural serum creatinine (scr) ranged from 1.5-5.8 mg/dl: [1:. 2.0 mg/dl (n = 6) 2.0-2.9 mg/dl (n = 7) 3.0-3.9 mg/dl (n = 5) 4.0 mg/dl (n = 2)] Max: Scr 1.5-9.4 mg/dl. Avg. contrast dose = 100 ml. One day after procedure 14 patients serum creatine decreased 0.1-0.8 mg/dl (avg. 0.1 mg/dl); 3 were unchanged, 2 increased 0.1 mg/dl; 1 increased 0.8 mg/dl. Average maximum fenoldopam dose achieved 0.45 mcg/kg/min.

Conclusion: Early data suggests that administration of the drug fenoldopam with contrast administration decreases the risk of renal impairment. This is of benefit to renal-impaired patients who will benefit from coronary or vascular angiography and angioplasty, and/or computerized tomography. A prospective randomized study is in process.

1190 14:20
Comparison of a monomeric and a dimeric contrast agent in electron beam tomography (EBT) of the coronary arteries
C.N. Enzweiler, T.H. Wiese, M. Taupitz, S. Höhn, A.C. Borges, P. Dohmen, B. Hamm; Berlin DE
Purpose: To quantitatively and qualitatively compare two contrast media in EBT-based coronary angiography.

Methods and materials: 59 patients with coronary heart disease (51 men) underwent EBT prior to conventional coronary angiography. Patients were randomly studied with lowosav (Optray, monomeric, 320 mg I/ml, n = 29) or Iodixanol (Visipaque, dimeric, 320 mg I/ml, n = 30). Volume and flow rate were individually adapted to the body surface (120-190 ml. 3.0-4.8 ml/s, injection time 40 s). 60 ECG-triggered slices were acquired (slice thickness 3 mm, increment 2 mm). The density in the aorta was measured. Examinations were subdivided into 4 intervals of 15 scans each. The area under curve was determined. Three blinded radiologists qualitatively assessed shaded surface display reconstructions of the coronary arteries. Wilcoxon’s test was used for statistical evaluation.

Results: The median blood density of scans 1-15, 16-30, 31-45 and 46-60 for lowosav and Iodixanol was 317 and 293 (p = 0.01), 334 and 309 (p = 0.01), 281 and 291, 190 and 195 HU (both not significant), respectively. No significant difference was found between the 3D-reconstructions of the contrast agents.

Conclusion: The monomeric agent lowosav achieves significantly higher intravascular density than the dimeric substance in cardiac scanning with EBT. However, quality of surface reconstructions of the coronaries does not differ significantly.

1191 14:30
Functional imaging of tumors using computed tomography and iodinated contrast media of different molecular weights
P. Robert, O. Clément, C.A. Cuendol, N. Slauve, A. Sobokta, E. Kahn, G. Frija; Paris/FR
Purpose: To study functional parameters of implanted tumors such as blood volume (BV), capillary permeability (k) and tumor perfusion (TP) using spiral Computed Tomography (CT) and iodinated contrast agents.

Materials and methods: S4T sarcoma was implanted in the flank of WAG rats. Images including the tumor and a reference blood vessel were acquired during the first pass of a bolus 1.5 ml/kg P743, a prototype macromolecular agent (Guerbet) with a rapid renal clearance. Temporal resolution during the first pass was 0.3 s. Then, images were acquired every minute for 20-25 minutes. 1 ml/kg Iohexol 300 (Nycomed-Hamershams) was then injected and the same imaging protocol was used. A compartmental analysis using the Patlak model allowed for the calculation of the blood volume (BV), capillary permeability (k) and tumor perfusion (TP).

Another original approach using a mathematical deconvolution method was developed under the IDL language to calculate the mean transit time (MTT) and tumor perfusion (TP).

The same tumor model was studied using intravital videomicroscopy during the injection and FITC-labelled albumin and using the Patlak analysis.

Results: Three tumorous zones could be identified with the functional parameters: the periphery, with high perfusion and permeability indexes, the central necrotic zone with low perfusion and permeability indexes and an intermediate zone. The macromolecular agent P743 had lower k and MTT than Iohexol. The two fitting models gave similar results for the perfusion indexes. Videomicroscopy allowed to see important differences in morphology and perfusion between close tumorous capillary.

Conclusion: Functional imaging of the tumors is feasible using spiral CT and iodinated contrast agents with reproducible quantitative results and a very high temporal resolution allowing for a good sampling of the first pass.

1192 14:40
MRA with a new blood pool contrast agent: Phase I clinical trial
B. Tottbach1; P. Reimer1, C. Bremer1, T. Allkemper1, M. Engelhardt1, M. Mahler2, W.L. Heindel3, Munster/DE, Berlin/DE
Purpose: To evaluate a new superparamagnetic iron oxide blood pool MRT contrast agent for MRA of the iliac vessels.

Methods: 16 healthy volunteers were enrolled into this prospective, single blinded, placebo controlled clinical trial (phase I) of the new blood pool contrast agent SHU 555 C. MRA of the iliac vessels was performed during first-pass and up to 42 min following the iv bolus injection of randomly assigned doses of 5, 10, 20 and 40 μmol/kg bw. Safety aspects were closely monitored and the enhancement was calculated in the abdominal aorta, the iliac arteries and the vena cava.

Results: No significant changes in vital signs, hematology and urinanalysis occurred following the iv bolus injection of SHU 555 C at either doses. The increase of serum iron was reversible. The blood pool effect was best at the highest dose of 40 μmol/kg bw resulting in a slight decrease of 81% within 42 min for the enhancement of iliac arteries. Diagnostic quality of first-pass MRT-angiograms were obtained at doses of 10, 20 and 40 μmol/kg bw. Safety aspects were closely monitored and the enhancement was calculated in the abdominal aorta, the iliac arteries and the vena cava.

Discussion: SHU 555 C can safely be iv bolus injected as a tiny volume for high contrast MRT-angiography of the abdominal and iliac vessels. Following the iv injection of 40 μmol/kg bw a time window of 42 min is diagnostic.

1193 14:50
Blood pool MR contrast agent for detection of pulmonary embolism: Initial clinical experience with ultrasmall superparamagnetic iron oxide NC 100150 (Clariscan)
W. Schima, U. Hoffmann, C. Bernhard, M. Cepna, S. Fuchssteiner-Helle, C.J. Herold, Vienna/AT
Purpose: To evaluate safety and efficacy of the USPIO blood pool MR contrast agent NC100150 for detection of pulmonary embolism in n = 10 x-ray pulmonary angiography.

Scientific Sessions
Materials and methods: The study was part of a multi-center phase 2 trial of the MR contrast agent NC100150 (Gianscan, Nycomed Amersham). Ten patients (5 f., 5 m.; mean age, 47 y.) underwent X-ray pulmonary angiography and MRA at 1.5 T (Vision, Siemens) after IV Clarscan at 0.75-6 mg Fe/kg bw. 11 W breath-hold 3D-GRE images (TR 4.6-5.0, TE 1.8-2.0) were obtained in coronal, oblique, and axial planes. The MR studies were evaluated by a reader blinded to the results of the X-ray angiography.

Results: X-ray angiography revealed emboli in all 10 patients (14 of 20 lungs). Lobar/segmental emboli were present in 12 lungs and subsegmental emboli only in 2 lungs. MRA showed emboli in 12 of 14 lungs (sensitivity per lung, 86%). MRA confirmed the presence of 29 of 39 proven lobar/segmental emboli (sensitivity per embolus, 74%). In 5 patients MR artifacts resulted in impaired visualization of subsegmental vessels. Clinically relevant adverse events were found in no patient.

Conclusion: Our initial experience shows that NC100150 is a well-tolerated MR blood pool contrast agent, which allows assessment of the pulmonary arteries in multiple projections. NC100150-enhanced MRA has a very good sensitivity to demonstrate pulmonary emboli on the lobar and segmental level.

1194 15:00
Value of blood pool contrast agent in magnetic resonance angiography (MRA) of the aorta, carotid, renal and pelvic arteries in comparison to conventional angiography
M. Aschaer, R. Stollberger, J. Raith, R. Stacher, S. Doder, G. Zenker, E. Spork, A. J. Ruppert-Kohlmayr, H. R. Porturesslager, F. Ebmer; Graz, AT

Purpose: To determine the value of NC 100150 (blood pool agent, single iron oxide crystal stabilized with a carboxyhydrate-polyethylene glycol) for the evaluation of degree of stenosis or aneurysm of the abdominal aorta, carotid, renal and pelvic arteries in comparison to conventional angiography.

Methods and materials: 17 patients with significant stenoses or aneurysm of the described vessels were evaluated with X-ray catheter intraarterial angiography and MR-angiography after intravenous injection of NC 100150 (0.75 mg Fe/kg, 1.25 mg Fe/kg and 3.0 mg Fe/kg) in the first pass and in the equilibrium phase (1.5 T Gyricor NT Philips, Netherlands), TR: 2 mm, coronal acquisition with flipangle 40°; TR/TE 5.0/1.4 ms, breath hold for the first pass and different parameters for the different concentrations in the equilibrium phase (coils depending of the regions: quad neck, synergy wrap around, body coil). For image interpretation were used source images and 3D MIP pictures on an independent workstation in consensus of two radiologists.

Results: In 16 of 17 patients the first pass with 0.75 mg Fe/kg was exactly comparable with the X-ray angiography. In one patient the time lagged. In the equilibrium phase after the second and third injection the vessels were interpretable. Because of venous overlap the stenoses could only be seen on the source images. In 7 patients also the source images did not show the degree of stenoses because of venous overlap.

Conclusion: NC 100150 as a blood pool contrast agent allows prolonged visualization of the arteries and may overcome some limitations of the first pass, expecially if timing or breath hold fails. Evaluation of stenoses only in the equilibrium phase is not recommended.

1195 15:10
Improvement of vascular signal intensity in contrast enhanced MRA with Gd-BOPTA: Comparison with Gd-DTPA
C. Catalano, P. Pavone, A. Laghi, V. Panebianco, F. Fraoli, F. Pediconi, A. Sarrantonio, R. Passanello; Rome/IT

Purpose: The need to decrease the acquisition time in contrast enhanced MRA determines a reduction of the signal to noise ratio, which can be increased by administering double doses of Gd-DTPA. Our purpose was to evaluate the possibility to perform contrast enhanced MRA with a high relaxivity paramagnetic contrast agent, which is Gd-BOPTA.

Material and methods: 12 patients with suspected carotid artery stenosis were examined on a 1.5 T magnet (Siemens Vision Plus) using a time resolved MRA sequence. In all patients MRA was performed twice within 24 hours using the same sequence parameters, injecting at the same flow rate of 2 ml/s 15 ml of Gd-DTPA in the first study and 10 ml of Gd-BOPTA in the second study.

Results: Gd-BOPTA provided a 1.5 times mean increase in signal intensity and a 1.4 times increase of signal to noise ratio, as compared to Gd-DTPA. The difference was significant with a t value of 26 at Student t test.

Conclusion: Gd-BOPTA enhanced MRA can provide superior vascular signal intensity and signal to noise ratio, as compared to Gd-DTPA, due to its higher relaxivity, even at lower doses; this agent can therefore be used to reduce costs and improve vascular enhancement.

1196 15:20
Excretion of Gadopentetate dimeglumine into human breast milk during lactation
R. A. Kubik-Huch, N. A. Gottstein-Aalame, T. Frenzel, B. Seifert, E. Puchhart, S. Witter, J. F. Debain; Graz/AT, Zürich/CH, Berlin/DE, Essen/DE

Purpose: To analyze the amount of excretion of gadopentetate dimeglumine (Magnevist, Schering AG) into human breast milk following i.v. injection of a clinical dose.

Materials and methods: Gadopentetate dimeglumine (Gd-DTPA) was injected i.v. in 20 lactating women (23 - 38 yr.). Breast feeding was interrupted for at least 24 hrs. Salival samples of expressed milk were collected and analyzed for gadolinium concentration by means of inductively coupled plasma atomic emission spectrometry at a wavelength of 343.237 nm.

Results: The cumulative amount of gadolinium excreted in human breast milk during a period of 24 hours was 0.57±0.71 µmol (range 0.05 - 3.0 µmol). There was a significant correlation between the cumulative amount of gadolinium and the injected dose (p < 0.01) as well as the volume excreted over 24 hours (p < 0.002). The excreted dose was 0.04 µmol of the administered i.v. dose (range 0.001 percentage 0.04 percentage mean 0.009±0.010 percentage) for all cases.

Conclusion: Less than 0.04 percentage of administered gadopentetate dimeglumine is excreted into human breast milk. The amount transferred to a nursing infant orally would be far more than 100x below the permitted i.v. dose (200 µmol/kg b.w.) for neonates. The recommendation of a 24 hr suspension of breastfeeding for lactating women should thus be reconsidered.

14:00–15:30 Room I

Vascular

SS 1815b
Renal arteries
Chairpersons: D.O. Cosgrove (London/GB) E. Kovisto (Tampere/FI)

1197 14:00
Meta-analysis of diagnostic tests in renovascular hypertension
G.B.C. V/sbinder, P.J. Neleman, J.M.A. van Engelshoven; Maastricht/NL

Purpose: To summarize and compare the validity of MA-angiography, spiral CT-angiography, ultrasonography and captopril renography as non-invasive diagnostic test in renovascular hypertension.

Methods and materials: For each diagnostic modality, published studies were identified by a literature search in MEDLINE. The results of this search were screened by text and abstract (if available). Included for meta-analysis were original investigations which met defined inclusion criteria. A standard form was used to extract relevant data from the included studies. The accuracy data (sensitivity and specificity) from the four different diagnostic modalities were analyzed and compared by a meta-analytic technique, known as the construction of Summary Receiver Operating Characteristic (SROC) curves.

Results: Though all diagnostic modalities showed a great variety in accuracy data, SROC curves found both spiral CT-angiography as well as gadolinium enhanced, three-dimensional MR angiography to be the most valid tests as compared to all other studied diagnostic tests (p < 0.05).

Conclusion: Since spiral CT-angiography exposes patients to radiation and iodine-containing contrast agents, gadolinium enhanced, three-dimensional MR angiography seems to be the preferred non-invasive diagnostic examination in renovascular hypertension. However, the number of published studies is limited for both CT-angiography and MR-angiography. Further research is therefore recommended.
Magnetic resonance angiography for the diagnosis of renal artery stenosis: A meta-analysis

K.T. Tan, E.J.R. van Beek, P.W.G. Brown, O.M. van Delden, L.E. Ramsay; Sheffield/GB, Amsterdam/NL

Purpose: To compare the sensitivity and specificity of Magnetic Resonance Angiography with and without Gadolinium in diagnosing renal artery stenosis.

Methods and materials: A meta-analysis was performed using English language articles, as identified by PubMed/Medline. No abstracts or unpublished data were included. The following criteria were used for inclusion: a) blinded comparison with angiography, b) indication of investigation stated, c) descriptions of imaging techniques, and d) duration between MRA and angiography less than 3 months.

Results: Thirty-six English-language studies were identified, of which 28 met the inclusion criteria. The studies were separated into non-enhanced MRA (18 studies) and Gadolinium-enhanced MRA (12 studies). The total number of patients included was 1141: 620 had non-enhanced MRA and 521 had Gadolinium-enhanced MRA. The overall sensitivity and specificity of unenhanced MRA were 94.0% and 87.1%, respectively, while these figures were 95.7% and 93.7% for Gadolinium-enhanced MRA. Accessory renal arteries were better depicted using Gadolinium-enhanced techniques (84.2%) than non-enhanced methods (52.8%).

Conclusion: There appears sufficient evidence to suggest that Gadolinium-enhanced MRA is currently able to replace arteriography in the majority of patients with suspected renal artery stenosis. This has major advantages in terms of non-invasiveness, lack of radiation involved and non-nephrotoxic contrast agent used.

Multidetector spiral CT angiography in the evaluation of renal artery stenosis

C. Catalano, A. Laghi, V. Panebianco, A. Grossi, A. Napoli, P. Pavone, R. Passanello; Rome/IT

Purpose: To evaluate the possible role of multidetector spiral CT Angiography (CTA) in the assessment of patients with suspected renal artery stenosis.

Material and methods: Eighteen patients with suspected renal artery stenosis were examined with multidetector spiral CTA (Somatom Volume Zoom, Siemens) after bolus injection of 60 ml of nonionic contrast agent at 4 ml/s. Four 1.5 mm thick slices per rotation (rotation time: 0.5 seconds) were acquired with a volume coverage from the origin of the celiac trunk down to the aortic bifurcation. Images were reconstructed using a volume rendering algorithm either on a Virtuoso (Siemens) or on a Vitrea console (Vital Images). In all patients DSA was performed within 72 hours from CTA and considered the standard of reference.

Results: CTA was considered diagnostic in all cases, free of artifacts. All 6 renal polar arteries were correctly demonstrated; in 3 patients with ostial calcified plaque the stenosis, discrete at DSA, was overestimated with CTA. CTA was considered decisive prior to angioplasty and stenting in demonstrating the morphology of the plaque.

Conclusion: Multidetector spiral CTA, due to the high spatial and temporal resolution, provides optimal images in patients with suspected renal artery stenosis. Low contrast agent dosage suggests its use also in patients with partially impaired renal function.

Contrast-enhanced MRA versus multidetector spiral CTA in the detection of renal artery stenosis

C. Catalano, P. Pavone, V. Panebianco, A. Laghi, R. Brillo, F. Fraioli, R. Passanello; Rome/IT

Purpose: To compare contrast-enhanced MRA (CEMRA) with Multidetector Spiral CTA in the detection of renal artery stenosis in patients with hypertension and suspicion of renal artery stenosis.

Material and methods: 12 patients were examined performing within 5 days CEMRA and CTA. MRA was performed on a 1.5 T magnet (Siemens Vision plus) using a high resolution turbo-MRA sequence with a bolus injection of a standard dose of 20 ml of Gd-DTPA at 2 ml/s. Multidetector spiral CTA (Siemens Somatom Volume Zoom) was performed with four 1.5 mm thick slices per rotation (rotation time: 0.5 seconds). With 60 ml of nonionic contrast agent at 4 ml/s. MIP and volume rendering reconstructions were used respectively for MRA and CTA. In all patients DSA was used as gold standard.

Results: MRA and CTA allowed to recognize all 6 polar arteries. MRA and CTA respectively detected 2 and 2 of the 2 occlusions, 19 and 18 of the 21 severe stenoses, 8 and 7 of the 9 moderate stenoses and both all 5 mild stenoses.

Conclusion: CEMRA and Multidetector spiral CTA provide comparable results in the assessment of renal artery stenosis. CEMRA may be preferred in patients with renal insufficiency due to superior tolerance of the paramagnetic contrast agent.

CT angiography and real-time volume rendering for renal stents follow-up

E. Nen, C. Vignati, R. Cioni, P. Petruzzi, E. Lavolo, C. Bartolozzi; Pisa/IT

Purpose: To test the feasibility and to determine whether the use of real-time volume rendering (VR) of the aorta and renal arteries could help the follow-up of renal stents with CT angiography (CTA).

Method/materials: Sixty patients treated with stent placement (58 Palmaz stents, 2 Wallstents) were imaged with CTA (HelSpeed Advantage; GE/Medical Systems, Milwaukee, WI) 1 month after the procedure. CTA images were processed separately by 2 investigators, with Advantage Windows 3.1 software, that aimed to generate VR by selecting the CT density range including the aorta, renal arteries and stents.

Results: VR allowed to visualize the aorta, renal arteries and stents from the outside and inside the lumen. The density interval for VR ranged between 20 and 730 HU. The interobserver correlation coefficient for the selection of low and upper thresholds was good and statistically significant (RS 0.789; P < 0.001); no significant correlation was observed for the time of volume rendering (range 3-15 minutes). The agreement between VR and native images was excellent (k = 0.95).

Contrast-enhanced MR angiography of the renal arteries: Means for improved resolution

S.J. Reederer, S.B. Fain, B.F. King; Rochester, MN/US

Purpose: To further develop techniques for high resolution 3D contrast-enhanced MR angiography of the renal arteries.

Methods: Based on theoretical analysis. High spatial resolution was targeted by minimizing field of view and repetition time and by precisely matching the acquisition time to the contrast bolus transit time. The RF flip angle was dynamically altered to account for the dynamic nature of T1 shortening. A respiration monitor was used to minimize breathing prior to triggering. The method was applied to 25 patients suspected of renal artery disease. Each was imaged with the high resolution MRA technique and subsequently using X-ray angiography. MRA results were evaluated with respect to overall quality, degree of motion artifact, and the presence and severity of renal artery disease. Results were compared with the X-ray angiograms.
Results: The techniques provided marked visual improvement in the resolution and confidence of diagnosis of the MR angiograms. Segmental renal arteries are routinely well seen. Verification of breathholding before triggering is useful in reducing motion artifact. Preliminary measurements of sensitivity and specificity values are 92 % and 94 % respectively.

Conclusions: An MR angiographic study of the renal arteries tailored for high spatial resolution provides high sensitivity and specificity compared to X-ray angiography.

1204 15:05

Doppler US study of the renal arteries before and after renal stenting
V. Nipoil, C. Vignali, R. Cioni, L. Cambi, N. Amirolla, P. Petruzzi, A. Cicorelli, C. Bartolozzi, Pisa/IT

Purpose: To evaluate the diagnostic accuracy of Doppler US in assessing stenosis before and after renal stenting.

Methods: Two-hundred eleven (211) hypertensive patients were enrolled in this prospective study. The baseline examination was performed within one month prior renal stenting. Follow-up examinations were performed at 3, 6, 12 months and every year thereafter. Peak systolic velocity (V), renal aortic ratio (R), acceleration time (T), acceleration (A), pulsatility (PI) and resistivity (RI) indices were compared before and after stent placement. Gold standard was provided by angiography.

Results: A total of 291 stenoses: 231 atherosclerotic, 60 fibromuscular were demonstrated (group I); 80 were treated by stenting, 211 were treated by primary angioplasty or not treated (group II). Among those treated by stenting restenosis occurred in 10/80 (12.5 %), 9 significant and 1 not significant, (group III). Using ROC curves, cutoff points for each indices were obtained before and after renal stenting. Cutoff points, sensitivity and specificity in each of the three groups of arteries were respectively: V > 13/135 cm/s, 77/86/78 %, 93/75/0 % - R > 3/2.3 units, 78/88/100 %, 93/65/100 % - T > 152/109 ms, 61/80/70 %, 71/65/0 % - A > 2.4/3.2 ms², 65/80/70 %, 70/60/60 % - PI > 1.05/1.1 units, 51/54/33 %, 59/55/0 % - RI > 0.64/0.64 units, 51/57/62 %, 60/55/0 %.

Conclusion: The most reliable indices (high sensitivity and specificity) before and after stenting are V and R. After stenting the incidence of false positive and false negative diagnoses increases, possibly due to the complex haemodynamic changes.

1205 15:15

Outcome analysis of different surgical procedures in renal artery aneurysm. Morphologic and functional assessment with MRI
F. Floeger, J. Gahlen, A. Mueller, S.O. Schoeneng, J.R. Alleneng, M.V. Knopp, Heidelberg/DE

Purpose: To analyse the individual surgical treatment outcome for patients with prior treatment of renal artery aneurysm. Renal artery blood flow, renal function and perfusion with current state of the art MR techniques are assessed and compared to current gold standard methods.

Material/methods: In an ongoing study, 11 patients with history of surgical therapy at least 10 years previously (venous saphena interponate placement, renal artery re-implantation after aneurysm resection, Dacron interponate placement, aneurysmorrhaphy) are being examined. According to the protocol, MR angiography combined with flow, scintigraphy, renal clearance, MR Urography and Doppler ultrasound were done. All patients were measured in a 1.5 T Siemens Magnetom Vision Plus.

Results: MR Angiography and flow measurement as well as MR Urography revealed corresponding findings to scintigraphy and renal clearance independent of the different surgical methods. The comparison of treatment outcome showed a trend for better renal function if venous interponates were used compared to Dacron or re-implantation of the renal artery.

Conclusion: Renal function before and after surgical treatments can be readily assessed by non invasive MR techniques and should be able to provide improved data for analysis in patient outcome.

1206 15:20

Presurgical evaluation of potential renal transplant donors: Value of two-phase contrast-enhanced MR angiography compared with DSA and urography
J.T. Winterler, C. Wolfram, C. Strey, P. Uhrmeister, C. Altehoefer, J. Laubenberger, M. Langer, "Freiburg/DE, "Bad Krozingen/DE

Purpose: To assess a contrast-enhanced standardized MRA protocol for presurgical evaluation of potential renal transplant donors.

Methods and materials: Twenty-two potential donors for renal transplantation were examined with Gadolinium-enhanced two-phase MR angiography (1.5 T) and DSA/Urography for the number of renal arteries, presence of aberrant arterial and venous branches, renal artery stenoses and anatomy of the renal collecting system and ureters. Diagnostic value was assessed evaluating different image processing modalities and inter-observer variability.

Results: Using Maximum intensity projections (MIP) together with Multplanar reformatting (MPR) accessory arteries were detected with a sensitivity/specificity of 100%/98%. Depending on diagnostic experience exclusive evaluation of MIP yielded a sensitivity/specificity of 67-100%/95-100%. Using MIP/MPR venous depiction was good in 80 %, with MIP solely in 30-40 %. At least the proximal third of the ureter was visible in 67 % of the venous phase angiograms.

Conclusion: MPR/MIP evaluation of two-phase contrast-enhanced MRA provides an excellent depiction of renal vessel anatomy for presurgical evaluation of renal transplant donors. Exclusive MIP assessment is less reliable and depends strongly on the examiners experience. For sufficient visualization of the ureters additional measurements have to be performed.

14:00—15:30 Room K

Cardiac

SS 1803

Atherosclerosis and coronary arteries

Charpersons: D. Revel (Lyon/Fr), R. Remmuller (Graz/AT)

1207 14:00

Significant coronary disease detection using electron beam CT
G.J. Friedrich, A. Stöger, H. Diltbacher, D. zur Nedden, O. Pachinger, Innsbruck/AT

Purpose: We analyzed the possibility of EBCT to predict significant obstructive atherosclerotic coronary lesions compared to angiography in patients with chest pain and suspected coronary disease.

Methods: 99 patients (54 male, 45 female) referred to angiography had EBCT determination of their coronary calcium score. 62 patients had positive non invasive testing for significant coronary disease. Significant coronary disease was defined as at least one angiographic ≤ 70 % stenosis in a major coronary vessel.

Results: From 99 patients, 70 presented anagographic significant coronary disease. In 86 % EBCT prediction of a significant lesion was correct. In 12 patients EBCT localization of high calcium scores was corresponding to severe diffuse atherosclerotic disease. In 10 cases EBCT could not predict a significant coronary stenosis revealed by angiography.

Conclusion: Patients with chest pain and suspected coronary disease, EBCT detection of significant coronary stenoses reaches high sensitivity. Severe diffuse atherosclerotic disease is also documented by high calcium scoring but differentiation from localized lesions is not possible.

1208 14:10

Coronary artery screening with electron beam CT: Difference between “asymptomatic” and “normal” patients
N. Gasgan, V.E. Sinitsyn, S. Ternovoy, E. Chazov, Moscow/RU

Purpose: To compare calcium scores in “asymptomatic” versus “normal” (in sense of presence of CAD) patients.

Material and methods: From a database of 420 EBCT examinations two groups of patients were selected. “Asymptomatic” patients (group 1, n = 64, mean age 53±9.6 years) were defined as persons with normal resting ECG, without typical angina and coronary anamnesis. “Normals” (group 2; n = 66, average age 50±11.4 years) had the same characteristics as “asymptomatic” but besides that they had more objective confirmations of CAD absence (negative results of stress tests, Holter ECG, thallium scintigraphy, coronary angiography). EBCT and calcium scoring were done using standard protocol (lmmatron C-150, 40 slices, thickness 3 mm, analysis according to Agatston).
Results: Coronary calcifications were detected in group 1 in 36 % of patients and in group 2 in 21 % of cases. Mean coronary calcium index in group 1 was higher than in group 2 (31.4±84.4 vs 5.8±18.0, δ = 0.0001). Age-related increase of calcium score was found in group 1, but not in group 2. Relative small sample size and possible bias in selection of patients are possible limitations of the study.

Conclusion: Problems of "normal" calcium score should be further investigated. Values of calcium scores should be adjusted according to age, sex and ethnicity. Some limitations of "normal" ranges of coronary calcium established in trials with asymptomatic patients should be taken into consideration.

---

1210 14:15

Intramammary arterial calcifications: Correlation with other risk factors and existence of cardiovascular diseases

P. Crystal1, E. Crystal1, J. Leor2, S. Strano2, "Beer-Sheva/IL, "Jerusalem/IL"

Objective: Cardiovascular disease is a leading cause of death among women in the western world. Early recognition of women with occult cardiovascular disease has become a public health priority. Modern mammography with its high sensitivity for detecting soft tissue changes offers a new opportunity to identify and describe these women. The association between them and the cardiovascular risk factors and current cardiovascular morbidity was performed.

Methods and materials: 865 consecutive women referred for mammography were studied. Prevalence of BAC in our study was 17%.

Results: Significant interaction was found between BAC and most of the risk factors (diabetes, hypertension, dyslipidemia, menopause). Logistic regression analysis was performed for cardiovascular diseases and BAC was found as strong, independent from age, predictive factor for existence of cardiovascular diseases.

Conclusion: Our findings suggest that mammography may be an effective and inexpensive screening tool for the detection of cardiovascular risk in women. The accurate value of BAC in predicting future cardiovascular events is currently being evaluated in a prospective trial.

---

1210 14:20

Validation of coronary artery calcification

A.H.H. Bongaerts, B. Song, R. Wijeghart, R. van Gelder, J. Witteman, P.J. de Feyter, Rotterdam/NL

Purpose: To validate the different acquisition, processing techniques and algorithms for calciumscoring.

Methods and materials: EBT and volume zoom CT measurements of the coronary artery tree were obtained with 1.5 mm and 3 mm collimation, both with 100-250 ms and 80 % RR triggering. Calculation of coronary calcium score was done using different software algorithms.

Results: 1400 persons for EBT evaluation and 2 subset for VZCT were included, stratified according to body weight. For 1.5 mm slices the cut-off for scoring level was always higher in all weight strata than for the 3 mm slices. The outcome of different acquisition and processing techniques will be evaluated.

Conclusions: Validation of calciumscoring is obligatory for further studies in coronary calcification.

---

1211 14:30

Electron beam CT compared to treadmill testing in the detection of coronary artery disease

G.J. Friedrich, A. Stöger, H. Ditlbacher, D. zur Nedden, O. Pachinger; Innsbruck/AUT

Purpose: We sought to analyze the feasibility of Electron Beam Computer Tomography (EBCT) to identify patients with significant coronary artery disease, defined by coronary angiography, in comparison to treadmill stress testing (TST).

Methods: 44 patients referred to coronary angiography because of typical angina symptoms were included in the study. Patients with already known history of coronary disease were excluded. All patients underwent EBCT and TST investigations before coronary angiography.

Results: 35 of 44 patients presented significant (at least one > 70 % stenosis in a major coronary artery) disease in quantitative angiography. 30 of these patients (86 %) had positive stress testing. 29 patients had positive EBCT scores (range from 70 to 2500). In 9 cases angiography revealed only diffuse coronary sclerosis. 7 of these patients had positive EBCT scores as well as positive treadmill stress tests.

Conclusion: In symptomatic patients, EBCT could detect significant and diffuse coronary artery disease with similar sensitivity than treadmill testing.

1212 14:40

High temporal resolution ECG-gated multi-slice spiral CT: A new method for 3D and "4D" cardiac imaging

B. Ohnsorge', T. Fohr, C.R. Becker2, A. Kneiz1, A.F. Kopp2, M.F. Reiser1, 'Forchheim/DE, 'Munich/DE, 'Tübingen/DE

Purpose: We developed a new method for cardiac investigations with retrospectively ECG-gated spiral scanning for a new 4-slice system. Scan and reconstruction techniques are optimized in order to provide motion-free 3D images in select­able heart phases.

Methods and materials: 3D volume data is reconstructed with 250 ms temporal resolution using advanced spiral algorithms including motion artifact suppression. Using retrospective ECG-gating, data segments are shifted incrementally along the diastolic phase for accurate volume quantification of coronary plaques for all clinically relevant pulse rates. Spiral scanning with 1 mm slices and sub-millimeter reconstruction increment can provide isotropic volume data within a single breath-hold for high resolution 3D-imaging of the coronary arteries and functional evaluations.

Conclusion: Our results indicate the potential of multi-slice cardiac CT to reliably and reproducibly detect coronary calcium and to open up new applications such as high resolution coronary CT angiography and 4D functional diagnosis.

1213 14:50

Automatic system for the detection of calcifications of coronary arteries in EBCT- and spiral-CT scans

P.G. Kriener1, J. Hiltiner1, J. Holstein1, M. Fatih2, B. Reusch1, D.H.W. Grönemeyer1; 'Bochum/DE, 'Dortmund/DE

Purpose: Automatic detection and evaluation of calcifications of coronary arteries in EBCT- and Spiral-CT-scans

Material/methods: Automatic detection, classification and scoring of calcifications in coronary arteries are important for reproducible and objective results. Also for screening the automatic evaluation of radiological images is desirable. To minimize the stress for the patient the duration of such imaging methods should be as short as possible. A computed system for viewing and evaluation images provided by electron-beam-computed-tomography (EBCT) and by spiral-CT has been developed in cooperation between physicians and computer engineers.

Results: This system is able to deal with vague and fuzzy knowledge. Human experts can describe searched structures in colloquial language, which can be interpreted by the computer system. This knowledge is stored in a knowledge base, which can be adapted and extended, by the physician without changing the program. Different tests have proved the feasibility of such a system to detect calcifications, to localize them according to the segmentation of the American-Heart-Association and to calculate the Agatston-score.

Conclusions: In future the knowledge base must be extended with more expert knowledge and special cases according to the variability of the vessel system. Aim is not the replacement but the support of the physician.

1214 14:55

Contrast-enhanced magnetic resonance coronary angiography: First experiences using an albumin bound contrast agent in humans

M. Regenfus, D. Ropers, S. Achenbach, W.G. Daniel, W. Moshage; Erlangen/DE

Purpose: Contrast-enhanced magnetic resonance (MR) angiography permits visualization of coronary arteries. But MR contrast agents as gadopentetate dimeglumine (Gd-DTPA) could only be used for first-pass studies because of their rapid redistribution into extracellular space. We investigated whether a MR contrast agent, gadobenate dimeglumine (Gd-BOPTA) with a transient albumin binding, might enhance image quality of MR coronary angiography.

Methods & materials: 40 patients underwent MR coronary angiography on a 1.5 T scanner using ECG-triggered 3D gradient-echo sequences. Coronary arteries were visualized using both navigator-echo based respiratory gating (TR/TE 7/4/
2) and a breath-hold technique (TR/TE 4/1.6) in 20 patients for each technique. 0.2 ml/kg was administered for both Gd-OTPA and Gd-BOPTA for each patient. Quantitative image analysis was performed by determination of signal-to-noise-ratio (SNR) and contrast-to-noise ratio (CNR) of coronary arteries.

**Results:** As for the navigator technique SNR and CNR were significantly improved by Gd-BOPTA in comparison to Gd-OTPA. In contrast, SNR and CNR for breath-hold imaging was not heavily improved.

**Conclusion:** Gd-BOPTA does enhance image quality in MR coronary angiography especially for respiratory gated techniques with longer acquisition times. For breath-hold imaging with short acquisition times there is no significant improvement in comparison to current MR contrast media.

**1215 15:00 Multidetector-row CT for the noninvasive detection of occlusions and high-grade coronary artery stenoses**

A.F. Kopp, C. Georg, S. Schröder, B. Ohnesorge, Tübingen, DE, Forchheim, DE

**Purpose:** Reliable noninvasive assessment of coronary-artery stenoses would constitute an advantage in the care of patients with CAD. With the new multislice technology it is possible for the first time to scan the heart with 1 mm slices during one breathhold. The purpose of this study is to evaluate this new technology for CT angiography of the coronary vessels.

**Method/materials:** 15 patients with suspected coronary artery stenoses underwent contrast-material-enhanced multislice CT of the heart following conventional coronary angiography as a gold standard. 3D volume data of the spiral acquisition was reconstructed with 250 ms temporal resolution applying advanced spiral algorithms, STS-MIP reconstructions, shaded surface displays (SSD), curvilinear MPRs, and volume-rendered images were generated to display the coronary arteries. In addition, virtual endoscopies of the coronary arteries were generated.

**Results:** Dedicated cardiac spiral 4-slice scanning with 1 mm slice-width covers the heart volume in less than 25 s. With 250 ms temporal resolution and overlapping image reconstruction, 3D images free of motion artifacts are obtained. The z-resolution is significantly improved compared to electron beam CTA. The combination of various postprocessing techniques (MPR, MIP, VRT) yielded the highest sensitivity for hemodynamically relevant stenoses.

**Conclusions:** Our first clinical results indicate that multislice cardiac CT can provide CTA of the coronary arteries of unprecedented quality. A clinical study to evaluate the sensitivity and specificity for depiction of hemodynamically relevant stenoses in comparison with cardiac catheterization in a large population is on its way.

**1216 15:10 Contrast enhanced electron beam CT: Assessment of coronary artery stenoses. A comparison of volume rendering and surface rendering 3D reconstructions**

A. Hübner, B.V. Ruckmann, A. Leber, C.R. Becker, K. Nikolaou, A. Knez, U.J. Schepf, R. Bruning, R. Habert, M.F. Reiser, Munich, DE

The purpose of the study was to investigate the value of Volume Rendering (VR) and Surface Rendering (SR) 3D Reconstructions of data sets obtained from contrast enhanced electron beam CT. The image quality and the diagnostic accuracy in comparison with conventional coronary angiography was analyzed. Fifty-two patients with proximal coronary artery stenosis underwent electron beam CT. Visualization of the main coronary arteries was analyzed after VR and SR 3D reconstructions for different coronary artery segments. Both reconstruction methods were compared with a 6-Point grading system. Two independent, blinded observers evaluated the VR and SR reconstructions for detection of hemodynamically significant stenosis.

The mean image quality scores for the proximal, middle and distal segments of the coronary arteries were 3.80, 3.01 and 1.33 for VR and 3.02, 2.16 and 0.75 for SR. For the assessment of coronary artery stenoses sensitivity was 52 % and specificity was 72 % for VR and respectively 58 % and 73 % for SR after evaluation by two observers.

Volume Rendering is a fast 3D-reconstruction method for the continuous visualization of coronary arteries from multiple views without previous segmentation, which shows a higher image quality than surface rendering, but a lower sensitivity in detection of stenosis.