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Abstracts

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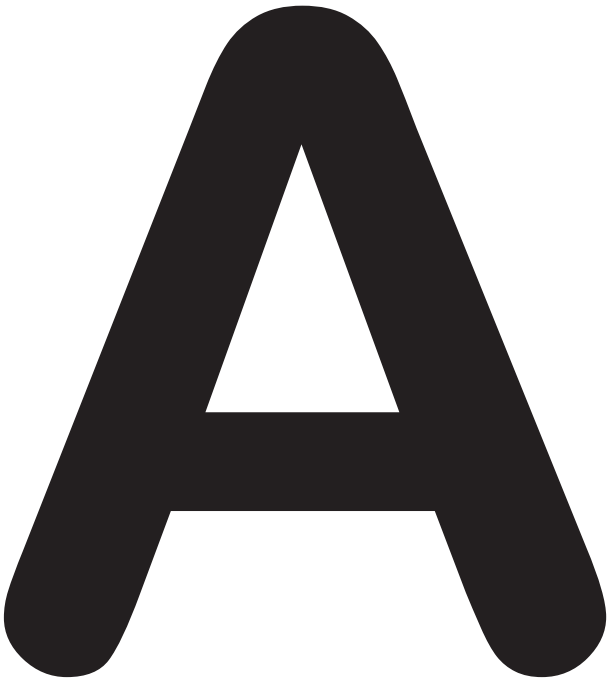

Postgraduate Educational Programme

Categorical Courses (CC)
EFOMP Workshop (EF)
ESR Audit Session
ESR meets Sessions (EM)
European Excellence in Education (E^3)
Honorary Lectures (HL)
Joint Session of ESR and EC (European Commission)
Mini Courses (MC)
Multidisciplinary Sessions (MS)
New Horizons Sessions (NH)
Opening Lecture (OL)
Professional Challenges Sessions (PC)
Refresher Courses (RC)
RTF - Radiology Trainees Forum (TF)
Special Focus Sessions (SF)
State of the Art Symposia (SA)

Thursday, March 4

14:00 - 15:30 **Room E2**

Interactive Teaching Session

E³ 120

Imaging in common clinical problems: Soft tissue tumors

Moderator:
R. Arkun; Izmir/TR

A-001 14:00

Imaging in common clinical problems: Soft tissue tumors

J.L. Bloem[1], A.M.A. de Schepper[2]; [1]*Leiden/NL*, [2]*Antwerp/BE (j.l.bloem@lumc.nl)*

Imaging is essential in diagnosis, grading, staging, and therapy monitoring of soft tissue tumors. Typically, a patient presents with a clinically detected soft tissue lump. In a general practice, benign tumors and tumor-like lesions are 100 times more frequent than malignant ones. This makes US a cost-effective first imaging method. Normal variants, non-neoplastic lumps (cysts, pos-traumatic lesions, muscle herniation) and benign lesions (subcutaneous lipoma) can often be diagnosed. US is also used to guide needle sampling for cytology or histology. If the lesion does not allow a specific US diagnosis, is larger than 3 cm, and/or is located deep to the fascia, low threshold MR is indicated. Dynamic Gd-enhanced MR has the highest accuracy (80-90%) in differentiating (grading) benign from malignant lesions. Benign lesions often have specific signs allowing a tissue specific MR diagnosis with high sensitivity (75%). A tissue specific diagnosis often cannot be made in malignant lesions (sensitivity 37%). Criteria for malignancy are: no tissue specific benign diagnosis can be made, size > 3 cm, located deep to fascia, liquefaction, early peripheral enhancement, inhomogeneous SI on T1 weighted images. Educational cases will be staged during the session, addressing concerns of surgeons. Parameters that are useful or worthless in monitoring therapy and detecting recurrences will be demonstrated in typical cases.

Learning Objectives:

1. To know when and how to use US and MR in making a tissue specific diagnosis.
2. To be able to use imaging criteria in differentiating benign from potentially malignant soft tissue tumors with high accuracy (grading).
3. To learn how to use MR in staging, monitoring therapy and detecting recurrence.

16:00 - 17:30 **Room B**

Radiology of the Spine in 2010

CC 216

Back to basics: Protocols for the spine

Moderator:
I. Cravo; Lisbon/PT

A-002 16:00

A. The role of the plain films

J.-L. Drapé; *Paris/FR (jean-luc.drape@cch.aphp.fr)*

Plain films of the spine remain widely performed. Radiologists must be aware of the quality criteria, diagnostic value and limitations of spinal plain films. Radiographs are most often the first imaging examination in a patient with clinical symptoms (pain, radiculalgia) related to the spine. Radiographs still play an important and preliminary role as an easy screening tool in degenerative disk disease. They are cheap, universally available, and offer a good panoramic view of the lumbar spine, adding meaningful details on bone structures and the stability of the spine. Functional dynamic radiography remains the gold standard for the assessment of lumbar instability. Because of its simplicity, low cost, and availability, functional flexion-extension radiography is the most thoroughly studied and the most widely used method in the imaging diagnosis of lumbar intervertebral instability. Full spine radiographs are mandatory in patients with scoliosis. In seronegative spondyloarthropathies, spinal radiographs remain useful; however, they are unable to detect early inflammatory changes of the spinal entheses, which are important for establishing a diagnosis and treatment without delay. In a patient with cervical spine trauma, plain films are of limited value and the analysis of the craniovertebral junction and upper cervical spine is often very difficult. For the diagnosis of myeloma, spinal metastases and spinal tumors plain films are complimentary to MRI and CT and basically play a much less significant role because of a lack of sensitivity. Radiographs are also of limited value in the early diagnosis of a spinal infection.

Learning Objectives:

1. To be knowledgable about normal and abnormal findings on plain films of the spine.
2. To become familiar with the most common “pitfalls” in reading plain films of the spine.

A-003 16:30

also EPOS

B. CT protocols for the spine

B. Tins; *Oswestry/UK (Bernhard.Tins@rjah.nhs.uk)*

CT is the examination of choice for the assessment of the bone structure of the spine. It is fast and tolerated by almost every patient. The choice of imaging parameters and also the reconstruction algorithm and the mode of display can make a significant difference to the perceived image quality and diagnostic accuracy. While generally a robust imaging method, artefacts can occur in CT imaging. In particular, movement artefact and streak artefact can cause a problem for image interpretation. Ways to minimize or limit these artefacts will be discussed. Generally improvement in image quality results in an increased radiation dose and longer imaging times. Depending on the clinical question, the imaging parameters should be varied accordingly. Usually, a common sense approach is all that needed to make CT imaging of the spine a relatively simple and highly reliable examination.

Learning Objectives:

1. To describe state-of-the-art CT protocol for the spine.
2. To become familiar with technical factors (acquisition, reconstruction) and parameters for CT examinations of the spine.
3. To recognise artifacts and errors in analysing CT of the spine.

A-004 17:00

C. MR protocols for the spine

J. Hodler; *Zurich/CH*

MR imaging of the spine is commonly performed with a number of different indications. Accordingly, imaging protocols vary. Most protocols include T1- and T2-weighted spin-echo sequences in the sagittal plane, T2w (often also T1w) images in the transverse plane or a plane angled into the disk spaces. Coronal images may be obtained for imaging of scoliosis, the atlanto-occipital and the sacral regions. Angled sagittal images may assist in the evaluation of the intervertebral foramen in the cervical spine. STIR sequences are employed for sensitive detection of radiologically occult fractures, screening for metastasis and infection and for grading in systemic inflammatory disease. Gradient-echo sequences are most commonly used in the cervical spine, often with T2*-weighting, in order to deal with flow artefacts and to obtain 3D data sets. Gadolinium-containing contrast is typically indicated in infection and neoplasm. Other types of contrast material such as USPIOs are not commonly reported but may contribute to the diagnosis in equivocal cases. Whole-body MR imaging has become more easily available due to multichannel scanners and dedicated software. There is an increasing role for such imaging in detection and staging of inflammatory diseases such as ankylosing spondylitis. Diffusion-weighted imaging appears to be promising in differentiating neoplastic from non-neoplastic fractures. Spectroscopy has rarely been employed for imaging of paraspinal muscles and may rather be of scientific interest.

Learning Objectives:

1. To become familiar with the latest MR techniques in MR imaging of the spine.
2. To implement fast and robust clinical MR protocols for comprehensive assessment of the spine.
3. To define the role of contrast media in evaluation of the spine.

16:00 - 17:30 **Room C**

Special Focus Session

SF 2

Optimal imaging of muscle pathology

Moderator:
C. Martinoli; Genoa/IT

A-005 16:00

Chairman's introduction

C. Martinoli; *Genoa/IT (carlo.martinoli@libero.it)*

Muscle imaging is inherently complex and presents unique morphologic challenges and continuing integration of dynamic, physiologic and functional capabilities as imaging technology progresses. After an overview of the most advanced techniques for morphologic and functional imaging of the skeletal muscle, such as whole body MR imaging, 23Na MR imaging, metabolite quantification in MR spectroscopy and contrast-enhanced ultrasound, this session will be focused on the optimal use of modern imaging in a variety of muscle disorders, including sport-related conditions, tumours and non-neoplastic masses, ischemic and inflammatory diseases. Speakers will present critical views on the various imaging modalities, to find the strengths and the weaknesses of the techniques, and will embrace controversial issues regarding the diseases or the technology. In doing so, this session will help to understand the appropriate place of modern imaging in the clinical management of patients with muscle disease. At the end, a panel discussion will give the occasion to draw perspectives and expectations for muscle imaging between morphology and function, and to provide an outlook to the future in this field.
Session Objectives:

1. To provide an overview of the state-of-the-art imaging of muscle pathology.
2. To learn about functional, dynamic, contrast-based and other new techniques imaging of muscles.
3. To review the clinically relevant features of muscle imaging.

A-006 16:03

Advanced techniques in MRI and functional imaging of muscle, dynamic ultrasound and contrast agents

M.-A. Weber; *Heidelberg/DE (MarcAndre.Weber@med.uni-heidelberg.de)*

Imaging of skeletal muscles has seen considerable advances in recent years regarding both morphological as well as functional imaging techniques. Regarding morphology, the advent of whole-body MRI has rendered the possibility to screen the whole skeletal muscle system for muscles with oedematous changes in suspected myositis to which a biopsy should be guided in order to reduce the sampling error. Functional MR methods are available that can visualize different aspects of muscular (patho)physiology, such as muscular sodium (Na^+) homeostasis using ^{23}Na MRI, muscular energy and lipid metabolism using ^{31}P and ^{1}H MR spectroscopy. ^{31}P MR spectroscopy also allows for quantification of the myocellular pH value. ^{23}Na MRI has demonstrated its usefulness in the diagnostic work-up and management of patients with muscular Na^+ channelopathies, where a myocellular Na^+ overload that causes muscle weakness can be quantified. Besides MRI, contrast-enhanced ultrasound (CEUS) methods have also been introduced that can quantify muscular microcirculation at rest and even during exercise using a second generation contrast agent. Using this CEUS method, the influence of different exercise intensities on the microcirculation of the exercising muscle becomes detectable. Also, CEUS is more efficient in the diagnostic work-up of suspected myositis than classic greyscale ultrasonography, because CEUS can detect the inflammatory-induced muscular hyperperfusion in acute myositis. It becomes obvious that modern muscular imaging techniques offer deeper insights in muscular (patho)physiology than just detecting unspecific myopathic manifestations like oedematous or lipomatous changes, hyper- or atrophy.
Learning Objectives:

1. To learn about recent MRI and US methods for assessing skeletal muscles.
2. To appreciate the abilities of these methods in normal and diseased skeletal muscles.
3. To understand the limitations of these methods.

A-007 16:23

Sports-related muscle injuries: Temporal changes and when to return to play

D. Connell; *Stanmore/UK (davidconnellrad@gmail.com)*

A thorough understanding of muscle anatomy and basic pathophysiology is essential for imaging interpretation. Muscle fibres (myofibrils) usually tear away from connective tissue elements, either the surrounding epimysial fascial covering or from the central tendon slip. This may result in a gap or defect within the muscle with the formation of oedema and blood fluid products. Recognising muscle injury and discriminating central tendon injury from epimysial tears is important. It is also important to exclude tendon-bone avulsion from muscle strain. Temporal changes following muscle injury follow an orderly pattern and can be observed with both MRI and ultrasound. Changes include the resolution of blood fluid products, decrease in oedema and the formation of scar tissue. The superior contrast resolution of MRI makes it a better modality for detecting the formation of granulation and maturing scar tissue. Despite the player becoming rapidly asymptomatic, pathologic changes continue for some time. Complications of muscle healing include chronic haematoma and myositis ossificans. A weak predictor of return to sporting activity is the amount of haematoma. More reliable predictors of return to play include the craniocaudal length and cross-sectional area of the muscle tear. Muscles healing involves scar formation which in turn limits the ability for the muscle to passively stretch, and places additional stress on adjacent muscle fibres predisposing to further injury. Risk factors for recurrent injury have been identified and these include a previous tear greater than 60 mm in craniocaudal length and a past history of an ACL sprain.
Learning Objectives:

1. To understand the appearance of muscle injury in US and MR imaging.
2. To provide information on how to assess severity and prognosis.
3. To estimate the time it takes for an athlete to return to play and to modify the rehabilitation regimen based on imaging findings.

A-008 16:43

Ischemic and inflammatory conditions: What we can see and what is important for the clinician

A. Cotten; *Lille/FR (acotten@chru-lille.fr)*

Inflammatory conditions of muscles are uncommon. These disorders include the three main types of chronic, or persistent, inflammatory myopathy: polymyositis, dermatomyositis and inclusion body myositis. Myositis can also be found in other autoimmune, granulomatous, vasculitic, and systemic disorders. The diagnosis may be highly suggested by the clinical and biological features and imaging is therefore used for the assessment of the extent and number of lesions, and for determining the right site for biopsy. However, the clinical and biological presentation of these disorders may be unusual. In these cases, ultrasound and MRI may represent a useful complementary diagnostic tool. Other conditions can be associated with imaging features that may mimic the appearance of myositis; the usefulness of imaging for differentiating these disorders will be presented. Muscle infarction, which is a rare complication of diabetes mellitus, will also be described.
Learning Objectives:

1. To learn about the main ischemic and inflammatory conditions of the muscles.
2. To understand the potential and limitations of US and MRI in the assessment of such disorders.
3. To consolidate knowledge of the clinically important imaging features.

A-009 17:03

Muscle tumors, non-neoplastic masses and mimickers: How to differentiate

K. Wörtler; *Munich/DE (woertler@roe.med.tum.de)*

Intramuscular tumors represent a large group of deep soft-tissue masses which comprises benign neoplastic and non-neoplastic (tumor-like) lesions as well as malignant neoplasms. Lipoma, hemangioma, myositis ossificans, myxoma, and intramuscular ganglion represent the most important benign muscle tumors. The differential diagnosis of malignant intramuscular masses includes different soft tissue sarcomas (myxofibrosarcoma/MFH, fibrosarcoma, liposarcoma, leiomyosarcoma, rhabdomyosarcoma, Ewing sarcoma/PNET), metastases, and lymphoma. Hematomas, foreign bodies, parasites, and anatomic variants can mimic intramuscular neoplasms. The presentation of patients with a soft-tissue mass is often rather unspecific. Clinical features, like sex and history of the patient, previous trauma, duration of symptoms, and pain, have not proved to be useful in discrimination of benign and malignant lesions. Imaging evaluation is therefore crucial for further management. As a general guideline, biopsy should be performed in any mass lesion which cannot be specifically diagnosed by imaging. This course reviews the

radiologic appearance of important intramuscular masses with an emphasis on MR imaging. Findings which allow for a specific diagnosis will be highlighted on the basis of pathologically confirmed cases.
Learning Objectives:
1. To become familiar with differential diagnosis of intramuscular soft tissue masses.
2. To learn about the radiologic approach to the diagnosis of tumors and tumor-like lesions of muscles.
3. To recognise typical morphologic features of important entities.
4. To understand the importance of biopsy in cases with non-specific imaging findings.

Panel discussion:
An outlook to the future: Muscle imaging between morphology and function 17:23

16:00 - 17:30 **Room D**

Imaging in Lung Diseases

CC 218

COPD: A disorder of the respiratory and cardiovascular systems

Moderator:
E.E.J.G. Coche; Brussels/BE

A-010 16:00

A. New facets of an old disease
A.A. Bankier; *Boston, MA/US (abankier@bidmc.harvard.edu)*

Chronic Obstructive Pulmonary Disease (COPD) comprises a group of disorders whose severity is graded along the decrease of the forced expiratory value in 1 second (FEV1), according to the Global Initiative for Obstructive Lung Disease (GOLD) classification. Although they share this common albeit potentially artificial definition, the diseases summarized under the umbrella COPD are heterogeneous in nature, have different underlying causes, and require different approaches to diagnosis and therapy. This presentation will summarize the historical background of terminology and classification of COPD. It will further describe the individual diseases and emphasize their common and distinguishing factors. The presentation will present imaging algorithms for the assessment of both individual diseases and the overall imaging assessment of COPD. Finally, the presentation will discuss the importance of phenotyping and objective disease quantification in the imaging assessment of COPD.
Learning Objectives:
1. To learn about evolving comprehension of COPD over the past three decades.
2. To understand the lung parenchymal, bronchial, and vascular contributors to pathophysiology, imaging and clinical presentation of COPD.
3. To introduce novel integral diagnostic approaches to this complex disease, including the imaging contributions to phenotyping patients with COPD.

A-011 16:30

B. Morphology and function with CT: Myth or reality?
M. Rémy-Jardin; *Lille/FR (mremy-jardin@chru-lille.fr)*

Chronic obstructive pulmonary disease (COPD) is a disease defined by irreversible airflow limitation with variable contributions of airway obstruction and parenchymal destruction, both accurately evaluated with thin-section volume. The spectrum of morphologic and functional evaluation of COPD with CT has recently been enlarged to the cardiovascular system, at the level of which specific lesions or functional alterations can be depicted, provided that CT examinations have been acquired with ECG gating. New options have been recently introduced with dual energy CT offering the possibility to generate morphological and functional information from the same examination. Because the severity of lung destruction and the distribution of lung perfusion determine the functional consequences of emphysematous changes, great attention has also been directed towards the analysis of lung perfusion alterations. As previously achievable with single-source CT, dual energy CT can provide thin-collimated high-resolution CT images that can be used to detect and characterise emphysema as well as to quantify its severity. From the same data set, it is also possible to provide information on the amount of iodine in the most peripheral parts of the pulmonary arterial bed, often referred to as «lung perfusion imaging», from which it is possible to identify links between the severity of parenchymal destruction and the degree of lung perfusion alteration. Moreover, dual energy CT can also approach lung ventilation, as recently investigated with the inhalation of xenon. The purpose of this lecture is to review the practical approach of these combined evaluations in COPD patients, demonstrating the reality of their clinical implementations in 2010.
Learning Objectives:
1. To consolidate knowledge of clinicians' expectations of functional information in the management of respiratory patients.
2. To learn about the most recent technological developments in multidetector-row CT (MDCT) enabling integration of morphology and function from the same examination.
3. To review the practical scanning protocols and the functional parameters that can be derived from MDCT examinations.

A-012 17:00

C. Functional MRI
H.-U. Kauczor; *Heidelberg/DE (hans-ulrich.kauczor@med.uni-heidelberg.de)*

MRI of the lung has significant potential beyond the mere visualization of structure by providing comprehensive information about "function", i.e. ventilation, respiratory mechanics, perfusion, and hemodynamics. Regional ventilation can be assessed by oxygen-enhanced proton MRI or in a more sophisticated way by the inhalation of hyperpolarized noble gases. Oxygen and ^{129}Xe help to assess gas exchange, whereas ^{3}He and ^{129}Xe will also address ventilation distribution ("alveolar filling time") and pulmonary microstructure. Dynamic proton MRI during tidal and forced breathing is well suited to investigate hyperinflation, diaphragmatic and rib cage geometry as well as breathing pattern and mechanics. Even paradoxical motion and effects of lung volume reduction surgery can be assessed. Dynamic contrast-enhanced MR perfusion allows for a high diagnostic accuracy in detecting perfusion abnormalities as they occur in COPD due to hypoxic vasoconstriction. Delayed, collateral or systemic perfusion can be measured by the "capillary filling time". MR perfusion ratios correlate well with radionuclide perfusion scintigraphy ratios and regional analysis can be achieved. Hypoxic vasoconstriction will lead to pulmonary hypertension and cor pulmonale. MR-based assessment is important as COPD patients with pulmonary hypertension have a poor prognosis and they need adequate treatment, including pulmonary vasodilators. MR will identify increased right ventricular volumes, decreased right ventricular function, and impaired left ventricular diastolic function. The general availability of MRI of the lung for advanced COPD is envisaged. The clinical impact will grow by increasing options for interventional regional treatment. Functional MRI might be complemented by structural CT-based phenotyping.
Learning Objectives:
1. To review the current MRI possibilities in lung functional imaging.
2. To envisage the expected developments and their clinical impact.
3. To describe the complementary roles of MRI and MDCT in providing functional information.

16:00 - 17:30 **Room E1**

Abdominal and Gastrointestinal

RC 201

Gastroesophageal cancer: Is modern imaging accurate enough?

Moderator:
F.-T. Fork; Malmö/SE

A-013 16:00

A. Role of US, EUS and CEUS
S. Roberts; *Cardiff/UK (Ashley.Roberts@CardiffandVale.wales.nhs.uk)*

The incidence of adenocarcinoma of the oesophagus and gastro-oesophageal junction (GOJ) has increased rapidly over the past 20 years, although squamous cell carcinoma (SCC) remains the commonest worldwide. Imaging has a major role in pre-treatment staging. We perform MDCT primarily to exclude distant metastases, then local staging with endoscopic ultrasound (EUS) and PET/CT to further exclude metastatic disease. This lecture will mainly focus on EUS with some discussion of the role of transcutaneous (US) and contrast enhanced ultrasound (CEUS). T1 -invades lamina propria/submucosa; T2 -invades muscularis propria (MP); T3-through MP; T4 -invades adjacent structures; N0/N1-loco-regional lymph nodes; M1a-distant lymph node metastases; M1b-distant metastases; GOJ tumours-Siewert I/II/III (Siewert III -gastric TNM). EUS requires a dedicated endoscope, including a slim probe for

stenoses. At 5-12 MHz, the five-layered gut wall correlates well with histology. The 4th (hypoechoic) layer represents MP, and tumour relationship to this provides a pre-operative T stage. Malignant nodes are defined by size, structure, margins and shape. EUS FNA improves specificity. Surgery has no impact on survival in EUS-defined T4 disease. Patients who have non-curative surgery have poor quality of life. EUS assists radiotherapy and surgical planning. US: Neck US ± FNA can be used in SCC. CT PET has diminished this practice, but FNA can confirm malignancy. CEUS: Occasional problem solver for equivocal liver lesions. CE EUS has been disappointing. Conclusion: Despite improvements in MDCT, MRI and PET/CT, EUS with EUS FNA retains a pivotal role in the management of oesophageal and gastrooesophageal cancer.

Learning Objectives:

1. To review the imaging modalities used in the staging of esophageal and esophagogastric junction cancer.
2. To discuss pragmatic staging algorithms according to the availability of these modalities.
3. To explore the importance of imaging in planning the delivery of treatment.

A-014 16:30

B. Role of CT and MRI

E.J. Rummeny; *Munich/DE (rummeny@roe.med.tu-muenchen.de)*

In general, both multidetector row computed tomography (MDCT) and MR-imaging (MRI) may be used for detection and staging of gastroesophageal cancer. However, since MDCT is faster and easier to perform it is still the preferred cross-sectional imaging technique. During this course, we will discuss the techniques used for MDCT and MRI to image patients with suspected cancer of the esophagus and/or the stomach. We will show how MDCT combined with air and water distension improves the capability of local preoperative staging and we will also review data for T- and N- staging. New techniques like MPRs may improve accuracy of staging even further as compared to transverse images. Furthermore, it can be shown that MDCT and MRI provide additional information on tumor depth and extragastric tumor spread. It will also be demonstrated how these techniques may be used for response evaluation after chemotherapy and radio-chemotherapy. As we could show in the literature, volumetry based on MDCT data can help to predict early response to treatment 2 weeks after the initiation of neoadjuvant chemotherapy in patients with esophageal cancer, while the classic approach of tumor diameter measurement shows no correlation with histopathological tumor regression. In general, we will discuss if MDCT and /or MRI can be used as primary tools for pre- and postoperative staging and follow-up in patients with gastroesophageal cancer.

Learning Objectives:

1. To describe how CT and MRI should be performed if esophageal and esophagogastric junction cancer is suspected.
2. To discuss the accuracy of these imaging modalities for staging.
3. To compare the use of CT and MRI in response evaluation after chemotherapy and radiation with other imaging modalities.

A-015 17:00

also EPOS

C. Role of PET/CT

W.L. Wong; *Northwood/UK (wailup.wong@stricklandscanner.org.uk)*

Drawing from a survey of the literature, the established role of FDG PET/CT in the assessment of patients with gastroesophageal cancer will be considered. The FDG PET/CT appearance of gastroesophageal cancer will be illustrated and the strengths and limitations of FDG PET/CT for the evaluation of gastroesophageal cancer will be highlighted.

Learning Objectives:

1. To demonstrate the typical imaging findings of PET/CT in GOJ cancer.
2. To discuss the accuracy of PET/CT in imaging GOJ cancer.
3. To describe the role of PET/CT in the management of GOJ cancer.

16:00 - 17:30 **Room E2**

Interactive Teaching Session

E³ 220a

Imaging in common clinical problems: Hematuria

Moderator:
W. Szmigielski; Doha/QA

A-016 16:00

Imaging in common clinical problems: Hematuria

J.J. Fütterer[1], R.H. Oyen[2]; [1]*Nijmegen/NL*, [2]*Leuven/BE (j.futterer@rad.umcn.nl)*

At present, once it is established that haematuria is of non-glomerular origin, the imaging modality of choice for imaging is Multi Detector-row Computerised Tomographic Urography (MDCTU). MDCTU has replaced Intravenous Urography (IVU). IVU has a limited role only (in young patients< 40 y - with hematuria) as has ultrasonography in investigating haematuria because of obvious limitations. MDCTU provides superior information on the renal parenchyma of the entire urinary tract in a single examination. Although MDCTU offers a unique tool for the investigation of haematuria, optimizing its role is still under investigation, particularly as there are several variations of examination techniques. These include combinations of phasic acquisitions (ranging from single to multiple, as well as low radiation dose and higher dose techniques) and various other supportive protocols: compression vs. no compression, saline infusion, administration of diuretics, supine and prone acquisitions, timing of acquisitions after intravenous contrast administration and split bolus techniques. In addition, postprocessing algorhythms (including the use of maximum and average intensity projection, as well as 3D-volume-rendered reconstructions), the methods used in analyzing the large number of images, and the radiation dose at the time of examination, all contribute to the final acceptance of this technique by radiologists, urologists and nephrologists. It is most likely that the technique will be more refined and adjusted to the patient and suspected underlying disease process (i.e. tailored MDCTU). Thus, the diagnostic accuracy will improve at a reasonable patient dose.

Learning Objectives:

1. To learn about the indications for CTU.
2. To understand the role of CTU in hematuria.
3. To appreciate the decreasing role of IVU.
4. To become familiar with CTU in routine clinical practice.

16:00 - 17:30 **Room F1**

Interactive Teaching Session

E³ 220b

Commonly missed diagnosis in musculoskeletal conditions

Moderator:
H. Imhof; Vienna/AT

A-017 16:00

Commonly missed diagnosis in musculoskeletal conditions

F. Kainberger[1], K. Bohndorf[2]; [1]*Vienna/AT*, [2]*Augsburg/DE*
(franz.kainberger@meduniwien.ac.at)

Many structures of the musculoskeletal system are prone to overuse and degeneration. Thus, stress-related injuries may mask the clinical appearance of many other entities. Indications for imaging: documentation of the patient's history and the knowledge of certain laboratory findings are of enormous help to differentiate overuse syndromes and arthritis from tumors, infections, vascular diseases, or others. Investigation: with standardized imaging protocols all relevant anatomic areas have to be included for documenting the effects of biomechanical stress, the symmetric manifestation of arthritis, the spread of tumors and infection, or trauma. Interpretation: the anatomic distribution of traumatic and stress-related injuries is influenced by "kinetic chains". Bone marrow or soft tissue edema and many other imaging findings act as footprint patterns for the differential diagnosis. Likewise in inflammatory disorders, the distribution pattern is often characteristic for common and uncommon forms of rheumatic diseases or of infections. In tumors, the structure ("matrix") and their borders are important features. Conclusion: a standardized diagnostic process bases on the analysis of distinct clinical and anatomic patterns. It also includes the recognition of patterns of misinterpretation.

Learning Objectives:
1. To learn about the differential diagnosis between stress injuries, inflammatory processes, necrosis and tumors.
2. To recognise the importance of insufficient consideration of clinical information and symptoms in the interpretation of imaging studies.
3. To recognise the consequences of uncritical imaging requests.
4. To stress the importance of a systematic approach to the interpretation of imaging, particularly radiographs.

16:00 - 17:30 **Room F2**

Breast

RC 202

Breast US

Moderator:
G. Rizzatto; Gorizia/IT

A-018 16:00

A. Ultrasound and BI-RADS

H.M. Zonderland; *Amsterdam/NL (h.m.zonderland@hccnet.nl)*

The BI-RADS lexicon for Ultrasound (US) dates from 2003. Adherence to its descriptors improves specificity. The descriptors shape, margin, boundary and surrounding tissue are most important, but also challenging, sometimes with considerable observer variability. The identification of boundary and surrounding tissue effects is the result of the soft tissue resolution properties of US, in which it is superior to mammography. The effects of a mass on its surroundings such as an echogenic halo, obliteration of the tissue planes and thickening of Cooper's ligaments have a high predictive value of malignancy and can avoid false negative results in otherwise round, oval or well-defined masses. Recent studies suggest that when a lesion is palpable and the US descriptors suggests BI-RADS 3 (probably benign), the likelihood is that it is benign and that the lesion may be managed without biopsy, similarly to non-palpable BI-RADS 3 lesions. The recommendation of follow-up by imaging alone is considered a laudable but difficult goal for many radiologists. Others suggest a negative psychological impact for the patient and prefer biopsy. Also, the guidance role of the multidisciplinary team cannot be denied. Therefore, some choice in recommendations should be acceptable, provided that it is properly worded in the report. The use of BI-RADS based-CAD for US is still in its infancy. It is a lesion analysis tool rather than a detection tool. Studies show mixed results, but even the most experienced reader seems to benefit on occasion from having CAD input during the image interpretation process.
Learning Objectives:
1. To learn how to use BI-RADS lexicon in US.
2. To review the most important pathologic signs.
3. To evaluate the latest advances in US.

A-019 16:30

B. The role of ultrasound in premalignant and benign lesions

I. Leconte; *Brussels/BE (Isabelle.Leconte@rdgn.ucl.ac.be)*

Benign lesions can be divided into cystic and solid lesions. Simple cysts, complicated cysts are classified Bi-Rads 2. It has been reported that clustered microcysts in premenopausal women without any solid component can also be classified Bi-Rads 2. Benign solid or indeterminate nodules may have specific US findings such as pure hyperechogenicity, parallel shape, well-defined margins, and few gentle lobulations. However, the predictive negative value of certain findings is less than 98%. The association of several findings is necessary as well as the absence of malignant finding. Specific benign diagnosis will be reviewed. Frequent premalignant lesions include atypical ductal hyperplasia (ADH), lobular carcinoma in situ (LCIs), radial scar and papilloma. ADH and LCis are incidental findings; so, their US features depend of the underlying lesion. Radial scars contain at least one suspicious finding and are classified at least Bi-Rads 4a. Specific premalignant diagnosis will be reviewed. To increase US specificity, it is necessary to improve US technique by following US guidelines published by ACR. Other technical artifices, like focal compression, are useful. The characterization of the lesions is also improved by the appropriate use of the compound imaging, tissue harmonic imaging and Color Doppler. Elastography seems really promising to reduce the false-positive rate, particularly in case of complicated cyts. Finally, care must be taken to correlate US findings with mammographic and physical examination findings. Furthermore, the final management of the lesion depends on the context, the personal history and the anteriority, when available.

Learning Objectives:
1. To describe the US features.
2. To differentiate between malignant, premalignant and benign lesions on US.
3. To learn how to avoid unnecessary biopsies.

A-020 17:00

C. Axillary tail and US

E.E. Deurloo; *Amsterdam/NL (e.e.deurloo@amc.uva.nl)*

Axillary lymph node status is strongly correlated with prognosis in breast cancer patients: patients without axillary lymph node metastases have a significant better prognosis than patients with axillary lymph node metastases. Nowadays, breast cancer patients with a clinically-negative axilla undergo a sentinel lymph node biopsy (SLNB) to sample the axillary lymph nodes. Ultrasonography of the axilla can be used to detect lymph node metastases prior to surgery in patients with a clinically-negative axilla, thereby reducing the number of (time-consuming and expensive) SLNBs. In ultrasonography of the axilla, the region that is examined is very important: the sentinel node is often located in the lower part of the axilla and can be found as low as the level of the nipple. A high frequency probe is required and ultrasonography should be combined with fine-needle aspiration (FNA). Characteristics of nodes that might differentiate between benign and malignant are: aspect of hilus and cortex, and with less accuracy size or shape. A more reproducible characteristic that can be used is cortex thickness. If a cortex thickness of e.g., 2.3 mm is used as cut-off point to perform FNA, a sensitivity of FNA of 95% can be obtained with a specificity of 44%, meaning that most of the ultrasonographically visible malignant nodes will be detected, and FNA will be performed in about 25% of all patients. Conclusion: Cortex thickness can be used to reduce the number of FNAs on benign nodes, while remaining a high sensitivity.
Learning Objectives:
1. To differentiate between normal and abnormal lymph nodes.
2. To give criteria for abnormal lymph nodes.
3. To describe the best biopsy technique.

16:00 - 17:30 **Room G/H**

Neuro

RC 211

Basic MRI

Moderator:
M.I. Argyropoulou; Ioannina/GR

A-021 16:00

A. Basic techniques and pattern recognition

P.M. Parizel; *Antwerp/BE (paul.parizel@uza.be)*

Diagnostic neuro-imaging procedures play an essential part in the diagnosis, management, treatment and follow-up of patients with lesions of the central nervous system (CNS). The purpose of this presentation is to review basic imaging techniques and to illustrate how pattern analysis contributes to the correct (differential) diagnosis for CNS lesions. The first step is to identify and outline the lesion and to establish its exact topography (anatomical location, intra/extra-axial, supra/infra-tentorial). Changes in tissue density (CT) and signal intensity (MRI) can provide clues to the histological nature (e.g. fat, fluid, gas, blood, etc). Central necrosis and perilesional vasogenic edema are markers of aggressive behavior of lesions. Contrast agents can be used to assess lesion vascularity or to detect blood-brain-barrier breakdown. Perfusion-weighted imaging provides information regarding the microvasculature (angiogenesis) of tissues and tumors, as well capillary permeability. Diffusion-weighted imaging, including diffusion tensor imaging and tractrography, provides information about the ultra-structural organisation of tissues and lesions at a cellular level. Magnetic resonance spectroscopy yields an insight into the biochemical composition of lesions and can be used in diagnosis and post-treatment follow-up. At the end of the lecture, we shall provide examples of typical disease patterns in CNS diseases, many of which can be associated with specific symbols. In summary, thanks to improvements in equipment, both hardware and software, a comprehensive multimodal neuro-imaging protocol provides not only anatomical images, but also gives information regarding tissue characteristics and contributes to the detection and biological characterization of CNS lesions.
Learning Objectives:
1. To present a comprehensive overview of basic MRI techniques in the detection, characterisation and follow-up of CNS lesions.

2. To illustrate how to correlate MRI signal intensity changes with biochemical and pathological findings.
3. To demonstrate how to use anatomic location in CNS lesion characterisation (intra vs extra-axial, supra- vs infratentorial).
4. To show how to use an analytic pattern recognition approach for differential diagnosis of CNS lesions.

A-022 16:30

B. New MR sequences in daily practice

R. Gasparotti; *Brescia/IT (gasparo@med.unibs.it)*

MR imaging of the brain and spine is experiencing continuous progress in the development of new sequences, which have significantly improved the diagnostic approach in several diseases in daily practice. Demonstration of hemosiderin has relied for a long time on T2* gradient echo images, which were characterized by low spatial and contrast resolution. Susceptibility-weighted imaging (SWI) is a new neuroimaging technique, based on high-spatial resolution 3D gradient-echo sequences with phase postprocessing, which uses tissue magnetic susceptibility differences to generate a unique contrast, different from that of T1, T2, and T2*. Due to its sensitivity in the detection of intravascular venous deoxygenated blood as well as extravascular blood products, 3D SWI has been successfully applied to stroke, head trauma, vascular malformations, cerebrovascular and neurodegenerative disorders. Diffusion tensor imaging (DTI) has become a research tool in almost any field of neurosciences. In daily practice, DTI can be applied to study brain and spinal cord tumors and cavernous malformations, where a thorough display of white matter fibers is crucial for surgical planning. Conventional MR imaging has not been an effective method for imaging the brachial plexus, due to its complex anatomy and low contrast resolution between nerves and muscles. A new MR neurography technique has been recently developed, consisting of 3D T2 turbo-spin-echo (TSE) sequences with short-term inversion recovery (STIR) and variable flip angle RF excitations (SPACE), with isotropic voxels, which allow multiplanar reconstructions along roots, trunks and cords. Clinical applications are represented by traumatic and immune brachial plexopathies, thoracic outlet syndrome.

Learning Objectives:

1. To become familiar with the new MR sequences for the investigation of brain and spine lesions.
2. To learn the essential features of the new MR sequences.
3. To illustrate specific indications for the new MR sequences in brain and spine imaging.
4. To discuss the impact of the new MR sequences on the clinical diagnosis.

A-023 17:00

C. Diffusion tensor imaging: Basic tool for radiologists?

S. Lehéricy; *Paris/FR (stephane.lehericy@psl.aphp.fr)*

Diffusion-weighted imaging (DWI) is sensitive to the random motion of water molecules in the brain. Measures of water diffusivity from DWI provide estimates of the microstructural integrity of the brain parenchyma. Diffusion tensor imaging (DTI) can also detect the directionality of molecular diffusion in the white matter. The directionality dependence of diffusion is called anisotropy and is measured using indices such as fractional anisotropy. In the white matter, diffusivity predominates along the direction of fiber bundles. By following the main direction of diffusion along the tracts, tractography allows the reconstruction of fiber bundles in humans in vivo. DTI has several applications in brain pathology, such as preoperative localization of fiber bundles, the evaluation of brain damage in patients with traumatic brain injury, and the detection of pathology in specific white matter fiber bundles. In this presentation, the basics of diffusion tensor imaging and fibre tracking and the main clinical applications of DTI in radiological practice will be presented as well as a practical guide on how to reconstruct major fibre bundles in the brain.

Learning Objectives:

1. To understand the basics of diffusion tensor imaging and fibre tracking.
2. To know the main clinical applications of DTI in radiological practice.
3. To learn how to reconstruct major fibre bundles in the brain.

16:00 - 17:30 **Room I**

Vascular

RC 215

Diseases of the visceral arteries

Moderator:
M.I. Furmanek; Warsaw/PL

A-024 16:00

A. Renal vascular disease

D. Vorwerk; *Ingolstadt/DE (dierk.vorwerk@klinikum-ingolstadt.de)*

Renal angioplasty meanwhile has developed into a standardized technique using primary stenting in ostial lesions and angioplasty and or stenting in distal lesions. Miniaturization of instruments allows a less traumatic single side approach as well as transbrachial or transradial access depending on the renal arterial anatomy. Technical success is high and acute complications relatively low. However, problems of cholesterol embolization following PTRA are still poorly understood. Patients with fibromuscular dysplasia usually benefit from renal angioplasty concerning their blood pressure. Patients with atherosclerotic disease are not benefitting in the same amount, some also will show deteriorated renal function. Actually, discussion is running high whether both patients with hypertension and/ or renal insufficiency may undergo renal angioplasty as larger randomized studies did not show major improvements compared to medication alone. Shortcomings of studies as well as intrinsic problems on looking on patients with renal artery disease will be discussed.

Learning Objectives:

1. To review the different causes of renal artery stenosis.
2. To discuss the role of Doppler US, CTA and MRA in diagnosis of renal artery stenosis.
3. To become familiar with optimised treatment planning and treatment selection.

A-025 16:30

B. Acute and chronic mesenteric ischemia

R. Uberoi; *Oxford/UK (raman.uberoi@orh.nhs.uk)*

Rapid and accurate diagnosis is vital in mesenteric ischemia and imaging has a major to play. Although, angiography remains the gold standard with the advantage that it also permits possible therapeutic intervention, include administering intra-arterial vasodilators and/or thrombolytic agents and angioplasty with or without stent placement. Imaging has evolved to using non-invasive techniques. Duplex of mesenteric arteries was developed in the late 1980s. Its primary application is to identify high-grade stenoses in mesenteric vessels. A peak systolic velocity of > 275 cm/s in the SMA identifies a > 70% SMA stenosis with a sensitivity of 92%, a positive predictive value of 80% and a negative predictive value of 99%. CTA and contrast-enhanced MRA are excellent non-invasive screening techniques for patients suspected of having mesenteric ischemia. CTA has higher spatial resolution and faster acquisition times, allowing assessment of the peripheral visceral branches and the inferior mesenteric artery with greater accuracy than contrast-enhanced MRA. In addition, in acute ischemia CTA is more widely available with good accuracy for the findings of acute ischemia including bowel wall thickening, portal venous gas, intramural pneumatosis, engorgement of mesenteric veins, loss or increase of bowel wall enhancement, and infarction of other abdominal organs. A sensitivity of 93%, specificity of 100%, and positive and negative predictive values of 100 and 94%, respectively, can be achieved for these CT findings. However, the lack of radiation and iodinated contrast agents make MRA the technique of choice for children and patients with azotemia.

Learning Objectives:

1. To describe the clinical manifestations of acute and chronic mesenteric ischemia.
2. To discuss the role of different imaging modalities in diagnosis of acute and chronic mesenteric ischemia.
3. To demonstrate potential artifacts and pitfalls in non-invasive diagnosis of mesenteric ischemia.

A-026 17:00

C. Imaging before and after liver transplantation

T. Schroeder; *Essen/DE (Tobias.Schroeder@uni-due.de)*

Background: Orthotopic and living donor liver transplantation (OLT, LDLT) are routinely used procedures in the treatment of irreversible end-stage liver disease. Preoperative imaging is important for exclusion of transplantation contraindications in the recipient, assessment of the operation anatomy in living liver donors, and to

avoid donor-recipient mismatch. In particular, accurate preoperative knowledge of hepatic vascular anatomical variants contributes to reduce the incidence of complications during and following transplantation. The main purpose of postoperative imaging is the early detection and characterization of operation complications.
Procedure Details: Earlier pre-harvest evaluation protocols included ultrasound, computed tomography (CT) or magnetic resonance imaging (MRI) for assessment of parenchymal lesions, tumor staging and liver planimetry, catheter angiography (DSA) for the display of the hepatic vascular system, ERCP for assessing the biliary anatomy and liver biopsy for the assessment of hepatic-cellular infiltration. To simplify and shorten such procedures to a minimum, comprehensive "all-in-one" MRI - and Multidetector-CT (MDCT) - protocols have been advocated. Both approaches combine the advantage of minimal invasiveness with simultaneous assessment of the hepatic parenchymal morphology and a detailed analysis of the biliary and vascular anatomy.
Conclusion: The most versatile imaging modality both for the preoperative evaluation process and the postoperative diagnosis of complications is MDCT. Its specific advantages lie in a wide availability and the possibility to evaluate all relevant anatomical components with high reliability within a single diagnostic step. If needed, it also offers the possibility of direct CT-guided intervention (e.g., abscess drainage).
Learning Objectives:
1. To learn about the importance of visualisation of hepatic vasculature prior to liver transplantation.
2. To become familiar with anatomical variants of the hepatic vasculature.
3. To become familiar with typical and pathological findings after liver transplantation.
4. To learn about the treatment strategies before and after liver transplantation.

16:00 - 17:30 **Room K**

Computer Applications

RC 205

Image sharing

Moderator:
A. Abildgaard; Oslo/NO

A-027 16:00

A. Exchange of imaging data with portable media (CD, DVD, USB)
N.H. Strickland; *London/UK*

Exchange of imaging data can be achieved with portable media, but is highly unsatisfactory because it is unreliable, cumbersome and slow. Imaging studies today are mostly very large and should include an associated report as well as the images. Unless the images are in DICOM format, they cannot be adequately manipulated. A self-launching DICOM viewer must be included on the portable media for the average recipient (with limited IT skills) to be able to view the images easily on an unsophisticated PC. Scrolling through > 1000 images in a single study on portable media via a PC-based DICOM viewer is aggravatingly slow. Uploading imaging data from portable media to the host PACS and RIS is often fraught with difficulty, and is a labour-intensive manual process. Lack of adherence to universal standards for portable media leads to frequent incompatibility problems between the host PACS and RIS and the portable media. In countries such as England, government-imposed information governance rules enforce encryption of imaging studies (for more than four patients) on portable media. The encryption and decryption processes, and the human errors often involved, for example the loss of passwords or codes, further complicates the use of such portable media, and introduces significant clinical risk. The many technical and human problems associated with using portable media to exchange imaging data relegate them to use as a last resort, best tolerated only for the exchange of low volumes of non-urgent data when no more automated direct exchange mechanism is available or feasible.
Learning Objectives:
1. To learn what are good portable media and how to create them within a PACS.
2. To know about workflow requirements integrating portable media in PACS (IHE PDI and IRWF).
3. To implement quality improvement concepts.

A-028 16:30

B. Images crossing borders: What about administration and law?
H.K. Pohjonen; *Espoo/FI (hanna.pohjonen@rosalieco.fi)*

eHealth community aims at creating a secure platform for the provision and consumption of clinical eServices by developing a new working environment for professionals and teams, a shared workspace for cross-border consultations and access to individual images and patient records. In this lecture, practical examples of cross-border workflow are shown. The cross-border availability and use of professionals as well as the possible technical, legal, organizational, semantic and quality assurance issues are discussed. Special attention is paid to emerging eMarket places for imaging: customers and providers for teleradiology meet via one connection node making the teleradiology more controlled and accessible. With one integration to the central platform, the whole market with several choices is opened up. The new generation cross-border team working reduces waiting times and gives access to a wide professional pool for consultations and second opinions increasing the quality of service. It also increases radiological effectiveness and gives financial savings. As an example, reporting of an extended MRI examination can be even five times less expensive. Cross-border eTeams can offer an efficient way to share resources by identifying the need and extra capacity for reporting and consultations. Clarifications regarding legal and financial matters and EU-level harmonization across different legal environments are still needed in order to boost cross-border teleradiology and maintaining the quality of the service. Linguistic issues are partly unsolved as well.
Learning Objectives:
1. To learn about European regulations in telemedicine.
2. To learn concepts for improvement of services for patients.
3. To be able to integrate quality assurance in teleradiology.
4. To be aware of administrative and workflow aspects.

A-029 17:00

C. Image compression: Acceptable? Unacceptable? Any decision yet?
E. Kotter; *Freiburg/DE (elmar.kotter@uniklinik-freiburg.de)*

During the past years, many clinical studies concerning radiological image data compression have been published. They all show that loss image compression can be used in radiology without loss of relevant image information. They disagree about the compression ration that can be used safely. It medical purposes, it should be distinguished between the technical loss of information (i.e. irreversible compression from a technical viewpoint) and the loss of medical relevant information. In some countries (Canady, Germany and UK), official recommendations concerning image compression in radiology have been published. These recommendations will be presented and compared. We will discuss practical aspects about consequences of different implementation models of image compression.
Learning Objectives:
1. To know that technical and medical lossy compression are different and why.
2. To learn about experiences in clinical studies with compression.
3. To know about legal aspects in different countries.
4. To implement a medical based decision model using lossy compression.

16:00 - 17:30 **Room L/M**

Multidisciplinary Sessions: Managing Patients with Cancer

MS 221

Carcinoma of the uterus and cervix

A-030 16:00

Chairman's introduction
R.H. Reznek; *London/UK (r.h.reznek@qmul.ac.uk)*

Imaging has become pivotal in all aspects of the management of patients with cancer. At the same time, it is acknowledged that optimal patient care is best achieved by a multidisciplinary team approach. The explosion of technological developments in imaging over the past years has meant that all members of the multidisciplinary team should understand the potential applications, limitations and advantages of all the evolving and exciting imaging techniques. Equally, to understand the significance of the imaging findings and to contribute actively to management decisions and to the development of new clinical applications for imaging, it is critical that the radiologist should have sufficient background knowledge of different tumours. Thus, the radiologist should understand the pathology, the clinical background, the therapeutic options and prognostic indicators of malignancy. This session will address these principles in carcinoma of the uterus and cervix.
Learning Objectives:
1. To become familiar with the factors that influence the decision to operate and the nature of the procedure in patients with carcinoma of the uterus and cervix.
2. To appreciate the information required from imaging by the oncologist in planning radio and chemotherapy.
3. To understand how the imaging has to be optimised and interpreted in order to provide the information needed by the surgeon and the oncologist.

A-031 16:05

What the surgeon needs to know

C. Pomel; *Clermont-Ferrand/FR (christophe.pomel@cjp.fr)*

The treatment of cervical cancer depends on the tumoral volume. Tumors of less than 4 cm (FIGO stage 1 b1) are usually treated by surgery alone or followed by adjuvant radiotherapy. Tumors superior to 4 cm are actually treated by an association of radio-chemotherapy. A conservative treatment can be proposed to women with small cervical carcinoma wishing to preserve fertility. MRI allows measuring the endocervical extents of the tumor. The clinical examination can correctly predict the invasion of parametria. This is well correlated with MRI imaging. The lymph node assessment is as crucial. It represents a major prognosis indicator. This assessment has its greater interest in patients with advanced cervical cancer, in whom no lymph node assessment will be done. The management of endometrial cancer is pending on the infiltration of the myometrium. Stage Ia, Ib grade 1 and 2, there is no need for a lymphadenectomy. For all other stages, the lymphadenectomy is mandatory. Patients with pelvic recurrence of cervical or endometrial cancer with no evidence of metastatic disease may be eligible for pelvic exenteration. As the patient presents a clinical suspicious of pelvic relapse, MRI is the ideal tool to diagnose, measure the extent and afterwards planify a surgical treatment. The invasion of the sciatic fossa as well of the external iliac vessells constitutes in our institution a major contra indication for surgery. On the other hand, patients with infiltration of the ureter, or the internal iliac vessels may be eligible for surgery.

Learning Objectives:

1. To learn the factors that are considered in deciding whether or not to treat patients surgically in carcinoma of the cervix.
2. To understand what considerations are taken into account in deciding whether fertility-sparing surgery is feasible in patients with carcinoma of the cervix or endometrium.
3. To appreciate how the decision is made as to whether or not a lymphadenectomy is performed in patients with carcinoma of the cervix.
4. To become familiar with the criteria for surgical intervention in patients with recurrent endometrial or cervical cancer.

A-032 16:25

What the clinical oncologist needs to know

P.R. Blake; *London/UK (peter.blake@rmh.nhs.uk)*

In chemoradiation of cervical cancer, staging is vital to determine the correct treatment protocol and radiotherapy volume. Imaging is now the mainstay of staging, rather than invasive investigations, and I will discuss this in terms of both direct invasion of tissues and metastasis. The radiotherapy planning process in the UK is usually done by clinical oncologists (radiation oncologists who also supervise chemotherapy). This has become much more sophisticated and time-consuming than was the case with conventional planning using orthogonal films. As a consequence, there are moves towards other groups of staff being used to define normal tissue volumes with only tumour volumes being defined by the clinical oncologist, with or without radiologists' help. Using multiple staff groups will require training and, possibly, audit by radiologists experienced in cervical cancer imaging. I will explain what is meant by gross tumour volume (GTV), clinical tumour volume (CTV) and planning tumour volume (PTV) in radiotherapy planning. With image-guided brachytherapy (IGBT), these same principles are being applied to the planning of brachytherapy. In the UK this is largely by specialist clinical oncologists, but in Europe this is often by radiologists. If the clinical oncologists are to do this, then they need appropriate training, subspecialisation and continued experience in order to maintain their skills. Follow-up is often devolved to local hospitals that are not cancer centres. The radiologists there need to be able to distinguish between post-radiotherapy effects and recurrent disease.

Learning Objectives:

1. To understand the basic principles of tumor staging in carcinoma of the cervix and uterus.
2. To learn the meaning of the terms GTV, CTV, PTV, treatment volume and organs at risk.
3. To appreciate how electronic portal imaging, cone-beam imaging and image-guided radiotherapy can be used to assure the quality of treatment delivered to the patient.
4. To understand the importance and the protocols for the follow-up of patients with carcinoma of the cervix and uterus.

A-033 16:40

Imaging in carcinoma of the uterus and cervix

R.H. Reznek; *London/UK (r.h.reznek@qmul.ac.uk)*

The purpose of imaging in endometrial cancer is to identify myometrial and cervical invasion and extra-uterine disease to allow preoperative surgical planning in patients who often suffer serious co-morbidity. Overwhelming evidence exists that magnetic resonance imaging (MRI) is the imaging technique of choice to provide this information. Nevertheless, several pitfalls exist in interpretation of MRI and technique is crucial. In cervical cancer, imaging is used to provide answers to several clinical questions including detection of parametrial invasion, accurate assessment of tumour volume, its proximal extension, early detection of recurrence and nodal disease. While computed tomography will accurately detect parametrial invasion, MRI has an established role in local staging. By assessing proximal extension of tumours in young women, MRI will determine the feasibility of fertility-preserving surgery. By accurately showing the volume of tumour, it is used to plan and administer conformal radiotherapy and for depiction of nodal disease in both cancers. For endometrial and cervical cancer, MRI is used for surveillance, detection of recurrence and evaluation of complications secondary to treatment.

Learning Objectives:

1. To understand how imaging is used to decide between surgery and chemoradiation in patients with cervical cancer.
2. To learn how imaging is used to decide whether uterus-conserving surgery is feasible in early stage cervical cancer.
3. To understand how imaging is used to plan conformal radiotherapy in cervical cancer.
4. To understand how imaging is used to determine the most appropriate surgical technique in patients with endometrial cancer.
5. To appreciate the pitfalls in the use of imaging to stage patients with endometrial and cervical cancer.

Panel discussion and case presentation 17:10

16:00 - 17:30 **Room N/O**

Head and Neck

RC 208

Skull base

Moderator:
K. Hrabak; Budapest/HU

A-034 16:00

A. Anatomical survival kit

E. Steiner; *St. Pölten/AT (erich.steiner@aon.at)*

Understanding anatomy is the basis for the interpretation of any imaging study. This anatomical survival kit aims to provide the anatomical principles of the skull base as a foundation for the evaluation of CT and MR imaging studies. On specimen photographs and schematic drawings views of the complete skull base from above and below are shown. The anatomy of the osseous components such as the frontal, ethmoid, sphenoid, temporal and occipital bone is discussed. The topographic relationship of the anterior, middle and posterior cranial fossa to the adjacent extracranial spaces such as the nasal cavity, paranasal sinuses, orbit, pterygopalatine fossa, middle ear, infracranial spaces and spinal canal is shown. The foramina and the fissures of the skull base including the cribriform plate, optic canal, superior orbital fissure, foramen rotundum, ovale and spinosum, foramen lacerum, Vidian canal, carotid canal, internal auditory canal, jugular foramen, stylomastoid foramen, hypoglossal canal, and foramen magnum are discussed together with the passing cranial nerves and vessel. Their significance as pathways for spread of disease is emphasized. Special attention is paid to the cavernous sinus and its content. In addition, anatomical structures are reviewed on multiplanar CT and MR images.

Learning Objectives:

1. To review the anatomy of the skull base.
2. To identify normal anatomical structures on CT and MRI studies of the skull base.
3. To understand anatomical fundamentals of the spread of disease.

A-035 16:30

B. Cranial nerves in cancer imaging

J.W. Casselman; *Bruges/BE (jan.casselman@azbrugge.be)*

Detection of nerve involvement by a head and neck tumor causes a dramatical increase in tumor staging (T4). Adenoid cystic carcinoma arising from salivary glands, squamous cell carcinoma, basal cell carcinoma, melanoma, lymphoma and sarcoma are frequently associated with perineural tumor spread (PNS). This PNS can occur in the absence of clinical signs; hence, the radiologist routinely has to exclude nerve involvement in all patients with head and neck cancer. Tumor spread is most frequent along the maxillary (V2) or mandibular (V3) branches of the trigeminal nerve although tumor can less frequently also follow the ophthalmic branch (V1). The mastoid segment of the facial nerve is another typical extension route and tumors will also follow the connections between the facial and trigeminal nerve. Tumor spread along the hypoglossal nerve is less frequent. Involved nerves enhance, are thickened and cause enlargement of the foramina, fissures and canals they pass through and eventually the tumor will extend intracranially and become more difficult to treat or intreatable. PNS can be detected on axial and coronal high resolution gadolinium-enhanced T1-weighted images although more and more isotropic sub-millimetric gadolinium-enhanced fat suppressed 3D-FFE/VIBE images are used. In this refresher course, the typical routes of PNS will be illustrated and the signs of PNS will be covered. Attention will be paid to the imaging techniques which should be used to detect tumor spread. An overview of the anatomical sites where it is easiest to pick up PNS and which should be checked will also be given.

Learning Objectives:

1. To learn the MR techniques used to depict cranial nerve involvement.
2. To recognise the signs of nerve involvement by tumor.
3. To understand the different routes of perineural tumor spread.

A-036 17:00

C. Depiction of dural invasion: How good is MRI?

A. Borges; *Lisbon/PT (borgalexandra@gmail.com)*

Transdural growth of head and neck malignancies has a major impact on treatment planning and patient's prognosis. Whereas tumours remaining extradural can be excised through a facial approach, tumours that transgress the dura require a combined craniofacial resection including dural resection to obtain free surgical margins and often major reconstructive efforts to avoid post-surgical complications. Several studies have demonstrated the negative impact of dural invasion in patient's outcome, together with the presence of positive margins and tumour histology. Therefore, all efforts should be made to recognize this feature pre-operatively. MR has proven to be the most accurate image modality to depict dural invasion and perineural spread of tumour. Dural enhancement, although very sensitive for dural invasion, has a low specificity as it may result not only from invasion by tumour but also from reactive fibrovascular changes and meningeal inflammation. The pattern of dural enhancement, thicker than 5 mm or nodular, is more accurate, with higher specificity. In addition, loss of the hypointense line which separates tumour from the adjacent enhancing dura, (corresponding to the epidural space), and loss of continuity of the enhancing dura, best depicted on high resolution MR sequences, are helpful imaging signs of dural invasion. During surgery, efforts should be made to resect the surgical specimen en bloc with the adjacent dura and, when not at all possible, to correctly label the excised fragments of the dura to allow for adequate pathologic staging.

Learning Objectives:

1. To recognise the most common routes of dural invasion by head and neck tumors.
2. To understand the impact of transdural growth on treatment planning and prognosis.
3. To become familiar with the MR criteria for dural invasion and their accuracy.
4. To understand the limitations of pathology in assessing dural invasion.

16:00 - 17:30 **Room P**

Cardiac

RC 203

Tips and tricks to improve your image quality

Moderator:
T. Bader; Vienna/AT

A-037 16:00

A. Sharp CT images with little radiation

L. Lehmkuhl; *Leipzig/DE (lukas.lehmkuhl@med.uni-leipzig.de)*

In recent years the technological development of cardiac MSCT has increased the importance of this procedure for the assessment of coronary heart disease in comparison with cardiac catheterization. Computed tomography coronary angiography (CTCA) is increasingly performed in the clinical setting. However, successful use of CTCA depends on the radiologist's knowledge of potential pitfalls. Artifacts and suboptimal contrast enhancement can degrade image quality and result in potential misinterpretation. Artifacts can have multiple reasons, for example motion-related artifacts caused by cardiac, pulmonary or breathing movement, beam-hardening effects caused by metallic implants and calcifications, structural artifacts due to adjacent contrast enhanced structures and vessels and artifacts that result from technical limitations. An optimal contrast enhancement depends mainly from the contrast injection protocol. Biphasic contrast injection protocols can be used for CTCA, while triphasic injection protocols are more suitable for functional analysis and for the assessment of the right ventricle. Furthermore, an optimal contrast depends from an appropriate planning of the bolus tracking and from the venous access chosen. Moreover, a successful cardiac CT depends on the radiation exposure applied. A high radiation dose results in high-resolution images, while a lower dose leads to increased image noise and results in unsharp images. There are several strategies to reduce the radiation dose during CT examinations without compromising the diagnostic value of the examination, for example by the use of a prospective gating or lowering the kV.

Learning Objectives:

1. To eliminate artifacts.
2. To optimise contrast injection.
3. To minimise radiation dose.

A-038 16:30

B. Clear MR images without artefacts

J. Bremerich; *Basle/CH (jbremerich@uhbs.ch)*

Introduction: Magnetic Resonance Imaging (MRI) of the heart is a powerful tool, but it is also technically demanding. Images, however, can be substantially degraded by artefacts. Knowledge of origin, appearance and significance of such artefacts is essential to avoid misinterpretation and to improve image quality.
Methods and Material: Cardiac imaging is typically performed on 1.5 or 3 Tesla magnets equipped with surface coils using ECG gated sequences. Imaging techniques have evolved from traditional spin-echo and gradient-echo to turbo-spin-echo, spoiled-gradient-echo, and balanced steady-state-free-precession sequences. Most recently developed techniques allow evaluation of morphology, function, perfusion, viability, coronary anatomy and flow; some advanced techniques are particularly vulnerable to artefacts.
Results: Gating related artefacts may be eliminated by repositioning of the leads, acquisition in end-expiration, optimization of sequence parameters or with peripheral pulse gating. Insufficient nulling of normal myocardium on late-enhancement sequences may be optimized by a dedicated TI scout. In balanced steady-state-free-precession sequences, dark-band artefacts may occur particularly on 3 Tesla systems. Such artefacts can be reduced by frequency shift technique. Some artefacts, however, may also be of diagnostic value. In cases when normal myocardium cannot be nulled even with long inversion times, amyloidosis may be suspected. Moreover, when gradient echo sequences provide low signal of myocardium, iron overload may be suspected.
Conclusion: Cardiac MRI is technically demanding and requires profound knowledge of MR physics as well as specific cardiac anatomy and physiology to identify artefacts, to avoid misinterpretation and to develop remedies for image improvement.

Learning Objectives:

1. To improve contrast, spatial and temporal resolution.
2. To discuss usefulness of parallel imaging.
3. To choose 1.5 or 3.0 Tesla: Is more always better?

A-039 17:00

C. Rescuing the examination with post-processing

P.M.A. van Ooijen; *Groningen/NL (p.m.a.van.ooyen@rad.umcg.nl)*

Cardiac Computed Tomography (CT) has seen a very fast development over the past few years. Although the quality of the examinations has increased due to this development, problems such as trigger artefacts, suboptimal contrast bolus and respiratory artefacts can still occur. For some of these problems, advanced post-processing techniques can be utilized to either reduce the resulting artefacts or to allow easy recognition of the artefacts. In this refresher course lecture, an overview of the current possibilities and impossibilities is given.

Learning Objectives:

1. To reduce ECG trigger artefacts on CT and MR.
2. To compensate for suboptimal contrast enhancement.
3. To choose appropriate visualisation techniques.

16:00 - 17:30 **Room Q**

Interventional Radiology

RC 209

The trauma patient

Moderator:
A.A. Hatzidakis; Iraklion/GR

A-040 16:00

A. Imaging algorithms

L.S. Fournier; *Paris/FR (laure.fournier@egp.aphp.fr)*

Injured patients are considered as multi-trauma victims according to the mechanism of injury or the number of lesions, at least one being life-threatening. Initial imaging evaluation of these patients will depend on the techniques available and the haemodynamical state of the patient; determining one of two imaging work-ups. In the haemodynamically unstable patient, chest and pelvis radiographs are performed as well as a US FAST (Focused Assessment with Sonography in Trauma) protocol. This abdominal ultrasound examination provides a quick overview of the intraperitoneal cavity to detect free fluid, an indirect sign of acute haemorrhage, and injury to visceral organs requiring immediate surgery. It can be performed with mobile equipment and by emergency staff, including non-radiologists or surgeons. US is highly sensitive (90%) for the detection of free intraperitoneal fluid but less (40%) for the identification of organ injuries. In the haemodynamically stable patient, whole-body multidetector computed tomography (WBCT) is performed, providing rapid and complete assessment of head, cervical spine, chest, abdomen and pelvis. WBCT has shown very high positive and negative predictive values > 90% for each of the anatomical regions and for detection of active bleeding, with 30% of patients presenting lesions in one or more anatomic region than that suspected clinically. Lesions to solid organs may be divided in hematomas, lacerations, and vascular injuries. CT is the best technique to detect bowel injuries which may be occult initially and must be suspected in presence of bowel wall thickening, free fluid or air in the peritoneal cavity.

Learning Objectives:

1. To discuss appropriate triage of trauma patients to imaging.
2. To learn the appropriate imaging techniques.
3. To review imaging appearances.

A-041 16:30

B. Principles of embolisation

J.C. van den Berg; *Lugano/CH (jos.vandenberg@eoc.ch)*

In the management of trauma patients, the role of embolisation has become more and more important over the last years. With refinement of technique and availability of new embolic agents and catheters, more patients can be treated minimally invasive nowadays. When performing transcatheter, knowledge of proper timing of the procedure and knowledge of material is essential. This paper will focus on this, and will give an overview of all currently available embolic agents and devices, their use, indications and contraindications for their application. Potential pitfals will be discussed, and complications will be dealt with. Finally, long-term outcome and results will be discussed.

Learning Objectives:

1. To discuss the indications and timing of embolisation for trauma patients.
2. To learn about principles and techniques of embolisation.
3. To review endpoints and results of embolisation.

A-042 17:00

C. Iatrogenic trauma

P. Haage; *Wuppertal/DE (patrick.haage@helios-kliniken.de)*

Traumatic injuries requiring prompt and effective treatment may in some instances be a consequence of iatrogenic procedures. They may be as diverse and individual as the triggering trauma itself. Of particular interest to the radiologist regarding diagnosis and treatment are vascular traumata. Iatrogenic trauma to the arterial and venous systems is quite frequent today, which may partly be attributed to the increase in interventional procedure in recent years. Observed injuries to the circulation may range from pseudoaneurysms, bleedings and dissections to arterial/deep vein thromboses, arteriovenous fistulae, embolism and occlusion. In this presentation, the necessary diagnostic imaging modalities in iatrogenic trauma and its interventional radiologic complication management will be presented and delivered via “typical” examples.

Learning Objectives:

1. To review causes and imaging appearances of iatrogenic trauma.
2. To review various IR methods of treatment.
3. To review results and appropriate follow-up strategies.

18:30 - 18:50 **Room A**

Plenary Session

OL

Presiding:
M. Szczerbo-Trojanowska; Lublin/PL

A-043 18:30

The two faces of HIV/AIDS in the brain: The face you know - And the one you don’t

A.G. Osborn; *Salt Lake City, UT/US (anne.osborn@hsc.utah.edu)*

HIV-induced brain injury is a significant complication of AIDS. CNS symptoms (HIV encephalopathy or “HIVE”) are the first complaint in 5-10% of patients. More than 25% eventually develop severe cognitive deficits (HIV-associated dementia complex). The face of HIV/AIDS that most of us know and recognize is that of the disease as managed in a “resource-rich” environment. Questions such as “who should be imaged” and “how should they be imaged” presuppose a wealth of resources unimaginable in many parts of the world. With the advent of highly-effective antiviral regimens, HIV/AIDS has become for many infected patients a chronic, difficult but manageable disease. This presentation will briefly demonstrate the pathology and imaging spectrum of HIV/AIDS as a chronic disorder, including examples of the new immune reconstitution inflammatory syndrome (IRIS) in the brain. The “other” face of HIV/AIDS, the one that most of us do not know, is that of the disease in populations with “resource-poor” environments. AIDS in developing countries often presents differently. While the virus is the same, its manifestations are quite different. Here AIDS can be an acute, often fulminant disease where co-infections such as TB create a deadly intersection that magnifies the morbidity and lethality of both agents. Imaging in these patients, when available, may show a very different disease spectrum from the more familiar patterns seen in resource-rich environments. With increased immigration and the rapid emergence of multi-drug resistant and extreme drug-resistant TB, this “second face” of HIV/AIDS may be the one we will see in the very near future.

Learning Objectives:

1. To learn about the imaging spectrum of HIV/AIDS in the central nervous system in a resource-rich environment where highly effective antiviral treatments and supportive therapy are widely available.
2. To identify the imaging manifestations of immune reconstitution inflammatory syndrome (IRIS) as seen in the brain.
3. To understand the “deadly intersection” between HIV/AIDS and TB in resource-poor environment.
4. To learn about the imaging manifestations of HIV/AIDS when it presents as acute, fulminant disease in a resource-poor environment.

Friday, March 5

08:30 - 10:00 **Room A**

Special Focus Session

SF 3a

Diffusion-weighted imaging of the abdomen: A new tool for oncologic imaging?

Moderator:
F. Caseiro-Alves; Coimbra/PT

A-044 08:30

Chairman's introduction
F. Caseiro-Alves; *Coimbra/PT (caseiroalves@gmail.com)*

Exploitation of the microscopic movement of water molecules within biological tissues by DWI is a new tool for MRI, now becoming more available and widespread for a variety of abdominal applications. In oncology, its role as an imaging biomarker is being progressively established for detection, characterization and monitor response to therapy. Despite all these features, there are still many open issues to be solved such as standard definitions for measurement analysis, imaging protocols for different anatomical locations, reproducibility among vendors, and interpretation of the quantitative ADC values. Also, as a measure of diffusivity of the extravascular extracellular space, complete understanding at the microscopic level is still incomplete and confounding factors may be present contributing to change the final imaging appearance. Taking in account all the potential benefits of DWI, it is thus essential that radiologists master the technique, understanding its physical principles, clinical applications, limitations and pitfalls. It is the purpose of this session to provide a comprehensive overview of the technique ranging from technical definitions and parametrization options to specific applications in the liver, pancreas and for lymph node mapping and/or characterization.
Session Objectives:
1. To introduce the imaging tools for evaluating tumor components.
2. To address quantification issues and the role of DWI.
3. To recall how to create imaging protocols.
4. To stress the role of DWI in oncologic imaging and future developments.

A-045 08:34

Diffusion imaging: From theory to protocol development
D.-M. Koh; *Sutton/UK*

Diffusion-weighted MR imaging (DW-MRI) derives its image contrast from differences in the mobility of water between tissues. The signal attenuation observed on DW-MRI reflects tissues cellularity, the tortuosity of the extracellular space, integrity of cell membranes, as well as bulk flow phenomenon such as microcapillary perfusion. DW-MRI measurements can be acquired very quickly (typically several seconds to a few minutes) without the administration of exogenous contrast media, and provides unique qualitative and quantitative information that can aid disease detection, disease characterisation and the evaluation of tumour response to treatment. In the body, DW-MRI is most often performed using single-shot echo-plainer imaging (EPI) technique. Image acquisition can be performed in breath-hold or free-breathing; the latter may be combined with respiratory and/or cardiac triggering. Each of these techniques has its advantages and disadvantages. DW-MRI in the body using EPI technique is prone to a variety of artefacts and careful imaging optimisation is therefore critical to success. The DW-MRI acquisition sequences should be optimised to maximise signal-to-noise and minimise potential artefacts. Adjustment of imaging parameters such as the echo-time, matrix size, partition thickness, parallel imaging, fat suppression scheme and the receiver band width are important to ensure that high quality DW-MR images can be consistently attained. A good apparent diffusion coefficient (ADC) measurement reproducibility can be achieve through meticulous technique. Evolving developments of DW-MRI in the body include more sophisticated image acquisition and evaluation techniques to gain further insights into tissue structure and function.
Learning Objectives:
1. To describe the principles of DWI and its technical settings
2. To discuss the influence of technical settings for imaging evaluation.
3. To explain the role of quantification obtained by ADC maps and measurements and to comment on reproducibility issues.
4. To discuss technique's pros and cons, trends and future developments.

A-046 08:53

Focal liver lesions: What can we expect?
M. Lewin; *Paris/FR (maite.lewin@sat.aphp.fr)*

As a result of rapid technological developments, DW-MRI is now a part of standard abdominal imaging practice. It is of special interest for detection and characterization of focal hepatic lesions because it improves tumor visualization and provides quantitative data (ADC map). This makes it possible to differentiate benign from malignant lesions which display higher ADC values due to higher cellularity. However, an overlap exists. The b value, characterizing the diffusion gradient's strength, is a clue parameter. A minimal b value is needed to avoid perfusion effect but too high b values result in signal loss. A series of b values, usually from 200 to 800 s/mm^2, are required to calculate ADC. Benign lesions have ADC values ranging from 2.04 to 2.89, HCC from 1.31 to 1.39 and metastasis 0.85 to 1.50 x 10^{-3} mm^2/s. An additional interest is the monitoring of treatment response and the prediction of treatment outcome for vascular disruptive drugs and apoptosis-inducing therapies. Successful treatment is generally reflected by an increase in ADC values because of tumor size reduction or tumor necrosis. Correlatively, patients with tumors having high ADC levels before treatment may be predicted to have a poor outcome. Furthermore, DW-MRI can be used as a pharmacodynamic biomarker that could support decision making in the drug development process, the aim being to increase the likehood of success in later more coslty trials. However, the major challenge is standardization of data acquisition and analysis for multicenter studies.
Learning Objectives:
1. To present DWI results for focal liver lesion detection and characterisation.
2. To discuss shortcomings, pitfalls and technical details essential for obtaining accurate clinical results.
3. To describe the current role of DWI in quantification and tumor response evaluation.

A-047 09:12

Pancreatic neoplasms: Is DWI helpful?
C. Matos; *Brussels/BE (cmatos@ulb.ac.be)*

Compared to T1-weighted and T2-weighted strategies, diffusion-weighted imaging (DWI) provides another mechanism for developing image contrast that may increase the sensitivity and the specificity of MRI of the pancreas. In addition to the information on tissue cellularity, on cell membrane integrity and on extracellular space turtuosity, apparent diffusion coefficients (ADC) maps of tissue water can be generated. For pancreatic DWI, parallel imaging, fat suppression, respiratory triggering and multiple b-values (typically 0, 150 and 1000 s/mm^2) are used. This strategy presents the advantages of exploring a large FOV and has acceptable spatial resolution. Moreover, patient cooperation is minimized. Promising results have been reported concerning the usefulness of DWI for investigating pancreatic adenocarcinoma and mass forming pancreatitis. It has been shown that mean ADC values of malignant lesions are significantly lower than those of benign lesions and that DWI has similar accuracy to conventional MR imaging in diagnosing pancreatic cancer. Our results using DWI to explore the full range of pancreatic diseases did not show statistically significant differences in mean ADC values between malignant and inflammatory diseases. Using DWI in addition to conventional MRI mainly increased the sensitivity and the negative predictive value of the MR examination. DWI was a useful non-invasive tool for the follow-up of inflammatory diseases, and for detecting a lesion that may be suitable for biopsy in patients with chronic pancreatitis or a cystic neoplasm.
Learning Objectives:
1. To present DWI results in cystic and solid pancreatic lesions, and explain its role in detection, characterisation and staging.
2. To discuss which sequence parameters should be used to get consistent clinical results.
3. To address the role of quantification, potential shortcomings and pitfalls of the technique for this application.

A-048 09:31

Pelvic cancers and lymph node imaging: The PET competitor?
S. Gourtsoyianni; *Iraklion/GR (sgty76@gmail.com)*

Identification of metastatic lymph nodes in pelvic malignancies is of paramount importance since it modifies treatment strategy and prognosis. In order to avoid unnecessary extended lymphadenectomy, non-invasive imaging techniques are tried out. Cross-sectional imaging relying on nodal size and morphology and PET on metabolic activity for lymph node characterization have not yet produced sufficiently effective staging results due to considerable overlap in imaging features of benign and malignant lymph nodes. Lymphotropic nanoparticle enhanced MR

imaging, however, has resulted in higher sensitivity in pelvic cancers lymph node characterization but requires long MR scanning time and is not available for routine clinical use. Diffusion weighted imaging has been tested with excellent results for delineation and characterization of primary pelvic cancers and shows promise for lymph node staging. Diffusion weighted whole body imaging with background body signal suppression (DWIBS) with inversion of gray scale producing images similar to PET and axial single shot EPI DWI with fat suppression demonstrate normal lymph nodes with a relative restricted diffusion, while both increase conspicuity of small (up to 2 mm) lymph nodes. ADC map produced from the latter sequence using a wider range of b values is rendered necessary for quantification and thus characterization of lymph nodes. ADC is relatively independent of lesion size and various criteria, such as relative ADC value, have been proposed to increase sensitivity of DWI regarding differentiation between metastatic and non-metastatic pelvic lymph nodes, with the largest series being those of gynecological malignancies due to extensive lymphadenectomy correlation data.
Learning Objectives:

1. To learn the technical settings (sequence characteristics, b values, necessity of ADC map or not, layout of images with or without 3D reconstruction) and the optimal compromise for evaluating prostate, rectal and gynecological tumors.
2. To review the literature on the Se and Sp of DWI, as compared with PET/CT and MRI with tissue-specific contrast media regarding local tumor staging.

Panel discussion:
Is DWI ready for routine use in oncological practice? 09:50

08:30 - 10:00 **Room B**

Radiology of the Spine in 2010

CC 316

Common spinal "problems"

Moderator:
I.M. Björkman-Burtscher; Lund/SE

A-049 08:30

A. "Myelopathy": Easy way to the correct diagnosis
M.M. Thurnher; *Vienna/AT (majda.thurnher@meduniwien.ac.at)*

Myelopathy is a term that actually means "there is something wrong with the spinal cord" itself. Increased signal intensity in the spinal cord on T2-weighted magnetic resonance images (MR) has been reported in numerous diseases. Causes include trauma, primary and secondary tumours, bacterial and viral myelitis, radiation myelitis, spinal cord ischemia, compression myelopathy, etc. It is then not surprising that the differentiation could be almost impossible based only on imaging findings. This lecture will focus on MR imaging findings in the spinal cord diseases and its practical value in narrowing the differential diagnosis. The location, extent, multiplicity, signal characteristics, and the degree of enhancement of abnormalities will be described. A practical schematic approach with integration of imaging features and clinical data will be introduced.
Learning Objectives:

1. To define the term "myelopathy".
2. To discuss the differential diagnoses of spinal cord diseases.
3. To introduce a "clinically useful" algorithm for myelopathy.

A-050 09:00

B. Congenital anomalies made "easy"
A. Rossi; *Genoa/IT (andrearossi@ospedale-gaslini.ge.it)*

Spinal and spinal cord malformations are collectively named spinal dysraphisms. They arise from defects occurring in the early embryological stages of gastrulation (weeks 2-3), primary neurulation (weeks 3-4), and secondary neurulation (weeks 5-6). Spinal dysraphisms are categorized into open spinal dysraphisms, in which there is exposure of abnormal nervous tissues through a skin defect, and closed spinal dysraphisms, in which there is a continuous skin coverage to the underlying malformation. Open spinal dysraphisms basically include myelomeningocele and other rare abnormalities such as myelocele and hemimyelo (meningo)cele. Closed spinal dysraphisms are further categorized based on the association with low-back subcutaneous masses. Closed spinal dysraphisms with mass are represented by lipomyelocele, lipomyelomeningocele, meningocele, and myelocystocele. Closed spinal dysraphisms without mass comprise simple dysraphic states (tight filum terminale, filar and intradural lipomas, persistent terminal ventricle, and dermal sinuses) and complex dysraphic states. The latter category further comprises defects of midline notochordal integration (basically represented by diastematomyelia) and defects of segmental notochordal formation (represented by caudal agenesis and spinal segmental dysgenesis). Magnetic resonance imaging is the preferred modality for imaging these complex abnormalities. The use of the aforementioned classification scheme is greatly helpful for making the diagnosis.
Learning Objectives:

1. To become familiar with normal and abnormal embryology of the spine.
2. To review the most common spinal congenital anomalies and their pathogenetic background.
3. To describe imaging findings in various spinal anomalies that allow differentiation between entities.

A-051 09:30

C. Extradural spinal tumors
P.C. Maly Sundgren; *Lund/SE (Pia.Sundgren@med.lu.se)*

Tumors of the spinal canal both the purely extradural tumors and those involving the spinal cord are uncommon lesions but may result in significant morbidity. The most important imaging tool for evaluating the spinal canal is magnetic resonance imaging (MRI). Conventional MRI has the capability to classify tumors of the spinal canal in extradural, intradural-extramedullary or intradural intramedullary lesions. The differential diagnosis for extradural and intradural-extramedullary spinal tumors are primarily based on location, but also the clinical presentation, age and gender of the patient are important factors in determining the diagnosis. The most common intradural extramedullary lesions are schwannomas, meningiomas, and neurofibromas. Less common lesions include paraganglioma, metastases, and rare tumors such as spinal nerve sheath myxoma (neurothekeoma), as well as lipoma, sarcomas and vascular tumors. These tumors occur far more commonly in the adult population than in children. Purely extradural lesions are rare, including lymphoma, metastasis and benign lesions like arachnoid cyst, dermoid, and epidermoid. Among the differential diagnosis to primary and secondary tumors, we have to consider epidural hematoma and abscesses. This short presentation will focus on the current classification and the conventional MRI imaging features of the more common extradural and intradural extramedullary spine lesions. The role of new MR imaging sequences such as diffusion weighted imaging (DWI) and diffusion tensor imaging (DTI) and the use of measurements of apparent diffusion coefficient (ADC) and fractional anisotropy (FA) to differentiate spinal neoplasms will be discussed.
Learning Objectives:

1. To review the current classification of tumors in the spinal canal.
2. To summarise key imaging findings in extradural spinal tumors.
3. To become familiar with new techniques used in differentiation of spinal neoplasms.

08:30 - 10:00 **Room C**

State of the Art Symposium

SA 3

Multiple sclerosis update

Moderator:
A. Rovira-Cañellas; Barcelona/ES

A-052 08:30

Chairman's introduction
A. Rovira-Cañellas; *Barcelona/ES (alex.rovira@idi-cat.org)*

Multiple sclerosis (MS) is a chronic, persistent inflammatory-demyelinating disease of the CNS that typically presents as an acute clinically isolated syndrome attributable to a monofocal or multifocal demyelinating lesion. Conventional MRI (cMRI) techniques, such as T2W and gadolinium-enhanced T1W sequences, are highly sensitive in detecting MS plaques and provide a quantitative assessment of inflammatory activity and lesion load. In fact, MRI is now integrated in the overall diagnostic scheme of the disease because of its unique sensitivity to demonstrate the spatial and temporal dissemination of demyelinating plaques in the brain and spinal cord. However, there is a persisting mismatch between clinical and cMRI efficacy of approved treatments, which underlies the fact that cMRI does not suffice to explain the entire spectrum of the disease process. In recent years, great effort has been dedicated to overcoming this limitation by using non-conventional MR-derived metrics that can selectively measure the more destructive aspects of MS pathology and monitor the reparative mechanisms. These metrics, which include

unenhanced T1-weighted imaging, measures of CNS atrophy, MT imaging, MR spectroscopy, DW imaging, and functional MRI, provide a better approximation of the pathological substrate of the MS plaques, have increased our understanding of the pathogenesis of the disease, and have proven useful for studying the natural history of MS and monitoring the effects of new treatments. Therefore, MRI not only plays an essential role in the diagnosis of MS, but can also serve as a true biological marker of the severity of this disease.
Session Objectives:
1. To introduce the clinical aspects and pathophysiology of MS.
2. To clarify the role of conventional and non-conventional MRI techniques in the diagnosis and monitoring of MS.
3. To stress the advantages and limitations of MRI as a biological marker in MS.

A-053 08:35
MRI and histopathological studies
F. Barkhof; *Amsterdam/NL (f.barkhof@vumc.nl)*

MRI is often used to diagnose multiple sclerosis (MS). This is due to the very high sensitivity of T2-weighted MRI for any alterations occurring in MS, including inflammation, demyelination, gliosis and axonal loss; even remyelinated lesion appear bright on T2-weighted images. For the same reason, it is hard to predict the relationship between the extent of abnormalities on T2-weighted scans and relapses or irreversible disability in MS - the so-called clinical-radiological paradox. Beyond the shortcomings of clinical scoring systems, MRI factors explaining this discrepancy include: a) location of lesions and spinal cord involvement, b) degree of tissue damage within lesions, c) abnormalities in the so-called normal appearing white matter, and d) grey matter involvement. Even newer techniques like double-inversion recovery (DIR) fail to identify the vast majority of cortical lesions, and only cortical atrophy is a useful predictor of disability in advanced stages of MS.
Learning Objectives:
1. To understand the clinical-radiological paradox concept in MS.
2. To comprehend the histopathological specificity of the various MR sequences based on radiological-pathological correlations.
3. To be aware of the clinical importance of grey matter involvement in MS.

A-054 08:58
Update on MRI diagnostic criteria
T.A. Yousry; *London/UK (t.yousry@ion.ucl.ac.uk)*

An early and accurate diagnosis of MS in CIS patients is important to relieve uncertainty, provide prognosis counseling and consider MS disease modifying treatments that have partial efficacy at this earliest clinical stage of the disease. Although, no single clinical feature or diagnostic test is sufficient for the diagnosis of MS, MRI has become the most useful investigation to support an MS diagnosis - and sometimes identifies alternative diagnoses. Diagnostic MRI criteria have been developed based on the demonstration of lesions disseminated in space (DIS) and time (DIT) and after exclusion of alternative causes. The most relevant are the “McDonald criteria” from 2001, and their revision in 2005. Whilst the new criteria are a logical step forward, they are complex. Increasing practical experience and the study of different diagnostic approaches have shown potential ways to simplify MRI diagnostic prerequisites without relaxing their specificity. A new algorithm is proposed by the MAGNIMS group, which takes into consideration both image interpretation and the timing of MRI.
Learning Objectives:
1. To be aware of the clinical importance of early diagnosis of MS.
2. To become familiar with the McDonald MRI-based MS diagnostic criteria.
3. To examine recent data that supports a revision of the McDonald MRI-based diagnostic criteria in MS.

A-055 09:21
MRI as a biomarker
M. Filippi; *Milan/IT (massimo.filippi@hsr.it)*

MS is a very heterogenous disease, which usually takes several years before disability accumulation can be measured clinically. This and the poor reliability of clinical scales, has led to the use of MR technology to monitor disease evolution. Traditionally, the extent of overall lesion burden, the frequency of occurrence of “active” lesions and their changes over time have been the most used MRI outcomes. These MR metrics, however, lack of pathological specificity and are unable to quantify the extent of damage outside focal lesions. Modern, quantitative MR techniques have the potential to overcome such limitations and have contributed to reshape the picture of MS as a condition which evolves through a balance between, on the one side, inflammatory-demyelination and degeneration and, on the other, the effectiveness of tissue repair and cortical reorganization. Measures of atrophy are increasingly used to quantify the extent of irreversible tissue loss. Metrics derived from magnetization transfer and diffusion-weighted MRI enable us to quantify the extent of structural changes occurring within T2-visible lesions and normal-appearing tissues (including gray matter); proton MR spectroscopy adds valuable pieces of information on the biochemical nature of such changes; functional MRI discloses the role of cortical adaptive changes in limiting the clinical consequences of tissue injury. This new picture of MS has important implications in the context of monitoring, since it calls for a multiparametric MR approach, which should be tailored according to the disease stage and the mode of action of the tested drug (e.g., anti-inflammatory vs. neuroproctective).
Learning Objectives:
1. To recognise the need for surrogate tools to monitor treatments in MS.
2. To understand the advantages and disadvantages of conventional and non-conventional MR techniques that can be used as biomarkers of inflammation and neurodegeneration in MS.
3. To introduce guidelines for the use of MR techniques in monitoring MS.

Panel discussion:
How should we use MRI in the diagnosis and monitoring of multiple sclerosis? 09:44

08:30 - 10:00 **Room D**

Imaging in Lung Diseases

CC 318

Cardiothoracic CT: One-stop-shop procedure?

Moderator:
P. Herzog; Munich/DE

also EPOS

A-056 08:30
A. How to assess cardiac function from a chest CT angiographic examination
G.W. Gladish; *Houston, TX/US (ggladish@mdanderson.org)*

Right heart dysfunction can result from a variety of pathologic processes and can be assessed both directly and indirectly using MDCT. Indirect assessment should be performed on all contrast enhanced examinations. This includes morphologic evaluation of the right cardiac chambers and pulmonary arteries in comparison to analogous left heart structures. The right ventricle diameter is normally less than the left ventricle. Dilation of the right ventricle indicates pulmonary hypertension or right ventricular volume overload and is a poor prognostic sign, particularly in patients with acute pulmonary emboli. Optimally performing this evaluation requires multiplanar reformatting capabilities, as the ratio of ventricular diameters is best demonstrated on images in the short axis of the ventricles. Other morphologic findings include straightening or reversal of the interventricular septum as an indication of elevated right ventricular pressure. Contrast enhancement patterns can also provide clues to right heart function. Significant reflux of contrast material into the inferior vena cava and hepatic veins indicates abnormal right heart blood flow due to pulmonary arterial hypertension, tricuspid regurgitation, or increased pericardial pressure. These conditions may also result in heterogeneous hepatic enhancement due to hepatic congestion. Direct assessment of cardiac function requires cardiac gating and optimized contrast administration. Right ventricle contrast enhancement must be maintained compared to standard coronary CT techniques. Right ventricle function can then be calculated using tools developed for left ventricular assessment. The assessment of right heart function can add prognostic information to the assessment of diseases affecting the pulmonary vasculature, including embolism and fibrosis.
Learning Objectives:
1. To review the different means of estimating right cardiac function with MDCT.
2. To consolidate knowledge of CT features of right ventricular dysfunction.
3. To understand the clinical usefulness of integrating cardiac functional information into the daily routine of a chest radiologist.

A-057 09:00
B. Impact in the management of acute pulmonary embolism
I. Hartmann; *Rotterdam/NL (i.hartmann@erasmusmc.nl)*

Pulmonary embolism (PE) is a common and potentially fatal cardiovascular disorder. Pressure overload of the right ventricle (RV) secondary to acute pulmonary hypertension is thought to play a significant role in PE-related mortality. Massive PE with hemodynamic instability (e.g., hypotension and cardiac shock) is associated

with a poor prognosis and high mortality rates (> 50%). There is general agreement that these patients should be treated aggressively (thrombolytic agents, surgery, or interventional procedures) whereas more aggressive therapy is generally not indicated in normotensive patients without RV dysfunction (RVD). However, up to 7% of hemodynamically stable patients treated with anticoagulants also eventually die related to the PE event. Various diagnostic techniques or laboratory tests have been proposed to classify patients with PE into groups with high risk and low risk of fatal PE, with the ultimate aim of identifying those patients who may benefit from more aggressive therapy. There are contradicting results regarding the association between the extent of obstruction of the pulmonary arteries at CT and immediate outcome. Presence and severity of RV dilatation as assessed by either echocardiography or CT have been described as independent predictors of mortality within 3 months. Although thrombolytic therapy in normotensive patients with RVD is currently controversial, they may also benefit from more aggressive treatment. MDCT can be used to assess the degree of vascular obstruction and cardiac dysfunction, stratify the patient's risk of death, and, if thrombolytic therapy is indicated, can be used as a non-invasive tool for monitoring treatment.

Learning Objectives:

1. To learn about the current markers of cardiac dysfunction in acute pulmonary embolism.
2. To review the prognostic role of MDCT in acute pulmonary embolism.
3. To become familiar with the therapeutic impact in the management of acute pulmonary embolism.

A-058 09:30

C. Clinical usefulness in chronic thoracic diseases

G. Bastarrika[1], T. Franquet[2]; [1]*Pamplona/ES*, [2]*Barcelona/ES (bastarrika@unav.es)*

MDCT was initially limited to the depiction of morphologic changes at the level of the thoracic organs. Actually, MDCT examinations offer the possibility of providing information on cardiac function by means of the availability of retrospective ECG-gating techniques and developments in dedicated cardiac analysis software. Chronic right ventricular (RV) hypertrophy and increased pulmonary resistance often go on to cause RV dilatation and failure. Cor pulmonale is the syndrome of RV hypertrophy, dilatation, and failure resulting from pulmonary hypertension secondary to lung disease. MDCT is an accurate and reliable noninvasive technique in the assessment of right ventricular (RV) function in the management of patients who have a wide variety of acute or chronic respiratory disorders.

Learning Objectives:

1. To describe the cardiac consequences of chronic thoracic diseases.
2. To discuss the concept of respiratory and cardiovascular disease in specific respiratory disorders.
3. To understand how the scanning protocols have to be modified to provide such information.

08:30 - 10:00 **Room E1**

Abdominal and Gastrointestinal

RC 301

Quantification of liver processes: Defining biomarkers

Moderator:
M.A. Bali; Brussels/BE

A-059 08:30

A. Steatosis

P. Chevallier; *Nice/FR (chevallier.p@chu-nice.fr)*

Hepatic steatosis is the most prevalent liver disorder in the developed world. Non-alcoholic fatty liver disease (NAFLD) is its most frequent manifestation and has been estimated to be as high as 35% in some populations. Currently, liver biopsy is still considered the gold standard for the assessment of liver fat, but there is a clear need for less invasive diagnostic techniques. Focus has been placed on non-invasive imaging modalities for liver fat detection and quantification. The rationale, performance characteristics, and limitations of these imaging modalities including ultrasound, computed tomography, magnetic resonance imaging, magnetic resonance spectroscopy and magnetic resonance elastography will be discussed. These techniques offer a wide range of anatomical and morphological information non-invasively even if none of them is able to assess all features visible using histology such as the differentiation between microvesicular and macrovesicular steatosis. Nevertheless, non-invasive imaging techniques and especially magnetic resonance are particularly useful to diagnose NAFLD in asymptomatic patients or to follow disease progression or response to treatment.

Learning Objectives:

1. To know the general features of the pathology and clinical issues.
2. To know the general imaging findings.
3. To identify the accuracy of each imaging modality to assess hepatic steatosis qualitatively and quantitatively.

A-060 09:00

B. Iron overload

J.M. Alústiza; *San Sebastián/ES (jmalustiza@osatek.es)*

Quantification of Liver Iron Concentration (LIC) is the definitive parameter for diagnosing hereditary hemochromatosis (HH). Values above 71 µmol Fe/g are highly suggestive of the disease. In iron overload (IO) secondary to liver disease, alcohol abuse, etc. LIC levels are always lower. In secondary hemochromatosis, LIC is higher than in HH. Traditionally, LIC quantification requires a biopsy of the liver. MRI is considered as the preferred choice for non-invasive quantification of the LIC. IO causes a T2 shortening that results in a proportional decrease in liver signal. Calculation of relaxation time constants (T2/R2, T2*/R2*) requires sequences with multiple TEs and complex post-processing calculations. Results have been reproducible in different machines and have shown a high correlation with LIC measured on biopsies at all iron overload levels, including the high levels found in secondary haemochromatosis. In fact, such calculations are still only performed in highly specialised centres. Calculation of LIC from Signal Intensity ratios between the liver and the paravertebral muscles is simpler to perform. Several different gradient echo (GE) sequences are used to be able to evaluate different iron overload levels and may be performed rapidly and easily in a vast majority of MRI machines. These calculations have shown a good correlation for LIC levels typical of HH, lower than 300-400 µmol Fe/g. However, they saturate with the higher overload levels characteristic of secondary hemochromatosis.

Learning Objectives:

1. To learn the importance of quantifying the liver iron concentration in the diagnosis of primary and secondary hemochromatosis.
2. To describe quantification of LIC by MRI. Calculation of T2-R2 vs measurement of signal intensity ratio liver/muscle. Advantages and disadvantages of each method. Reproducibility, standardisation, availability.
3. To know the indication of the quantification of the LIC by MRI in the diagnosis of primary and secondary hemochromatosis.

A-061 09:30

C. Fibrosis

B. Van Beers; *Clichy/FR (bernard.van-beers@bjn.aphp.fr)*

Liver fibrosis is a non-specific cicatrization process that occurs in all chronic insults of the liver. Hepatic fibrosis is reversible and can be treated, especially before cirrhosis occurs. The diagnosis of fibrosis relies on liver biopsy. However, hepatic biopsy is invasive and there is a sampling variability related to the heterogeneity of fibrosis and the small size of the biopsies. Scoring systems based on serum tests have been developed. These biomarkers only enable differentiation between minimal and advanced fibrosis. Anatomical imaging is limited to the detection of advanced fibrosis. Functional imaging can be used to stage liver fibrosis. Microcirculatory changes that can be detected with perfusion CT or MRI are observed in hepatic fibrosis. However, the correlation between the changes of the perfusion parameters and the stage of fibrosis is only moderate. At diffusion-weighted MRI, there is a decrease of the apparent diffusion coefficient of the liver that correlates with increased fibrosis. However, this decrease is mainly related to perfusion rather than true extracellular diffusion changes. Elastography is a new method that measures the visco-elastic parameters of the liver. Transient and acoustic radiation force impulse elastography are ultrasound methods that are increasingly used to stage liver fibrosis. With MR elastography, a more accurate and precise assessment of the visco-elastic parameters of the liver can be obtained. These visco-elastic parameters are currently the most accurate biomarkers of liver fibrosis. However, other factors than fibrosis can influence the mechanical properties of the liver, including inflammation, bile duct obstruction and stellate cell activation.

Learning Objectives:

1. To understand the importance of detecting and assessing the severity of liver fibrosis.
2. To learn about the value and limitations of different imaging methods for the quantification of liver fibrosis.
3. To compare imaging and non-imaging biomarkers of liver fibrosis.

08:30 - 10:00 **Room E2**

Foundation Course: Head and Neck Radiology

E³ 320a

Imaging techniques and common pitfalls

Moderator:
B. Bobek-Billewicz; Gliwice/PL

A-062 08:30

A. Computed tomography

R. Maroldi; *Brescia/IT (maroldi@med.unibs.it)*

The main advantages of the current CT technology consist of its high spatial and temporal resolution. A key issue of spatial resolution is the availability of isotropic voxels below 0.30 mm to study very small bony structures as the ossicles in the middle ear, or the bony labyrinth. Improvements of temporal resolution permits to examine the head and neck in most uncooperative patients, and to better separate arterial and venous phases. The combination of high spatial and temporal resolution enables a precise evaluation of complex structures, as the larynx, minimizing artifacts due to patient movement. However, the smaller are the voxels, the more the SNR diminishes, thereby often resulting in a poor contrast resolution. The radiologist should be aware of this limitation. The choice of the proper slice thickness in MPR or MIP may significantly increase the SNR and the detectability of the vascular structures, respectively. In addition, MPR and MIP reconstructions provide the power of high resolution in the coronal and the sagittal planes. Specific CT protocols have been tailored to achieve the necessary information in the various areas of the head and neck and in different diseases (i.e. low mA in sinonasal inflammatory lesions, high mA in tumor assessment to maximize lesion detection). Though contrast agent administration usually enhances the pattern of the lesions (and the adjacent neck "key" vessels), on CT the contrast resolution of tissues is poor when compared to MR.

Learning Objectives:

1. To appreciate the possibilities and limitations of CT in head and neck radiology.
2. To become familiar with technical factors affecting image quality, including contrast agent administration protocols.
3. To learn how to fully exploit the possibilities of multidetector CT in head and neck imaging.

A-063 09:15

B. Magnetic resonance imaging

M.G. Mack; *Frankfurt a. Main/DE (m.mack@em.uni-frankfurt.de)*

Magnetic resonance imaging is the state-of-the-art method for the evaluation of head and neck disease. Especially in the head and neck area, the quality of the examination depends on the correct selection and adjustment of the MR sequences. The goal of this course is to learn how a MRI examination of the head and neck can be optimized. The advantages and disadvantages of different MR sequences will be discussed. Over the past few years, diffusion-weighted MRI has evolved from a technique that is primarily used to evaluate acute cerebral infarction to one that is employed to study a variety of head and neck disease. The use of specific contrast agent will be evaluated further. This course will reduce the rate of diagnostic errors by helping radiologist distinguish pathology from MRI appearance that may simulate disease. Tips and tricks of patient positioning and adaption of the sequences will be presented. In addition, this course will demonstrate the different artefacts and the most common pitfalls of magnetic resonance imaging in the head and neck and how to avoid them.

Learning Objectives:

1. To appreciate the possibilities and limitations of MRI in head and neck radiology.
2. To become familiar with technical factors affecting image quality in head and neck MRI.
3. To learn about new developments in MRI of head and neck pathology.

08:30 - 10:00 **Room F1**

Interactive Teaching Session

E³ 320b

Breast cancer: Diagnosis, staging and follow-up

Moderator:
A. Tardivon; Paris/FR

A-064 08:30

Breast cancer: Diagnosis, staging and follow-up

K. Kinkel[1], J. Camps Herrero[2]; [1]*Chêne-Bougeries/CH*, [2]*Valencia/ES (karen.kinkel-trugli@wanadoo.fr)*

Imaging guided biopsy has replaced surgical biopsy of suspicious breast lesions to reduce unnecessary surgery for benign disease and indicate the need for sentinel lymph node procedure. Biopsy guidance depends on lesion visibility at sonography, mammography or MRI. To minimize false negative results, 9-14G needles and vacuum assisted systems are preferred sampling methods for most lesions. Image documentation of non palpable lesion location and residual amount after biopsy is mandatory for preoperative lesion localization planning. A clip is positioned at the site of biopsy whenever a suspicious lesion disappears during sampling or neoadjuvant chemotherapy. Preoperative lesion localization is usually guided by the imaging modality that has been used for biopsy. Specimen radiograph during surgery reduces surgical cancer removal with positive tumor margins at postoperative pathology. Breast cancer staging encompasses a wide variety of anatomical and pathologic features that have a clear impact on treatment: size, extensive intraductal component, extension to the nipple-areola complex, the pectoralis muscle or the skin and lymph node status. Compared to mammography and ultrasound, MRI is the most accurate imaging modality for local staging, except for lymph node assessment, where ultrasound and fine-needle aspiration biopsy are the techniques of choice. The different follow-up strategies in the breast cancer patient depend on the clinical scenario: assessment of response to neoadjuvant chemotherapy, follow-up of patients treated with conservative or reconstructive surgery, confirmation of a suspected recurrence and evaluation of residual disease after positive margins at pathology. The role of different imaging modalities will be demonstrated in teaching cases.

Learning Objectives:

1. To obtain adequate lesion samples to allow histological proof prior to treatment.
2. To learn how to evaluate the extent of breast cancer.
3. To learn the different follow-up strategies in patients with breast cancer.

08:30 - 10:00 **Room F2**

Multidisciplinary Sessions: Managing Patients with Cancer

MS 321

Prostate gland

A-065 08:30

Chairman's introduction

U.G. Mueller-Lisse; *Munich/DE (ullrich.mueller-lisse@med.uni-muenchen.de)*

Prostate cancer is now estimated to be the most frequently detected cancer in men, with the exception of skin cancers (25% of all new cancers in male patients in the US). It is the second most common cause of cancer death among men (9% of all cancer deaths in male patients in the US). The debate over screening for prostate cancer has been active for years. While regional and multinational trials continue, there is as yet no nationwide screening project established. Prostate specific antigen (PSA) has increased the number of prostate cancers detected at an early stage, with curative treatment options and increased post-therapeutic survival. With increased numbers of small cancers being detected, there are more therapeutic modalities available, both in urological surgery and in radiation oncology. Choice demands for selection criteria, including radiological imaging, as an aid to decisions. After therapy, patients with prostate cancer are being followed-up, to rule out both complications of the respective therapy selected and the development of recurrence or metastasis. Findings at follow-up may have to be corroborated and treatments planned based on radiological imaging. This multidisciplinary session demonstrates and discusses current diagnostic and therapeutic options in prostate cancer and the respective role of radiological imaging, with emphasis on communication, multidisciplinary interaction and decision-making.

Learning Objectives:
1. To know which clinical and imaging tests are available to detect and localise prostate cancer, and how they are currently being applied in clinical practice.
2. To know which clinical and imaging tests are available to determine the extent of prostate cancer and its complications both before and after therapy.
3. To know which therapeutic options are available to treat prostate cancer, and what factors influence the selection of treatment modality.

A-066 08:35

What the surgeon needs to know

M. Seitz; *Munich/DE (Michael.Seitz@med.uni-muenchen.de)*

The diagnosis of prostate cancer (PC) is based on a combination of digital rectal examination (DRE), serum prostate specific antigen (PSA) testing, and transrectal ultrasound (TRUS)-guided biopsy. In prostate cancer diagnosis or staging, neither computed tomography (CT) nor magnetic resonance imaging (MRI) are routinely recommended by European Association of Urology (EAU) guidelines. Nevertheless, MRI, PET/CT-scans and other modalities such as contrast-enhanced TRUS, MRI-guided biopsy, MRI/TRUS-fusion guided biopsy and elastography are increasingly gaining recognition as important tools for the detection and localization in patients suspected of prostate cancer. The aim of the lecture is to review the current and future clinical status of imaging procedures in the detection and localization of prostate cancer and what factors may influence the selection of treatment modality such as radical prostatectomy (RP), radiation (EBRT), hormonal therapy (HT), watchful waiting (WW) and active surveillance (AS). Another main issue of the lecture, which is of high interest for clinicians, is the diagnostic value of imaging in patients with recurrent PC after definitive therapy. We illuminate the advantages and drawbacks of TRUS, MRI and functional MRI-techniques as well as choline-based PET/CT-scanning.

Learning Objectives:
1. To know which tests can be performed to detect and localise prostate cancer, and the role diagnostic imaging plays.
2. To know which urologic treatment options there are for prostate cancer, what factors influence the selection of treatment modality, and if those factors can be evaluated on a clinical basis.
3. To know what information is necessary and what is useful for the surgical treatment of prostate cancer.
4. To know how surgical results are evaluated and how complications are detected.
5. To know how the patients are followed up.
6. To know how recurrence is detected, analysed, and managed.

A-067 08:55

What the oncologist needs to know

C. Belka; *Munich/DE (Claus.Belka@med.uni-muenchen.de)*

Radical surgery and radiation alone or in combination comprise highly effective treatment modalities for prostate cancer. Up to now, only population based data indicate that in primary treatment settings surgery and radiation are equally effective. Due to compliance problems and ethical consideration, no randomized trial will address this question in the foreseeable future. In case of a biochemical relapse or R1 resection, radiotherapy is the only curative approach currently known. Diagnosis and treatment monitoring is still based mainly on PSA determination. However, MRI and chlorine-PET may add important information in several clinical situations. In this regard, the determination of an exact T stage and N stage is the most important question to be addressed by imaging.

Learning Objectives:
1. To know about clinical staging of prostate cancer and what role there is for diagnostic imaging.
2. To know which radiation therapy options there are for prostate cancer, what factors decide on the selection of treatment modality, and if those factors can be evaluated on a clinical basis.
3. To know how the response to the treatment is evaluated.
4. To know which complications may occur and how complications are detected.
5. To know how the patients are followed up.
6. To know how recurrence is detected, analysed, and managed.

A-068 09:15

Imaging in prostate cancer

U.G. Mueller-Lisse; *Munich/DE (ullrich.mueller-lisse@med.uni-muenchen.de)*

Digital rectal examination (DRE) and prostate-specific-antigen testing (PSA) represent the mainstay of prostate cancer (PCA) detection and are of limited use for staging. Transrectal ultrasonography (TRUS) guides prostate biopsy when either DRE or PSA yields abnormal results. Magnetic resonance imaging (MRI) appears to be more accurate than either DRE or TRUS-guided biopsy and can help to detect and localize PCA and guide targeted biopsy in patients with suspicious PSA and previously negative prostate biopsy results. Studies in small patient populations with negative prostate biopsy results concordantly show moderate to high positive predictive values (approximately 40-90%) and high negative predictive values (approximately 87-100%) for combined MRI and MR spectroscopy. MRI can be helpful for the local staging of PCA, including extracapsular extension (ECE) and seminal vesical invasion (SVI). MRI findings most indicative of ECE include obliteration of the recto-prostatic angle and asymmetry of the neurovascular bundle. While accuracy of MRI varies widely, it appears to improve with maturation of MR technology (e.g., combined phased-array-endorectal-coil-systems, faster MRI sequences, more powerful gradient coils, and improved image post-processing), reader experience (e.g., almost 40% more sensitivity for ECE in experienced readers), and combination of MRI with other MR techniques (e.g., combined dynamic, contrast-enhanced MRI with sensitivity/specificity of 85/95% for ECE, respectively). For SVI, sensitivity of MRI varies (approximately 25-80%), while specificity is high (approximately 80-99%). Data are limited for recurrent PCA, but one study reports sensitivity/specificity of 95/100% for local recurrence. PET/CT with choline-markers aids in the detection of nodal and distant metastasis of PCA.

Learning Objectives:
1. To review different diagnostic imaging modalities and their respective capabilities in the diagnosis.
2. To summarise diagnostic imaging modalities and their respective test quality parameters in tumor detection and localisation.
3. To learn about tumor staging.
4. To learn about challenges in the detection of recurrences.

Panel discussion and case presentation 09:35

08:30 - 10:00 **Room G/H**

Special Focus Session

SF 3b

Imaging the polytrauma patient

Moderator:
A. Palkó; Szeged/HU

A-069 08:30

Chairman's introduction

A. Palkó; *Szeged/HU (palkoand@gmail.com)*

In the modern trauma management environment, the role of imaging diagnostics is paramount. At the same time, the number of available modalities and the special expertise required for the appropriate treatment of the trauma patient makes it of utmost importance to define the optimal, but at the same time sufficiently flexible, diagnostic algorithm. The definition is supposed to extend not only to the sequence of available modalities in different clinical settings but should also reflect the special attitude required from the radiologist in this special emergency environment. Thus, the goal of this session is to discuss rather the management and procedural details, the structured diagnostic algorithm than the imaging symptoms and techniques, while of course these should still play a role in the introduction and discussion of the topic.

Session Objectives:
1. To introduce the critical role of the radiologist in the care of polytrauma patients.
2. To understand the role of imaging and image-guided intervention in reducing morbidity and mortality.
3. To explain appropriate diagnostic algorithms in different clinical settings

A-070 08:35

Who, when and where: The role of the radiologist in the trauma team

G. Schueller; *Vienna/AT (gerd.schueller@meduniwien.ac.at)*

Trauma induced mortality is approximately as high as of cardiovascular and oncologic disease together. During the last decade, the radiologist's role in dedicated trauma centres has been changing considerably. Most often, time is the major determinant for the prognosis of the traumatized patient. The radiologist's expertise is needed to rapidly assess life-threatening conditions on the one hand and to provide adequate information about the extent of organ lesions on the other, thereby predicting whether surgery would become necessary or wait and see strategies would be of help. Hence, the radiologist is in the very middle of the trauma team,

along with trauma surgeons and anesthesiologists. For that purpose, injury severity scores are of great help, and the radiologist must be familiar with these scores, as well as with the therapeutic consequences associated with them.
Learning Objectives:
1. To learn about teamwork and evidence-based procedures in the management of polytraumatised patients from the radiologist's point of view.
2. To understand CT-based injury severity scores, and the associated therapeutic consequences.
3. To become familiar with the specific requirements regarding equipment, workflow and training of technicians and radiologists in an emergency unit environment.

A-071 08:45
Front line sonography
E. Danse; *Brussels/BE (danse@rdgn.ucl.ac.be)*

Our aim is to report on the current opinion about the role of US for the management of polytraumatized patients. In this specific context, US is used for detection of intraperitoneal free fluid, pleural effusion, and indirect signs of pneumothorax. In hemodynamically unstable patients, US is followed by an urgent exploratory laparotomy or an angiographic procedure depending of US findings. In stable patients, negative or positive US is followed by a whole body CT evaluation. Based on this presentation, the audience has to be informed to the current opinion about the following items: 1. When to do this examination? At the time of accident, during the resuscitation process, during the transport or at the initial time of admission in the emergency room? 2. Where to do this examination? On the scene of the trauma, in the emergency department, in the operating room, in the radiological department? 3. Who will do the examination? The more skilled and available operator, a sonographer or a doctor, including an emergency physician, a surgeon, an anesthesiologist, and at the end, a radiologist? 4. Which device has to be used? Mobile/portable sonographic machine, high tech device? 5. What do we have to look for? a) ascitis and visceral lesions, chest and cardiac abdnormalities? b) which findings can help for triage of the patients and definitions of priorities? Wait and see, CT without delay, CT with delay, early angiographic procedure or early laparotomy.
Learning Objectives:
1. To learn about the role and limitations of sonography in the management of polytraumatised patients.
2. To be informed about the indications, timing, technical requirements and operator skill of US examination of the polytrauma patient.
3. To understand the significance of different findings (visceral, chest and cardiac abnormalities, pathologic fluid accumulations, vascular injuries, etc). detectable by US.

A-072 09:05
MDCT as the single best solution
U. Linsenmaier; *Munich/DE (ulrich.linsenmaier@med.uni-muenchen.de)*

Diagnosis of trauma-related injuries is a key issue in modern emergency radiology. Fast, early and comprehensive, as well as accurate depiction of potentially life-threatening injury patterns is crucial. Conventional radiography (CR) and ultrasound (US) are well-established and still in use for a basic diagnostic work-up; however, many of studies have shown a lower detection rate compared to CT. MDCT with its shorter scan time and increased accuracy has become the gold standard for all patients after major trauma. This lecture will cover the following issues: we will initially present current concepts of the so called „whole body CT (WBCT)" or synonymously used „trauma pan scan" protocols for the initial radiological management of patients with major trauma (syn. polytrauma, multiple injured). We discuss also the use of MDCT for the primary patient survey (ATLS), integration of MDCT scanners in the emergency room and outcome of patients after MDCT. We then focus on comprehensive whole body MDCT scan protocols for use in different scanner types, from 4, 16, 64 to 128 detector row scanners, including, technical aspects, slice and detector collimation, contrast medium injection, scan phases and image reconstruction parameters. MDCT delivers higher radiation dose, professional optimization of imaging parameters is recommended to minimize exposure and maximize diagnostic safety. We then present recent approaches for fast volume image data reading (VIR), handling large data sets, as well as handling of a larger number of patients as in mass casualties incidences.
Learning Objectives:
1. To understand the major role of MDCT in the early assessment of polytrauma patients and its influence on outcome.
2. To learn about comprehensive whole body protocols for patients with polytrauma (for 4-16-64 and > 64*MDCT scanners), technical aspects, contrast medium injection, scan phases and image reconstruction parameters.
3. To appreciate approaches for fast volume image data reading, logistics of an emergency radiology unit and factors affecting patient throughput.

A-073 09:25
The growing importance of interventional radiology
T. Jargiello; *Lublin/PL (tojarg@interia.pl)*

Catheter-based, endovascular techniques had become an integral part of the trauma team's armamentarium. Although recognition of the role of interventional radiology in vascular trauma have a significant impact in decreasing morbidity and mortality, not all hospitals have possibility to use it as 24-hour service. Transcatheter arterial embolization is the basic IR technique used to control bleeding in polytrauma patients. Each case of vascular or solid organ trauma is different, especially when it takes multi-organ injury. That is why specialized IR team must have at their own disposal all possible catheter equipment (coaxial technique) and all available embolization materials. Injuries of main vascular trunks can also be managed with covered stents (stentgrafts) - but it is really hard to have all its types and sizes on stock. Apart from TEA and stenting, percutaneous drainage procedures are also of some importance especially, when there is a need to minimally invasive treatment of pathologic blood or other fluid collections. Sometimes, both methods are used in particular patient simultaneously. Good results of IR treatment of polytrauma patients are strictly depend on patients' clinical status. Stable patients or those with rapid response to fluid resuscitation (SBP > 80 mmHg) have better chance for successful minimally-invasive intervention. Injury Severity Score (ISS) is very helpful in predicting the final outcome (mortality rate). According statistics, patients with ISS less than 50 are almost all to survive after non-surgical treatment and those with ISS > 50 may not respond to this type of therapy.
Learning Objectives:
1. To discuss the role of interventional radiologists in the trauma team.
2. To learn about the possibilities of interventional radiology.
3. To recommend the appropriate methods depending on the clinical status of the patient.

Panel discussion:
Imaging in polytrauma: How can we help most? 09:45

08:30 - 10:00 **Room K**

Special Focus Session

SF 3c

Pediatric non-traumatic emergencies: What we must know!

Moderator:
M. Raissaki; Iraklion/GR

A-074 08:30
Chairman's introduction
M. Raissaki; *Iraklion/GR (mraissaki@yahoo.gr)*

Pediatric non-traumatic emergencies represent a large proportion of all pediatric radiology cases and are ideally managed by experienced personnel, familiar with the nature of the emergency. It is important to appreciate that certain signs and symptoms are indicative of dangerous conditions with significant morbidity and mortality if left untreated or if there is delay in diagnosis and treatment. It is equally important to realise that conversely, in other cases, imaging could be delayed but is usually performed on an emergency basis to alleviate parent's and/or doctor's anxiety. In some life-threatening conditions, symptoms may be disturbing and alarming while in other situations with equally dangerous conditions, symptoms may be mild. In all cases, the radiologist should play an active role by keeping a high index of suspicion for the devastating pediatric emergencies and by choosing the most appropriate test taking under consideration the age of the patient, past medical and present history, together with the signs and symptoms. Every test should be performed appropriately with a dedicated technique, depending on the clinical question especially when considering aspirated foreign bodies and gastrointestinal abnormalities. Experienced radiologists prove an invaluable assistance to clinicians for the management of these cases guiding towards medical or surgical therapy and sometimes offering therapeutic intervention. Paediatric non-traumatic emergencies can be divided into four main categories, requiring imaging of the brain, chest, abdomen and musculoskeletal system.
Session Objectives:
1. To discuss the most common non-traumatic pediatric emergencies.
2. To understand the potentially devastating complications of delay in their diagnosis and treatment.

3. To recommend the most appropriate imaging test depending on age, history and symptoms.
4. To understand the importance of appropriate technique when performing certain tests on children.

A-075 08:33

Neurological emergencies

C. Garel; *Paris/FR (catherine.garel@trs.aphp.fr)*

Some conditions or symptoms may be highly suggestive of brain damage. In neonates, hypoxic-ischaemic encephalopathy, seizures with or without fever, marked hypotonia, apnea, marked thrombopenia or thrombophilic disorders prompt rapid investigation. In both neonates and older children, intracranial hypertension, consciousness disorders or infectious context with neurological findings require urgent cerebral imaging. In older children, acute onset or rapid evolution of neurological symptoms or onset of neurological symptoms in a child suffering from sickle cell disease, haematological malignancy or solid tumour are also an emergency. In all these conditions, cerebral imaging may directly impact on therapeutic management. Conversely, in other cases, cerebral imaging could be delayed but is usually performed rapidly due to parental and/or medical anxiety. This is particularly true in neonates when brain abnormality was diagnosed by prenatal imaging and pregnancy was not terminated or when facial malformation or syndrome with possible brain involvement are discovered at birth and were not diagnosed by prenatal ultrasound. Ultrasound is a good screening and monitoring imaging modality in neonates but lacks sensitivity and may overlook numerous cerebral lesions. Computed tomography can rapidly detect hydrocephalus or haemorrhage but it also lacks sensitivity. Magnetic resonance is the most sensitive current imaging modality and has better contrast resolution. Diffusion weighted imaging may be particularly useful in the setting of cerebral emergency.

Learning Objectives:

1. To appreciate alarming symptoms requiring urgent investigation.
2. To differentiate true emergencies for which cerebral imaging may directly impact on therapeutic management and “delayed” emergencies related to parental and/or medical anxiety.
3. To be aware of the main cerebral non-traumatic emergencies in neonates and older children.
4. To learn about the respective contributions of US, CT and MRI.

A-076 08:51

Thoracic emergencies

C.E. de Lange; *Oslo/NO (charlotte.eva.delange@rikshospitalet.no)*

In children, non-traumatic thoracic emergencies are very frequent and usually present with breathing difficulties. Sometimes, feeding or swallowing problems are associated or presenting symptoms. In addition, less specific general symptoms like fever, sepsis or chest pain may occur. The emergencies always require a rapid diagnosis to establish a medical or surgical intervention plan, and radiological imaging most often plays a key role. Correct interpretation of the radiological findings is of great importance to diagnose and monitor the illness and to avoid serious complications. Plain radiography with inspiratory and sometimes expiratory films or fluoroscopy still remains the most important and frequently used tool to gain information on acute pulmonary problems of all kinds. Ultrasonography is the first choice for diagnosis and treatment of pleural effusions. Cross-sectional techniques like multidetector computed tomography and magnetic resonance imaging are mainly used for investigating pulmonary/mediastinal masses and congenital abnormalities of the great vessels and the lungs. This lecture will review the imaging characteristics of acquired and congenital causes to non-traumatic thoracic emergencies; the common conditions involving the respiratory tract, chest wall and the esophagus, as well as the less frequent causes like tumours and manifestations of congenital malformations. The choice of imaging modality and the urgency of radiological management depending on the clinical presentation and the age of the child will be discussed, with the main focus beyond the neonatal period.

Learning Objectives:

1. To learn about the spectrum of thoracic emergencies in children, including foreign bodies, mediastinal tumors, infection, asthma, air leaks and delayed manifestations of congenital chest malformations.
2. To consolidate knowledge of the essential role of radiology in making a rapid diagnosis, planning treatment and avoiding devastating complications.
3. To understand the different thoracic emergencies depending on age.
4. To recommend the appropriate radiological technique depending on the clinical indication and the patient’s age.

A-077 09:09

Abdominal emergencies

S.G.F. Robben; *Maastricht/NL (srob@rdia.azm.nl)*

Several pediatric diseases are real abdominal emergencies. Any delay in diagnosis and treatment may result in death or severe morbidity. These diseases are highly age-dependent. Newborn infants may have congenital diseases as Hirschsprung’s disease or meconium ileus or may develop necrotizing enterocolitis, incarcerated inguinal herniation and midgut volvulus. Infants and preschool children have intussusceptions, urinary tract infections and (rare) hemolytic uremic syndrome. Children and adolescents have appendicitis, genito-urinary infections, ovarian torsion and Henoch Schonlein purpura. Considering radiation dose in children and the excess value of ultrasonography (US) in small individuals, US plays an important role as initial diagnostic modality in pediatric abdominal emergencies. Sensitivity and specificity for US in diagnosing intussuception, midgut volvulus, urinary tract abnormalities and appendicitis is over 90%. Conventional abdominal radiographs or fluoroscopy are valuable in Hirschsprung’s disease, meconium ileus, malrotation and necrotizing enterocolitis. I consider CT as an additional technique when the initial techniques (US and conventional radiography) are inconclusive. MRI is seldom indicated in pediatric patients with abdominal emergencies because of motion artifacts in anxious children and sometimes limited MR capacity. Delay in diagnosis of the above-mentioned diseases may be devastating, ranging from life-long disability to death. Therefore, it is important to consider these diagnoses and to initiate prompt adequate diagnostic work-up.

Learning Objectives:

1. To discuss the most common and devastating pediatric abdominal emergencies.
2. To discuss the appropriate imaging techniques in pediatric abdominal emergencies.
3. To understand the consequences of any delay in diagnosis.

A-078 09:27

Musculoskeletal emergencies

K.J. Johnson; *Birmingham/UK (karl.johnson@bch.nhs.uk)*

The common non-traumatic paediatric musculoskeletal emergencies which involve radiological evaluation in the order of priority are sepsis, slipped capital (upper) femoral epiphysis (SCFE) and malignant tumours. This presentation will discuss the clinical presentation of these conditions, the role and timing of imaging (and its limitations) and the appropriateness of specialist referral in these conditions. A septic joint or limb can rapidly cause significant dysfunction and long-term morbidity. Fortunately, appropriate rapid treatment will often lead to complete cure. Radiology is helpful in confirming the diagnosis, but the imaging features can be non-specific. Importantly, normal radiological findings, in particular radiographs and ultrasound, cannot exclude the diagnosis and clinical evaluation remains vitally important. The radiological features of osteomyelitis and septic arthritis will be demonstrated. The value of magnetic resonance imaging in detecting occult infection, assessing collections and planning appropriate surgical intervention will be illustrated. SCFE can either present as an acute or an acute and chronic problem. It is important that both AP and lateral radiographs are obtained to assess the hips. The important diagnostic clues in assessing for SCFE will be discussed. The role of MR imaging as a complementary investigation will be highlighted. When there is a suspicious bone lesion, those features which suggest more rapid and aggressive growth will be illustrated. The difficulties in excluding a malignant lesion along with the appropriate use of cross-sectional imaging and the importance of specialist referral will be discussed.

Learning Objectives:

1. To learn about the three commonest musculoskeletal diseases that require urgent radiological evaluation and stress the complications of delay in diagnosis and treatment.
2. To discuss the complementary role of different imaging modalities in the evaluation of musculoskeletal infection, slipped capital femoral epiphysis and malignancy.
3. To recommend imaging algorithms.

Panel discussion:
How to manage the stressed pediatrician 09:45

08:30 - 10:00 **Room L/M**

Special Focus Session

SF 3d

Fetal body MRI

Moderator:
M. Bekiesinska-Figatowska; Warsaw/PL

A-079 08:30

Chairman's introduction

M. Bekiesinska-Figatowska; *Warsaw/PL (m.figatowska@mp.pl)*

Over the last 27 years, much has been written about fetal MRI, an adjunct technique to sonography in the detection of prenatal malformations, allowing for confirmation, completion and/or correction of sonographic findings. Most publications concerned fetal neuroradiology as the assessment of the central nervous system of the fetus was the main indication for prenatal MRI. The spectrum of indications has grown however and MRI has emerged as a diagnostic tool for global assessment of the fetal body because new ultrafast MRI sequences have eliminated artifacts caused by fetal motion and provided very good quality of T2-weighted images acquired in less than one second. A high contrast between details of fetal body can be obtained thanks to the large amounts of water in most of fetal tissues. The purpose of this session is to review practical aspects of MR imaging of fetal thorax, abdomen and musculoskeletal system. The radiologists should know the normal anatomy of the fetal body and be able to recognize the pathologies characteristic for this developmental period. A discussion closing the session should answer the question whether this concerns every radiologist or will remain a task for superspecialized radiologists.

Session Objectives:

1. To understand the role of prenatal body MRI.
2. To learn about the added value of MRI compared to US in prenatal diagnosis of the thorax, abdomen and musculoskeletal system.
3. To become familiar with imaging features of pathologies in these areas of the fetal body.

A-080 08:35

MRI of the thorax

P. Eliás; *Hradec Králové/CZ (elias@fnhk.cz)*

Magnetic resonance imaging (MRI) still suffers from limited temporal resolution and is rarely used for fetal cardiac studies. On the contrary, MRI has fewer physical and subjective limitations than ultrasonography (US) and offers different information using fast T2 and T1-weighted sequences. That is why it is becoming a valuable adjunct to US in evaluation of fetal thorax. MRI can aid in three categories: 1) to provide more details on abnormalities seen on US, 2) to refine volumetry of the lungs, and 3) to provide the data on lung maturation. In congenital diaphragmatic hernia, two major prognostic factors can be accurately evaluated: presence of intrathoracic liver tissue (T2 hypo- and T1 hyperintense structure) and volume of the residual lungs. Estimation of total fetal lung volume on MRI seems to have better predictive value than traditionally used lung/head ratio based on US. Congenital cystic adenomatoid malformation and pulmonary sequestration present as T2 hyperintense and T1 hypointense expansile lesions. MRI is frequently used to confirm the diagnosis and for follow-up of possible regression of these abnormalities. Contrary to Doppler US, MRI is not able to differentiate between each other and is of limited predictive value. Developing fetal lung shows gradual increase of T2 and decrease of T1 signals due to increasing fluid content. Thus, the quantification of their relative values with liver serving as a reference organ can be used for assessment of pulmonary maturation. Diffusion weighted or spectroscopic MRI studies do not seem to be of additional value at present.

Learning Objectives:

1. To become familiar with the standard US and MR examination techniques for imaging of the fetal thorax.
2. To learn the basic aspects of normal imaging anatomy.
3. To cover the most important pathological entities affecting the fetal thorax and to show the strengths and weaknesses of US and MR in diagnosing them.
4. To point out currently accepted indications and future perspectives of MRI.

A-081 08:58

MRI of the abdomen

T.A.G.M. Huisman; *Baltimore, MD/US (thuisma1@jhmi.edu)*

Fetal MRI has evolved to be a valuable second line imaging modality to confirm, correct or complete prenatal ultrasound (US) findings. Fetal MRI has proven to be especially helpful for the central nervous system (CNS), but is however less well established for fetal abdominal pathologies. With growing fetal imaging expertise, increasing acceptance of fetal MRI, and ongoing hard- and software developments, fetal MRI is progressively been used for abdominal indications. The fetal radiologist should be familiar with the normal abdominal fetal anatomy and embryology to understand and identify fetal abdominal pathology. Based upon the normal development of the abdominal organs and gastrointestinal (GI) tract, we will review the various fetal pathologies that can be identified by fetal MRI. In particular, we will review what the added value of fetal MRI is compared to prenatal US, which kind of image contrasts should be used and what their respective value is in the examination of fetal pathology. Many abdominal indications have already been established including pathologies of the GI-tract (atresia), the mesenterium (lymphangioma), the solid organs (neuroblastoma) and urogenital tract (renal agenesis, cloacal malformation). The list of abdominal indications is however continuously growing. The importance of evaluating abdominal pathologies in the context of the entire fetal anatomy is obvious. Lesions within the abdomen may be related to adjacent or distant lesions but may also be part of a syndrome or even related to a possible twin fetus. Consequently, a fetus with an abdominal pathology should always receive a complete fetal MRI examination.

Learning Objectives:

1. To learn about fetal abdominal MRI and its current and future indications.
2. To understand the strengths and weaknesses of fetal MRI of the abdomen.
3. To appreciate the added value of fetal MRI compared to US in examining fetal abdominal pathologies.
4. To become familiar with the different fetal MRI techniques for studying abdominal pathologies.
5. To consolidate knowledge of abdominal pathologies that can be encountered intrauterine.

A-082 09:21

MRI of the skeleton

D. Prayer, S.F. Nemec, G. Kasprian, D. Bettelheim, P.C. Brugger; *Vienna/AT (daniela.prayer@meduniwien.ac.at)*

Diagnosis of pathologies of the fetal musculoskeletal system is regarded as a domain of ultrasound. Especially, 3D techniques allow detailed information on small details already in the early second trimester. Regarding these details, MRI is inferior to ultrasound even if the availability of echoplanar or gradient-echo sequences has improved its ability to visualize bone. However, skeletal malformations and deformities may be parts of complex syndromes, the prognosis of which depends on the presence or absence of additional pathology. In such cases, for instance in Chiari II syndrome, MRI may provide information that allows to estimate the prognosis more accurately. MRI can show the type of spinal dysraphism, and the extent of cerebral involvement. In syndromes like arthrogryposis that have a wide variety of etiologies, some of them may be proved or excluded. In case of a single anomaly, as for instance, a club foot, the question of presence or absence of a complex malformation or an underlying syndrome may be answered by MRI. Skeletal malformations are often associated with thoracic deformities leading to a reduction of lung volumina. Lung volumetry and assessment of lung signals help to conclude on postnatal lung functionality. Malpositioned limbs may be the consequence of neuromuscular diseases. In such cases, MRI may find pathological signals in the muscles. It has also been described that MRI can demonstrate the developmental changes of the non-osseous parts of the metaphysis of the long bones. Whether this information will be usable for diagnostic purposes will have to be proved.

Learning Objectives:

1. To understand which sequences demonstrate the fetal musculoskeletal system most adequately.
2. To learn the contribution of MRI in the workup of musculoskeletal pathologies.
3. To recognise characteristic features of such pathologies on US and MRI.

Panel discussion:
Superspecialised examination or a task of the general radiologist? 09:44

08:30 - 10:00 **Room N/O**

Professional Challenges Session

PC 3

Teaching: Art, habit or science?

Moderator:
J.E. Wildberger; Maastricht/NL

A-083 08:30

Chairman's introduction: Teaching and education - help yourself: Requirements for the future of radiology
J.E. Wildberger; *Maastricht/NL (j.wildberger@mumc.nl)*

Teaching and education in medicine is paid more and more attention, last but not least for the evident shortage of young academics. If students and young professionals are made enthusiastic by inspiring lectures and interactive seminars, it will be more likely that they are interested in becoming e.g. a radiologist. This session will provide different facets of lecturing and seminars. Standards, such as the European Training Charter for Clinical Radiology, form a good basis for a local adaptation. Core competencies and clinical expertise will always be required to present and communicate goals and objectives on a high level. In order to meet the miscellaneous expectations, learning objectives and the current level of knowledge in the auditorium have to be considered. Improvements in teaching skills can be trained and reflected, e.g. by changing the perspective (teacher-learners), by receiving and providing feed-back, from independent evaluations, etc. to meet the ultimate goal, a higher level of educational effectiveness. Different approaches and perspectives will be presented: active participation can be combined with traditional interaction. Also, „new media" such as e-learning will be discussed, which offer great opportunities for teaching and education, especially for our „visual" and „digital" discipline. These can also be incorporated into dedicated new teaching concepts, such as „problem-based learning", where imaging is integrated rather than being a stand-alone discipline. Finally, we are looking forward to a vivid panel discussion on the different facets, opportunities and challenges in teaching and education.
Session Objectives:
1. To review the specific features of teaching and education in radiology.
2. To understand the need of young radiologists in this context.
3. To learn about the current and future concepts for improving teaching and education.

A-084 08:35

Clinical teaching: Avoid the yawn
R. Greif; *Berne/CH (robert.greif@insel.ch)*

With a little effort, you, too, can deliver an exciting lecture or teaching session. As an expert in the field, your job is not just to know your topic by heart - it is to inspire your students, igniting the fire of learning rather than inspiring yawns. Effective clinical teaching requires involvement with your learners. Knowledge of their problems, views and visions of the topic influences the learning climate. Exciting clinical teachers are not born, they are trained. Get involved in CME seminars about teaching, or formal medical education training programs. Spend your limited time in seminars focusing on teaching skills that you might transfer to your clinical teaching environment. Interaction and emotions initiate learning on the neurophysiologic level via the hypothalamus. For this reason, inspiring your students intellectually will do more than a brilliant Powerpoint slide show. Communicate meaningful learning goals which are relevant for the students' clinical tasks and assignments. Give them experience by involving them actively in planning, conducting and assessment of teaching. Interactive participation provides intellectual stimulation, fostering understanding and retention of the subject matter, and motivates further engagement in the topic. You as a teacher modulate the learning climate by using a variety of teaching methods and learning materials and by adapting your teaching style to the learners' needs. Finally, recognize that improvement comes through feedback. Actively seek assessment of your performance from your peers and your students. Stimulate yourself to take on new learning and teaching experiences - and stay awake throughout your career.
Learning Objectives:
1. To understand the need for intellectually inspiring lessons.
2. To learn options for exciting teaching.
3. To develop a practical approach to clinical teaching.

A-085 08:50

Clinical teaching: The young doctor's perspective
C. Nyhsen; *Sunderland/UK (nyhsenc@doctors.net.uk)*

When preparing a teaching program, one usually thinks of the contents first and how to incorporate as much information as feasible into a relatively short period of time. Much effort goes into layout, making the sessions appealing and giving valuable advice. The learners' perspective is however often much different. Learning for the greater good is frequently replaced by „surviving" in real life, such as passing the next exam or managing the next on-call successfully. It is, therefore, important that educators consider the learners' point of view. The better they understand the students' situation, the better the sessions will be received and the more motivated the students will become. Furthermore, considering the level of students one is teaching is important. Medical students vary greatly from junior medical doctors, and first year radiology trainees to more senior trainees. Therefore, a distinction has to be made between the very young, the young and the „more mature" students, not only with respect of contents but also with respect of teaching methods used. This talk will introduce the Radiology Trainees Forum of the ESR with their role in representing the trainees' perspective and it is going to address questions such as: What are a young doctor's expectations? How can I get and maintain the student's interest? What are the worst mistakes to avoid?
Learning Objectives:
1. To be aware of the special needs of teaching in radiology.
2. To provide an overview on current practical concepts: The young radiologist's expectations.
3. To become familiar with the concept of the Radiology Trainees Forum (RTF).

A-086 09:05

e-Learning: Concept for the future?
R. Fowler; *Leeds/UK (richard.fowler@leedsth.nhs.uk)*

This short presentation will address the potential benefits of e-learning in radiology training. It is best utilised as a complementary resource to traditional work-place training, but can substitute for many of the repetitive instructional tasks allowing a more productive interface between learner and trainer. We will consider some of the current options with reference to the RCR Radiology Integrated Training Initiative (R-ITI). We will suggest how materials like these can best be integrated into radiology training.
Learning Objectives:
1. To learn the benefits of e-learning in radiology. Is it a complement or a substitute to conventional learning?
2. To learn what the current e-options and models are.
3. To become familiar with the e-learning programme of the Royal College of Radiology.

A-087 09:20

Quality and outcome for teaching in radiology
S. Kolkman; *Amsterdam/NL (s.kolkman@amc.uva.nl)*

A doctor of the future should have a natural ability to use radiology for optimizing patient care. This doctor knows which investigation is the best for assessing pathology, is aware of the ranking of different imaging modalities, from simple to complex; knows the indications for the different investigations and knows how to provide a radiologist with relevant information. He/she has practical knowledge of the basics of the most commonly used radiologic techniques and knows the risks of ionizing radiation. This doctor can identify normal anatomy in different radiological investigations and recognize pathology. At night, this doctor must recognize life-threatening disorders immediately. In every situation he/she must be able to explain his/her request to the imaging specialist in a succinct way. To reach this goal, a perfect educational radiology program during the medical curriculum is needed. Before developing an educational program, the final goal (s) must be clearly formulated. The contents should be in accordance with clinical issues. And for optimal results, the educational processes should be strictly controlled. In the AMC, Amsterdam, we developed a radiology educational program. Starting in the first year of medical school, different topics with increasing complexity are offered to the students throughout all years of the curriculum. The contents are developed by a radiologist in close cooperation with anatomists, pathologists and different clinicians, according to the subjects. For each part of the program, all students have to pass an exam. The programs are continuously evaluated and adapted when necessary, according to feed-back questionnaires.
Learning Objectives:
1. To understand the special needs of teaching in radiology.
2. To be aware of quality criteria and standards in clinical education.
3. To learn how to implement quality control in your teaching practice.

A-088 09:35

Teach the teacher

M. Hofer; *Düsseldorf/DE (matthias.hofer@uni-duesseldorf.de)*

This presentation will present a short overview of three core competencies in order to provide effective lectures and seminars in radiology teaching sessions: a) Methods to communicate goals and objectives effectively, b) adequate use of questioning- and-answering techniques in interactions and c) effective slide design/ use of media to foster understanding and retention. The most common pitfalls in the design of lectures and small group seminars, which we experienced in over 75 train-the-teacher workshops at six medical schools over the last five years will be demonstrated by short examples: • teacher-centered lecturing without active involvement of the learners; • to much content per time uncoupling of listeners; • unnecessary dark slide design fatiguing effects on learners; • inadequate use and dosage of animation in PowerPoint-presentations; and • inadequate use of assessment questioning. The influence of "psychological size" and the "threat of embarrassment", especially in interactive teaching sessions on diagnostic imaging modalities, will be elaborated. Thus, we intend to enhance the teachers' awareness of these aspects of our interaction between us and our learners in UGME (UnderGraduate Medical Education) as well as in PGME (PostGraduate Medical Education). Finally, the predominant "blind spot" concerning our own teaching skills will be figured out and quantified, based upon previous and retrospective self-reflections of the trainees (colleagues) before and after their participation in teaching skills workshops.

Learning Objectives:

1. To learn about the need to educate educators.
2. To understand the interaction between teachers and learners.
3. To develop a structured path on how to teach effectively.

Panel discussion:

Teaching and education in radiology: Well-prepared for the future? 09:50

08:30 - 10:00 **Room P**

Cardiac

RC 303

Systematic approach to congenital heart disease (CHD)

Moderator:

A. de Roos; Leiden/NL

A-089 08:30

A. Echocardiography: The first line modality

H. Abdul-Khaliq; *Homburg a.d. Saar/DE (abdul-khaliq@uks.eu)*

The prevalence of congenital heart disease in infancy is nearly 8/1000 and represents a heterogeneous spectrum of isolated or a combination of different malformations in the heart of connected vessels. Depending on the severity of congenital heart disease, immediate postnatal diagnosis is performed by transthoracal echocardiography in the majority of infants. Prenatal diagnosis in the majority of cardiovascular malformations or vessels is possible and may contribute to lower postnatal morbidity and mortality. Echocardiography is the first choice to diagnose structural and functional abnormalities in infants, children and adults before and after corrective surgery of congenital heart disease. Using 2D echocardiography, the intra cardiac and extra cardiac anatomy can be visualized in the majority of patients. Colour Doppler can be used to assess normal and abnormal intra- and extra-cardiac blood flow patterns. Doppler echocardiography provides quantitative information in blood velocity and the calculated pressure gradient. The introduction of new imaging modalities such as the tissue Doppler and speckle tracking enables quantification of myocardial wall movements and deformations providing information on the regional myocardial function. 3D echocardiography is not routinely used in assessment of structural heart abnormalities. However, the novel real time 3D echocardiography presents a reliable method for volumetric assessment of left and right ventricular function. Using these parameters, LV ejection fraction and dyssynchroneous contractile function can be assessed easily. In conclusion, the conventional and novel echocardiography methods provide a non-invasive and easy to perform method for evaluation of the morphology and function in the majority of congenital heart diseases.

Learning Objectives:

1. To discuss differential indications for echocardiography.
2. To systematically analyse CHD.
3. To review cases with complex CHD.

A-090 09:00

B. MRI: Getting more specific

P. Beerbaum[1], S. Sarikouch[2]; [1]*London/UK,* [2]*Hannover/DE*

Cardiac MR (CMR) has evolved as a diagnostic tool of key importance in the management of patients of all age with congenital heart disease (CHD). In clinical practice, CMR is considered an ideal adjunct to echocardiography in older children, adolescents and adults as reflected by class I-II recommendations for the clinical use of CMR by recent consensus panels. More recently, CMR is being increasingly used to image complex neonatal and infant CHD to plan surgical, interventional or hybrid repair, particularly during staged Fontan-type palliation of single ventricle physiology. The main reasons for its attractiveness include the unique abilities of CMR to: (1) non-invasively quantify blood flows and ventricular function and (2) provide detailed information on cardiovascular and airway morphology, particularly in complex CHD. Furthermore, hybrid systems of X-ray fluoroscopy combined with MRI scanners ("XMR systems") allow for detailed investigation of pulmonary vascular resistance using MR flow and invasive pressure recordings. There is active research to proceed towards MR-guided cardiovascular interventions in CHD as recent advances in the development of MR-safe guide wires and instrumentation allow for novel concepts of imaging during interventional procedures, using CMR as road map and pre-/post intervention assessment of procedural results. Large-scale clinical trials have utilized CMR for quantification of ventricular function in CHD and have much improved our understanding of prognostic factors for example in tetralogy of Fallot and Fontan circulation. Stress-CMR protocols using physical exercise or pharmacological stimulation are currently being investigated with respect to their potential role in diagnosing early ventricular failure.

Learning Objectives:

1. To understand the advantages of MRI in CHD.
2. To use dedicated MRI techniques (e.g. flow measurements) in CHD.
3. To learn which MR parameters have a prognostic value in CHD.

A-091 09:30

C. MDCT: Filling the gap

A. Küttner; *Erlangen/DE*

In recent years a multitude of different examining techniques for cardiac CT have emerged. Retrospective gating, prospective triggering, Step and shoot and most recently the ultra high pitch technique (FLASH) have become available. All techniques have their distinctive advantage and disadvantages, which are to be discussed when and how to use them properly and how the patient needs to be prepared (beta-blocker, nitroglycerine). Furthermore different techniques for delivering contrast media are discussed. A special section will also address the issue of radiation dose and how to practically implement these considerations in daily examination routine. MRI and CT both can create images with high spatial and temporal resolution. In this course the advantages and disadvantages of both techniques are discussed as well as when to use them in regard to CHD, e.g. plaque imaging vs. scar tissue imaging (late enhancement). Coronary Heart disease has a wide spectrum, ranging from early plaque detection ("vulnerable plaque"), stenosing coronary heart disease (angina pectoris, chest pain protocol, triple-rule-out), acute phase imaging (vital myocardium vs. scar tissue), as well as follow up scan after stent placement or bypass surgery. The course is discussing different techniques how to image specific features and when to apply cardiac CT best.

Learning Objectives:

1. To learn how to examine CHD with MDCT.
2. To compare the advantages and limitations of MDCT in comparison to MRI.
3. To understand the role of CT in differentiating various types of CHD.

08:30 - 10:00 **Room Q**

Genitourinary

RC 307

Female infertility

Moderator:
E. Kuligowska; Boston, MA/US

A-092 08:30

A. "Functional imaging" of the ovary for everybody
M. Weston; *Leeds/UK (Michael.Weston@leedsth.nhs.uk)*

Ovarian morphology, as seen on ultrasound, provides information on the functional status of the ovary. The appearance changes as a woman progresses from childhood, through menarche and into her post-menopausal years. Furthermore, during her menstrual years, the ovary shows clear cyclical changes with each menstrual cycle. Intersex states can be suspected from the lack of normal ovarian morphology, for example: androgen insensitivity may show a normal female phenotype but have intra-pelvic testes rather than ovaries. Chromosome anomalies such as Turner's syndrome may also demonstrate altered ovarian morphology, typically 'streak' ovarian stroma with no follicles. Polycystic ovary syndrome is a complex and heterogeneous condition, the cardinal features of which are hyperandrogenism, ovulatory dysfunction and polycystic ovary appearance (though this is not essential to the diagnosis). The polycystic ovary appearance requires 12 or more follicles of 2 to 9 mm in size or a volume of greater than 10 mls. If there is a follicle of 10 mm or greater, then the scan should be repeated at a later date when the ovary is quiescent. Other features of increased stroma or increased stromal echogenicity are specific but are not needed for diagnosis. It is recognised that a stromal area to total area ratio may be predictive of hyperandrogenism. Assisted conception uses ultrasound to track development of follicles and aid timing and dosage of medication and egg retrieval. Hyperstimulated ovaries are a risk and need to be identified. 3D scans may offer advantages over 2D in follicle counts and tracking.
Learning Objectives:

1. To review the different images associated with ovarian dysfunction such as polycystic disease, ovarian insufficiency, and chromosomic abnormalities.
2. To understand the role of the radiologist in preparation and management of ovarian stimulations.

A-093 09:00

B. Pelvic endometriosis: Why is it commonly overlooked?
G. Restaino; *Campobasso/IT (gennares@hotmail.com)*

Endometriosis is defined as the presence of endometrial-like tissue outside the uterus, which induces a chronic, inflammatory reaction. Subfertility is associated to endometriosis, with several proposed causal mechanisms: distorted pelvic anatomy, altered peritoneal, hormonal, and cell-mediated function, endocrine and ovulatory abnormalities, and impaired implantation. Imaging techniques currently used to diagnose endometriosis are ultrasound and magnetic resonance imaging (MRI). Sonographic features of endometriomas are low-level internal echos, multilocularity and parietal hyperchoic foci. At MRI, endometriomas appear hyperintense at T1- and T2-weighted sequences persisting at fat-suppressed T1-weighted images, often with loss of intraluminal signal on T2-weighted images, due to high concentrations of iron and protein. Common sites of endometriosis are: Douglas' pouch, utero-sacral ligaments, vagina, rectum and bladder. Rarer sites are: abdominal wall, fossa ischio-rectalis, round ligament, lymphnodes, vulva, liver, and chest. Presentation of endometriosis is protean and aspecific, with diagnostic delay up to 12 years. This is because endometriosis is not an organ pathology, but an abdomino-pelvic disease, heterogeneous for genetic background, pathogenesis, location, extent, severity, clinical manifestations, treatment requirement and outcome. Differential diagnoses of endometrioma include corpus luteum, teratoma, cystadenoma, fibroma, tubo-ovarian abscess and carcinoma. Neoplasm must be ruled out particularly in pregnant patients with decidualized endometriosis. A surgical procedure such as laparoscopy is required for definitive diagnosis of endometriosis. Transabdominal and transvaginal ultrasound represents the first-line imaging process for suspected endometriosis. MRI is the modality of choice to diagnose all lesion sites of endometriosis, and is performed in selected patients according to the results of ultrasound and the severity of symptoms.
Learning Objectives:

1. To learn that pelvic endometriosis is a leading cause of infertility.
2. To review the typical and atypical appearance of endometriosis, to explain the diagnostic delay and potential differential diagnosis.
3. To understand the role of imaging in establishing treatment strategies.

A-094 09:30

C. Understanding gynecologic malformations
F.M. Danza, A.L. Valentini; *Rome/IT (fmdanza@rm.unicatt.it)*

The multiple embryologic steps of the urogenital system are reviewed to understand the numerous malformations of the ginecological organs that are possible to observe during the radiological workup; pelvic or abdominal masses and infertility are usually the causes requiring a diagnostic study of these patients. Particular attention will be devoted to the diagnostic possibilities of radiological imaging in the anatomical demonstration of various clinical settings. Ultrasound and MRI are the methods of choice, owing to the absence of radiation risks, while CT is reserved only to particular case usually when the diagnostic orientation is confused or in emergency. Histerosalpingography is important when a fine anatomical detail of inner cavities are requested. Anyway, US and MRI, due to their capabilities to create series of multiplanar images and characterize tissues and liquids, are the main tools radiologists can use. A wide pictorial assay of the common and rare malformations of uterus, ovary and annexed bodies, in one with urologic associated conditions will be presented, as they appear on each imaging modalities, so that a correct diagnosis can be achieved. The differential diagnosis with other pelvic masses will be also displayed.
Learning Objectives:

1. To understand the most common uterine and vaginal malformations, with regard to embryology.
2. To review the imaging appearance of uterine and vaginal malformations, with a special emphasis on US and MRI.
3. To be able to determine whether or not a malformation is the cause of infertility.

10:30 - 12:00 **Room A**

ESR meets Poland

EM 1

Emergency radiology: The new frontiers, the old barriers

Presiding:
C.J. Herold; Vienna/AT
M. Sasiadek; Wroclaw/PL
M. Szczerbo-Trojanowska; Lublin/PL

A-095 10:30

Introduction
M. Sasiadek; *Wroclaw/PL (mareks@rad.am.wroc.pl)*

The history of Polish radiology started in 1896, just few months after Wilhelm Roentgen's discovery, when the first X-ray image was performed in Cracow. Polish Medical Radiological Society (PMRS) was established in 1925. Currently, PMRS has 15 subspecialty sections, each of them organizes annual meetings and courses. The Congress of Polish Radiologists, which covers all fields of radiology, are held every third year. PMRS organizes every year a lot of postgraduate courses e.g. "Polish School of Radiology", School of MRI, School of Multidetector CT, as well as subspecialty and regional courses. We also organize European Congresses and Courses, like European Society of Neuroradiology Congress (2008), European School of Radiology (ESOR) or Erasmus MRI Courses. The growing role of Polish radiology is reflected by fact, that the President of ECR 2010 is Prof. Malgorzata Szczerbo-Trojanowska from Lublin, Poland. Polish radiologists, especially those from academic centers, are active professionally and scientifically in all fields of modern radiology. In this session, we decided to present the selected topics of emergency radiology. The lecturers represent the younger generation of Polish radiologists and are considered to be the "rising stars". The particular topics we have focused on are: stroke imaging, cardiac emergencies, management of aortic dissection and pulmonary embolism. The lecturers will present the updates in the fields mentioned above and propose the optimal management protocols in routine emergency setting.
Session Objectives:

1. To outline the activities of the Polish Medical Society of Radiology.
2. To present the updates of the selected topics of emergency radiology.
3. To present the achievements of the rising stars of Polish radiology.

A-096 10:35

Modern emergency stroke imaging

K. Sklinda; *Warsaw/PL (katarzyna.sklinda@gmail.com)*

Stroke became one of the most common emergencies; however, very few patients arrive at ER departments within “time-window” which deprives some of them of r-tPA administration only because the limit of time has been exceeded. Allocation of treatment is still dominated by the 3-hour time-window but rising availability of neuroimaging techniques would enable refining the indication for thrombolysis and set a new tissue-window basing on the determination of the extent of the salvageable tissue. Non-contrast CT in stroke imaging is dedicated to exclude contraindications such as cerebral hemorrhage or marked early infarct signs. However, MRI has become more available recently allowing delineation of ischemia in DWI within minutes after onset and depicting hypoperfusion in PWI. PWI/DWI mismatch can be seen in about 80% of stroke patients in acute phase and quantitative PWI/TTP maps reduce risk of its overestimation. In clinical practice MR examination may not be available. Under such circumstances, CT could be the method of choice enabling fast quantitative evaluation of penumbra. In 256-detector row systems, it is possible to cover the whole brain and perform hemodynamic assessment at one bolus administration. It seems that CT can compete with MR in tissue - window imaging. The large number of patients arriving at ER-units with stroke-like symptoms and a relatively low sensitivity of CT in detection of cytotoxic/early vasogenic edema causes a need for developing a CAD system which would enable to exclude certain groups of patients from further diagnostics. Initial experience with this kind of software would be presented.

Learning Objectives:

1. To consolidate knowledge of the methods already acknowledged.
2. To learn about CAD in stroke imaging.
3. To appreciate the value of CT.

A-097 10:53

Cardiac emergency imaging: Crossing frontiers, meeting barriers

K. Gruszczynska; *Katowice/PL (KJgruszczynska@gmail.com)*

Acute myocardial infarction (AMI) affects approximately one million Polish inhabitants per year. The diagnosis of acute coronary syndrome (ACS) is not always straightforward, as the spectrum of clinical signs is wide. In Poland, ACSs account for 2/3 of patients hospitalized in intensive care units. Cross-sectional imaging may be most helpful in patients with atypical chest pain and non-diagnostic ECG. Computed tomography (CT) allows better definition of cardiovascular risk (coronary calcium score). CT coronary angiography can rule out significant coronary stenosis and identify non-cardiac causes of chest pain (triple rule-out). Imaging patients with acute ongoing chest pain may be challenging. Careful patient preparation and optimization of scan protocol are mandatory to optimize image quality and keep radiation exposure to a minimum. Due to recently reduced radiation exposure cardiac CT become a viable option to study newborns with congenital heart disease before cardiac surgery. Cardiovascular magnetic resonance (CMR) may improve the triage of patients with ACS. It allows the diagnosis of several non-coronary emergencies (myocarditis or cardiomiopathy). However, CMR requires prolonged patient cooperation. Moreover, coronary artery imaging by CMR is still technically challenging. Cardiac imaging with CT and CMR is established in a wide range of clinical indications. Many radiologists in Poland underwent training in this subspecialty and many practice it in elective, non-emergency settings. Cardiac emergency imaging represents ‚the next frontier' for them. Proper training, an enthusiastic approach and tight cooperation with clinicians will hopefully allow young Polish radiologists to overcome the logistic barriers to non-invasive cardiac imaging in emergency settings.

Learning Objectives:

1. To outline the clinical needs for cross-sectional imaging techniques such as CT and MR in cardiac emergencies.
2. To discuss the feasibility and the difficulties of performing CT and MR imaging in emergency cardiac clinical conditions.
3. To review successes and failures achieved by cardiac radiologists in Poland with CT and MR imaging in cardiac emergencies.

A-098 11:11

Dissection of descending aorta: Diagnosis and management of aortic or end-organ complications

K. Milczarek; *Warsaw/PL (krzys-km@wp.pl)*

Acute aortic dissection is a life-threatening disease with aortic rupture as a main complication followed by end-organ ischemic complications resulting with multiorgan failure. Dissection of descending aorta is usually treated with aggressive medical therapy. However, complications of aortic dissection should be early diagnosed and treated promptly emphasizing the role of imaging modalities. Indications for intervention in an acute setting include: impending or contained rupture, malperfusion syndrome, untreatable hypertension, persistent pain and early aneurysmal formation. The following treatment options are recognized: aortic stent-graft implantation, aortic branch stenting or fenestration as a solitary methods or combined with SG placement. The main goal of thoracic endografting is to seal the primary tear, re-establish the collapsed true lumen and resolve end-organ ischemia if present. Some patients receiving only BMT require intervention. Analyses from different groups revealed several features that predict poor outcome including initial aortic diameter > 4 cm or partial thrombosis of the perfused false lumen. A resent consensus statement considered following indications for endovascular repair in patients with chronic aortic dissection: aortic diameter > 5.5 cm, annual aortic expansion > 1 cm, resistant hypertension, recurrent pain and chronic malperfusion syndrome. However, despite successful endografting of the thoracic aorta, in some cases the problem of dissection remains on the abdominal level. To our knowledge, there is no overall clinical experience in endovascular repair of complicated aortic dissection in this region. We want to share experience of a leading center in Warsaw with the endovascular repair of descending aorta dissections, including the most challenging, abdominal region of aorta.

Learning Objectives:

1. To present the most frequent complications of descending aorta dissection.
2. To define indications for intervention.
3. To review possible therapeutic strategies.

A-099 11:29

also EPOS

What you see is what you diagnose: Staging the severity of acute pulmonary embolism with computed tomography pulmonary angiography

G. Staskiewicz; *Lublin/PL (grzegorz.staskiewicz@gmail.com)*

Acute pulmonary embolism presents with a wide spectrum of clinical conditions, which range from clinically irrelevant isolated subsegmental embolism to a life-threatening central embolism, resulting with hypotension and cardiogenic shock. Recent advances in the computed tomography have allowed a rapid progress in imaging of pulmonary embolism. Computed tomography pulmonary angiography (CTPA) makes it possible to visualize embolic material even in subsegmental arteries, and to assess pulmonary parenchyma and mediastinal structures at the same time. Furthermore, in large group of patients in whom PE has been excluded, CTPA allows for an alternative or additional diagnosis. CTPA allows an objective staging of obstruction of pulmonary arteries. It may also suggest the right ventricular dysfunction in the course of acute pulmonary embolism, as well as visualize the background of thrombotic event.

Learning Objectives:

1. To summarise scoring systems used for objective staging of obstruction of pulmonary arteries.
2. To review CT signs of right ventricular dysfunction in the course of acute pulmonary embolism.
3. To become familiar with the range of alternative and additional diagnoses based of CT findings.

Panel discussion 11:47

10:30 - 12:00 **Room E2**

Foundation Course: Head and Neck Radiology

E³ 420

Temporal bone

Moderator:
B. De Foer; Antwerp/BE

A-100 10:30

A. External and middle ear

A. Trojanowska; *Lublin/PL (agnieszka30@yahoo.com)*

External and middle ear diseases are the second most frequent cause of visiting ENT specialist. With the introduction of multislice CT imaging and new MRI techniques, excellent visualization of minute structures can be achieved. Therefore, accurate diagnosis of temporal bone diseases may be performed. In fact, the percentage of temporal bone imaging studies is growing fast. The critical condition for depiction any external and middle ear pathology is the profound knowledge of anatomy. Since not all pathological conditions require imaging, it is very important to know exactly which diseases will require radiological evaluation. Detailed indications for imaging and proper imaging techniques will be discussed. Although both CT and MRI can be applied, CT is the workhorse for the majority of pathological

conditions. A detailed overview of common and most important external and middle ear diseases will be presented. These will include: EAC atresia, exostoses, osteoma, squamous cell carcinoma, congenital anomalies, post-traumatic changes, osteosclerosis, glomus tympanicum, middle ear schwannoma, inflammation and cholesteatoma. For each case, the most relevant clinical and radiological findings will be discussed together with differential diagnosis.
Learning Objectives:
1. To review the relevant radiological anatomy of the external and middle ear.
2. To learn about the indications of imaging in external and middle ear disease.
3. To appreciate the relative value of CT and MRI in external and middle ear disease.
4. To become familiar with the imaging findings on CT and MRI in external and middle ear disease.

A-101 11:15
B. Inner ear and internal auditory canal
B. Verbist; *Leiden/NL (b.m.verbist@lumc.nl)*

Over the past years, there has been a growing interest in inner ear and cochlear nerve imaging due to advances in treatment of sensorineural hearing loss. Whereas in the past, hearing aids were the only option for amplification of sound, nowadays there is a possibility of direct stimulation of the cochlear nerve with cochlear implantation. In those cases, careful assessment of the cochleovestibular system and nerve provides crucial information for the surgeon. Abnormal development of the inner ear or cochleovestibular nerve, pathologies influencing the cochlear patency - such as labyrinthitis ossificans or abnormalities of bone metabolism - or the presence of retrocochlear pathology will influence patient management. Proper assessment of these structures requires high resolution CT or MR imaging. In this lecture, the normal anatomy of the inner ear and internal auditory canal will be illustrated and the imaging findings of congenital, infectious or inflammatory and tumoral pathology of the cochleovestibular system and nerve will be discussed.
Learning Objectives:
1. To review the normal radiological anatomy of the inner ear and internal auditory canal.
2. To understand the importance of high-resolution imaging in evaluating inner ear and internal auditory canal pathology.
3. To become familiar with the imaging findings in inner ear and internal auditory canal disease.

12:15 - 12:45 **Room A**

Plenary Session

HL 1

Wilhelm Conrad Röntgen - Honorary Lecture

Presiding:
M. Szczerbo-Trojanowska; Lublin/PL

A-102 12:15
Diagnostic radiation and carcinogenesis: What do we know?
M.N. Brant-Zawadzki; *Newport Beach, CA/US (mbrant@hoaghospital.org)*

The lay media and even most radiologists assume that exposure to diagnostic radiation is carcinogenic. However, a review of the literature demonstrates that the state of knowledge of regarding carcinogenesis from diagnostic radiation is not at the level of scientific fact; indeed, it is at most a theory, and more likely the level of knowledge is at the stage of hypothesis, with evidence both for and against the null. This lecture will review that state of knowledge and provide a broad context for the concern regarding cancer production by diagnostic levels used in everyday radiologic procedures. Comparison of risk to other industries and actuarial risk of detriment will be discussed. The controversial concepts about the theory of hormesis or potential benefits of minimal doses of radiation in stimulating defence mechanisms potentially mitigating carcinogenesis will be explored. The purpose of the lecture is to stimulate discussion in this very controversial, yet somewhat misunderstood, area. All can agree that using the least amount of radiation necessary for appropriate diagnosis is the ideal state; however, unnecessary fear of diagnostic radiation when it is appropriate should also be minimized. To these ends, a transparent review of the topic is worthwhile.
Learning Objectives:
1. To comprehend the historical evidence for radiation induced carcinogenesis.
2. To understand the state of knowledge regarding low-dose induction of cancer, and controversy surrounding the “no threshold hypothesis”.
3. To become more familiar with the levels of risk posed by diagnostic radiation.

14:00 - 15:30 **Room E2**

Foundation Course: Head and Neck Radiology

E³ 520

Nose and paranasal sinuses

Moderator:
H. Eggesbø; Oslo/NO

A-103 14:00
A. Inflammatory disease
D. Farina; *Brescia/IT (nappaje@yahoo.it)*

Anatomy is the key for a conceptual understanding of inflammatory disease of the paranasal sinuses; in particular, the complex network of infundibula and recesses that mark the pathway of mucus from the periphery (sinuses) to the centrum (nasal cavities). A vast number of variants complicate the interpretation of the anatomy: some are clinically irrelevant, some may predispose to rhinosinusitis, and some are potential sources of iatrogenic damage. Acute rhinosinusitis generally requires no imaging. Only on the onset of ocular or neurological sign and symptoms, cross-sectional imaging (mainly MSCT) is urgently needed to identify complications. In patients affected by chronic rhinosinusitis, imaging must provide a roadmap for proper endoscopic surgery planning. In this setting, coronal MSCT is the standard for evaluation and represents a shared language that allows mutual understanding between head and neck radiologists and surgeons. According to the drainage pathway (s) impaired, chronic rhinosinusitis can be classified in five patterns that, while simplifying the reporting process, also account for the pathophysiology of the disease. Among these, nasal polyposis is the most extensive and requires careful observation in order not to overlook benign or malignant neoplasms. Sagittal MPR reformations will be included in the protocol whenever the course and patency of the oblique frontal recess are to be demonstrated. MRI is inferior to MSCT in demonstrating the labyrinth of sinuses and drainage pathways. This technique will be used only in specific circumstances, such as when bone destruction (not necessarily over the midline) and orbital or deep soft tissue lesions are found.
Learning Objectives:
1. To review the normal anatomical variants of the sinonasal cavities, and their importance.
2. To understand the indications for imaging in patients suffering sinusitis.
3. To learn how to adapt the imaging technique according to the clinical presentation.
4. To learn about the imaging findings in acute, chronic and complicated sinusitis.

A-104 14:45
B. Neoplastic disease
T. Beale; *London/UK (timothy.beale@royalfree.nhs.uk)*

The lecture will review the role of imaging in the diagnosis of sinonasal tumours, illustrating the diversity of tumours affecting this region. The patterns of local and distant spread of sinonasal neoplasia will be demonstrated and the respective roles of computed tomography and magnetic resonance imaging explained. Critical imaging review areas are discussed, in particular the assessment of orbital and intracranial involvement and perineural extension. The imaging features that aid in distinguishing inflammatory from neoplastic and benign from malignant sinonasal conditions will be discussed. The imaging protocol and follow-up imaging strategy undertaken at our institution will be explained.
Learning Objectives:
1. To review the relevant anatomy in neoplastic disease of the sinonasal cavities.
2. To learn about the imaging findings in benign and malignant tumors of the sinonasal cavities.
3. To appreciate the relative value of CT and MRI in sinonasal tumors.
4. To understand the importance of imaging in determining the extension pattern of sinonasal tumors.

16:00 - 17:30 **Room A**

New Horizons Session

NH 6

Functional imaging in CT: Optional or built-in?

Moderator:
H. Alkadhi; Zurich/CH

A-105 16:00

Chairman's introduction

H. Alkadhi; *Zurich/CH (halkadhi@partners.org)*

In the past years, there has been a marked increase in attempts to image diseases with CT not only on a morphological but also on a functional basis. The reasons for these developments are manifold. One major reason is the known, inherent limitation of morphological imaging alone that may lack important information on function being of prognostic value or being relevant to gauge treatment efficacy. Another - simplistic though true - reason for these current attempts is a technical one: current CT scanners have undergone such tremendous technical developments with more and more gantry rotation speed and acquired slices as well as faster volume coverage that functional imaging with CT became feasible at a reasonable radiation dose. Currently, functional imaging with CT is emerging in a number of divergent fields, including the diagnosis and characterization of coronary heart disease and myocardial function as well as for the early prediction of treatment efficacy and identification of progressive disease in patients with cancer. This session will deal with the technical requirements for functional imaging with CT and will introduce the various concepts including perfusion, dual- or multi-energy imaging. In addition, it will aim to highlight the added diagnostic value that can be extracted from this functional data for the ultimate goal to improve the care of our patients.
Session Objectives:

1. To provide an overview on the technological developments that enable functional imaging with CT.
2. To learn the different types of algorithms for functional CT imaging.
3. To understand the added value of functional imaging with CT.

A-106 16:03

What functional CT requires: Speed, coverage, and many slices

P. Rogalla; *Berlin/DE (rogalla@charite.de)*

Functional CT is governed by many technical factors. Depending on the analytic model for data evaluation, fast sampling might represent the most important parameter for accurate capture of density changes over time. In order to ensure homogeneous sampling with time uniformity in the body area targeted for perfusion analysis, mechanical motion of the patient for larger Z-axis coverage should be applied with due caution. Alternative models are based on extended time coverage necessitating data sampling over more than 60 seconds. Longer scanning times result in proportional increase in radiation dose raising the need to implement low-dose imaging techniques and data noise suppression. Motion correction poses an additional challenge independent of subsequent analysis techniques. Longitudinal tracing the volume of interest with rigid or elastic data warping surfaces the necessity of evading patient motion during scanning by either breath holding or - alternatively - shallow free breathing. Additionally, thin slice isotropic volume reconstruction plays a key role in data post-processing when elastic warping is deemed necessary for image registration. Overall, functional imaging poses tremendous technical challenges as to the optimal hardware selection, adequate scanning protocols, and post-processing algorithms.
Learning Objectives:

1. To explain the technical prerequisites for functional CT.
2. To discuss the influence of reconstruction techniques, temporal resolution and temporal uniformity.
3. To outline the role of functional CT in view of risks and benefits.

A-107 16:21

Multi-energy: An approach to functional imaging with CT

P. Stolzmann; *Zurich/CH (paul.stolzmann@usz.ch)*

The ability of dual-source dual energy (DE) CT to simultaneously acquire two X-ray spectra during the same phase of contrast enhancement excludes temporal changes in enhancement between acquisitions and spatial misregistration. Specific attenuation behaviours of different materials enable their differentiation which is caused by material-dependent Compton and photo-electric effects. DECT can thereby accurately measure elemental concentrations by using three-material decomposition algorithms. These algorithms are used to identify and quantify contrast materials allowing for the reconstruction of virtual non-enhanced (VNE) images and the assessment of perfusion or ventilation volumes. VNE data sets are a reasonable approximation of true non-enhanced image allowing for the replacement of non-enhanced acquisitions in the assessment of vascular disorders or enhancing masses. Data on contrast material distribution provide information that is complimentary to morphological CT. Regional alterations of lung perfusion are depicted by DECT in patients with predominant emphysema or pulmonary embolisms. Dynamic and static regional ventilation are displayed by ventilation DECT. Regarding cardiac imaging, DECT is promising for the integrative analysis of the coronary artery morphology and the myocardial blood supply. DE CT is an emerging technique that not only provides morphological but functional information.
Learning Objectives:

1. To understand the principle and potential benefit of multi-energy and spectral imaging.
2. To learn how multi-energy CT may replace multi-phase imaging, giving rise to functional analyses.
3. To understand how multi-energy CT may be used for monitoring treatment and for simultaneous visualisation of morphology and function.

A-108 16:39

Functional cardiac imaging: The blessing of high spatial and temporal resolution

C. Catalano, M. Francone; *Rome/IT (Carlo.Catalano@uniroma1.it)*

Accurate and reproducible determination of cardiac function is essential for diagnosis, therapeutic management and follow-up of cardiac diseases. A variety of imaging techniques are used for the assessment of regional or global function however cardiac MRI has been widely adopted as the gold standard due to its unmatched temporal resolution and superior tissue contrast. Conversely, because of the radiation exposure and poor temporal resolution of previous scanners, MDCT has been seldom used for functional cardiac imaging. Limited temporal resolution of the method hampered evaluation of both regional wall motion, which generally requires a resolution of 80 msec and the assessment of time-dependent parameters such as peak filling rate and peak ejection rate and led to systematic underestimation of ventricular volumes. Recent technical improvements of CT systems allowed to reach high temporal resolution (up to 83 msec) minimizing motion artefacts and leading to widespread diffusion of cardiac MDCT; accordingly, because information on any heart phase could be obtained using a retrospective ECG-gating, use of CT for functional analysis has started to be accepted and clinically applied. Combination of high spatial and temporal resolution yields another advantage, which is accurate depiction of cardiac valves and valvular leaflets motion can be analyzed, allowing to exclude stenoses or high-grade insufficiency and to quantify the orifice area. In conclusion, while the evaluation of coronary arteries remains primary clinical indication, the improved performances of last MDCT scanners allow simultaneous and accurate assessment of global functional parameters, regional wall motion and valvular function in a single scan.
Learning Objectives:

1. To understand the advantages of recent CT technological developments in terms of spatial and temporal resolution.
2. To comprehend the importance of high spatial and temporal resolution in cardiac functional analysis, including assessment of regional and global wall motion and valvular function.
3. To emphasise the importance of quantitative and qualitative assessment of cardiac function for clinical diagnosis, risk stratification, patient management and prognosis.

A-109 16:57

Can CT perfusion monitor tumor therapy response?

V.J. Goh; *Northwood/UK (gohmcglone@hotmail.com)*

The use of imaging to monitor tumor therapy response has increased in recent years, both in the clinical setting and in clinical trials. With the increasing use of novel drugs, many of which are cytostatic, in combination with standard chemotherapy or radiotherapy to improve progression free survival, there is an increasing need for functional evaluation. Anti-angiogenic agents and vascular disruptive agents target the tumor vasculature, resulting in vascular pruning or vascular shutdown, and slowing of tumor growth. Kinetic modeling of tumor enhancement at Perfusion CT provides valuable information of tumor vascular physiology. Quantitative Perfusion CT parameters reflect in vivo perfusion, blood volume and vascular leakage may provide complementary information to standard assessment, and show promise as a biomarker. In early phase clinical trials, Perfusion CT may provide evidence of an

anti-vascular effect, be used to define a biologically active dose, may provide insight into drug mechanism of action, and may aid treatment scheduling. The challenge for multicentre implementation of Perfusion CT to monitor tumor therapy response is to implement quality assurance, to standardize procedures and measurements, and to improve scan reproducibility, within a framework for imaging biomarker development.
Learning Objectives:
1. To illustrate the methods that can be applied in clinical practice.
2. To give clinical examples of the application of CT for monitoring tumor therapy response.
3. To discuss the challenges and limitations of CT for monitoring therapy response.

Panel discussion:
Functional imaging with CT: Ready for prime time? 17:15

16:00 - 17:30 **Room B**

Radiology of the Spine in 2010

CC 616

Discs: Old problems and new solutions

Moderator:
A. Gouliamos; Athens/GR

A-110 16:00

A. Spinal stenosis: How do you measure it?
M. Gallucci; *L'Aquila/IT (massimo.gallucci@cc.univaq.it)*

A small canal diameter has been associated with an increased risk of injury; however, there is a lack of reliable normative data on spinal canal diameters and several different proposals have been reported by researchers. Stenosis can be determined by several causes. Classically, congenital, acquired (degenerative) or mixed forms are distinguished. Moreover, central stenosis is distinguished from lateral, foraminal or concentric ones. Cervical stenosis is usually defined as a canal diameter of < 12 mm. An index often used on oplan X-ray film was the Torg ratio (canal vs body sagittal diameters. If less than 1= stenosis). A more modern concept is the SAC (space available for the cord). MRI permits to directly visualize the cord and the subarachnoid space. The mean diameter of the cervical cord is 7 mm and the SAC is therefore reduced when less than a 1 mm CSF layer is present around the cord, thus indicating a severe stenosis. At the lumbar level, congenital stenosis shows short pedicles, while acquired forms have their maximal expression at the level of the endplates. A mid sagittal diameter inferior to 14 mm is considered below normal limits. If inferior to 10 mm, it is severely below. Following both radiological and post-mortem studies, narrow canal appears to be very common. Therefore, radiographic finding should be closely correlated with clinical signs to make the diagnosis of stenosis and to make decision regarding treatment. Electromyography is strongly recommended to achieve the correct interpretation.
Learning Objectives:
1. To be knowledgable about the normal mechanisms responsible for spinal stability.
2. To describe causes and imaging features of spinal stenosis.
3. To learn about measurements for assessment of spinal stenosis.

A-111 16:30

B. Degenerative disc disease
L. van den Hauwe[1], C. Venstermans[2], F. De Belder[2], M.H.J. Voormolen[2], J.W.M. Van Goethem[2], P.M. Parizel[2]; [1]*Brasschaat/BE*, [2]*Antwerp/BE (lucvdhauwe@mac.com)*

The functional unit of the vertebral column consists of two adjacent vertebral bodies, an intervertebral disc and two facet joints. This unit is called the motion segment. It constitutes a three-joint-complex; degenerative changes of the intervertebral disc will, therefore, affect the normal anatomy and function of the facet joints. Plain X-ray films are of limited use in the assessment of DDD since early signs of degeneration cannot be seen. Multi-detector row computed tomography (MDCT) provides excellent anatomic detail for the detection of disc herniation and nerve root compression. However, reporting disk contour changes has suffered greatly from incoherent and non-uniform nomenclature. Therefore, the Nomenclature Committee of the American Society of Spine Radiology has proposed a coherent and uniform nomenclature system, which has been widely accepted now among radiologists and physicians dealing with patients with DDD. Magnetic resonance imaging (MRI) is now considered the most sensitive imaging technique in DDD. Due to its superb soft tissue contrast discrimination, intrinsic disc changes may be observed early in DDD. MRI abnormalities in DDD include: disk height narrowing, T2 signal intensity changes, internal disk disruption, disk contour changes, spinal canal narrowing, associated changes in the vertebral endplates and posterior elements. Accurate interpretation of these findings remains a diagnostic challenge since not all imaging abnormalities are clinically relevant and may be encountered in the normal ageing population. The value of newer MRI techniques (diffusion-weighted imaging, T2-relaxometry, dynamic imaging) in patients with DDD are under evaluation.
Learning Objectives:
1. To learn the current nomenclature for degenerative disc disease.
2. To be knowledgable about morphologic changes of the degenerated discs.
3. To introduce new MR imaging techniques for evaluation of the degenerative disc disease.

A-112 17:00

C. Minimally invasive therapies for discogenic disease
M. Muto; *Naples/IT (mario.muto@ospedalecardarelli.it)*

In the last 10 years, many types of percutaneous disk approach came out and have minimized the invasive nature of surgical techniques and avoid complications like infection linked to surgery. All those techniques try to decompress the disk and/or reduce the inflammatory reaction (oxygen-ozonetherapy) to improve clinical symptoms. There are emergency surgery indications for HNP that include: progressive foot droop, hyperalgic paralazyng sciatica, cono-cauda syndrome. All the other clinical symptoms can be treated by percutaneous disk treatment trying to avoid surgery. Nucleoptesis by oxygen-ozone mixture drying the nucleus with an oxygen-ozone mixture (O_2-O_3) uses a colourless irritant gas with a pungent odour which is unstable and has a strong anti-oxidizing power. The O_2-O_3 gas mixture produced can be injected into the intervertebral disc and root foramina, 3-4 ml into the disc and 15-20 ml into the neural foramen and root canal. The indications for O_2-O_3 treatment were extended to FBSS patients when it was understood that the ozone mechanisms of action could be exploited to treat the chronic inflammation and venous stasis present in FBSS. On the basis of our results and the assessment of our failures, we recommend selecting patients to avoid broadening the indications for treatment, thereby ensuring a high success rate. Accurate diagnosis of the lesion and the spinal level to be treated, accurate technical execution under CT or fluoroscopic guidance in expert hands and patient follow-up by the neuroradiologist after treatment are key factors in ensuring the successful outcome of percutaneous treatment for this common condition.
Learning Objectives:
1. To review the indications/patient selection criteria for percutaneous nucleoplasty.
2. To understand current nucleoplasty techniques.
3. To become familiar with the techniques and safety considerations associated with ozone therapy.

16:00 - 17:30 **Room C**

ESR meets Neurologists

EM 2

Ischemic stroke: Diagnosis and treatment

Presiding:
J.M. Ferro; Lisbon/PT
C.J. Herold; Vienna/AT
M. Szczerbo-Trojanowska; Lublin/PL

A-113 16:00

Introduction
J.M. Ferro; *Lisboa/PT (jmferro@fm.ul.pt)*

In a western population of 1 million inhabitants, 2,400 new strokes occur every year, of which 80% are ischemic in origin. One year later, less than 50% of patients will be independent, and many survivors will have residual deficits. At the acute stage of cerebral ischemia, the treatment consists of: (i) keeping biological parameters within normal limits and preventing complications; (ii) admission in a stroke unit; (iii) intravenous administration of rt-PA as soon as possible after admission up to 4.5 hours; (iv) in patients who are not eligible for rt-PA, aspirin, and (v) decompressive surgery in patients with or at high risk to develop malignant infarct, Other measures such as intra-arterial pharmacological or mechanical thrombolysis in basilar artery occlusions or T occlusion of the end part of the internal carotid artery, or hypothermia in malignant infarcts are possible at the acute stage but, in the absence of clear proof of efficacy should be restricted to randomized trials or life salvage. Diagnostic

imaging of ischemic stroke should rule out other pathologies such as intracerebral bleeding but provide positive evidence for the ischemic event. This helps in case of unclear clinical presentations, provides prognostic and etiologic clues and serves to appreciate the location and extent of parenchymal damage Information on tissue at risk and the state of the extra- and intracerebral vessels would also be desirable as it can heavily influence therapeutic decision making. All imaging data should possibly be collected on one machine and as fast as possible.
Session Objectives:
1. To define what information on stroke neurologists expect from radiologists.
2. To become familiar with the neuroimaging of acute stroke.
3. To be able to select the stroke patient for appropriate treatment.

A-114 16:05

What are the clinical requirements and expectations of diagnostic imaging
F. Fazekas; *Graz/AT (franz.fazekas@medunigraz.at)*

Ischemic stroke is quite variable in its presentation and aetiology, and the increasing possibilities of acute treatment further add to the complexity of its management. Ideally, diagnostic imaging should not only rule out other pathologies such as intracerebral bleeding but also provide positive evidence for the ischemic event. This helps in case of unclear clinical presentations, provides prognostic and etiologic clues and serves to appreciate the location and extent of parenchymal damage which may influence the risk/benefit ratio of therapeutic interventions. Information on tissue at risk and the state of the extra- and intracerebral vessels would also be desirable as it can greatly influence therapeutic decision making. Time is a critical factor in all situations of ischemic stroke; therefore, all imaging data should possibly be collected on one machine and as fast as possible. In addition to local options, it is always the patient's clinical situation which ultimately defines the trade-off between the amount of information that would be desirable and that which is absolutely needed. Furthermore, planning image acquisition for ischemic stroke must also consider the possible need for medical support and supervision of the patient and problems which may be encountered because of co-morbidities, implants and inadequate patient collaboration.
Learning Objectives:
1. To define what neurologists expect from diagnostic imaging.
2. To understand the importance of identifying the type and site of the lesion causing stroke and the location and extent of parenchymal ischemia.
3. To describe the minimal diagnostic imaging requirements for a stroke unit.

A-115 16:23

Diagnostic imaging of ischemic stroke
M.M. Thurnher; *Vienna/AT (majda.thurnher@meduniwien.ac.at)*

Ischemic penumbra was first defined by Astrup in 1981 as perfused brain tissue with the capacity to recover. Penumbra has become the focus of intense imaging research. Accurate detection of this 'tissue at risk' would identify patients who would benefit from thrombolysis. However, new insights in the stroke pathophysiology have shown that the concept of penumbra has some serious limitations and raised doubts on its clinical significance in acute stroke setting. It is now known that perfusion MR cannot identify tissue at risk, and signal abnormality on DWI does not represent only infracted tissue, it can also contain penumbra. The debate on CT and MRI as imaging modalities for stroke is still ongoing and the question is not answered yet. What is the best imaging modality for thrombolysis triage inside of three hours of stroke, and what is the best modality after three hours of stroke onset? The purpose of this lecture will be to describe neuroimaging modalities capable of identifying infarcted and penumbra tissue. Surrogate markers that could be used in ischemic stroke patients will be discussed also.
Learning Objectives:
1. To demonstrate advantages and disadvantages of CT and MRI in assessment of ischemic stroke.
2. To explain DWI/PWI and CT perfusion "mismatch" and the concept of penumbra.
3. To give an overview of the past, present and future of stroke imaging.

A-116 16:41

Management of the acute stroke patient
D. Leys; *Lille/FR (DLEYS@CHRU-LILLE.FR)*

Despite advances in prevention, the treatment of acute ischemic stroke remains essential to improve outcome and to lower mortality. At the acute stage of cerebral ischemia, the treatment consists of: (i) general non-specific rules, such as treating a vital emergency, keeping biological parameters within normal limits and preventing complications; (ii) admission in a stroke unit, to decrease mortality without increasing dependence or recurrence risks; (iii) intravenous administration of rt-PA as soon as possible after admission, and within 3 hours of stroke onset in eligible patients, with a possible extension up to 4.5 hours although the benefit decreases rapidly over time; (iv) in patients who are not eligible for rt-PA, aspirin (160 to 300 mg) to reduce early recurrence risks and death, even in atrial fibrillation, and (v) decompressive surgery in patients with raised intracranial pressure or at high risk to develop malignant infarct because of a abnormality of more than 145 cm^3 on diffusion weighted images during the first 24 hours. Other measures are possible at the acute stage but, in the absence of clear proof of efficacy, should be restricted to randomized trials or tissue salvage: intra-arterial pharmacological or mechanical thrombolysis in basilar artery occlusions or T occlusion of the end part of the internal carotid artery, or hypothermia in malignant infarcts. Besides, early secondary prevention measures should be started as soon as possible at least in patients who have no large infarct.
Learning Objectives:
1. To manage the flowchart of acute stroke treatment.
2. To learn who are the candidates for IV and IA thrombolysis.
3. To learn how to manage physiological parameters.

A-117 16:59

Endovascular treatment of the patient with ischemic stroke
D. Vorwerk; *Ingolstadt/DE (dierk.vorwerk@klinikum-ingolstadt.de)*

Role of radiology in acute stroke was for a long time limited to imaging and exclusion of differential diagnoses. CT and MRA now allow noninvasive localization of the occlusion level that may have rapid impact on the techniques of treatment. Although being used for only about 1% of all stroke patients, or of 10 % of all patients undergoing thrombolysis, intraarterial techniques further improved and play a significant role in the treatment of patients with occlusions of the basilary artery, the carotid T and the M1 segment. Furthermore, acute recanalization of the internal carotid artery in case of severe symptoms following thrombotic occlusions or dissections are available. More and more mechanical systems are used alone or in combination with intraarterial thrombolysis. Close cooperation between neurologists and radiologists is required to determine the best additive treatment. Results from literature show that under these particular circumstances, patients benefit from an invasive approach in comparison to IV thrombolysis with/without ultrasound enhancement.
Learning Objectives:
1. To learn about the role of interventional treatment in acute cerebral stroke.
2. To understand techniques of thrombolytic therapy and mechanical thrombectomy.
3. To understand parameters of acute success and long-tem outcome in interventionally treated patients.

Panel discussion 17:17

16:00 - 17:30 **Room D**

Abdominal and Gastrointestinal

RC 601

Tumor follow-up evaluation: Which modality for what?

Moderator:
S. Terraz; Geneva/CH

A-118 16:00

A. US and CEUS
T. Rettenbacher; *Innsbruck/AT (thomas.rettenbacher@i-med.ac.at)*

Conventional US is the most frequently used liver imaging modality worldwide but has a lower sensitivity and specificity than contrast-enhanced CT and contrast-enhanced MRI in the assessment of focal liver lesions. The introduction of US contrast agents has opened new diagnostic possibilities and markedly reduced the superiority of CT and MRI. In most cases, hepatic lesions have typical perfusion characteristics and enhancement patterns that allow definite differentiation. Due to the high spatial and time resolution of tumour vessel perfusion, contrast-enhanced ultrasound (CEUS) is very appropriate in the differentiation of uncharacteristic focal liver lesions detected at conventional US and is superior to CT or MRI. Conventional US and CEUS should also be used in cases of liver lesions appearing uncharacteristic on CT or MRI scans. Under good US and CEUS examination conditions, the detection rates of liver metastases are only slightly higher using contrast-enhanced

CT or contrast-enhanced MRI. But in general, conventional US and CEUS cannot replace the necessity of contrast-enhanced CT for tumour staging and tumour follow-up. On the other hand, conventional US and CEUS applied percutaneously and especially intraoperatively are able to detect additional small metastases not visible on CT or MRI. This is of impact for staging and follow-up of tumours in which the liver is an important organ for metastases like gastrointestinal, liver, bile duct, and pancreatic malignancies. CEUS can also be helpful for guiding liver tumour ablation. However, in the follow-up after tumour ablation, contrast-enhanced CT or contrast-enhanced MRI is more sensitive.

Learning Objectives:

1. To learn about enhancement characteristics of the liver and the various focal liver lesions.
2. To understand in which situations US and CEUS is expected to be appropriate.
3. To discuss the role in comparison to CT and MRI.

A-119 16:30

B. CT and MRI perfusion

F. Berger; *Munich/DE (Frank.Berger@med.uni-muenchen.de)*

At initiation, tumors in a pre-vascular phase are supplied by oxygen and nutrients that diffuse from pre-existing normal vessels. When the tumor reaches a critical size of approximately 1-4 mm diameter, the resultant ischemia leads to secretion of angiogenic factors. These factors, such as vascular endothelial growth factor (VEGF), recruit and maintain tumor vessels. „New" vessels (neovasculature) exhibit increased blood volume and permeability compared with normal vessels. Various new specific therapies in oncology target tumor vasculature or tumor neoangiogenesis. It is not uncommon that these targeted therapies have pronounced cytostatic and not predominantly cytotoxic effects. This limits the usefulness of size based morphological tumor response assessments utilizing RECIST or WHO criteria. Of newer magnetic resonance imaging (MRI) modalities, perfusion MRI has emerged as a valid marker of tumor-induced blood vessels and their function. MRI perfusion measures the vascularity within a tumor, as well as its component heterogeneous parts. Of parameters which can be measured to date, blood volume and permeability are commonly applied in patient studies. Blood volume measures the aggregate size of the vascular space, while the permeability function informs about the integrity of vessels and their ‚leakiness' to contrast agents. We will describe the use of MR perfusion to monitor such new therapies and discuss its specific advantages and limitations in comparison to CT perfusion protocols. PET based strategies for targeted treatment-monitoring in oncology will be briefly mentioned, with prospect on the significance of combined vascular and metabolic imaging for further optimizing non-invasive response assessment in specific anticancer therapies.

Learning Objectives:

1. To learn about established morphological-based strategies for tumor response monitoring: RECIST and WHO criteria with its limitations in targeted treatment surveillance.
2. To learn about the latest antiangiogenic/antivascular treatment strategies in oncology.
3. To learn about perfusion imaging protocols, specific advantages and technical challenges when utilising CT or MRI.
4. To learn about the significance of CT or MR perfusion imaging in oncology, typical applications and future strategies for improvement of non-invasive treatment monitoring in oncology.

A-120 17:00

C. MR diffusion

C. Della Pina; *Pisa/IT (mclotilde@virgilio.it)*

The purpose of the lecture is to review the ability of diffusion-weighted magnetic resonance (MR) imaging in the assessment of loco-regional treatments of primary and secondary liver tumor. Guidance and monitoring local therapy, including radiofrequency ablation (RFA) and transarterial chemoembolization (TACE), are crucial to evaluate the success and efficacy of therapy. A change in tumor size at computed tomography (CT) or MR imaging is the accepted criterion for assessing response after chemotherapy, according to RECIST criteria. In the early post-treatment period after loco-regional therapies, however, tumors may not change in size. Advances in MR imaging techniques, which include diffusion MR imaging and apparent diffusion coefficient (ADC) maps, can provide in vivo metabolic information. Recent studies demonstrated that water diffusion can be used to differentiate viable and cellular regions from necrotic area in the tumor. Viable tumors have intact cells that restrict the motion of water molecules, reducing ADC value; on the other hand, necrotic regions allow free diffusion of water molecules and increase ADC value. This additional information may enhance the morphologic findings of baseline and dynamic MR study. Moreover, new classes of antitumor therapy have been developed that have an antiproliferative effect, inducing a delay in tumor shrinkage. Diffusion MR imaging can be promising in this clinical setting as a biomarker to predict early response to systemic chemotherapy.

Learning Objectives:

1. To describe physical and technical principles of diffusion-weighted imaging in tumors.
2. To discuss the qualitative and quantitative information of the modality.
3. To review imaging findings after percutaneous and intra-arterial treatments of liver malignancies.
4. To address the clinical role of diffusion-weighted imaging in monitoring tumor response.

16:00 - 17:30 **Room E1**

Musculoskeletal

RC 610

Metabolic bone diseases

Moderator:
G. Guglielmi; Foggia/IT

A-121 16:00

A. Latest advances in osteoporosis

C.R. Krestan; *Vienna/AT (christian.krestan@meduniwien.ac.at)*

Osteoporosis is of great socioeconomic impact, as approximately 30% of all postmenopausal women have osteoporosis in developed countries. Ageing of populations worldwide will be responsible for a major increase of the incidence of osteoporosis in postmenopausal women. In 1994, the WHO Working Group defined osteoporosis according to measurements of bone mineral density (BMD) using dual energy X-ray absorptiometry (DXA) as a bone density T score at or below 2.5 standard deviations (T score) below normal peak values for young adults. The relative risk of a fracture is between 1.3 and 1.6 for each unit decline in spine or total hip T score. Due to limitations of the T-score concept, a 10-year risk calculating tool has been developed by the WHO to determine intervention thresholds. Fragility fractures are however not only related to bone mineral density (BMD). Trabecular bone microarchitecture is a significant determinant of the bone's mechanical properties and is thus of major clinical relevance in predicting fracture risk. Trabecular bone structure analysis can be based on images from multidetector computed tomography, high-resolution peripheral computed tomography, high-resolution MRI and projection radiography. Advantages and disadvantages of the different methods depend on radiation, costs, availability and a reasonable time for in vivo scanning. Grading of vertebral fractures can be done by using a visual semiquantitative scoring method. Vertebral morphometry is based on radiographs or scans from DXA-machines calculating ratios of vertebral heights with normal values to identify vertebral fractures.

Learning Objectives:

1. To describe what the radiologist ought to know about the WHO definition of osteoporosis and vertebral fracture risk.
2. To describe the standard techniques and newer diagnostic techniques that provide insights to the structure of trabecular bone.
3. To analyse the pros and cons of these techniques.
4. To describe methods of grading and quantitative morphometric assessment.

A-122 16:30

B. The many faces of Paget's disease

V.N. Cassar-Pullicino; *Oswestry/UK (Victor.Pullicino@rjah.nhs.uk)*

Paget's disease of bone can be monostotic or polyostotic in distribution. The pelvis, femur, spine and the sacrum in particular are commonly involved sites but any bone can be affected. The characteristic pathological process and its manifestation vary on conventional radiographs. The coarse enlarged trabeculae and consolidation of bone are particularly prominent along the cortical contours of long bones. The appearances differ depending on the ratio of cortex to trabecular bone. The appearances vary from a predominantly lytic to very sclerotic radiographic features with a variable degree of expansion. In such instances, there is no need for further imaging to make a diagnosis. Advanced imaging (scintigraphy, CT, MRI) is required in instances of diagnostic uncertainty and to exclude the development of complications secondary to Paget's disease. In some instances, biopsy may also be necessary.

Learning Objectives:
1. To highlight the pathological mechanisms of Paget's disease.
2. To discuss the radiological manifestations in the peripheral skeleton.
3. To stress the imaging characteristics of spinal involvement.
4. To review the benign and malignant complications that can arise in the disease.

A-123 17:00

C. Rickets and osteomalacia

J.E. Adams; *Manchester/UK (judith.adams@manchester.ac.uk)*

Metabolic diseases are caused by genetic, endocrine, nutritional or biochemical factors. Rickets in children (osteomalacia [OM] in adults) is a qualitative abnormality (reduced mineral/osteoid ratio), in contrast to osteoporosis which is a quantitative abnormality (too little bone). Aetiology: vitamin D and normal phosphate, alkaline phosphatase and serum pH are important requirements for normal mineralisation of bone. Rickets/osteomalacia is caused by vitamin D deficiency, end-organ resistance to vitamin D, hypophosphataemia, hypophosphatasia and severe acidosis. Vitamin D deficiency results from lack of sunlight, dietary deficiency, malabsorption, chronic liver disease, chronic renal failure (CRF) and end-organ resistance (rare genetic disorders). Hypophosphataemia and phosphaturia result from renal tubular abnormalities including X-linked hypophosphataemic [XLH] and 'oncogenic' osteomalacia, in which a humoral factor is produced by the tumour ('phosphatonin'). Candidates for phosphatonin include FGF-23 (fibroblast growth factor 23), PHEX (phosphate-regulating gene located on X-chromosome) and MEPE (matrix extracellular phosphoglycoprotein). A large variety of tumours can cause oncogenic OM, which are often small and vascular (haemangiopericytoma); imaging is important in identification, as removal results in cure. Imaging: ricketic/osteomalacic bones are soft and bend (Harrison sulcus, bowed legs, knock knees, varus deformity proximal femur, tri-radiate pelvis). Abnormal endochondral ossification causes metaphyses to be cupped and poorly mineralized with widened growth plates. In adults, the pathognomonic feature is the Looser's zone composed of unmineralized osteoid, typically found in medial femoral neck, pubic rami, lateral scapula and ribs. Some conditions (XLH) have other characteristic features (enthesopathy, extra-skeletal ossification, dense bones with coarse trabecular pattern).

Learning Objectives:
1. To recognise the imaging features of rickets and osteomalacia.
2. To learn the various causes of vitamin D deficiency and other disorders that result in rickets and osteomalacia.
3. To appreciate the role of imaging in oncogenic and x-linked hypophosphataemic osteomalacia.

16:00 - 17:30 **Room E2**

Foundation Course: Head and Neck Radiology

E³ 620

Oral cavity, oropharynx and nasopharynx

Moderator:
V. Chong; Singapore/SG

A-124 16:00

A. Oral cavity and oropharynx

A. Borges; *Lisbon/PT (borgalexandra@gmail.com)*

Although the oral cavity and oropharynx are in contiguity and affected by some of the same pathologic processes, they are anatomically and embriologically distinct and diseases affecting these regions differ in prognosis. Therefore, it is mandatory to recognize the boundaries between the two. The oral cavity is a space open anteriorly, very accessible to clinical inspection. It is separated from the oropharynx by the boundary between the hard and soft palate superiorly, the anterior faucial arches laterally and by the circunvallate papilla of the tongue, inferiorly. Lesions affecting the oral cavity and oropharynx may originate from the mucosa, readily available to clinical inspection, or may be submucosal and more difficult to characterize only on clinical grounds. The most common disease affecting these anatomic compartments is infection. In this setting, imaging is used in cases refractory to conventional treatment and on patients with a more serious clinical condition (airway compromise). Squamous cell cancer is the most common neoplasm occurring in the oral cavity and oropharynx. Incidence decreases from anterior to posterior while the prognosis aggravates. Imaging is mandatory for tumor staging particularly in depicting deep extent. Tumors tend to grow along muscles and nerves and may invade bone. Disease extent dictates treatment modality and the extent of surgical resection, when surgery is the treatment option. Submucosal lesions span a wider gamut of pathologies including pseudomasses, infection, benign and malignant neoplasm. In this case, imaging is crucial to characterize the lesion and to provide a limited list of differential diagnoses.

Learning Objectives:
1. To review the relevant anatomy of the oral cavity and oropharynx.
2. To learn about the imaging features of benign lesions occuring in this region.
3. To understand the extension patterns observed in malignant tumors of this region.
4. To appreciate the clinical impact of imaging findings in diseases of this region.

A-125 16:45

B. Nasopharynx

F. Dubrulle; *Lille/FR (f-dubrulle@chru-lille.fr)*

The nasopharynx represents an intersection between the nasal choanae, the oropharynx, the deep facial spaces, the skull base and the intracranial cavity. Most nasopharyngeal neoplasms are malignant tumors showing aggressive local infiltration along well-defined routes. The primary role of imaging is accurate tumor mapping and detection of possible tumor extension, especially to the skull base and the deep facial spaces. The aim of this presentation is to illustrate these extension patterns of nasopharyngeal carcinomas on imaging and to show the particular implication of imaging in the correct staging of the lesion.

Learning Objectives:
1. To review the relevant radiological anatomy of the nasopharynx and related spaces.
2. To learn about the imaging features of benign lesions occuring in this region.
3. To understand the extension patterns observed in malignant tumors of this region.
4. To appreciate the clinical impact of imaging findings in diseases of this region.

16:00 - 17:30 **Room F1**

Genitourinary

RC 607

Imaging of the scrotum and penis

Moderator:
B. Brkljacic; Zagreb/HR

A-126 16:00

A. Acute scrotum

L.E. Derchi; *Genoa/IT (derchi@unige.it)*

Ultrasonography is the technique best suited to evaluate the acute scrotum, since modern transducers provide depiction of both fine anatomic details and intratesticular vessels in all cases. It must be considered that causes of acute scrotum have different frequencies according to patient age. Torsion is more common in the pediatric age group; infections are more frequent in adults. In suspected testicular torsion, color Doppler evaluation of intratesticulr flow allows diagnostic sensitivity of 86%. However, flow signals can be seen in low-grade torsions and identification of high-resistance flow at spectral analysis may help avoid false negatives. Torsion of the testicular appendages may be recognized when a small nodule, adjacent to a normal-looking testis, with normal intratesticular flow, is encountered. Infection usually starts at the epididymis and is diagnosed on clinical grounds; imaging is only rarely needed, but may be helpful in assessing testicular involvement. In patients with trauma, imaging plays a key role in assessing testicular integrity, since surgery is needed when there is testicular rupture. Other, less common, causes of acute scrotum involve the scrotal skin, vessels and spermatic cord. Additionally, in rare case, "non-scrotal" causes may produce acute scrotal symptoms. The most typical example is extension of pain to the scrotum during a renal colic. Other causes may be due to involvement of the scrotum from intrabdominal inflammatory or traumatic pathologic changes due to patency of the processus vaginalis.

Learning Objectives:
1. To understand the role of imaging, especially US in testicular trauma.
2. To learn whether imaging is required for testicular torsion and what the imaging signs are.
3. To review the appearance of acute and subacute orchiepididymitis.

A-127 16:30

B. Incidentaloma in scrotal US

L. Rocher; *Le Kremlin-Bicêtre/FR (laurence.rocher@bct.aphp.fr)*

The most frequent pseudotumoral lesion is the tubular ectasia of the rete testis: it is characterized by a group of numerous tiny cysts and/or tubular configurations. Multinodular echotexture (similar nodules with diffuse regular distribution) involving testis of normal size is usually bilateral and not malignant: it will be controlled. A medical evaluation in search of a granulomatous disease like sarcoidosis is recommended, especially if the epididymis is also pathological. Multinodular aspect (hypo or hyperechoic nodes) involving very small testis (less than 3 ml) suggests a Klinefelter disease. Nodules are small benign leydig cell tumors or hyperplasia. The hypoechoic nodules greater than 5 mm, within vessels, identified by color Doppler will generally be explored: Two main diagnoses are proposed: Seminoma and leydig cell tumor. Extemporaneous histologic analysis may be difficult. Hypoechoic areas, microlithiasis ou macrocalcification in the vincinity of the nodule, multifocal pattern, and very hypoechoic echotexture suggest malignity. A normal echotexture of the adjacent pulp, slight lobulate contours, a vascularity proportional to the size suggest a Leydig cell tumor. In this case, a peroperative ultrasound may help the surgeon to perform a tumorectomy. MRI does not help us to distinguish these pathologies. Small nodules of less than 5 mm incidentally found are generally controlled. We suggest monitoring by ultrasound at 3, 6 and 12 months the first year, and then annually for two years. The announcement of a potentially malignant unexpected lesion should be very prudent and appropriate.

Learning Objectives:

1. To learn the various images that can be found incidentally on scrotal US, like masses, calcifications, parenchymal heterogeneity and ductal ectasies.
2. To determine which images may correspond to significant diseases and require follow-up or surgery.

A-128 17:00

C. Imaging of the penis

M. Bertolotto; *Trieste/IT (bertolot@univ.trieste.it)*

Ultrasonography (US) is the first-line imaging modality in patients with penile disease. Using high-end equipment after pharmacologically induced erection penile anatomy is well defined and virtually all clinically significant penile vessels can be evaluated in normal and in impotent men. The superior soft-tissue contrast resolution afforded by MR imaging provides an opportunity to advance imaging evaluation of the penis in selected cases. In the clinical practice, erectile dysfunction is the most frequent penile abnormality which is investigated with Doppler US. The clinical role of this evaluation, however, reduced after the introduction of oral medications for impotence. Differentiation among different forms of erectile dysfunction is mainly based on evaluation of Doppler waveform changes in the cavernosal arteries. Peyronie's disease is the most frequent cause of penile induration. Imaging is often required to evaluate the extension of the plaques, involvement of the penile septum, and relationship between the plaques and penile vasculature. In patients with penile traumas, imaging allows accurate evaluation of albugineal tears, extra-albugineal and cavernosal hematomas, vascular lesions producing high flow priapism and other pathological changes. Compared with US, MR imaging has some advantages in identification of small albugineal tears, and is more accurate in identification of urethral or spongiosal involvement. Other situations in which penile imaging can be required are circumscribed or diffuse cavernosal fibrosis, tumors, priapism, severe inflammation, and evaluation of postsurgical complications. Most of these conditions are first investigated with US; MR imaging is optimal for tumor staging.

Learning Objectives:

1. To learn the most frequent penile diseases that can be diagnosed by imaging.
2. To understand the respective roles of US and MRI and technical challenges of imaging.
3. To know how imaging influences treatment and follow-up.

16:00 - 17:30 **Room F2**

Breast

RC 602

Breast MRI: Lesion characterisation

Moderator:
K. Kinkel; Chêne-Bougeries/CH

A-129 16:00

A. Morphology and kinetics at CE dynamic imaging

G. Esen; *Istanbul/TR (gulesenicten@gmail.com)*

MRI is the most sensitive imaging modality for the detection of invasive breast carcinoma regardless of the fibroglandular composition of the breast. It is performed in prone position, in the axial, sagittal or coronal planes. Axial position is preferable because correlation with mammography and comparison with the opposite breast is possible. In order to detect small enhancing lesions reliably, fatty tissue signal is suppressed, either by active fat suppression or subtraction. Examinations should be performed in the second week of the menstrual cycle. Differential diagnosis is based on morphologic findings as well as contrast enhancement kinetics. It is important to have high resolution images while scanning as fast as possible so that the temporal data is not lost. On MRI, benign lesions usually demonstrate minimal and slow enhancement, whereas malignancies are expected to show rapid enhancement and then washout. Morphologic findings are described according to the MR BI-RADS lexicon for the standardization of reports and interpretation criteria. Masses with irregular or spiculated borders that show rim enhancement are highly suspicious for invasive tumors. Non-mass-like enhancement in the form of ductal or segmental clumped enhancement is also considered suspicious and can be detected in DCIS. While interpreting breast MRI examinations, morphological and kinetic findings should be combined and correlated with mammographic and sonographic findings. Risk factors, if there are any, should also be taken into consideration. In this lecture, appropriate imaging techniques as well as findings that can be helpful in lesion characterization will be reviewed.

Learning Objectives:

1. To know the protocols used in breast MRI.
2. To describe the different aspects of benign and malignant lesions.
3. To review the basics of kinetic behaviour of breast lesions.

A-130 16:30

B. Overdiagnosis by breast MRI

F. Sardanelli; *Milan/IT (f.sardanelli@grupposandonato.it)*

Overdiagnosis should be considered for MRI indications in which lesions are diagnosed which would have been undetected using only conventional imaging. This is intrinsically associated with screening MRI, recommended for high-risk women. However, high-risk cohort studies showed early stage of MRI-diagnosed cancers with a high rate of negative nodal status, which plays in favor of an outcome effect (using assumptions derived from mammographic screening in the general female population). Conversely, the relatively higher probability of triple negative cancers in these women (in particular BRCA1 mutation carriers) should be taken also into account. Meta-analyses showed that the risk of overdiagnosis is more important for preoperative MRI (pMRI) which changes 16.6% of surgical treatments: 9.2% increase of mastectomies due to 8.1% for true positives plus 1.1% for false positives; 7.4% wider/additional excisions due to 3.0% plus 4.4%, respectively. Moreover, pMRI yields a 4.1% incremental detection rate of contralateral cancers (positive predictive value 48%); 35% DCIS and 65% invasive (mainly node negative). To reduce overtreatment, we need needle sampling (including MRI guidance), reaching 13% of MRI-induced correct changes of surgical planning, to be compared with only about 1% annual risk of recurrences (but also with 20-40% rate of positive surgical margins). For contralateral cancers, needle biopsy can also reduce overtreatment, allowing excising contralateral cancers with simultaneous conservative surgery in 4% of the women, to be compared with only 0.5-1% annual risk for contralateral cancer. pMRI has also been shown to detect extensive intraductal component, but with 11-28% overestimate and 17-28% underestimate.

Learning Objectives:

1. To estimate overdiagnosis for preoperative MRI and for MRI screening of high risk women.
2. To evaluate the potential impact of overdiagnosis.
3. Possible ways to avoid overdiagnosis.

A-131 17:00

C. How to improve specificity of breast MRI?

J. Veltman; *Nijmegen/NL (j.veltman@rad.umcn.nl)*

Breast MRI has shown diagnostic sensitivities of 94-99% for invasive breast cancer; however, specificities have been reported significantly lower with values between 37 and 86%. The specificity of breast MRI is mainly based on the evaluation of morphologic features and relative “slow” dynamic characteristics of enhancing lesions. The only moderate specificity that is achieved using these characteristics can result in a significant number of false positive findings during for instance screening or pre-operative imaging. These findings will often require short term follow-up, target ultrasound with biopsy or even MRI guided biopsy. Fast dynamic imaging, spectroscopy and diffusion weighted imaging (DWI) have been described to have potential for improving the specificity of breast MRI. The use of fast dynamic imaging sequences results in a more accurate evaluation of the initial enhancement of the lesion. In combination with pharmacokinetic modeling, this can result in a more quantitative evaluation of enhancement. In proton-MR Spectroscopy (MRS), the presence of a choline signal, a cell-membrane precursor, in breast lesions can be used to differentiate benign from malignant lesions. The specificity of MRS varies between 67 and 100% in literature (average 87%). DWI has also shown potential in differentiating between benign and malignant lesions, but, like with other techniques, varying specificity values are reported ranging between 46 and 93%. In this presentation, the value of these techniques for improving the performance of breast MRI will be discussed.

Learning Objectives:

1. To discuss literature on MRI specificity.
2. To discuss the value of ultrafast sequences.
3. To discuss the value of spectroscopy and diffusion-weighted imaging.

16:00 - 17:30 **Room G/H**

State of the Art Symposium

SA 6

Adrenals: Small glands, big problems … and practical solutions

Moderator:
Y. Menu; Paris/FR

A-132 16:00

Chairman’s introduction: Five good reasons for the radiologist to image the adrenals

Y. Menu; *Paris/FR (yves.menu@sat.aphp.fr)*

There are many reasons why adrenal imaging is meaningful. Five will summarize the objectives of this session: 1. Adrenal lesions including tumours are extremely common. It is likely that any radiologist will face these questions almost every day. 2. The problem of the so-called «incidentalomas» is especially common, and is sometimes a very difficult situation in patients with known or suspected cancer. 3. Many imaging modalities, including ultrasound, CT, MR and nuclear medicine are useful in the detection, characterization, staging and follow-up of adrenal lesions. 4. Imaging is powerful as long as precise protocols are applied, especially dynamic enhanced CT/MR and in-phase/opposed phase imaging. 5. Appropriate strategy, associating imaging and biology are sometimes poorly understood and should be clarified, because the radiologist is in most cases the person who discovers adrenal lesions. Therefore, he/she should orientate the strategy according to the likelihood of specific diseases, advising either a simple follow-up or even no further examination, or conversely prompting further clinical, biological or imaging investigations. This session will answer these questions and provide the attendance with solid knowledge, useful for everyday’s practice.

Session Objectives:

1. It is a common clinical problem.
2. It is the role of the radiologist.
3. It is easy to manage.
4. It is helpful for the patient.
5. It saves anxiety and money.

A-133 16:05

What is normal, what is abnormal?

M.-F. Bellin, S. Ferlicot, L. Rocher; *Le Kremlin-Bicêtre/FR (marie-france.bellin@bct.aphp.fr)*

Because of the increasing use of cross-sectional imaging, adrenal masses are commonly detected, with reported frequency up to 5% at abdominal CT. Radiology plays a critical role in not only the detection of adrenal abnormalities but in characterizing them as benign or malignant. Computed tomography continues to be the cornerstone of adrenal imaging and has become the study of choice to differentiate a benign adenoma from a metastasis in the oncology patient. An array of pulse sequences is now available that improves the image quality and diagnostic value of adrenal MR imaging. Adrenal masses can be classified into various groups on the basis of the presence of intracellular lipid, macroscopic fat, haemorrhage, cystic changes, vascularity and shape of the tumour. Recognition of the typical imaging features of adrenal lesions is important for radiologists because it often changes the treatment approach and may obviate surgery.

Learning Objectives:

1. To explain the optimal techniques of MRI and CT for the examination of the adrenals.
2. To learn imaging landmarks of normal adrenal glands.
3. To understand the concept of adrenal hyperplasia.
4. To review the classification of adrenal tumours, benign and malignant, illustrated by radiopathological correlations.
5. To learn the clinical and radiological data in the most common diseases associated with adrenal insufficiency like TB, histoplasmosis, haemorrhage, etc.

A-134 16:30

What is abnormal and not a problem?

G. Heinz-Peer; *Vienna/AT (gertraud.heinz@meduniwien.ac.at)*

The widespread use of modern imaging techniques has significantly increased the number of incidentally detected adrenal masses. Adrenal incidentaloma is not so much a disease entity as a finding that may or may not represent a disease. Thus, incidental adrenal findings by their very nature pose a risk of over diagnosis and overtreatment. Although most adrenal incidentalomas are of no significance beyond the anxiety they produce indirectly. Some incidentalomas are clinically significant, and inadvertently leaving them alone might damage the patients´ health. Therefore, detection of an incidentaloma necessitates a conscious decision regarding its management. The past few years have seen an increasing reliance on semiquantitative techniques in imaging and characterization of adrenal masses. Evaluation of the mean percentage washout for adrenal masses on delayed enhanced CT series allows differentiating benign and malignant incidentaloma with high sensitivity and specificity. On MRI, dynamic gadolinium enhanced - and chemical shift (CSI) - techniques have become well-accepted diagnostic methods in the characterization of adrenal masses. Additionally, nuclear medicine studies, and PET/CT have proved to be useful adjuncts in the whole assessment of adrenal lesions. All general approaches in managing adrenal incidentalomas involve hormonal screening. However, they vary both in extent and in the specific screening tests. In this lecture, an algorithm on the management of adrenal incidentalomas will be presented.

Learning Objectives:

1. To understand the prevalence of adrenal incidentalomas.
2. To learn how radiology may help in differentiating benign and malignant incidentalomas.
3. To be able to advise adequate examinations, both biological and radiological, for the initial workup of adrenal incidentaloma.
4. To understand how to organise follow-up.

A-135 16:55

What is abnormal and a problem, and what are the solutions?

U.G. Mueller-Lisse; *Munich/DE (ullrich.mueller-lisse@med.uni-muenchen.de)*

Since the advent of cross-sectional imaging in clinical medicine, adrenal lesions are frequently diagnosed even in asymptomatic patients. The term «incidentaloma» has been coined for such lesions. However, while incidentalomas are frequently benign, finding an adrenal lesion may constitute a diagnostic problem when the patient has previously been diagnosed with malignant disease. Following lung, liver, and bone, the adrenal is the 4th most common site of malignant metastasis. Unenhanced CT and MRI with in-phase and out-of-phase GRE-sequences may help to characterize adrenal lesions as (non-functioning) adenoma when the lesion measures less than 4 cm, appears round and homogenous, and there is sufficient intracellular fat. Contrast-dynamic imaging recognizes adrenal adenoma with low contrast uptake and relatively fast wash-out (> 50% within 15 minutes).

The majority of metastases are bright on T2-weighted and iso- or hypo-intense in liver on T1-weighted MR images. Desmoplastic reaction may render a metastasis dark at MRI. Frequently, adrenal metastases demonstrate the same or similar imaging characteristics as the primary malignancy. In some tumor entities, e.g., NSCLC, lymphoma, or melanoma, PET/CT may demonstrate adrenal metastasis with markedly increased specific-uptake-values for 18-FDG. However, tumors producing catecholamines, e.g., benign or malignant phaeochromocytomas or their metastases, may be characterized biochemically by means of MIBG- or octreotide szintigraphy (±SPECT), or Dota-Tate-PET/CT, and, in some instances, morphologically by their inhomogeneity and contents of calcification and haemorrhage. Risks of needle-tract-seeding, haemorrhage, and severe, acute hypertension are associated with adrenal biopsy. Localization and characterization of functional adrenal tumors may require adrenal venous blood sampling or orthostasis testing.
Learning Objectives:

1. To learn the natural history and the usual and unusual appearance of primary cortical malignant tumors.
2. To identify adrenal metastases, and the specific appearance according to the primary site.
3. To understand the role of PET/CT in adrenal malignancies.
4. To be able to explain the advantages and limitations of percutaneous biopsy.
5. To understand the radiological appearance and staging strategy in case of symptomatic adenoma.

Epilogue:
The practical role of the radiologist facing adrenal masses 17:20

16:00 - 17:30 **Room I**

Vascular

RC 615

Peripheral vascular malformations

Moderator:
M. Sapoval; Paris/FR

A-136 16:00

A. Pathology, correct anatomical classification and clinical work-up
H. Kubiena; *Vienna/AT (harald.kubiena@meduniwien.ac.at)*

Patients presenting with vascular malformations mostly are nomadic and hopeless individuals looking for help. Finally having reached a "multidisciplinary specialist-group" after a sometimes long and misleading trip throughout the ocean of "single-players" of different specialities, these patients do not ask for any more diagnostics - they strongly claim for therapy. Vascular malformations are congenital lesions, although merely seen at birth they become evident throughout the individual's growth. These developmental errors can affect all components of the vascular tree in any area of the body. The therapeutic goal must be defined rather as "control" than "cure" of this disease. To make this point understandable for both patients and colleagues, a fundamental understanding of the pathogenesis and natural course must be created. In special cases of complex vascular malformations, the precise diagnosis and the information about all potential side-effects as well as risk-factors of progression enables these patients to manage their daily life. Therefore, indications for treatment vary depending on the specific type of slow flow or high flow lesion, location, pain, functional and cosmetic impairments and general side-effects of each particular lesion. Since no single specialist has enough knowledge to diagnose or treat vascular anomalies beyond the border of his/her distinct specialty, multidisciplinary working-groups have emerged at these interdisciplinary interfaces. Their common language in classifying and their overall understanding of pathogenesis, prognosis offers these mostly hopeless patients a costume-fit treatment addressing their symptoms.
Learning Objectives:

1. To understand the difference between AVMs and hemangiomas.
2. To review the classification of arterio-venous malformations.
3. To understand the influence of AVM types on treatment selection.

A-137 16:30

B. Diagnostic approaches to AVM: How to image the dynamic
S. Frevert; *Copenhagen/DK (susanne.frevert@rh.regionh.dk)*

An arterio-venous malformation consists of a nidus made of micro- or macro fistulas and the feeding arteries and draining veins. The lesion is hemodynamically active with fast-flow and early venous shunting. AVMs are considered congenital but most become evident later in life. The ideal examination to evaluate arterio-venous malformation must be safe, reliable and give answers to questions about the feeding arteries and draining veins as well as the nidus. The vessel supply and involvement of bones, muscles, subcutaneous tissues and organs have to be determined and finally the flow in the lesion must be addressed. Ultrasound combined with color Doppler examination is the primary diagnostic tool and documents the arterio-venous shunting. The angioarchitecture of the lesion can be difficult to evaluate.
Contrast enhanced CT scanning is of limited value in arterio-venous malformations except in lesions involving the internal organs and the visceral vessels. The single most useful examination is MRI. The scanning has the distinct advantage to demonstrate the extent of the lesion. Contrast-enhanced MR angiography especially with time resolved sequences allow the flow characteristics to be assessed. Typical findings of AVM are dilated tortuous vessels with flow void corresponding to the fast flow in the arteries and veins. The black round holes are visible in most sequences. There is little if any soft tissue mass. The hypertrophied arteries and enlarged draining veins are depicted on contrast-enhanced MR angiography. Conventional angiography is indispensable for precise pre-therapeutic evaluation of the nidus and angioarchitecture.
Learning Objectives:

1. To learn about techniques for dynamic non-invasive vascular imaging.
2. To demonstrate the imaging findings of different types of AVMs.
3. To understand potential pitfalls of imaging modalities.

A-138 17:00

C. Treatment of AVMs: Image-guided interventions: When and when not
J.A. Reekers; *Amsterdam/NL (J.A.Reekers@amc.uva.nl)*

Management of arterio-venous malformations (AVM) is still one of the most challenging interventional procedures. All AVMs are unique and need tailored treatment. The typical medical history of an increasing tumour, often already diagnosed in childhood, and the "trill" in a high-flow AVM already makes a diagnosis. The imaging pathway is the same for all AVMs. MRI is the first choice diagnostic step. The typical appearance on T1 and T2 makes the diagnosis. The most important feature of the MRI is that it will show the extent of the lesion. The latter is important for possible treatment options. MRA does not contribute to the diagnosis and is therefore not necessary. After the diagnosis of a high-flow AVM, a treatment plan can be made. As an AVM is a benign disease, it is the patient's complaints that lead to a treatment. Just having an AVM is not an indication for treatment. Pain, bleeding, physical constrain and sometimes cosmetic problems are the right indication for treatment. In high-flow lesions, the aim is to close the direct A_V fistulae. This can be done with several materials. Glue often gives the best results, but also coils or Onyx can be used. The outcome of treatment is not total cure (which is seldom reached) but improvement of QOL.
Learning Objectives:

1. To learn about optimised treatment strategies.
2. To learn about risks and contraindications.
3. To discuss pros and cons of percutaneous and/or endovascular treatment.

16:00 - 17:30 **Room K**

RTF - Radiology Trainees Forum

TF 1

Highlighted Lectures

Moderators:
D. Bulja; Sarajevo/BA
P.R. Kornaat; Leiden/NL

A-139 16:00

Common pitfalls in MR mammography
D. Djilas-Ivanovic; *Sremska Kamenica/RS (draganadji@hotmail.com)*

Magnetic resonance imaging (MRI) of the breast is emerging as the most sensitive modality available for the detection of primary or recurrent breast cancer. The published sensitivity ranges between 89 and 100%, with more variable specificity ranging between 20 and 100%. There are number of technical artifacts (motion artifacts, misregistration, magnetic susceptibility artifacts etc). and pitfalls (such as inadequate fat saturation at 3.0 T units) that can limit the interpretation of the images by masking or simulating disease. Both morphologic and kinetic features should be considered in the image interpretation. However, many diagnostic pitfalls must be considered. Both strong background enhancement and lack of enhancement of the lesion can lead to diagnostic mistakes. Lack of enhancement is strongly

predictive of benignity, with negative predictive value for invasive cancer of 94-96%, but the absence of observed enhancement does not necessarily exclude a cancer. Morphologic criteria, such as margin characteristics of a focal lesion or the distribution of area enhancement, are considered the most important features for breast lesion diagnosis. ^{1}H MR spectroscopy is a promising tool in the detection of breast malignancy, but there are many technical and interpretational pitfalls that one should be aware of. Correlation of breast MRI with other imaging modalities (mammography and ultrasound) improves the diagnostic specificity. If breast MRI reveals a lesion that was not detected with previous, standard procedures, the radiologist should try to localize the lesion using second-look ultrasound.

Learning Objectives:

1. To learn about technical artifacts and pitfalls commonly encountered in breast MRI.
2. To become familiar with specific morphologic and kinetic features that should be considered in the image interpretation.
3. To appreciate the importance of correlation of breast MRI with other imaging modalities.

A-140 16:30

An easy approach to tackle neck imaging

D. Farina; *Brescia/IT (nappaje@yahoo.it)*

Essentially, two factors make neck imaging a demanding task: the challenge posed by motion artefacts and the understanding of the anatomy. First of all, neck imaging can be simplified if images of good quality are acquired. The routine use of multidetector CT equipments has noticeably decreased the impact of motion artefacts in CT imaging. Nonetheless, MRI should be preferred in the evaluation of soft tissue masses of the neck. Tailoring of the protocol to both patient and lesion is thus essential to obtain a correct diagnosis, by combining time decreasing tricks (such as parallel imaging), contrast improving sequences (fat saturation, above all) and high resolution acquisition (such as 3d-VIBE). Secondly, neck imaging can be simplified if the complex anatomy of this region is disassembled in spaces that are easily identified on cross-sectional scans, basically on axial plane (though also on coronal and sagittal images). These spaces are defined by the splitting of the three layers (superficial, middle, deep) of the deep cervical fascia. Nine spaces are thus defined, 4 located in the suprahyoid neck (parapharyngeal, masticator, parotid, pharyngeal mucosal), 1 in the infrahyoid neck (visceral) and 4 extending vertically on both sides of the hyoid bone (carotid, retropharyngeal, perivertebral, posterior cervical). This schematic classification helps to assign each lesion to a space of origin, and consequently, to narrow the list of differential diagnoses to a minimum. Moreover, this classification accounts for the need to scrutinize the neck along all its length when acute inflammatory processes are under investigation.

Learning Objectives:

1. To become familiar with MSCT/MRI protocols for neck imaging.
2. To learn the tricks to improve the quality of images.
3. To understand the boundaries and vertical extension of the spaces of the neck.
4. To become familiar with the space-specific differential diagnosis.

A-141 17:00

Management in radiology

L. Donoso; *Barcelona/ES (ldonoso@clinic.ub.es)*

As the importance of imaging studies in the diagnosis and treatment of all kinds of patients continues to grow, professionals from many different backgrounds are gaining footholds in what was once the radiologist's exclusive domain. Radiology departments need to adopt a proactive approach to ensure that radiologists will continue to lead the imaging revolution. Innovative proposals focused on maximizing client satisfaction and creating added value are the best way to keep a competitive edge. The management strategy of creating added value through innovation has been effective in many different branches of industry, and the basic principles of this approach can be applied in radiology. This presentation will focus on different ways to become more competitive by creating added value in the services we provide. The future of radiology departments will depend largely on our willingness and ability to manage innovatively to ensure that we deliver added value to our clients. Innovative management begins with a critical evaluation of all the activities that make up the value chain. It is essential to review all the organization's processes to determine which activities should be improved, reduced, or eliminated and to introduce new activities that create value for clients. Value curves make it possible to examine these activities in detail and to compare traditional approaches with innovations. Information and communication technologies are key to this strategy and this presentation will emphasize and illustrate their role in developing the radiology department's business strategy.

Learning Objectives:

1. To recognise the importance of innovative management in delivering radiological services.
2. To understand how innovative management creates added value for clients.
3. To appreciate the crucial role of information and communication technologies.

16:00 - 17:30 **Room L/M**

Special Focus Session

SF 6

Imaging of cardiomyopathies

Moderator:
V.E. Sinitsyn; Moscow/RU

A-142 16:00

Chairman's introduction

V.E. Sinitsyn; *Moscow/RU (vsini@mail.ru)*

Primary cardiomyopathies (CMP) are diseases of the myocardium of unknown origin, associated with cardiac dysfunction. There is a need for better detection and characterization of these diseases. Modern classification of CMP is quite complex. Thanks to progress of cardiac imaging, new types of CMP have been discovered. There is growing clinical interest in the use of cardiac MRI and MDCT in detection and characterization of CMP. Major tasks of cardiac imaging in CMP are: assessment of cardiac morphology and function, quantification of blood flow and valve motion and myocardial characterization, e.g. identification of foci of inflammation and fibrosis. Both MRI and MDCT may detect major diagnostic features of CMP without limitations of echocardiography. MR with late gadolinium enhancement (LGE) has turned into one of the best modalities for myocardial characterization, competing with nuclear imaging. Recent clinical studies have suggested that the extent and pattern of LGE may have prognostic and therapeutic value in patients with CMP. CTA can reliably differentiate ischemic CMP from non-ischemic ones. New technologies of MDCT, such as dual energy CT, may be also used for myocardial characterization. It has been shown that MRI and MDCT can provide a valuable contribution to the diagnosis of CMP and contribute substantially to proper management and treatment of patients with CMP. Current clinical recommendations list CMP as one of the major indications for cardiac MRI or CT. Broad and growing scope of indications for cardiac imaging requires corresponding competence of radiologists in diagnosis of non-coronary cardiac diseases, including CMP.

Session Objectives:

1. To learn about the increasing incidence of cardiomyopathy, the various etiologies and the terminology.
2. To be aware of the natural history of cardiomyopathies.
3. To understand why the radiologist has an added value in the diagnosis, work-up and follow-up of cardiomyopathies, and how CT and MRI may play an important role in addition to echocardiography.

A-143 16:03

Imaging of cardiomyopathies: What is important for the cardiologist?

J. Schulz-Menger; *Berlin/DE (jeanette.schulz-menger@charite.de)*

Cardiac Magnetic Resonance (CMR) has the capability to assess cardiac function, to visualize small myocardial lesions and to differentiate myocardial tissue changes. One of the most challenging tasks in cardiology is the differentiation of the underlying cause of a wall motion abnormality, impaired myocardial function or causes for hypertrophy. In case of dilated cardiomyopathy, mainly the differentiation of ischemia and inflammatory reaction has to be elucidated. Beside characterization of tissue changes, CMR has the potential to differentiate prospectively between reversible and irreversible myocardial injuries. The changes can be monitored during follow-up. The broad clinical spectrum from subclinical disease to severe heart failure and a course of the disease from complete convalescence to dilated cardiomyopathy depends on the extent of the myocardial damage and its immediate detection. Therefore, an early non-invasive differentiation is warranted. Contrast-enhanced CMR and combined protocols has been used to detect myocardial inflammation for several years and for follow-up. In case of hypertrophic cardiomyopathy, CMR is superior in comparison to echocardiography in detecting small and uncommon localized hypertrophied regions. The high spatial resolution allows the visualization of small abnormalities including findings affecting the papillary muscle. The application of contrast-enhanced CMR may be helpful to differentiate the cause

and provides some information regarding risk-assessment. Detection of myocardial tissue changes offers the opportunity to understand the development of disease and therefore the potential to optimize therapy.
Learning Objectives:
1. To become familiar with classification and manifestations of cardiomyopathies.
2. To understand the major needs for imaging in cardiomyopathies.
3. To indicate the modern role of cardiac CT and MRI in the work-up of a patient with cardiomyopathy.

A-144 16:15

MRI and MDCT in dilated cardiomyopathy
J. Bogaert; *Leuven/BE (Jan.Bogaert@uz.kuleuven.ac.be)*

The role of non-invasive imaging techniques, in particular computed tomography (CT) and magnetic resonance imaging (MRI), is rapidly expanding in investigating patients with dilated ventricles. The etiology of uni- or biventricular enlargement is widely variable (e.g. idiopathic dilated, ischemic, toxic, metabolic, arrhythmogenic RV dysplasia, non-compaction cardiomyopathy), making straightforward diagnosis and treatment often challenging. Both CT and MRI provide volumetric data, and in combination with ECG triggering, ventricular volumes and volume changes of both ventricles throughout the cardiac cycle can be accurately quantified. The MRI, and CT to a lesser extent, can provide valuable information on the underlying cause and detect associated pathology (e.g. thrombus formation, valvular regurgitation). The presence and pattern of myocardial enhancement is informative about the type of myocardial insult (e.g., ischemic versus inflammatory) and helpful in predicting response in cardiac resynchronization therapy (CRT). Angiographic CT/MRI techniques can be used to visualize the cardiac venous system, facilitating CRT lead placement. To conclude, the novel, not infrequently unique, information obtained by both techniques has been extremely helpful in better understanding the "dilated" heart.
Learning Objectives:
1. To understand how to perform cardiac MRI and MDCT in order to assess cardiac morphology and function in patients with dilated cardiomyopathy.
2. To learn how imaging helps to differentiate dilated cardiomyopathy from ischemic cardiomyopathy and chronic myocarditis.
3. To compare MRI and MDCT with other imaging modalities in diagnosis of dilated cardiomyopathy and to show their contribution to treatment selection and patient outcome.

A-145 16:35

MRI and MDCT in hypertrophic cardiomyopathy
M. Gutberlet; *Leipzig/DE (matthias.gutberlet@herzzentrum-leipzig.de)*

Hypertrophic cardiomyopathy (HCM) is a cardiomyopathy, which is characterized by an inappropriate myocardial hypertrophy in the absence of an obvious cause and is genetically transmitted in the majority of patients. It can occur with an obstruction (HOCM) of the left ventricular outflow tract (LVOT) and without (HCM). Magnetic Resonance imaging (MRI) as well as Multi Detector Computed Tomography (MDCT), i.e. in patients with contraindications for MRI, can assess left and right ventricular function and muscle mass. MRI with its possibilities of tissue characterization has improved the knowledge about different cardiomyopathies in the recent years so much. Especially, for the risk stratification of patients suffering from hypertrophic cardiomyopathy (HCM), MRI with the use of „late gadolinium enhancement" (LGE) as a surrogate parameter for fibrosis or scar tissue seems to be of an additional value, because the areas of LGE can be seen as a potential arrhythmogenic region. Furthermore, MRI provides the unique possibility to quantify the LVOT-obstruction by the use of MR-flow measurements.
Learning Objectives:
1. To become familiar with major forms of hypertrophic cardiomyopathy, clinical manifestations and complications of the disease.
2. To show the role of cardiac MRI and MDCT in the assessment of myocardial hypertrophy, flow and valvular disturbances in this form of cardiomyopathy.
3. To consolidate knowledge about possible links between imaging features of the disease, its complications and patient's prognosis.

A-146 16:55

Uncharted waters: Unclassified and rare cardiomyopathies
J.D. Dodd; *Dublin/IE (J.Dodd@st-vincents.ie)*

Cardiomyopathies are an important and heterogeneous group of diseases. They may be classified into primary and secondary etiologies. Primary cardiomyopathies are those solely/predominantly confined to heart muscle, whilst secondary cardiomyopathies demonstrate myocardial involvement as part of a more generalized systemic multi-organ disease. The number of entities in both categories continues to rise as our definition and understanding of cardiomyopathies continues to evolve. In each broad category, what was once considered rare is becoming increasingly commonly recognized as our appreciation of the importance of genetic factors in combination with environmental influences continues to grow. The increasing availability of non-invasive imaging modalities such as cardiac magnetic resonance imaging (CMRI) and echocardiography is playing an increasingly central role in the evaluation of patients suspected of cardiomyopathy. Rare primary cardiomyopathies include morphological and genetic variations of ARVD, non-compaction syndrome and glycogen storage disorders. Of the mixed cardiomyopathies, unusual infectious and toxic causes are being increasingly recognized. The evolving role of cardiomyopathies in the autoimmune and neuromuscular disease categories is of burgeoning interest. Our understanding of the acquired cardiomyopathies such as Tako-tsubo and peri-partum cardiomyopathies continue to develop. A number of secondary cardiomyopathies are now being characterized, such as those occurring as part of the connective tissue disorders. An overview of the clinical characteristics and potential etiologies of some of these rare cardiomyopathies and examples illustrated on CMRI will be provided.
Learning Objectives:
1. To review the etiologies of the various unclassified/rare cardiomyopathies.
2. To learn about the clinical features and pathophysiology of the unclassified/rare cardiomyopathies.
3. To acquire the latest knowledge of the appearances of the unclassified/rare cardiomyopathies on cardiac MRI.

Panel discussion:
Imaging of cardiomyopathies: A wake-up call for the general radiologis 17:15

16:00 - 17:30 **Room N/O**

Contrast Media

RC 606

Organ-specific and future contrast media in MRI

Moderator:
A.J. van der Molen; Leiden/NL

A-147 16:00

A. Real added value of liver-specific contrast media
O. Clément; *Paris/FR (olivier.clement@inserm.fr)*

Liver specific contrast agents have been developed by pharmaceutical companies for almost 20 years, but what remains in 2010? A few specific indications. There are two major mechanisms for liver specific uptake: 1. A specific hepatobiliary uptake through a membrane transporter at the sinusoidal face of the hepatocyte (Multihance®, Primovist®) or through a non-specific mechanism for manganese (Teslascan®). 2. An uptake by the cells of the reticulo endothelial system for iron oxide particles (Resovist®, Endorem®). The resulting liver parenchymal enhancement will be a bright with gadolinium and manganese chelates (T1 effect) and dark with iron particles (T2 effect). On clinical routine for liver imaging, the initial dynamic arterial and portal phases are of paramount importance to detect and more to characterize lesions. With liver specific agents, another phase is added, the delayed parenchymal phase which adds information, especially for lesion detection. Clinical trials and marketing authorizations for liver specific agents concern either detection of metastasis or characterization of liver tumors. After so many years of market release, only few liver examinations are performed routinely, mainly in centers specialized in liver surgery. This can be explained because none of these agents offer both possibilities to have dynamic and delayed phases, and a good dynamic phase with a non-specific gadolinium chelate already answers a majority of the clinical questions. This course will detail the different clinical situations where a specific liver contrast agent is needed in routine liver imaging.
Learning Objectives:
1. To know which liver-specific contrast media can be used in clinical practice.
2. To understand the respective working mechanisms.
3. To know the evidence for clinical applications and indications.

A-148 16:30

B. Contrast for atherosclerosis imaging
J.H. Gillard; *Cambridge/UK (jhg21@cam.ac.uk)*

Despite tremendous advances in the recognition and management of risk factors for atheromatous disease, it remains responsible for substantial morbidity and mortality in the Western world. Until recently, the risk of carotid disease in symptomatic patients was determined by simple luminal measurements. We are now able to image

individual plaque components including the fibrous cap, lipid core and haemorrhage. The current goal is to be better able to characterise plaque risk, whether it is in the carotid, coronary or peripheral vasculature. Our understanding of the natural history of atheroma development continues to grow. Whilst the assessment of risk is aided by the quantification of individual morphological components in plaque viewed with MR, it has been difficult to image true plaque function. Enticing studies of plaque activity demonstrated using FDG PET showed that it is possible to image inflammatory activity in humans. We now have MR contrast agents that are taken up by macrophages and are visible with high-resolution MR. We are also able to image not only individual plaque structure, but also function, allowing an improved understanding of why two patients will identical degrees of luminal stenosis may have completely different degrees of vulnerability. There have been tremendous advances in our ability to access plaque instability using MR over the last few years, the most exciting being the ability to use cell specific markers of inflammation. The challenge is to validate these techniques in the carotid and assess their utility and effectiveness in clinical practice.
Learning Objectives:
1. To understand the pathophysiology of the formation of the atherosclerotic plaque.
2. To understand how contrast agents can visualise plaques.
3. To know what the clinical applications and indications are.

A-149 17:00

C. CEST-type contrast media in MRI

M.T. McMahon, A.A. Gilad, G. Liu, P.C.M. van Zijl, J.W.M. Bulte;
Baltimore, MD/US (jwmbulte@MRI.jhu.edu)

A novel approach to generate MRI contrast without the use of metal-based contrast agents is to perform Chemical Exchange Saturation Transfer (CEST) imaging in the presence of agents with multiple exchangeable protons that are off-resonance. When irradiated with a saturation pulse at the specific off-resonance frequency, the protons lose their capability to create signal, with the signal loss transferred to bulk water (the source of MRI signal) through chemical exchange. Several types of CEST contrast agents have now been described, containing amide, amine, or hydroxyl protons as off-resonance exchangeable protons. By virtue of their frequency-specific resonance, it is possible to selectively saturate the proton group of choice, permitting a distinction of different polypeptides by assigning multiple colors. Some biological applications of CEST contrast agents include the cloning and expression of an amide-rich reporter gene for MRI cell tracking, their use as pH sensor, and lipoCEST agents for imaging of lymph nodes. As they are bio-organic and consist of naturally occurring compounds, the future clinical use of CEST agents may be facilitated. A closely related type of contrast media, PARACEST agents, works using a similar principle but uses metal ions to shift away the proton resonance from the water peak. Some examples of other groups developing these PARACEST agents will also be highlighted.
Learning Objectives:
1. To understand the working mechanism of CEST-type imaging.
2. To introduce the potential clinical indications and applications.

16:00 - 17:30 **Room P**

Chest

RC 604

Hot CT issues in clinical practice

Moderator:
C. Schaefer-Prokop; Amsterdam/NL

A-150 16:00

A. How to manage incidentally found pulmonary nodules

L. Bonomo; *Rome/IT (lbonomo@rm.unicatt.it)*

Pulmonary nodules are small, focal, radiographic opacities that may be solitary or multiple. Solitary pulmonary nodule (SPN) is a single, round, well circumscribed radiographic opacity that measures < 3 cm in diameter and is surrounded completely by aerated lung. Small subcentimeter nodules measure < 8 to 10 mm in diameter and can be solitary or multiple. The improved technology in CT scanners has resulted in the detection of large number of small noncalcified pulmonary nodules (< 10 mm) on CT scans. In reported studies the frequency of detecting one or more SPN on a screening CT scan ranges from 5 to 60%. The clinical significance is unknown. Characterization of small pulmonary nodules is very difficult because detailed morphologic features often cannot be perceived. For small pulmonary nodules, CT morphology is quite non-specific, no typical feature of malignancy is defined, and considerable error is associated in the density measurement. The likelihood of malignancy depends on patient risk factors, nodule size and morphologic characteristics; it is highest in current smokers and increases with age. A strong association between nodule diameter and the likelihood of malignancy has been reported. Regarding the morphology, the nodules may be characterized as solid, partly solid or pure ground glass opacities. In some studies, the likelihood of malignancy was high in ground glass opacities and in partly solid lesions but much lower in solid nodules. The optimal approach to the management of subcentimeter nodules remains problematic and the current guidelines are not in complete agreement.
Learning Objectives:
1. To review the different risk situations for patients with pulmonary nodules.
2. To describe the rationale for choosing different management options in different patient populations.
3. To recommend management strategies for the individual patient.

A-151 16:30

B. Optimising and minimising radiation dose

D. Tack; *Baudour/BE (denis.tack@skynet.be)*

The radiation dose delivered by MDCT for a standard chest volumetric acquisition ranges between 10 and 100 times the one delivered for a chest radiograph. Numerous recent technical improvements help limit the dose of volumetric CT. Using appropriate parameters, optimized MDCT of the chest delivers less than 10 times the dose of a chest radiograph while providing excellent diagnostic image quality. Low-dose chest MDCT with slightly reduced image quality may deliver a radiation dose in the range of that delivered for a radiographic examination. In this presentation, we will review the available reference diagnostic levels, and compare them to optimized dose and to low-dose levels. The reasons for inappropriate use of higher doses will be reviewed in addition to the most recent technological advances and research enabling further radiation dose reductions.
Learning Objectives:
1. To review the latest technological advances for dose optimisation and minimisation.
2. To provide CTDIvol, DLP and effective dose values for state-of-the-art chest MDCT scanning.
3. To review radiation risks and benefits from perfusion and triple-rule-out MDCT studies of the chest.

A-152 17:00

C. Phenotyping and interventions in COPD

P.A. Grenier; *Paris/FR (philippe.grenier@psl.aphp.fr)*

Chronic obstructive pulmonary disease (COPD) is a slowly progressive airway obstructive disorder resulting from an exaggerated inflammatory response that ultimately destroys the lung parenchyma (emphysema) and induces irreversible reduction in the caliber of small airways (airway wall remodeling). Bronchial wall thickness and the extent of emphysema at CT in COPD patients have proven to be both the strongest independent determinants of the degree of airflow obstruction at pulmonary function tests. Using CT to define phenotypic abnormalities in COPD patients may serve to optimize treatment and assess response to potential therapeutic interventions. Although the different morphologic abnormalities seen on CT scans of COPD patients often overlap, two separate groups of patients can be identified, those with emphysema predominant disease and those with airway predominant disease due to chronic inflammation resulting in airway remodelling and narrowing. The former category can be further subdivided based on the type of emphysema present and further characterized by anatomic distribution and severity using visual assessment and volumetric quantitative CT techniques. Patients in the airway predominant category can also be characterized by CT as showing bronchial wall thickening, small airway inflammation, mosaic perfusion and air trapping expressing small airway narrowing, and expiratory bronchial collapse due to cartilage deficiency. Recent advances in automated airway segmentation and quantitative analysis have made measurements of airway dimensions feasible. In longitudinal studies, standardization of procedures and quality control are needed, particularly if quantitative CT outcomes are used as endpoint in clinical trials and ultimately in the clinical management of individual patients.
Learning Objectives:
1. To know the classification of COPD phenotypes, and the key role of CT in determining the predominant phenotype in any given COPD patient.
2. To understand the methods used for CT quantitative assessment of emphysema and airway wall remodelling, and their limits.
3. To know the role of imaging in selecting candidates for interventions, and in follow-up of longitudinal studies.

16:00 - 17:30 **Room Q**

Interventional Radiology

RC 609

RF ablation beyond the liver

Moderator:
R.D. García Mónaco; Buenos Aires/AR

A-153 16:00

also EPOS

A. RF ablation in bone

A.D. Kelekis; *Athens/GR (akelekis@cc.uoa.gr)*

The purpose of this refresher course is to demonstrate techniques used in bone ablation in the spine and the appendicular skeleton. There is an active dilemma on which lesions to use thermal ablation and on which stabilization by bone augmentation techniques. We will review differences between lytic and blastic lesions and characteristics of various ablation devices (such as monopolar, bipolar, single and multitined electrodes). Imaging techniques, including fluoroscopy, computed tomography and magnetic resonance will be addressed. Analgesia is being discussed. Complications are analyzed. By the end of this presentation, users of ablation techniques should be aware of the possible anatomical and positional landmarks, as well as the possible advantages and disadvantages of each device. Results of ablation will be discussed. Combination of the ablation technique with other methods will be presented. We will explore the possible advantages to standard osteoplasty. In conclusion, bone ablation is a valid technique, standing alone or in combination with other procedures. The purpose of this presentation is to allow the interventional radiologist to perform the ablation in a safe and efficient way. Knowing the limitations of the material at hand seems to be important for avoiding technical complications.

Learning Objectives:

1. To discuss indications, patient selection and preprocedural imaging.
2. To descibe the technique.
3. To review the results and complications.

A-154 16:30

B. RF ablation in the kidney

M.A. Farrell; *Waterford/IE (michaela.farrell@hse.ie)*

Over the last two decades, open nephron sparing surgery has become the preferred surgical alternative to nephrectomy for treatment of patients with a single, small (< 5 cm) clearly localized renal mass and a normal contralateral kidney. Because 25-49% of newly diagnosed small renal masses are identified incidentally on cross sectional imaging, often in elderly patients, less invasive surgical nephron sparing alternatives have been advocated, including laproscopic partial nephrectomy and laproscopic cryoablation, for select tumors in an effort to reduce surgical mortality and morbidity while preserving renal function. Percutaneous image-guided ablation offers potential advantages over surgical methods including the minimally invasive nature of the procedure, less mortality and morbidity than surgery, shorter hospital stay, and quicker recovery. Local tumor control rates of up to 95% have been reported for small tumors. Central tumors and tumors greater than 3 cm in diameter are more difficult to successfully treat with local tumor progression occurring 25% of central tumors. Tumors larger than 3 cm in diameter typically require overlapping ablations and incomplete treatment can result from residual tumor at the ablation interfaces. While in some reports, local tumor progression occurred in up to 20% of tumors larger than 3 cm, in contrast, others have shown that all exophytic tumors, despite their size, can successfully be treated using multiple overlapping ablations and complete treatment may require more than one ablation session. The most clinically relevant and potentially avoidable complication is ureteral injury with resultant obstruction of the intrarenal collecting system.

Learning Objectives:

1. To discuss indications and patient selection.
2. To describe currently available therapeutic alternatives.
3. To review the results of RF ablation compared with other treatments.

A-155 17:00

C. RF ablation in the chest

I. Bargellini; *Pisa/IT (irenebargellini@hotmail.com)*

In the past decade, percutaneous image-guided radiofrequency ablation (RFA) has been proposed as a safe and effective minimally invasive procedure in selected patients with unresectable or medically inoperable lung malignancies. When adequately performed by experienced operators, the procedure is associated with up to 99% immediate technical success rate and low incidence of major (8-15%) and minor complications (20-40%). The most frequent complications are alveolar haemorrhage, pleural effusion and pneumothorax (9-52%), the latter requiring chest tube placement in a relatively low number of cases (3-5% of ablation sessions). Some studies have pointed out that, although these complications are unpredictable, there are some significant risks factors for pneumothorax, some of them being inevitable (such as patients' age, emphysema, and tumor diameter and location), some others being avoidable, particularly when planning the needle access and track through the lung parenchyma. After RFA, sustained complete tumor response has been demonstrated in about 85-90% of the target lesions. These favourable figures are associated with promising survival rates. According to the RAPTURE study, the 2-year cancer-specific survival was 73% in patients with NSCLC, 68% in patients with colorectal metastases, and 67% in patients with other metastases, with corresponding overall survival rates of 48, 66 and 64%, respectively. These results can be obtained after proper patient selection by a multidisciplinary team. In particular, RFA can be useful in nodules smaller than 3 cm and in peripheral location (possibly > 1 cm from the hilum). The association between RFA and chemo-/radioteraphy should also be considered in selected patients.

Learning Objectives:

1. To discuss indications and patient selection.
2. To describe the technique and complications.
3. To review the results of RF ablation to date.

Saturday, March 6

08:30 - 10:00 **Room A**

Special Focus Session

SF 7a

Cardiac CT: Imaging beyond the coronaries

Moderator:
K. Nikolaou; Munich/DE

A-156 08:30

Chairman's introduction

K. Nikolaou; *Munich/DE (konstantin.nikolaou@med.uni-muenchen.de)*

While multislice CT (MSCT) has so far mainly been tested to detect obstructive coronary artery disease (CAD), ongoing developments of scanner technology open up new diagnostic options and indications. With the improvement of temporal resolution, an accurate assessment of regional and global ventricular function, as well as of the cardiac valves, is becoming feasible. Regarding the assessment of the myocardium, new techniques such as myocardial perfusion imaging with CT or dual/multi energy imaging open up new horizons, depicting areas of ischemia and non-viable tissue. Finally, the ease and speed of CT - in conjunction with an improved radiation dose efficiency - have increased the number of CT acquisitions in cases of congenital heart disease, even in younger patients. While the evaluation of coronary artery stenoses will for now most probably remain the primary clinical indication for cardiac CT, these new applications are steadily under development and widening the options for cardiac CT imaging.
Session Objectives:

1. To become familiar with the potential use and viability of CT for imaging of heart function.
2. To learn about indications and protocols for the use of CT in congenital heart disease.
3. To review dose reduction strategies for various protocols.

A-157 08:36

Myocardial and valvular function

T.R.C. Johnson; *Munich/DE (thorsten.johnson@med.uni-muenchen.de)*

Dynamic CT with a muliphase coverage of the heart throughout the cardiac cycle requires restrictions in tube current modulation and implies a comparatively high radiation exposure. Thus, the indication is restricted to elderly patients or individuals in whom echocardiography and MRI are not available as alternatives. However, dynamic information is also available as side information if the coronary arteries are of primary diagnostic interest. Practically it is easiest to perform a multiphase reconstruction of the entire data volume, e.g. in non-overlapping thin axial slices at 10% steps over the cardiac cycle. The evaluation of cardiac motion is best visualized in standard planes known from MRI and echocardiography, i.e. in long and short axis slices aligned parallel and perpendicular to the interventricular septum. New software tools also provide the option to automatically quantify parameters of global and regional volume, wall motion and ejection. These parameters can help to identify cardiomyopathy or areas of infarction. Dynamic reconstructions also make it possible to assess valvular function. The left ventricular valves are normally well visualized, while a long bolus or preferentially a mixed chaser bolus is necessary to opacify right atrial and ventricular volume sufficiently to depict the pulmonary and especially the tricuspid valve. Aortic stenoses are usually quite obvious due to extensive calcification and lack of motion with small residual opening area. CT is far less sensitive to insufficiencies because a tiny gap between the leaflets can cause clinically relevant regurgitation, especially at the mitral valve.
Learning Objectives:

1. To understand the technique and become acquainted with the practical evaluation of dynamic CT.
2. To become familiar with changes in myocardial wall motion and their diagnostic relevance.
3. To recognise valvular disease and know the diagnostic accuracy in estimating the degree of changes.

A-158 09:04

Myocardial viability and perfusion

J.-F. Paul; *Le Plessis Robinson/FR (pauljf@ccml.fr)*

After an acute myocardial infarction (MI), myocardial damage varies within the ventricle wall. At first pass, myocardial ischemia is seen as a subendocardial hypodensity, more or less transmural and more or less persistent over time after injection of contrast medium. However, first pass imaging of cardiac muscle may be not accurate enough to assess ischemia. Additional delayed enhanced images may be also very useful to assess inflammatory changes within the cardiac muscle, either in case of myocardial infarction or myocarditis. Some clinical examples will be provided in case of unexplained severe chest pain, illustrating the great clinical interest of MDCT based on delayed enhancement imaging. A comprehensive protocol in acute setting (including arterial phase and delayed acquisition) will be proposed for quick diagnosis of myocardial infarction. Very recently, MDCT delayed imaging has shown to be also useful for assessment of myocardial viability. MDCT may be then performed just after PCI, using intracoronary contrast injection required for stent placement. These histological changes are more or less severe resulting in a functional point of view from complete non-viability to complete recovery of the segmental contractility: transmural late enhancement is associated with non-viability. A dual-phase MDCT will be also detailed for assessment of viability in the first week after myocardial infarction. In summary, beyond coronary arteries, CT provides relevant information about cardiac perfusion and viability after myocardial infarction.
Learning Objectives:

1. To understand the potential of CT for evaluating viability and perfusion.
2. To describe appropriate protocols for optimisation of late enhancement imaging.
3. To know how to use myocardial information in emergency settings.

A-159 09:32

Congenital heart disease

S. Leschka; *Zurich/CH (sebastian.leschka@kssg.ch)*

Various imaging modalities contribute diagnostic information in patients with congenital heart disease (CHD). Although echocardiography is the diagnostic method of choice, the development of multi-detector row computed tomography (CT) has increased its clinical application in evaluating patients with CHD. Because of increased scan speed, high spatial resolution, and simultaneous evaluation of cardiovascular structures and lung parenchyma, CT has become a helpful complementary imaging modality in pre- and post-surgical evaluation of patients with CHD. When coupled with electrocardiography-gating, CT can provide data on ventricular function and cardiac valves, and allows for accurate assessment of the coronary arteries. Expertise in morphology and terminology, profound knowledge in wide spectrum of surgical procedures, and dedicated imaging protocols for CT are required to comply with the altered flow conditions in patients with CHD. The sequential, segmental approach will be described for accurate morphologic interpretation of several CHD conditions.
Learning Objectives:

1. To determine appropriate CT protocols for evaluating congenital heart disease (CHD).
2. To describe a sequential approach that may be used in interpreting CT images of CHD.
3. To provide typical case studies of congenital heart disease.

08:30 - 10:00 **Room B**

Radiology of the Spine in 2010

CC 716

Spinal cord: Difficult but devastating diagnoses

Moderator:
D. Balériaux; Brussels/BE

A-160 08:30

A. Demyelinating diseases of the spinal cord

A. Rovira-Cañellas; *Barcelona/ES (alex.rovira@idi-cat.org)*

The spinal cord is commonly affected in multiple sclerosis (MS) and other idiopathic inflammatory demyelinating diseases, such as acute demyelinating encephalomyelitis and neuromyelitis optica. The prevalence of cord abnormalities is as high as 74 to 85% in established MS. In clinically isolated syndromes (CIS), the prevalence of asymptomatic cord lesions is lower, although they can be found in 30 to 40% of patients with this condition. MRI of the spinal cord can provide important diagnostic information in several clinical settings. Patients initially diagnosed with MS, but showing signs or symptoms of myelopathy, are typically evaluated by spinal cord MRI to exclude treatable lesions. Moreover, the presence of cord lesions may help to determine dissemination in space according to the 2005 McDonald diagnostic criteria, and can strengthen the diagnosis of MS in patients fitting the clinical criteria for MS, but with negative or inconclusive brain MRI findings. Similarly, diagnostic certainty can be increased in patients with non-specific brain findings, particularly those > 50 years old, because asymptomatic cord lesions are relatively frequent

in MS, but are rare in other white matter diseases. Spinal cord abnormalities, as seen on conventional MRI scans, mainly reflect demyelination, but underestimate axonal damage, which is likely the reason why the relationship with disability is poor. The progressive refinement of modern quantitative techniques (e.g., diffusion tensor imaging, MR spectroscopy, and magnetization transfer) should result in a more complete in vivo picture of spinal cord pathology in MS and, ultimately, a better relationship with the clinical picture.

Learning Objectives:

1. To explain the mechanisms of demyelination.
2. To review the most common demyelinating diseases and their key imaging findings.
3. To comprehend the clinical criteria for diagnosing demyelinating diseases of the spinal cord.

A-161 09:00

B. Spinal cord tumors

C. Mueller-Mang; *Vienna/AT (christina.mueller-mang@meduniwien.ac.at)*

Spinal cord tumors are uncommon, accounting for about 4 to 10% of all central nervous system tumors. Despite their rarity, these neoplasms are important to the radiologist because MR imaging provides essential information about the extent, location, and internal structure of spinal cord tumors, thus critically narrowing the differential diagnosis and guiding surgery. Most spinal cord tumors are malignant, and 90-95% are classified as gliomas. Astrocytoma is the most common spinal cord glioma in the pediatric age group, whereas spinal cord ependymoma is the most common type in adults. Both entities constitute up to 70% of all intramedullary neoplasms. Nonglial neoplasms are much less common and include hemangioblastomas, paragangliomas, metastases, lymphoma, and primitive neuroectodermal tumors (PNETs). On MR imaging, intramedullary neoplasms cause enlargement of the spinal cord caused and almost always show contrast enhancement. They may be solid or associated with neoplastic cysts that are located within the tumor and result from necrosis and degeneration, or non-neoplastic cysts that are located at the cranial and caudal pole of the tumor and most probably represent reactive dilatation of the spinal canal. An optimal MR imaging study not only enables the correct differential diagnosis in the majority of spinal cord tumors preoperatively, but also allows the discrimination of tumor from these non-neoplastic cysts and edema, which is crucial for surgical planning. New MR techniques, such as diffusion tensor imaging (DTI) and fiber tracking (FT), may be helpful with further characterization of some spinal cord tumors and in better delineation of their margins.

Learning Objectives:

1. To review the most common spinal cord tumors.
2. To summarise key imaging findings in different spinal cord neoplasms.
3. To discuss how to create the optimal MR imaging protocol for preoperative planning of spinal cord tumors.

A-162 09:30

C. Vascular disorders of the spinal cord

T. Krings; *Toronto, ON/CA (timo.krings@uhn.on.ca)*

Spinal vascular diseases are rare and constitute only 1-2% of all vascular neurological pathologies. Since their clinical diagnosis is based mainly on magnetic resonance imaging (MRI) and digital subtraction angiography, the radiologist plays a major role in the diagnostic workup. In the lecture, the following vascular pathologies of the spine are described: spinal arterial infarcts, spinal cavernomas, and spinal arteriovenous shunting lesions and an overview about their imaging features both on MRI, MR angiography and digital subtraction angiography is given. Clinical differential diagnoses, the neurological symptomatology and the potential therapeutic approaches of these diseases which might vary depending on the underlying pathology are presented. Although MRI including MRA constitutes the diagnostic modality of first choice in suspected spinal vascular malformation, a definite diagnosis of the disease and therefore the choice of suited therapeutic approach rests on selective spinal angiography, which should be performed at a specialized center.

Learning Objectives:

1. To understand the pathophysiology of spinal vascular anomalies.
2. To describe imaging findings in different spinal vascular diseases.
3. To comprehend the concepts of CTA, MRA and angiography in evaluation of spinal vascular disorders.

08:30 - 10:00 **Room C**

New Horizons Session

NH 7

Biomarkers: New word, new world, new work?

Moderator:
A.R. Padhani; Northwood/UK

A-163 08:30

Chairman's introduction

A.R. Padhani; *Northwood/UK*

This introductory 90 min symposium focuses on clinical imaging biomarker development with a view to meeting current challenges in clinical diagnosis and management and of drug development. The lecturers will discuss via didactic talks the key biological hallmarks of cancers that are assessable by imaging techniques that are ready for clinical translation. For each imaging biomarker chosen, the biological basis, quantification methods, validation and clinical use will be described by experts involved biomarker development. Emphasis will be placed on biomarker qualification processes. The approaches demonstrated will be relevant to other biomarkers and will be adaptable for diagnosing, assessment of tumour aggressiveness, therapy response and resistance and be relevant to the development of novel anti-cancer therapeutics.

Session Objectives:

1. To understand the challenges of clinical diagnosis and management and of drug development.
2. To understand that cancers have unique hallmarks including cellular proliferation, tissue hypoxia and angiogenesis, many of which can be imaged and used for diagnosis, to assess therapy response and its outcome, as well as for drug development.
3. To review the biological basis and evidence for MRI and PET biomarkers that are ready for clinical translation.
4. To consider methods for predictive biomarker qualification.

A-164 08:33

Biomarkers: What are they?

B. Van Beers; *Clichy/FR (bernard.van-beers@bjn.aphp.fr)*

Biomarkers are characteristics that are objectively measured as indicators of normal biological processes, pathological processes, or pharmaceutical responses to a therapeutic intervention. Compared with biochemical and histological biomarkers, imaging biomarkers have the advantage of remaining non-invasive and being spatially and temporally resolved. They are thus ideally suited for assessing the response to treatment. In new drug development, assessment of benefit and risk has to be done. The most reliable way to assess the clinical impact of a therapeutic intervention is through its effect on a clinical endpoint such as survival or disease-free survival. These standards may be impractical because long periods are required for these clinical endpoints to be achieved and trials with large number of patients are needed for their evaluation. Surrogate endpoints are biomarkers that are intended to substitute for a clinical endpoint. Anatomical, molecular, and functional characteristics can be used as imaging biomarkers. The RECIST criteria are anatomical imaging biomarkers that are accepted surrogate endpoints in cancer treatment, but are limited in the assessment of some tumors. The use of molecular imaging biomarkers is limited by their narrow target specificity. Functional biomarkers are increasingly used with PET, contrast-enhanced CT, perfusion CT and MRI, diffusion-weighted MRI, MR elastography and spectroscopy. They have an important potential to help in selecting the patients and assessing the response to new treatments. However, important efforts of validation and standardization remain to be done before the wide use of functional biomarkers and their acceptance as surrogate endpoints.

Learning Objectives:

1. To be able to distinguish biomarkers from surrogate markers.
2. To be able to give examples of the major classes of biomarkers (preclinical and clinical examples).
3. To know generally what needs to be done for any biomarkers to be useful in the clinic and for drug development.

A-165 08:51

MRI biomarkers: Ready in abdomen?

D.J. Lomas; *Cambridge/UK (djl15@radiol.cam.ac.uk)*

Four quantitative MR biomarker examples will be presented including the basis for the observations, biological mechanisms, clinical context, analysis and evidence for their validation. These aspects will be discussed briefly along with what further development is required for their routine use in clinical practice. 1. Hepatic and cardiac iron measurements using R2 (*) methods, 2. Liver and spleen stiffness with elastography, 3. Hepatic steatosis using MRI and MRS, and 4. Tumour response with DWI.

Learning Objectives:

1. To be able to cite examples of MRI biomarkers that can be used to investigate abdominal disease.
2. To get to know the clinical context, biological basis, measurement and analysis methods of biomarkers of angiogenesis, hypoxia and fibrosis.
3. To become familiar with the clinical evidence for biomarker usage and limitations for each biomarker.

A-166 09:09

PET cancer biomarkers at the starting line

E.O. Aboagye; *London/UK (eric.aboagye@imperial.ac.uk)*

Positron emission tomography (PET) permits detection of molecular interactions and pathways non-invasively in living subjects. Of interest to cancer, PET molecular biomarkers are being adopted into the clinical research arena for studying tumour biology. Regional distribution and levels of both extracellular and intracellular targets can be measured. Presently, there are molecular probes for measuring the biochemistry of tumours including glucose metabolism proliferation, apoptosis, multi-drug resistance phenotype, hypoxia and angiogenesis. With PET, unique information is present in both the spatial (limited) and temporal domains. Fusion of such molecular information with other imaging platforms that provide high anatomical resolution such as computed tomography (CT) provides improved detection and definition of lesions; improved quantification of 'change' results from this. A number of PET biomarkers including [^{18}F]fluorodeoxyglucose and [^{18}F]fluorothymidine have 'matured' are being used in drug development as pharmacodynamic and response markers. New imaging biomarkers have to be qualified/validated to enable their use for drug development and ultimately for patient management. This lecture will discuss the evidence for biomarker usage together with the potential and limitations of the methodologies.

Learning Objectives:

1. To be able to provide examples of PET tracers that can be used to investigate tumor biology.
2. To get to know the clinical context, biological basis, measurement and analysis methods of PET biomarkers of angiogenesis, hypoxia, proliferation, apoptosis and multi-drug resistance of angiogenesis.
3. To become familiar with the clinical evidence for biomarker usage and limitations for each biomarker.

A-167 09:27

Biomarkers: An illustrated framework for development

A.R. Padhani; *Northwood/UK*

Development frameworks outlining the practical steps for the qualification of functional imaging as biomarkers for pharmaceutical drug development and clinical therapeutic efficacy assessments are urgently needed. The process is iterative involving several key steps which include: 1. Defining the key clinical/drug issues with reference to the tumour and therapy in question. 2. Biomarker selection process - linking the imaging biomarker to underlying pathophysiological processes or to changes induced by therapies. 3. Initial feasibility studies - demonstrating in principle the link between the chosen biomarkers and therapy response. 4. Biomarker optimization before implementation of the biomarker into a generalised clinical trial setting. 5. Early efficacy studies documenting test performance and for estimating group predictive values. 6. Determining the level of change of a biomarker that predicts response to therapy on an individual basis via measurement of error determinations. 7. Definitive clinical studies with efficacy endpoints beginning with demonstration of multisite working.

Learning Objectives:

1. To understand how dynamic MRI has progressed as a method for personalised assessment of therapy response in breast cancer.
2. To be able to assess for any other biomarker the extent of development and so to be able define the next steps in development.
3. To discuss whether imaging biomarkers can realistically be developed for their intended purpose.

Panel discussion:
How should we implement biomarkers in clinical practice? 09:45

08:30 - 10:00 **Room D**

Abdominal and Gastrointestinal

RC 701

Abdominal MRI: Protocols that work

Moderator:
L. Grazioli; Brescia/IT

A-168 08:30

A. Liver

W. Schima; *Vienna/AT (Wolfgang.Schima@khgh.at)*

Liver MRI is undertaken to study the liver parenchyma, vasculature, and biliary system. It is necessary to employ a variety of different MR pulse sequences to achieve lesion detection and characterization. A set of T1- and T2-w pulse sequences is standard for evaluation of fat and iron content and for lesion delineation. In-phase and opposed-phase, T1-w GRE images show focal or diffuse fatty infiltration and focal sparing. For T2-w imaging, a TSE sequence with fat suppression (either breath-hold or with free breathing) is robust and provides high tumor contrast. The quite popular T2-w half-Fourier single-shot TSE (e.g., HASTE) pulse sequences show anatomic detail (including bile ducts), but lack lesion contrast because of the long echo train. In case of suspected iron overload (i.e., hemosiderosis and hemochromatosis), an additional T2*-w GRE is recommended because of the susceptibility. Administration of a contrast agent is mandatory in liver MRI because many focal lesions are only highlighted by enhanced pulse sequences. Dynamic gadolinium chelate-enhanced T1-w GRE pulse (preferably 3D interpolated) sequences are versatile and useful for lesion detection and characterization as well assessment of the vasculature (i.e., hepatic artery aneurysms, Budd-Chiari-S., portal vein thrombosis, etc). Both hepato-biliary and reticuloendothelial liver-specific contrast agents render excellent results for detection and differentiation between metastases and hemangiomas or FNH. Manganese- or superparamagnetic iron oxide liver-specific contrast agents can be administered in patients with renal insufficiency. The choice of contrast material should be based on availability, the specific clinical question, and the renal function of the patient.

Learning Objectives:

1. To learn about the standard pulse sequences for liver imaging and the critical technical parameters.
2. To discuss the diagnostic value of non-specific gadolinium chelates and different liver-specific contrast agents depending on the clinical question.
3. To learn how to optimise pulse sequences and imaging protocols according to the scanner's and the patient's performance.

A-169 09:00

B. Small bowel and colon

N. Papanikolaou; *Iraklion/GR (npapan@med.uoc.gr)*

The advent of powerful gradient systems resulted in substantial improvement of image quality in ultrafast magnetic resonance (MR) imaging and therefore novel clinical applications emerged including gastrointestinal tract imaging. Within this context, MR enteroclysis and MR colonography were developed, providing luminal, transmural and extramural diagnostic information at the same imaging session. Two different protocols have been developed for imaging the small bowel with MR. These include MR follow-through and MR enteroclysis. MR follow-through is based on the oral ingestion of an adequate amount of contrast agent and acquisition of consecutive sequences. In a clinical setting, sufficient luminal distention that guarantees accurate individual lesion detection can be achieved by MR enteroclysis. Two MR colonography protocols have been proposed. According to the first, termed as ‚bright lumen MRC', a gadolinium-spiked water solution is administered endorectally to the patient who has previously undergone colonic cleansing to distend the colon, resulting in a homogeneous high-signal intensity on heavily T1-weighted 3D gradient echo images. Polyps are demonstrated as filling defects while air bubbles can be differentiated by performing the examination in both supine and prone positions. According to the second approach, termed as ‚dark lumen MRC', dense barium or tapped water is used to distend the colon in conjunction with post-gadolinium 3D gradient echo with fat-saturation sequences. The colonic wall and the corresponding polyps exhibit high signal intensity as a result of gadolinium uptake while the colonic lumen presents with low signal intensity.

Learning Objectives:

1. To review technical aspects of MR enteroclysis and MR colonography.
2. To review MR enteroclysis imaging features of Crohn's disease.
3. To address the current clinical role of MR enteroclysis in patients with Crohn's disease.
4. To address the potential of MR colonography in the era of CT colonography.

A-170 09:30

C. Pancreas and bile ducts

C. Matos; *Brussels/BE (cmatos@ulb.ac.be)*

MR imaging of the pancreas and bile ducts relies upon a combination of T2-w and T1-w strategies in order to safely acquire anatomic, cross-sectional and functional information. Tissue-imaging strategies include free breathing T2-w imaging (obtained with echo-train spin-echo sequences with or without fat saturation) and breath-hold 3D-gradient echo T1-w imaging (obtained with fat saturation) without gadolinium and in the capillary phase and in the interstitial phase post-gadolinium. This combination is valuable in the assessment of the full spectrum of pancreatic diseases and malignant bile duct obstruction. Hardware improvements (gradients) and the advent of more sophisticated phased-array coils and parallel imaging capabilities in modern MR scanners allowed increasing the spatial and temporal resolution of "conventional" T2-w and T1-w sequences. Furthermore, it provided the possibility of adding high-b-value diffusion weighted imaging (DWI) to our routine protocol in order to increase the sensitivity of MRI. To obtain conventional MRCP imaging, thick-slab heavily T2-w TSE sequences or 3D heavily T2-w TSE sequences may be used. Advantages and limitations of both sequences will be underlined. Functional bile duct imaging is obtained using contrast agents that are taken up by hepatocytes and excreted through the biliary system in combination with volumetric T1-w sequences. We use this technique in postoperative complications and to elucidate complex biliary anatomy. Functional imaging of the pancreas is obtained by combining MRCP along with hormonal stimulation with secretin. In addition, secretin improves anatomic delineation and allows MRI quantification of fluid production by the exocrine pancreas.

Learning Objectives:

1. To describe the preferred imaging sequences for MRI/MRCP of the pancreas and bile ducts.
2. To describe the use of techniques/methods to improve image quality.
3. To propose imaging protocols for MRI/MRCP of the pancreas and bile ducts in different clinical settings.

08:30 - 10:00 **Room E1**

Musculoskeletal

RC 710

Arthritis: Back to basics

Moderator:
V. Jevtic; Ljubljana/SI

A-171 08:30

A. Radiographic diagnosis

A.J. Grainger; *Leeds/UK (andrew.grainger@leedsth.nhs.uk)*

Despite the increasing availability of modern imaging techniques such as ultrasound (US) and MRI, conventional radiographs (CR) continue to be fundamental to rheumatological imaging, playing an important role in diagnosis and monitoring of the arthritides. Evaluation of plain films includes an assessment of the soft tissues for swelling and calcification. Soft tissue swelling can be extremely subtle but may be the first CR sign of joint disease. Joint space on CR reflects the thickness of articular cartilage and is typically lost as a result of arthropathy either symmetrically, as seen in the inflammatory arthritides, or asymmetrically as in osteoarthritis. In some arthritides, such as gout, joint space is preserved until subsequent stages in the disease process, while in other conditions bony ankylosis may occur. Evaluation of the periarticular bone usually reveals the presence of erosions, osteophytes, subchondral bone changes, such as cysts and sclerosis, and changes in bone density. Finally, plain films allow an assessment of joint alignment and also, in the case of hand and foot films, give an indication as to the distribution of disease. Despite the wide use of CR in the evaluation of the arthritides, it has the disadvantage in that it is relatively insensitive to the early changes of disease and changes occur relatively slowly. In the early stages of arthritis, when therapy may have the greatest role and where structural abnormalities may be reversible, radiographically defined joint damage is not a prominent feature.

Learning Objectives:

1. To be able to recognise the range of the radiographic changes seen in arthropathy.
2. To be able to identify features on the radiograph that allow a specific diagnosis to be made.
3. To understand the role of radiographs in monitoring the progression of arthritis.

A-172 09:00

B. Imaging crystal arthritis

A. Cotten; *Lille/FR (acotten@chru-lille.fr)*

Gouty arthritis, calcium pyrophosphate dihydrate crystal deposition disease and calcium apatite crystal deposition disease represent the three main crystal deposition disorders encountered in the clinical practice. If the clinical and radiological features are usually straightforward, some presentations may be misleading. This presentation will focus on the typical and atypical or unusual radiological features of these crystal deposition disorders. It will also present the potential usefulness and limitations of US, CT and MR imaging in the diagnosis of these diseases.

Learning Objectives:

1. To present the main radiographic features of crystal deposition disorders.
2. To show the potential of US, CT and MRI in the diagnosis of these disorders.
3. To present some unusual radiological presentations of these disorders.

A-173 09:30

also EPOS

C. Imaging the spine in arthritis

A. Jurik; *Århus/DK (anne.jurik@aarhus.rm.dk)*

The spine can be involved as part of most inflammatory disorders, but most frequent in rheumatoid arthritis (RA) and seronegative spondyloarthropathies (SpA). Involvement in RA is usually located to the cervical spine where erosive changes are predominantly seen in the atlanto-axial region. The diagnosis of cervical RA changes is important as they can cause instability potentially risking spinal cord injury. In RA patients with neck pain, radiography of the cervical spine including a lateral view during flexion is mandatory. Supplementary MRI or CT may be needed before treatment of instability and can sometimes reveal inflammatory changes in patients with normal radiography. According to the European classification criteria, seronegative spondyloarthropathies are divided into ankylosing spondylitis (AS), psoriatic arthropathy, reactive arthritis, arthritis associated with inflammatory bowel disorders (enteropatic arthropathy) and undifferentated spondyloarthropathy. Inflammatory changes at the sacroiliac joints always occur in AS and is part of most other forms of SpA. Spinal changes are also a feature of SpA, especially in late stages of AS. Manifest structural changes can be diagnosed at radiography. Vertebral squaring, syndesmophytes and ankylosis of apophyseal joints are characteristic of AS whereas more voluminous paravertebral new bone formation occur in psoriatic arthropathy and reactive arthritis. The features of enteropatic arthropathy often resemble those of AS. Detection of early inflammatory changes of the sacroiliac joint or the spine demands an MRI. MRI is also valuable for estimating and monitoring post-diagnostic disease activity. CT predominantly plays a role in the diagnosis of complicating fractures.

Learning Objectives:

1. To become familiar with the radiographic features of spinal involvement in rheumatoid arthritis (RA) and seronegative spondyloarthropathy (SpA).
2. To know the MRI and CT features in RA and SpA.
3. To know the diagnostic advantages of MRI and CT.

08:30 - 10:00 **Room E2**

Foundation Course: Head and Neck Radiology

E³ 720a

Larynx and hypopharynx

Moderator:
M. Gödeny-Polony; Budapest/HU

A-174 08:30

A. Benign lesions

R. Hermans; *Leuven/BE (Robert.Hermans@uz.kuleuven.ac.be)*

The larynx and hypopharynx are anatomically very closely related. Essentially, the larynx consists of a supporting skeleton (made up of cartilages and fibrous bands), a mucosal surface, and in between a soft tissue layer containing fat, some ligaments and muscular structures. The larynx is divided into three regions: glottis (corresponding to the level of the true vocal cords), subglottis and supraglottis. The hypopharynx is the portion of the pharynx that extends from the oropharynx to the esophageal verge. The larynx forms the anterior wall of the hypopharynx. The border between the hypopharynx and the oropharynx is at the level of the pharyngo-epiglottic folds, while the border with the esophagus is at the level of the inferior rim of the cricoid cartilage. The hypopharynx is divided into three regions: pyriform sinus (one on each side), post-cricoid region and posterior hypopharyngeal wall. On imaging studies,

the appearance of the laryngeal cartilages varies considerably, depending on the degree of ossification and the amount of fatty marrow in the ossified medullar space. The assessment of the intralaryngeal and intramural hypopharyngeal fat planes is essential in the workup of patients: obliteration of these fat planes may be the only sign of underlying pathology. Benign pathology of the larynx and hypopharynx requiring radiologic evaluation is uncommon. Laryngocele, traumatic pathology and vocal cord paralysis are the most frequent conditions imaged. Among the congenital lesions, thyroglossal duct cyst is most commonly seen.
Learning Objectives:
1. To review the relevant anatomy of the larynx and hypopharynx.
2. To become familiar with some anatomical variants that may mimic disease.
3. To learn about the imaging findings in benign lesions of the larynx and hypopharynx.

A-175 09:15
B. Malignant lesions
F.A. Pameijer; *Utrecht/NL (f.a.pameijer@umcutrecht.nl)*

Imaging of the larynx is essentially the same as imaging of the hypopharynx because these structures are anatomically and functionally closely integrated. The presentation will focus on squamous cell carcinoma, which is by far the most prevalent histology in laryngeal and hypopharyngeal cancer. The nature of malignancies in this region will be discussed with some epidemiological data. CT or MRI has become essential for the correct pretherapeutic staging of laryngeal and hypopharyngeal tumors. In this era of cost concern, it seems to be a good principle to do one cross-sectional study that accurately answers the clinical questions. The relative value of CT and MRI in this aspect will be discussed. While the otolaryngologist uses endoscopy to evaluate the mucosal surface, it is the radiologist's role to show the deep extent of a lesion. This effort becomes more effective if the radiologist is aware of the spread patterns observed in laryngeal and hypopharyngeal cancer. These typical spread patterns will be shown, using clinical examples from daily practice, in relation to the T-staging criteria for these tumors.
Learning Objectives:
1. To learn about the nature of malignant lesions occuring in this region.
2. To understand the relative value of CT and MRI in evaluating malignant disease in this region.
3. To become familiar with the extension patterns observed in laryngeal and hypopharyngeal cancer.

08:30 - 10:00 **Room F1**

Interactive Teaching Session

E³ 720b

Cancer of the uterus: Diagnosis, staging and follow-up

Moderator:
H. Hricak; New York, NY/US

A-176 08:30
Cancer of the uterus: Diagnosis, staging and follow-up
B. Hamm[1], P. Petrow[2]; [1]*Berlin/DE*, [2]*Paris/FR (bernd.hamm@charite.de)*

MR imaging is the method of first choice for staging uterine malignancies. The main criterion for staging endometrial cancer is the depth of myometrial invasion. The diagnostic accuracy can be improved by performing a dynamic contrast-enhanced study in addition to T2-weighted imaging. The backbone of staging cervical cancer is T2-weighted imaging with a high spatial resolution performed in sagittal and transverse slice orientation. Invasion of the parametrium can thus be assessed with a high degree of accuracy. Especially in staging cervical cancer, MR imaging can replace numerous other diagnostic tests and thus improve pretherapeutic staging while at the same time reduce costs. In addition, MR imaging is used in planning radiotherapy and following-up patients having undergone irradiation. Lymph node staging still remains to be improved, for example, by a combination of MR lymphography and diffusion-weighted imaging.
Learning Objectives:
1. To become familiar with imaging features in staging cervical and uterine cancer.
2. To understand the impact of imaging on modern patient treatment.
3. To understand the imaging findings on follow-up.

08:30 - 10:00 **Room F2**

Multidisciplinary Sessions: Managing Patients with Cancer

MS 721

Lung cancer

A-177 08:30
Chairman's introduction
J. Cáceres; *Barcelona/ES (josecac@gmail.com)*

Bronchogenic carcinoma is one of the main causes of mortality from cancer in the western world. Lung cancers are either suspected clinically or by the chest radiograph and confirmed with computed tomography. Lung biopsy corroborates the diagnosis and establishes the histological type. The cooperation with other clinical disciplines is crucial to obtain an adequate evaluation of the patient and to institute adequate therapy.
Learning Objectives:
1. To optimise the use of diagnostic techniques in lung cancer.
2. To promote cooperation with other clinical disciplines in the management of lung cancer.
3. To emphasise the help of clinicians in image interpretation.

A-178 08:35
What the surgeon needs to know
W. Weder; *Zurich/CH (walter.weder@usz.ch)*

With increasing multidisciplinary efforts, accurate diagnostics and staging remains crucial in decision making for an individualized therapy at different stages of lung cancer patients. Radiologists are indispensably involved in each step of this process. Using the TNM staging system CT scans, especially high resolution CTs, are still the gold standard of morphologic tumor assessment concerning primary tumor extension, signs of malignancy or relation to surrounding structures, which is essential for planning the surgical procedure. Furthermore, radiologists can help us to gather the initial diagnosis of undetermined pulmonary nodules by using CT guided fine needle aspiration techniques. For determining the N stage, contrast enhanced CT helps the surgeon to detect suspicious mediastinal lymphnodes and decide whether to go for primary surgery or further diagnostic with neoadjuvant therapy. In terms of mediastinal lymphnode and especially extrathoracic metastases, the combination of PET/CT has added a lot more value to the pure morphologic assessment of staging; the high negative predictive value has changed the ‚pre-surgical' management of patients and has become a standard staging procedure for all stages in many institutions. For planning oncological resections, modern three-dimensional techniques are used more frequently. Also for evaluating the patients' response to neoadjuvant therapy or as postoperative control of recurrency or late metastatic disease, CT scans (or PET/CTs) are performed routinely. Finally, treatment regimens should be discussed in a multidisciplinary tumor board in the presence of an experienced radiologist in order to get the best information on the morphologic extent of the disease.
Learning Objectives:
1. To know the local extension of the lesion as well as loco-regional metastasis.
2. To know the presence or absence of extrathoracic disease.
3. To determine the severity of co-morbidities on chest imaging such as emphysema, PH and others.

A-179 08:55
What the oncologist needs to know
R. Pirker; *Vienna/AT (robert.pirker@meduniwien.ac.at)*

Patients with lung cancer are treated based on histology and initial tumor stage. Clinical tumor stage is crucial for both prognosis and optimal treatment. Staging should focus on size and location of primary tumor, mediastinal lymph node involvement and potential presence of distant metastasis. Other important information refers to tumor tissue accessible for diagnostic biopsies, tumor invasion of major vessels and tumor cavitation. CT of the lungs and upper abdomen is recommended for all patients but imaging of brain and bones depends on the clinical situation. Patients with resectable NSCLC will undergo surgery. Patients with pathological tumor stages II and III and selected patients with stage IB will receive adjuvant chemotherapy. Patients with incomplete tumor resection will receive adjuvant radiotherapy. With regard to stage III NSCLC, information on mediastinal lymph node involvement (single versus multiple levels, bulky) is required. Patients planned for curative treatment should also undergo brain imaging. Most patients with clinical stage III

NSCLC are treated with chemoradiotherapy. Re-staging after chemoradiotherapy should particularly characterize patients with mediastinal down-staging who might benefit from additional surgery. Patients with advanced NSCLC receive palliative chemotherapy and, in case of progression, second-line therapy. Patients undergo radiological imaging usually every other cycle according to RECIST criteria and in case of clinical signs of progression. Patients with small cell lung cancer receive chemotherapy and, in case of limited disease, also local radiotherapy. Follow-up examinations in patients with lung cancer should focus on signs of progression and side effects of treatment such as infections and pneumonitis.
Learning Objectives:
1. To present clinical guidelines for staging, prognosis and therapy in carcinoma of the lung.
2. To describe the criteria for adjuvant therapy in NSCLC.
3. To evaluate patients with NSCLC stage III.
4. To differentiate progression vs infection in advanced NSCLC.

A-180 09:15
Imaging in lung cancer
J. Cáceres; *Barcelona/ES (josecac@gmail.com)*

The initial examination in patients with lung carcinoma is the chest radiograph. Once the diagnosis is made, it is important to perform the proper radiological work-up to establish the stage and the adequate treatment. Staging is a key factor in lung cancer management and is important to select the proper imaging technique in individual cases. In treated patients, imaging is a main aspect of the follow-up. The radiologist must know how to evaluate signs of recurrence, which should be distinguished from related processes and post-radiotherapy changes.
Learning Objectives:
1. To select appropriate imaging techniques in lung cancer.
2. To describe current tumor staging.
3. To learn to discover recurrences and complications post-treatment.

Panel discussion and case presentation 09:35

08:30 - 10:00 **Room G/H**

EFOMP Workshop

New technology in diagnostic radiology: Risk management, technology assessment and improved diagnosis

EF 1

Technology assessment for imaging equipment

Moderators:
A. Del Guerra; Pisa/IT
K. Faulkner; Wallsend/UK

Welcome address 08:30
S. Christofides; Nicosia/CY
M. Szczerbo-Trojanowska; Lublin/PL

A-181 08:40
Introduction to EC initiatives in acceptability criteria for imaging equipment
K. Faulkner[1], J. Malone[2], S. Christofides[3], S. Lillicrap[4]; [1] *Wallsend/UK*, [2]*Dublin/IE*, [3]*Nicosia/CY*, [4]*Bath/UK (keith.faulkner@nhs.net)*

In 1997, the European Commission published Radiation Protection 91: Criteria for acceptability of radiological (including radiotherapy) and nuclear medicine installations. This document specified minimum criteria for acceptability. It has been used to this effect in legislation, codes of practice and by individual professionals. Since the original publication, development of new radiological systems and technologies, as well as improvements in traditional technologies, has created circumstances where the acceptability criteria have been reviewed. In this lecture, the background to the development of the publication, and the implications on change in radiation protection/quality assurance philosophy for acceptability criteria and minimum performance standards for radiological, nuclear medicine and radiotherapy equipment are described. Acceptability criteria have been produced consistent with the European Commission's Medical Exposures Directive which requires that patient exposures are justified. Criteria were developed by a team drawn from a broad range of backgrounds including hospitals, industry, government bodies, regulators and standardisation organisations. Representatives were mainly from Europe, but individuals from the American Association of Medical Physics and International Atomic Energy Agency were included in the drafting process.
Learning Objectives:
1. To understand the philosophy behind acceptability criteria.
2. To be aware of the implications of new acceptability criteria.
3. To discover the consensus based approach used in their development.

A-182 09:05
also EPOS
Technology assessment and radiological imaging
S. Christofides; *Nicosia/CY (cstelios@cytanet.com.cy)*

Technology Assessment (TA) in health care is a multidisciplinary field of policy analysis. It involves the study of the medical, social, ethical, and economic implications of development, diffusion, and use of health technology. Health Technology Assessment (HTA) is a multidisciplinary process that summarises information about the medical, social, economic and ethical issues related to the use of a health technology in a systematic, transparent, unbiased and robust manner. Its aim is to inform the formulation of safe, effective, health policies which are patient focused and seek to achieve best value. Despite its policy goals, HTA must always be firmly rooted in research and the scientific method. HTA is an approach to meet those challenges and apply the cost effectiveness in the selection of new technologies that are advancing rapidly and becoming highly sophisticated with time. It can help to meet the ever-increasing demands on competence, specialization and cost effectiveness that modern health care services are faced in today's economically conscious world. The methodology developed by the EUnetHTA project will be used to demonstrate the value of HTA with particular emphasis in the evaluation of radiological imaging technologies.
Learning Objectives:
1. To become familiar with the concepts of health technology assessment.
2. To understand the multidisciplinary nature of health technology assessment.
3. To appreciate the value of health technology assessment in providing cost effective and evidence based procedures for the benefit of the patient.

A-183 09:30
Acceptability criteria: A perspective from standards and equipment manufacturers
R. Klausz; *Buc/FR (remy.klausz@med.ge.com)*

In Europe, different systems exist to rule the design and performance of medical devices, in particular when they use ionising radiation. From one side, the European Council Directive 93/42/EEC (MDD) requires that medical devices are designed and manufactured so as to meet specified essential requirements. They should then be placed on the market or put into service within the territory of member states without any obstacle. The compliance with the Essential requirements can be reached by complying with harmonized standards, in particular, the EN60601 series ruling Basic Safety and Essential Performances of Medical Devices. From another side, the Council Directive 97/43/Euratom requires that member states adopt specific criteria of acceptability for radiological installations in order to indicate when appropriate remedial action is necessary, including, if appropriate, taking the equipment out of service. The transposition of this directive in the regulation of the member states has resulted in methods and values for these criteria of acceptability, differing from country to country as well as from those driven by the MDD. It can, therefore, happen that a medical device is installed and put into service according to the MDD, and not authorized to be used following the national criteria of acceptability. To respect the policy set by the MDD which allows complying equipment to move freely within the Community and to be put into service in accordance with their intended purpose, the acceptability criteria throughout European Union should be harmonized, and fully compatible with the standardized criteria for design and manufacturing.
Learning Objectives:
1. To identify the different standards and regulations applicable.
2. To understand the consequences of the acceptability criteria on the manufacturing and service of medical devices.
3. To understand the benefits for a standardisation of the acceptability criteria.

08:30 - 10:00 **Room I**

Vascular

RC 715

Vascular imaging: The diabetic patient

Moderator:
J.H. Peregrin; Prague/CZ

A-184 08:30

A. What the radiologist needs to know about the diabetic patient
A. Raptis; *Athens/GR (atraptis@med.uoa.gr)*

Diabetes mellitus (DM) is recognized as a major health - economic problem in the 2 1st century. Ninety percent of the diabetic population is suffering from type 2 and the remaining 10% from type 1 and other types of DM. An epidemic of type 2 DM is occurring across the world and the number may increase from 100 to 200 million over the next 15 years. As rates of childhood obesity escalate, type 2 DM has increasingly been diagnosed in children and adolescents. Duration of diabetes is an important factor in the pathogenesis of complications, but other risk factors - for example, hypertension, cigarette smoking, and hyperlipidaemia - interact with diabetes to affect the clinical course of microangiopathy and macroangiopathy. Cardiovascular disease (CVD) accounts for a great majority of deaths in patients with type 2 DM. According to the WHO, the prevalence of CVD in diabetic patients ranges from 26 to 36%. Fatality rate after myocardial infarction is greater in diabetic patients, and overall prognosis after coronary heart disease is worse. Based on these observations, it has been proposed that DM should be considered as a coronary heart disease risk equivalent. Atheromatous disease in the legs, as in the heart, tends to affect more distal vessels producing multiple, diffuse lesions that are less straightforward to bypass or dilate by angioplasty. The serious complications associated with DM make it essential for physicians to be aware of the risk factors and the screening guidelines, allowing for earlier patient diagnosis and treatment.
Learning Objectives:
1. To learn about the prevalence, risk factors and prognosis of diabetic patients in the 2 1st century.
2. To understand the multimorbidity of diabetic patients.
3. To learn about the vascular manifestations of diabetes.

A-185 09:00

B. Imaging of the diabetic patient
L.P. Lawler; *Dublin/IE (llawler@mater.ie)*

Diabetes is a systemic disease with potential multi-organ dysfunction. Significant diabetic pathophysiology is linked to vasculopathy which can have distinctive features and patterns. We shall discuss how these vessels and territories may be optimally imaged, assessed and interpreted using current non-invasive and invasive imaging modalities. The particular challenges and limits to imaging diabetic vascular disease will be discussed. The latest changes in contrast/medication guidelines will be discussed. The particular patient risks from diabetes-related disease and medication and their management will be reviewed. Key elements of image acquisition and processing will be covered for 3D CTA, PET/CTA, MRA and DSA. The major arterial vascular territories including carotid-cerebral, coronary, aortic, mesenteric, renal and peripheral systems will be covered. Modern screening, diagnostic and therapeutic imaging strategies will be addressed. Novel imaging developments such as disease biomarkers, plaque imaging, and stem cell research will be considered. This lecture will provide the elements for comprehensive clinical assessment and problem solving as well as research potential in imaging the diabetic patient and vasculopathy.
Learning Objectives:
1. To become familiar with the specific diagnostic requirements in diabetic vasculopathy.
2. To learn about specific risk factors for imaging and treatment in diabetic patients.
3. To discuss optimised imaging strategies in diabetic patients.

A-186 09:30

C. Cost-effective selection of the appropriate imaging technique
R. Ouwendijk; *Rotterdam/NL (r.ouwendijk@erasmusmc.nl)*

With the current constraints on health care resources and the emphasis on value for money, it is important to assess new technologies and demonstrate their value prior to their widespread use in day-to-day practice. To determine the optimal diagnostic imaging work-up for patients with peripheral arterial disease, we need to take into account not only the diagnostic accuracy of each test, but also the related effects of diagnostic imaging tests on treatment planning, functional improvement, quality of life and costs. Digital subtraction angiography is an invasive technique that requires post-procedural observation and, sometimes, hospitalization of the patient. DSA is associated with a higher complication rate and higher costs as compared with less invasive imaging techniques such as duplex ultrasound (DUS), computed tomographic angiography (CTA) and magnetic resonance angiography (MRA). DUS is an inexpensive non-invasive technique providing both anatomical and functional information. DUS, however, results in lower therapeutic confidence and more additional imaging compared to CTA and MRA. CTA and MRA are minimal invasive and can be performed as an outpatient procedure. Disadvantages of CTA are the use of radiation and impaired image interpretation in the presence of vessel wall calcifications. Disadvantages of MRA include the higher investment cost for equipment and venous overlay in the calf. Venous overlay and vessel wall calcifications are especially a problem in diabetic patients. During this presentation, the cost and effects of the different imaging techniques for peripheral arterial disease will be discussed including clinical utility, quality of life, functional patient outcomes and actual costs.
Learning Objectives:
1. To understand the pros and cons of different diagnostic modalities with regard to cost effectiveness.
2. To provide cost-effective diagnostic algorithms in diabetic vasculopathy.

08:30 - 10:00 **Room K**

Pediatric

RC 712

Imaging the GI/GU tracts

Moderator:
G. del Pozo; Madrid/ES

A-187 08:30

A. Is ultrasound enough for a comprehensive diagnosis?
M. Riccabona; *Graz/AT*

Paediatric US has emerged to a sophisticated technique allowing definite diagnosis of many paediatric GI and GU conditions. Restrictions have to be considered then indicating fluoroscopy or sectional imaging. The common GI queries where US has practically replaced other imaging are HPSt, volvolus, intussusception, IBD/appendicitis. In these, complementary imaging (usually fluoroscopy, sometimes MRI/CT) is rarely needed. Other queries need fluoroscopy (malrotation) or MRI/CT (tumours), some only radiographs (atresia, NEC), although US may offer some information. And US helps as a therapeutic option (US-guided hydrostatic reduction). GU tract US is even more important; indication for other studies (VCUG, MRU) heavily relies on US. A skilled and experienced technique by knowledgeable investigators applying age-adapted transducers is mandatory to exploit the vast US potential reducing/optimising additional imaging in many conditions. US is the primary imaging tool in HN, obstructive uropathy, urolithiasis, cyst and masses, and genital conditions (malformations, torsion). In significant HN, additional reflux assessment and grading of obstructions is needed (VCUG, scintigarphy or MR-Urography). Childhood urolithiasis can usually be diagnosed by US, sometimes complemented by KUB, hardly adapted IVU or stone CT is necessary. In tumours, additional sectional imaging serves for imaging work-up/staging. In conclusion, modern US allows a comprehensive diagnosis in many paediatric GI and GU conditions obviating the need for additional, more invasive or radiating imaging. However, one needs to know US restrictions to then choose appropriate complementing imaging.
Learning Objectives:
1. To learn about the technical requirements and potential of US in the GI/GU tracts.
2. To revisit important conditions that can be comprehensively assessed and partially treated by US.
3. To understand the limitations of US in the GI/GU tracts.
4. To learn about complementary imaging techniques when US is not enough.

A-188 09:00

B. Role of plain film, fluoroscopy, nuclear medicine and CT
V. Donoghue; *Dublin/IE (veronica.donoghue@cuh.ie)*

There have been many advances in cross-sectional imaging over the past years. Despite this, plain radiography still plays a significant role in the diagnosis of many abdominal conditions, particularly abnormalities of the gastrointestinal tract. Its role is particularly important in newborn infants in assessing the many causes of bowel obstruction. The indications for fluoroscopy in children have decreased

significantly in recent years; for example, many patients with inflammatory bowel disease are investigated using ultrasonography, MRI and CT and urocystosonography has replaced the voiding cystourethrogram in many departments. However, fluoroscopy is still required for the diagnosis of many conditions, such as newborn bowel disorders and the assessment of feeding problems and is frequently used to guide the reduction of intussusception. In the paediatric population, it is important to keep the radiation dose to a minimum and some methods of fluoroscopic dose reduction will be addressed. Ultrasonography is the first choice in the investigation of most GI and GU disorders. However, CT is required in many instances such as in the assessment of abdominal tumours, the investigation of major trauma and occasionally in patients with acute appendicitis. The role played by nuclear medicine examinations will also be discussed particularly the role of Tc99m Mag3 renography and Tc99m DMSA scans in assessing the many frequently encountered renal disorders in children.

Learning Objectives:

1. To illustrate the continued usefulness of plain film radiography in children of all ages, in particular in the neonatal period.
2. To describe the current status of fluoroscopy and issues relating to dose reduction.
3. To discuss the uses and benefits of CT and the role played by nuclear medicine studies in specific GI and GU conditions.

A-189 09:30

C. MRI: Current state and new options

W. Hirsch; *Leipzig/DE (hirw@medizin.uni-leipzig.de)*

Besides ultrasound, MRI is the imaging modality of choice of the abdomen in children and is equally important in paediatric radiology. Especially for children, 3.0 Tesla MRI is gradually established in the daily routine alongside using 1.5 T. Fortunately, the shorter wave length of 3.0 T avoids typical artefacts especially in children because of their smaller body sizes in comparison to the higher incidence of these artefacts in adults with larger body sizes. The current state of paediatric abdominal imaging will be discussed by means of typical imaging examples using 1.5 T as well as 3.0 T MRI. MRCP has gained a new quality using higher field strength and contrast enhanced MRA has also improved significantly. Increasingly, paediatric radiology makes use of perfusion studies to characterise lesions of the liver as well as other parenchymatous organs. MR spectroscopy has not yet been established in abdominal examinations of children. An exception is the spectroscopic estimation of liver fat in children, which is however in an experimental stage.

Learning Objectives:

1. To learn about typical indications and findings of abdominal MRI and how it compares with other imaging modalities.
2. To show the possibilities, advantages and disadvantages of standard and high field strength.
3. To show how we do it and how we try to avoid artefacts in imaging abdominal solid organs.

08:30 - 10:00 **Room L/M**

Radiographers

RC 714

MRI

Moderators:
H. Ringertz; Linköping/SE
C. Vandulek; Kaposvár/HU

A-190 08:30

A. Investigation of occlusive peripheral arterial diseases: Role of CT, MR, US and DSA

G. Pavlikovics; *Miskolc/HU (gpavlikovics@gmail.com)*

Atherosclerosis is a generalized disease and contributes to cardiac death, stroke, limb loss and a range of other illnesses. Disease in the major arteries, including the infrarenal abdominal aorta, renal and internal iliac arteries, and peripheral vasculature, remains a major cause of morbidity and mortality. Traditional catheter-based angiographic techniques are invasive and require arterial puncture. They also rely upon potentially nephrotoxic iodinated contrast agents; however, less invasive imaging techniques as US, CT and MRI have been developed. The accuracy of these might approach the accepted standard of diagnostic X-ray based angiography. In this lecture: First, the clinical basics of peripheral arterial occlusive diseases (PAOD) with the anatomical fundamentals will be summarized; Second, an overview of the angiographic modalities will be presented; Finally, the methodology of peripheral MR angiography will be discussed with emphasis on: •Image quality (Signal optimization, Contrast optimization, linear k-space reordering); •Timing (test bolus, bolus trigger); •Contrast agent (extracellular (role of concentration!), and blood-pool agents); •Instruments and patient preparation; •Contrast agent (Injection protocols for different agents, minimizing the dose, role of renal function - NSF!!!, blood-pool agents: steady-state imaging (perfusion?), pitfalls of blood-pool agents); •Sequences (first pass and steady-state).

Learning Objectives:

1. To consolidate knowledge about occlusive peripheral arterial diseases.
2. To appreciate the role of imaging modalities (CT, MR, DSA, US) in investigation and therapy planning with emphasis on bolus-chasing peripheral MRA and CTA.
3. To summarise the basics of contrast-enhanced MRA and CTA.
4. To learn about two kinds of MR contrast agents (extracellular and blood pool).

A-191 09:15

B. Practical approach to fMRI: Methods and cases

P. Bogorodzki; *Warsaw/PL (piotr@ire.pw.edu.pl)*

Magnetic resonance imaging (MRI) provides anatomic images of the human brain. Besides anatomy, recent scanners can provide physiological information, which is based on the blood oxygen level dependency (BOLD) effect. A technique called functional MRI (fMRI) allows us to detect the functional brain areas involved in various tasks: motor, hearing, language, etc. FMRI methodology involves several aspects: scanner settings, stimulation paradigm programming, subject preparation, subject's performance monitoring and post processing software pipeline settings. Although not equally important, all these determine the final quality of fMRI. Moreover, fMRI studies require from clinical staff additional skills and knowledge about application of dedicated software for stimulating paradigms, application and maintenance of MR-compatible devices (headphones, display, response buttons) used for fMRI stimuli presentation, and application of statistical tools used for brain activations localization. All these aspects will be explored and illustrated with clinical and experimental examples from Bioimaging Research Center and collaborating institutions. Despite a large number of publications in medical imaging science, most of the recent developments in neuroimaging are not used in clinical routine. Many clinical radiologists consider these techniques as research tools and are not aware of their clinical applications. The main goal of this talk is therefore to promote this technique and translate fMRI imaging from bench to bedside.

Learning Objectives:

1. To learn about the practical application of functional magnetic resonance imaging (fMRI) technique in terms of physics, instrumentation and experimental design.
2. To learn about critical factors determining repeatability and quality of fMRI, which will be illustrated using clinical examples.
3. To learn about the clinical use of fMRI.

08:30 - 10:00 **Room N/O**

Special Focus Session

SF 7b

Present and future direction of ultrasound

Moderator:
L.E. Derchi; Genoa/IT

A-192 08:30

Chairman's introduction

L.E. Derchi; *Genoa/IT (derchi@unige.it)*

US is the most widely used and rapidly growing of all sectional imaging methods and constitutes a large part of the workload of many radiological departments. However, many radiologists seem to perceive it as a "mature" specialty, in which there are only few possibilities to advance and little chance to publish or present innovative studies. On the contrary, recent advances have significantly boosted the research horizons of US. This session will discuss the clinical applications and research relevance of three of the most important innovations in diagnostic US: contrast enhanced studies, volume US and elastography. Integration of these new US techniques into the activities of a busy radiological department needs efforts. It may be difficult to invest money into the new technologies, to have time to acquire

the necessary expertise and to maintain high patient throughput. The entire workflow of US studies should be adapted, possibly with shorter acquisition times and some marked time for the post-processing phases. Furthermore, the provocative title of the panel discussion will lead to evaluate the role of radiologists in US and, even in a situation in which many clinicians are using US as a "new stethoscope", to maintain a strong position of our discipline in this field.
Session Objectives:
1. To learn about technical advances in US.
2. To understand how new US techniques integrate into the activities of the radiology department.
3. To discuss the role of radiology in the future of US.

A-193 08:35

Clinical applications of US contrast media: Present guidelines
M. Claudon; *Vandoeuvre-les-Nancy/FR (m.claudon@chu-nancy.fr)*

Ultrasound contrast agents (UCAs), in conjunction with contrast specific imaging techniques, are increasingly accepted in clinical use for diagnostic imaging and post-interventional workup in several organs. A first consensus document focused on focal liver lesions detection, characterization and follow-up was published by EFSUMB (European Federation of Societies for Ultrasound in Medicine and Biology; website: www.efsumb.org) in 2004. The first paper was updated and expanded in 2008 to include recommendations for applications in the kidney, in vesico-ureteric reflux, in the pancreas, in trauma and in the cerebral circulation. Both papers were well received and are within the top 1%, according to their citation index. These guidelines and recommendations are based on comprehensive literature surveys including results from prospective clinical trials. On issues where no significant study data were available, evidence was obtained from expert committee reports or was based on the actual consensus of experts in the field of US and contrast enhanced ultrasound during consensus conferences. They provide general advice for the use of UCAs and are intended to create standard protocols for the use and administration of UCAs, and improve the management of patients. Beyond general recommendations, individual cases must be managed on the basis of all clinical data available for that specific case. These guidelines will be subject to change to reflect future advances in scientific knowledge and the rapidly evolving field of US technology.
Learning Objectives:
1. To understand the basic principles of contrast enhanced US (CEUS).
2. To discuss appropriate technical settings and examination protocols.
3. To illustrate various examples of the main clinical applications of CEUS in adults and children.

A-194 08:58

Elastography: Clinical tool or toy?
G. Rizzatto; *Gorizia/IT (grizzatto@libero.it)*

The mechanical properties of biologic tissues depend on their constituents and their structural organization. Usually, tumors are stiffer than normal soft tissues and benign lesions. Sonoelastography is an ultrasound (US) technique that allows to estimate in vivo the mechanical properties of tissues; it mostly uses conventional ultrasound systems and customized software. The principle of elastography is based on slight tissue compression on the structures examined. It produces strain (displacement) within the tissue. Calculation of the strain profile along the axis of compression is converted into a real-time elastic modulus image. Basically, tissue elasticity US methods fall into two main groups: methods where a quasi-static external compression is applied to the tissue and the resulting components of displacement or of the strain tensor are estimated; transient elastography which relies on the observation of the propagation of a transient shear wave generated directly by the transducer to determine the viscoelastic properties of the tissues. Shear propagation imaging requires dedicated ultrafast scanners. A large number of reports show that US elastography is already a clinical tool in breast imaging. It mainly increases the specificity for benignity. Other proposed clinical applications include liver (diffuse and focal diseases), prostate (cancer detection), thyroid (benign nodules vs. carcinoma), lymph nodes (normal or reactive vs. metastatic), muscles and tendons (inflammations, traumas and tumors), and skin (abscesses). US elastography may be also part of more sophisticated applications (US endoscopy of pancreatic lesions, MRI and US fusion imaging of breast lesions, and monitoring of the efficacy of US guided therapies).
Learning Objectives:
1. To describe the biomechanics that are the basis of tissue elastography.
2. To review the different methods of US tissue strain analysis.
3. To review the clinical and research results obtained in different areas.

A-195 09:21

Volume US in clinical practice for the radiologist
S.T. Elliott; *Newcastle upon Tyne/UK (simon.elliott@nuth.nhs.uk)*

The common perception of 3D ultrasound is of surface-rendered images, especially of the fetus. While these images are fascinating and appealing, they have little clinical application in the non-obstetric environment. However, the same equipment, enhanced by new transducer technology and software, can be used to take ultrasonography to another level, providing different image presentations, and working practices similar to those of CT and MR. This talk will describe the latest volume ultrasound technology and show new clinical applications, multiplanar reconstruction, multislice imaging, and volumetric analysis. The proven and potential benefits, in terms of clinical accuracy, training, workflow and overall efficiency, will be discussed.
Learning Objectives:
1. To learn about the indications and applications for volume US in non-obstetric imaging.
2. To understand the technology involved in acquisition, manipulation and interpretation for volume US datasets.
3. To learn the benefits that can be gained by using volume US in terms of diagnosis and workflow efficiency.

Panel discussion:
Will ultrasound remain only the stethoscope of the clinician? 09:44

08:30 - 10:00 **Room P**

Chest

RC 704

"Known" conditions revisited

Moderator:
M.-L. Storto; Chieti/IT

A-196 08:30

A. An approach to cystic lung disease on HRCT
A. Devaraj; *Cambridge/UK*

Lung cysts are rounded areas of reduced attenuation usually surrounded by a thin wall and should be distinguished from lung cavities. The pathogenesis of multiple cysts in lung disease is mostly poorly understood. Offered explanations include focal necrosis, partial bronchiolar obstruction causing bronchial dilatation or retractile interstitial fibrosis. Disorders characterised by multiple lung cysts are, with the exception of centrilobular emphysema, rare conditions. In diseases such as lymphangioleiomyomatosis, LIP and langerhans cell histiocytosis, HRCT can provide useful diagnostic information by illustrating the distribution of disease and demonstrating other ancillary signs. In other instances (e.g. the rare disorder Birt-Hogg-Dube syndrome), lung cysts are distributed randomly and CT does not show characteristic features. In this setting, a confident diagnosis requires lung biopsy. A more common occurrence is the identification of an occasional lung cyst on CT, with aetiologies including focal emphysema, pneumatocoeles, squamous cell metastatic disease and also as part of a normal phenomenon in elderly patients. Where possible, an explanation should always be sought when isolated lung cysts are identified, because simple lung cysts (equivalent to simple cysts in the kidney for example) are not typically seen in the lung.
Learning Objectives:
1. To become familiar with a basic classification of cystic lung diseases.
2. To understand the pathogenesis of cystic air spaces in the lungs.
3. To learn about the spectrum of diseases characterised by pulmonary cysts.
4. To appreciate ancillary signs on HRCT that may refine the differential diagnosis.

A-197 09:00

B. Under-recognised infections in immune competent individuals
T. Franquet; *Barcelona/ES (tfranquet@santpau.cat)*

There have been increasing numbers of underdiagnosed emergent pulmonary infections in immunocompetent and immunocompromised adults. Necrotizing pneumococcal pneumonia, community-acquired methicillin-resistant Staphylococcus aureus (CA-MRSA), non-tuberculous mycobacterial infections and community-acquired respiratory viral infections are emerging pathogens that can cause severe infections in healthy individuals and/or immunocompromised patients. Combination of pattern

recognition with knowledge of the clinical setting is the best diagnostic approach to pulmonary infectious processes. When pulmonary infection is suspected, knowledge of the varied radiographic manifestations will narrow the differential diagnosis.
Learning Objectives:
1. To understand the different clinical settings in patients with pulmonary infections.
2. To discuss the role of imaging methods in the management of patients with suspected pneumonia.
3. To become familiar with uncommon, but not rare, pulmonary infections.
4. To be aware of under-recognised pneumonias with unusual radiological features.

A-198 09:30
C. Imaging of thoracic tuberculosis
I.E. Tyurin; *Moscow/RU (igortyurin@gmail.com)*

Approximately 1.7 billion people worldwide are infected with Mycobacterium tuberculosis, of which 20 million are active cases. The reasons for resurgence of TB infection include the HIV epidemic, a rise in reactivation disease in the elderly, a growing migrant population and spread of drug resistant strains. In AIDS patients, the imaging features depend on the degree of immune suppression, TB is more often disseminated and more than half of patients have at least one extrapulmonary site of the disease. A pattern of postprimary TB is also usually seen among patients with decreased immunity due to alcoholism, renal failure, diabetes mellitus, ageing, malignancy, renal and cardiac transplantation. The development of the disease is a complex process closely related to the patents immunity and hypersensitivity. The pathologic form of the pulmonary infection depends on the sensitivity of the infected host and is classified as primary or postprimary. Primary TB pattern represents infection resulting from recent contact with the pathogen. Postprimary TB pattern results from reactivation of a dormant focus within the lungs or exogenous infection. Thoracic tuberculosis produces a broad spectrum of radiographic abnormalities. The radiological patterns had been described as parenchymal, airway, vascular, mediastinal, pleural, and chest wall lesions. Common causes of a missed diagnosis of thoracic tuberculosis are failure to recognize hilar and mediastinal lymphadenopathy as a manifestation of primary disease in adults, overlooking of minimal productive lesions or reporting them as inactive, and failure to recognize that an upper-lobe or superior segment of lower lobe mass might be tuberculosis.
Learning Objectives:
1. To understand the radiologist's role in diagnosis and management of thoracic tuberculosis.
2. To illustrate imaging features of thoracic tuberculosis and typical patterns of primary and post-primary infection, both at presentation and on follow-up.
3. To become familiar with the radiological patterns of multidrug-resistant tuberculosis and imaging features of thoracic tuberculosis in immune compromised patients.

08:30 - 10:00 **Room Q**

Genitourinary

RC 707

CTU and MRU: Urinary tract imaging

Moderator:
H.J. Michaely; Mannheim/DE

A-199 08:30
A. CTU/MRU in acute obstruction
T. Meindl, U.L. Mueller-Lisse, U.G. Mueller-Lisse; *Munich/DE (thomas.meindl@med.uni-muenchen.de)*

A variety of pathological processes that involve the upper urinary tract (UUT) may cause acute urinary obstruction: impacted calculi, neoplasms, intra- and extraluminal ureter compression, coagulopathy, fibrosis and surgery. Clinically acute obstruction leads to significant flanc pain and renal colic that urges the clinician to immediate diagnostic work-up and appropriate treatment. Radiological imaging procedures include ultrasonography, intravenous urography, computed tomography (CT) and magnetic resonance (MR) imaging. Among the cross-sectional examinations, multidetector CT is the modality of choice for clarifying the underlying cause of acute obstruction. Unenhanced (low-dose) CT is the new imaging standard for detection of calculi. Contrast-enhanced CT allows diagnosis of virtually all pathologies leading to obstructive nephropathy. After intravenous contrast media application, several contrast-phases can be imaged including the excretory phase for depiction of the UUT. Since radiation dose is a major drawback, imaging protocols have to be optimized and must be tailored to the clinical question. Magnetic resonance urography reveals the possibility of imaging the urinary tract without the need for contrast media by means of heavily T2-weighted sequences. These static urograms provide information about the grade and site of obstruction, independent of the excretory function of the kidneys. After injection of Gadolinium chelates, one or more urograms can be acquired during contrast media excretion. In the context of acute obstruction, MR urography is preferred in pediatric, young and pregnant patients. Patients with renal impairment are examined with T2-weighted sequences without the need for contrast media. Magnetic resonance urography is complementary to CT in challenging cases.
Learning Objectives:
1. To learn the technical tips for MRU and CTU in acute obstruction.
2. To discuss the value of cross-sectional urography compared to IVP.
3. To review the appearance of major diseases like urinary stones, clots, etc.
4. To understand the drawbacks of each method and which one should be used first.

A-200 09:00
B. Chronic/intermittent obstruction
M.-F. Bellin[1], M. Claudon[2], J. Ifergan[1]; [1]*Le Kremlin-Bicêtre/FR*, [2]*Vandoeuvre les Nancy/FR (marie-france.bellin@bct.aphp.fr)*

The recent technological advances of CTU and MRU have had an exceptional impact on the assessment of chronic/intermittent obstruction. Imaging studies should help answer the clinical questions raised concerning the presence, level, and cause of obstruction. In this session, the recommended techniques of CTU and MRU will be described and their relative merits and limitations reviewed. 3D CT images should be used as an adjunct to the transverse images, instead of a replacement, because volume-rendered images best depict the lumen and not the wall of the urinary tract. Thin-section reformatted CT images likely are as sensitive as transverse images in the detection of urinary tract abnormalities. MRU is being increasingly used because it provides excellent anatomic and functional imaging in a single setting. The relative advantages of static-fluid MRU and excretory MRU will be discussed. The main etiologies of chronic/intermittent obstruction will be illustrated. Bladder cancer, cervical cancer, and prostate cancer are relatively common causes of malignant ureteral obstruction. UPJ is the most common site of urinary tract obstruction in children. Vessels crossing a ureteropelvic junction obstruction contribute to the degree of hydronephrosis in up to 46% of these patients. Demonstration of these vessels and their location anterior or posterior to the obstruction facilitates surgical planning and limits potentially serious complications. Benign strictures of the ureter may complicate abdominal and pelvic inflammatory processes, infection, surgical or interventional procedures. At the end of the lecture, attendees will become familiar with moderate or severe urinary obstruction and their various features and causes.
Learning Objectives:
1. To learn the technical tips for MRU and CTU in chronic obstruction.
2. To review the appearance of major diseases like PU junction, prostate masses, chronic inflammation and extrinsic compression.
3. To understand the advantages and disadvantages of each method.

A-201 09:30
C. Tumors: CTU/MRU
N.C. Cowan; *Oxford/UK (nccowan@gmail.com)*

1. Technological advances in both computed tomography (CT) and magnetic resonance (MR) imaging have improved diagnostic imaging of the urinary tract, surpassing ultrasound and the intravenous urogram. Multidetector computed tomography urography (CTU) is defined as CT examination of the kidneys, ureters and bladder with at least one imaging series acquired during the excretory phase of contrast enhancement. MR urography (MRU) can be performed by using heavily T2-weighted sequences without contrast material or T1 spoiled gradient- recalled echo sequences during the excretory phase after administration of gadolinium-based contrast material. In adults, CTU or MRU is now the preferred examination. Technical aspects of image acquisition and processing will be explored and technical tips relating to protocol design given. 2. The typical and atypical appearances of upper urinary tract urothelial tumours and bladder cancers will be demonstrated. A method of fluoroscopic biopsy of upper tract tumours is described for validation of the imaging diagnosis. 3. Early and accurate diagnosis of urinary tract tumours helps optimise prognosis but conventional investigative pathways are complicated and lengthy, utilising multiple imaging tests and many diagnostic algorithms exist without rigorous evaluation. CTU offers a single imaging test of high diagnostic accuracy with the potential to replace multiple alternative imaging tests in the diag-

nostic pathway, improve patient experience, improve diagnostic performance and accelerate diagnosis. MRU is a promising technique that may be used for the initial evaluation of patients at high risk for developing upper-tract urothelial carcinoma when CTU or intravenous urography is contraindicated.
Learning Objectives:
1. To learn the technical tips for MRU and CTU in the detection of urothelial tumors.
2. To review the typical and atypical appearance of urothelial tumors.
3. To understand why CTU/MRU are complementary tools to other imaging methods.

10:30 - 12:00 **Room B**

ESR meets Argentina

EM 3

Argentine radiology: Past, present and future

Presiding:
A.E. Buzzi; Buenos Aires/AR
C.J. Herold; Vienna/AT
M. Szczerbo-Trojanowska; Lublin/PL

A-202 10:30

Introduction

A.E. Buzzi; *Buenos Aires/AR (alfredo.buzzi@diagnosticomedico.com)*

The Sociedad Argentina de Radiología (SAR) was founded on May 14th, 1917, in Buenos Aires, and has been the core of academic and social activity of the Argentinean radiological community. Many pioneers made original contributions to both diagnostic and therapeutic radiology that deserve a universal repercussion, as we will show. Since its origins, the SAR has carried out numerous activities among which we can highlight the publication of the "Revista Argentina de Radiologia" (edited since 1937), the dictation of the Course of Specialist in Diagnostic Imaging for more than 30 years (now in a virtual format), the organization of the Argentine Congress of Radiology for 55 years (with more than 2000 attendees), the organization of the Council of Professional Certification, and many services to its members. Since 2000, the SAR has the purpose of placing Argentinean radiology in the international radiological community, having signed scientific agreements with many radiological societies both in America and Europe that are very active. To keep the high academic level reached throughout the years, the SAR has maintained the ever-growing scientific, cultural and social activities, and has strongly worked in the formation of professionals. Despite the economic situation that Argentina and other Latin American are facing (that makes difficult for all our radiological community to accede to the top technology), there are many institutions with both medical level and equipment of the first level, as the speakers will demonstrate.
Session Objectives:
1. To describe the original Argentinean contributions to clinical and technological radiology.
2. To describe the actual status of radiological practice in Argentina.
3. To share our vision of Argentinean radiology.

A-203 10:35

Pneumo esophageal MDCT: Its role in cancer presurgical characterisation and staging

M. Ulla; *Buenos Aires/AR (marina.ulla@hospitalitaliano.org.ar)*

Pre-surgical characterisation and staging of esophageal and gastro esophagic junction (GEJ) cancer with a sole imaging method could be useful for the therapeutic strategy since gastric invasion determines the scope of resection to be performed. Conventional CT scans have some limitations for hollow organ assessment in the absence of lumen distension, since the organ wall may be collapsed. Indeed, it is sometimes difficult to define wall thickening or to guarantee the presence of esophageal tumors with endoluminal growth. For these reasons, optimal esophageal distension has been considered useful to overcome these limitations. Although esophageal and gastric lumen distension has been performed with oral contrast agents, it is often suboptimal due to contrast rapid transit. Moreover, oral contrast enhancement may generate confusing images, with the same density as the tumor. This potential drawback is crucial at the level of the GEJ, a typically difficult region to evaluate, where depiction of the tumor anatomic location conditions the surgical strategy. To better evaluate the GEJ while staging the esophageal cancer, we develop a novel technique under MDCT in which CO_2 is instilled into the esophagus to achieve maximum lumen distension. With this study, called pneumo esophageal MDCT, the thickened areas are highlighted in relation to the normal esophageal wall. The aim of this communication is to describe this technique, showing its results and imaging in correlation with surgical findings.
Learning Objectives:
1. To learn about pneumo esophageal MDCT technique.
2. To understand its role in esophageal cancer presurgical characterisation and staging.
3. To appreciate the typical imaging findings.
4. To become familiar with the technique and interpretation.
5. To consolidate knowledge of esophagus tumor evaluation.

A-204 10:53

Cystic echinococcosis: Our experience in Patagonia

S. Moguillansky; *Cipolletti Rio Negro/AR (smoguil@speedy.com.ar)*

Human cystic echinococcosis (CE) or hydatidosis is a zoonotic infection caused by the larval stages of Echinococcus granulosus and its genetic variants. It is still endemic in Mediterranean countries, the Middle and Far East, and South America. One of the major endemic regions in Argentina is Patagonia, where the dominant strain of E. granulosus is the sheep-dog strain or G1. Humans become infected through accidental ingestion of contaminated water or vegetables or through contact with a definitive host. Imaging techniques represented a breakthrough in the diagnosis, treatment, and follow-up of patients with CE. Ultrasonography (US) is considered the gold standard for the diagnosis of hepatic hydatidosis (HH). US field surveys have been useful to reveal the natural history in asymptomatic individuals and allow improved epidemiologic evaluation. US is the method of choice to monitor response to treatment and guide surgical intervention. Its high sensitivity and specificity relegates immunodiagnosis as a complementary tool. Two classifications are widely used: the Gharbi and the WHO classification; however, controversy exists as to which better reflects the natural history and post-therapy changes. Different imaging signs have been described and are well known. This presentation emphasizes key features in differential diagnosis with other space-occupying lesions of the liver. CT and MRI studies in the face of complications of HH will be reviewed. Therapeutic options are varied and far from uniform among different centers. They will be briefly mentioned and include: "watch and wait", chemotherapy, surgery, and PAIR.
Learning Objectives:
1. To illustrate national experience in mass screening approach.
2. To become familiar with the common imaging findings.
3. To understand how current classifications correlate with the natural history or treatment-induced changes of the cysts.
4. To appreciate how the imaging workup aids selection of optimal treatment.

A-205 11:11

also EPOS

Radioanatomy of the lower uterine arterial anastomoses

R.D. García Mónaco; *Buenos Aires/AR*
(ricardo.garciamonaco@hospitalitaliano.org.ar)

The utero-ovarian anastomosis (upper or proximal uterine arterial anastomosis) are well described in the literature and have been related to hormonal alterations as a consequence of ovarian ischemia after uterine embolization (UAE). On the contrary, even though complications after UAE have been reported, the utero-vesical-vaginal anastomosis (lower or distal uterine arterial anastomosis) are less known and descriptions are scanty. Indeed, non-target embolizations (bladder,vaginal and vulvar) were reported after UAE. It has been often speculated that arterial reflux of the embolic agents might have been the cause. A better possible explanation could be the undesired passage of the embolic material from the uterine artery towards the vaginal or vesical arteries through the lower anastomotic plexus. Surgical or endovascular occlusion of both uterine arteries have proved to be inefficient in certain types of obstetric bleeding, probably due to collateral arterial supply from the lower uterine arterial anastomosis. These utero-vesical-vaginal anastomosis are constant, although hard to observe in normal clinical situations. They become angiographically evident in some hipervascular conditions such as pregnancy or placental infiltration, otherwise by forceful contrast injection in wedge catheter position. The lower uterine anastomotic system should be well recognized by interventional radiologists to avoid iatrogenic extrauterine ischemic complications or prevent symptomatic recurrence after embolization of obstetric hemorrhage. In this communication, we shall describe and illustrate the lower uterine arterial anastomosis, its angiographic and anatomical characteristics, with the aim of increasing the efficacy and safety of UAE.

Learning Objectives:
1. To learn about the uterine-vesical-vaginal arterial anastomoses.
2. To become familiar with arterial lower vascular supply.
3. To understand its clinical role in UAE and obstetric hemorrhage.
4. To appreciate its relation in placenta accreta diagnosis and management.
5. To avoid iatrogenic non-target UAE complications.

A-206 11:29
High-resolution MRI in rectal cancer
A. Dieguez; *Buenos Aires/AR (amdieguez@speedy.com.ar)*

High-resolution magnetic resonance has become an important tool in the staging of rectal cancer, directing the therapeutic strategy in the preoperative multidisciplinary team. MRI can clearly show the relevant anatomy for Total Mesorectal Excision, in particular the mesorectal fascia, assessing resectability. It can also identify patients with prognostic risk factors such as depth of invasion and status of the surgical circumferential resection margin. In this way, patients at highest risk can undergo preoperative adjuvant treatment, which has a better outcome and less toxicity than postoperative treatment. The report should include the T and N staging, the status of the circumferential resection margin, and the presence or absence of extramural vascular invasion. Knowing that the prognosis for low rectal cancer is different from that for upper and middle third level tumors, the analysis in this location deserves special attention. High-resolution magnetic resonance is reproducible and accurate in the selection of the proper preoperative treatment. We will describe the pertinent anatomy, the MRI technique, and the prognostic risk factors, and show our 5-year experience with a multidisciplinary team for the assessment of these patients.
Learning Objectives:
1. To describe the high-resolution MRI state-of-the art technique and the data-reporting form in patients with rectal cancer.
2. To describe the anatomic landmarks of relevance in Total Mesorectal Excision of the rectum.
3. To illustrate the use of high-resolution MRI in the identification of poor prognostic factors in rectal cancer.
4. To understand its role in selecting patients for preoperative neoadjuvant therapy.

Panel discussion 11:47

10:30 - 12:00 **Room E2**

Foundation Course: Head and Neck Radiology

E³ 820

Neck lymph nodes and glands

Moderator:
S. Robinson; Vienna/AT

A-207 10:30
A. Neck lymph nodes and salivary glands
H.C. Thoeny; *Berne/CH (harriet.thoeny@insel.ch)*

Involvement of lymph nodes in various pathologies of the head and neck is frequent not only in malignant diseases but also in inflammatory conditions. As size criteria are not sufficient to define a lymph node as malignant, other criteria such as shape, central necrosis and extracapsular spread are other helpful signs. However, micrometastases are still an unresolved problem although new imaging methods have already shown promising results. Typical imaging features of CT and MRI indicating extracapsular spread and carotid artery invasion will be discussed as these have therapeutic and prognostic implications. Although salivary gland pathologies are relatively rare, its large variety of differential diagnoses makes it challenging. In children and pregnant women, sonography is the first step, and CT is the method of choice in inflammatory disease. MRI is the first line examination in palpable salivary gland masses to assess the exact extent of tumours, the invasion of neighbouring structures, perineural spread and bone invasion. Differential diagnoses and imaging features of the most frequent tumour types will be discussed and an approach to differentiate between benign and malignant lesions will be provided.
Learning Objectives:
1. To become familiar with the normal appearance of lymph nodes and salivary glands on imaging studies.
2. To review the imaging findings in common diseases affecting the neck lymph nodes.
3. To review the imaging findings in benign and malignant diseases of the salivary glands.
4. To appreciate the relative value of different imaging techniques in the evaluation of neck nodal and salivary gland disease.

A-208 11:15
B. Thyroid and parathyroid glands
A.D. King; *Hong Kong/CN (king2015@cuhk.edu.hk)*

Thyroid Gland: The normal appearance and developmental abnormalities of the thyroid are covered briefly, followed by a discussion of some of the more important malignant and benign diseases of the thyroid. Imaging thyroid cancer will be illustrated with an emphasis on papillary carcinoma, which is the most common thyroid cancer. Diagnosis is obtained from ultrasound guided biopsy. Ultrasound is often sufficient to also stage early thyroid cancer in the neck, but MRI/(CT) is required for more advanced disease where there is extra-thyroidal primary tumour spread or extensive nodal disease. The impact of imaging on thyroid cancer management will be discussed. Benign thyroid nodules are common and ultrasound is used to distinguish these nodules from cancer; however, some nodules remain indeterminate on ultrasound and in these cases selection of criteria for biopsy is controversial. Finally, the imaging appearances in Graves's thyrotoxicosis and thyroiditis (Hashimoto's, subacute and suppurative) will be illustrated. Parathyroid Glands: Imaging is used to localise the abnormal parathyroid gland (parathyroid adenoma, hyperplasia or rarely carcinoma) in hyperparathyroidism. There are usually four parathyroid glands located in the neck but supernumerary or ectopic glands may occur in the neck and mediastinum. Pre-operative localisation reduces operative time and allows minimally invasive forms of surgery to be performed. In this context, ^{99m}Tc- sestamibi scintigraphy and ultrasound are usually the first choice for localisation, while additional techniques such as MRI or CT are reserved for cases where the abnormal gland cannot be localised or there is persistent/recurrent disease after surgery.
Learning Objectives:
1. To review the normal anatomy and imaging appearance of the thyroid and parathyroid glands.
2. To learn about the imaging findings in benign and malignant disease of these structures.
3. To understand the relative value of different imaging techniques to evaluate pathology of these structures.
4. To appreciate the impact of imaging findings on patient management.

10:30 - 12:00 **Room G/H**

EFOMP Workshop

New technology in diagnostic radiology: Risk management, technology assessment and improved diagnosis

EF 2

Risk management and technology assessment

Moderators:
S. Christofides; Nicosia/CY
A. Torresin; Milan/IT

A-209 10:30
Acceptability criteria and radiography equipment, digital imaging and CT
J. Malone; *Dublin/IE (jifmal@gmail.com)*

In 2007, the EC commissioned a group of experts to undertake the revision of Report RP91 on "Criteria for Acceptability of Radiological (including Radiotherapy) and Nuclear Medicine Installations". This paper introduces some of the concerns encountered in the diagnostic radiology section of the report and the approach adopted to establishing the criteria. It is expected that after a period of consultation, the report will be finalised by the European Commission and published. The group was particularly concerned to devise a set of criteria that applied to contemporary radiological equipment. Thus, all modalities including general film screen radiography, CR, DR, fluoroscopy, interventional radiology, CT, dental radiography and DXA were reviewed. The group concentrated on identifying performance criteria which, if not met, would require equipment to be removed from service immediately. These were defined as suspension levels. The methodologies for assessing performance and the performance levels were, where possible, based on literature that commanded a high level of consensus. Where this was not available, the judgment

of the expert group, followed by peer review was employed. Where possible, the approach used has been consistent with the approach in international standards such as those issued by IEC. The paper will present the approach employed and some examples of the values recommended.
Learning Objectives:
1. To comprehend the different meanings associated with terms like acceptance test, criteria for acceptability, and commissioning, as used with diagnostic imaging equipment.
2. To understand the status that will be afforded to criteria for acceptability for radiological equipment under the EU Medical Exposures Directive, and how this may influence the end users of equipment in hospitals/clinics and manufacturers/suppliers of equipment and services.
3. To become familiar with the bodies involved in the creation of standards and criteria for acceptability for diagnostic radiology imaging equipment.
4. To become familiar with the consultation process presently open with respect to the new draft criteria for the acceptability of equipment.
5. To examine examples of criteria for acceptability from the draft report.

A-210 11:00

Acceptability criteria and equipment for fluoroscopy and interventional radiology

S. Balter; *New York, NY/US*

Fluoroscopic systems can be highly flexible and are open to a wide range of applications. They may offer a multiplicity of modes (and sub-modes) of operation. Commissioning of newly installed equipment includes optimizing the equipment settings for its intended use. A representative subset of the most probable intended uses of the equipment should be identified for acceptability testing. For example, the main “cardiac mode (s)” and associated sub-modes might be tested in a unit whose intended application will be in the area of cardiac imaging. If the unit is later deployed for different purposes, the need for new commissioning and a new acceptability test will have to be considered by the practitioner and the MPE. Fluoroscopes intended for interventional use ought to have dose measurement capabilities such as Air Kerma Area Product and/or Accumulated Air Kerma at a reference point. Acceptability testing includes evaluating the accuracy of these instruments. In many cases, fluoroscopic systems are supplied as dedicated units suitable for cardiac, vascular, gastrointestinal or other specific applications. Powerful mobile units are available and are generally flexible. In all cases, the MPE will have to consider the intended application of the unit and the environment in which it will be installed and used. With respect to the X-Ray generator, many of the criteria of acceptability are similar to those prevailing for general radiographic systems.
Learning Objectives:
1. To become familiar with the process of testing fluoroscopes for clinical acceptability.
2. To be aware of the need for optimizing the setting of a fluoroscope corresponding to its intended use.

A-211 11:30

Acceptability criteria and equipment for nuclear medicine

S. Christofides[1], L. Malone[2], P. Horton[3], S. Mattsson[4]; [1]*Nicosia/CY*, [2]*Dublin/IE*, [3]*Newcastle upon Tyne/UK*, [4]*Malmö/SE (soren.mattsson@med.lu.se)*

Purpose: To specify acceptable performance tolerance levels (suspension levels) for gamma camera and positron emission based procedures. Instruments needed for therapeutic procedures and intra-operative probes are also covered.
Methods and Materials: As shown in the preceding papers describing the revision of the EC RP91 criteria.
Results: This section considers equipment for: 1. Nuclear medicine therapeutic procedures. 2. Radiopharmacy quality assurance programme. 3. Gamma camera based diagnostic procedures. 4. Positron emission diagnostic procedures. 5. Hybrid diagnostic systems. 6. Intra-operative probes. Each part is comprised of a brief introduction and a list of equipment for which suspension levels are given. For each equipment, a table is given with the performance parameters and the suspension levels.
Conclusion: It is evident that there are few publications that give hard values for suspension levels, especially for new and evolving technologies in nuclear medicine. Therefore, it was necessary to quote acceptable tolerance levels, which are related to the value used for acceptance testing/commissioning of the equipment and on values quoted by the manufacturer. It was also evident that case studies describing the suspension of equipment based on the characteristic parameters falling outside defined tolerance levels or hard parameter values were not identified in the published literature. It is recommended that such case studies should be published for future use in defining more solid suspension levels. Since technology is evolving continuously and new equipment is placed on the market with a rapid tempo, it is necessary with a regular review and updating of the recommended suspension levels.
Learning Objectives:
1. To comprehend the background for and rational of the revised RP91 acceptability criteria for nuclear medicine installations.
2. To understand when equipment no longer meets the required performance tolerance levels (suspension levels) and has to be withdrawn from use.
3. To become familiar with the revision of the EU RP91 document and with documents from IAEA, IEC and NEMA related to performance measurements and quality assurance for nuclear medicine equipment.

10:30 - 12:00 **Room Z**

ESR Audit Session

Clinical audit for radiologists: Why it is worth doing, and how to make it work

Moderator:
E.J. Adam; London/UK

A-212 10:30

Clinical audit: What is it and who should do it?

E.J. Adam; *London/UK (Jane.Adam@stgeorges.nhs.uk)*

This talk will focus on how radiologists can become involved in and carry out clinical audit, and what benefits it can bring. There are many definitions of clinical audit, some of which imply regulation or outside scrutiny, but clinical audit should be viewed as a professionally led method of improving patient care through the systematic examination of systems, processes and outcomes against chosen and agreed standards. It is a process that can readily be carried out by individuals, groups or whole departments. If properly conducted, with appropriate confidentiality and in a no-blame environment, clinical audit can be a professionally satisfying, productive and effective way of examining what we do to provide reassurance that all is well, or where necessary, find ways to improve and enhance the care we offer to patients.
Learning Objectives:
1. To comprehend the definition of clinical audit.
2. To understand the methodology and scope of clinical audit.
3. To become familiar with the benefits of audit and how it can become part of our normal professional practice.

A-213 10:50

Clinical audit and accreditation: Intimidating or encouraging? Experience in Germany

B. Ertl-Wagner; *Munich/DE (Birgit.Ertl-Wagner@med.uni-muenchen.de)*

In Germany, quality management (QM) has been obtaining increasing attention in the medical arena, as the legislature now demands the introduction of a QM system both in the in- and out-patient settings. This has led to a steep increase in accreditations in recent years, also in the field of radiology. A commonly used QM system in German hospitals is KTQ, a genuinely German system that can only be applied for entire hospitals and not for departments. In addition, ISO 9001:2008 is a prevalent system both for the in- and out-patient settings. Other QM and accreditation models include EFQM, Joint Commission International, proCum cert, and several models specifically designed for the out-patient practice setting. The introduction of QM to German medicine has caused a pronounced increase in both internal and external audits. These mechanisms have to be incorporated into the management system and organisational structure in order to ascertain continuous improvement of the department. Even though audit is oftentimes initially perceived as threatening, it can be an extremely rewarding and educational experience if conducted properly. Audit has the capability to identify potential weaknesses and to devise mechanisms to ameliorate or eradicate these. In a blame-free environment, this can lead to an improved and more content situation for patients, staff and referring physicians.
Learning Objectives:
1. To become familiar with the various QM models commonly used in German medicine and radiology.
2. To become acquainted with the common processes of introducing a QM system to a radiological department.
3. To explore the mechanisms and benefits of both internal and external audits.

A-214 11:10

also EPOS

Clinical audit: Getting everyone involved! UK experience and the role of national audit projects

S. Barter; *Cambridge/UK (suebarter@btinternet.com)*

The Clinical Radiology Audit Sub-Committee (CRASC) of the Royal College of Radiologists (RCR) was established to co-ordinate national radiology audit activity. Its function is to promote and facilitate audit through nominated audit leads in each hospital trust, who act as a link between the RCR and their department, encouraging audit locally and participating in relevant RCR national audits. At least one national audit is carried out annually, with data collected via electronic submission and the anonymised results presented to audit leads at an annual Audit Forum. Individual departmental results are analysed using statistical process control (SPC) methodology. This enables identification of departments underperforming against the national mean, and recommending corrective action, by redesigning the process being audited, or by identifying and eliminating specific root causes locally. Past National Audits include: 2006 - Audit of outcomes of Nephrostomy, 2007 - Audit of Effective Communication and 2008 - Audit of Accuracy of Staging of Uterine Cancer. The Committee has developed a web-based tool for facilitating local audit, "AuditLive", a fully searchable collection of templates or "recipes" which can be downloaded and adapted. Fellows are also able to submit their own templates for audit for publication hence sharing best practice nationally. We encourage radiologists in training to participate in audit by holding Audit Poster competitions at National Radiology Scientific Meetings, and produce an audit newsletter, distributed to every member and Fellow of the RCR. Our experience leads us to believe that audit succeeds when relevant, locally owned and properly structured, and multi-professional, and our model encourages this.

Learning Objectives:

1. To comprehend the role of clinical audit in radiology practice.
2. To understand how to facilitate clinical audit locally and nationally.
3. To become familiar with some of the systems developed in the UK by the Royal College of Radiologists.

A-215 11:30

Implementation of the EC guideline in practice

S. Soimakallio; *Tampere/FI (seppo.soimakallio@pshp.fi)*

Purpose: To introduce the new EC guideline of Clinical Audit (CA) and how it is to be implemented in practice of radiological department.
Methods and Materials: Guideline contains the terminology and practical matters of INTERNAL (annually) and EXTERNAL (within 5 years) AUDIT. Every radiological unit must have some kind of quality system with documented practice in quality manual. Motivation of staff is necessary to achieve the good quality of work and to prepare for the external inspection. Enough resources (time, costs, etc). must be reserved for updating of quality manual. Auditing organization can use only independent, experienced and educated auditors. The audited unit should change its own practice according to the recommendations given by auditors. National Advisory Committee is useful to coordinate and to develop the national audit practice. Criteria of good practice should be developed in cooperation with national societies.
Results: The new guideline is supposed to give advice to every question concerning clinical audit. In Finland, the most difficult thing was how to start the process. With two runs of CA, we will notice improved quality of diagnostics, reduced dose of radiation, effective use of resources and professional education. The number of recommendations has strongly diminished during two runs.
Conclusion: Guideline is the necessary tool to implement clinical audit in practice of radiology. National legislation and regulations should be taken into account in this process.

Learning Objectives:

1. To comprehend the EC guideline.
2. To understand the whole process of clinical audit.
3. To become familiar with implementation of the guideline in radiology practice.

Discussion 11:50

12:15 - 12:45 **Room A**

Plenary Session

HL 2

Josef Lissner - Honorary Lecture

Presiding:
M. Szczerbo-Trojanowska; Lublin/PL

A-216 12:15

The advance of musculoskeletal radiology and creating defining moments

S.E. Anderson; *Sydney/AU (andersonsembach@yahoo.com.au)*

Musculoskeletal radiology has experienced significant progress in clinical expertise, research and teaching. Technology has been, among others, a very positive driving force. However, medicine and radiology are still human centric disciplines. Teachers, students and patients are important stakeholder groups. Their daily interaction on different levels sometimes blurs the key moments that might otherwise impact on individual choices in the long term. How do we leverage the human aspect in a more defined way? The speaker will discuss this topic and some ideas with the focus on teaching and cross-generational influence.

Learning Objectives:

1. To have an appreciation of the advance of musculoskeletal radiology.
2. To appreciate the specific potential role of "defining moments" influencing education, teaching and to developing musculoskeletal radiology further.

12:30 - 13:30 **Room I**

Joint Session of ESR and EC (European Commission)

eHealth: Legal and technical challenges for radiology

Moderator:
I.W. McCall; Oswestry/UK

A-217 12:30

Introduction on eHealth

C. Dima; *Brussels/BE*

European health systems are faced with challenges like citizens' expectations for high-quality care, staff shortages, unequal territorial distribution and rising healthcare costs. eHealth and telemedicine in particular are tools which can help to address challenges, like contributing to deliver better quality of care, to increase accessibility to healthcare in remote geographical locations or to overcome shortages of health professionals in given situations. Recognising the potential benefits of ICT tools in this context, the European Commission has been supporting efforts in the field of ICT for Health for the last 20 years. EC instruments used for making eHealth a reality are a mix of research, policy and support to deployment activities. Research activities in three main areas (Personal Health Systems, Patient Safety, Virtual Physiological Human) are being financed under the Seventh Framework Programme for Research (FP7). Several policy actions have been adopted in order to support eHealth development: Action Plan for a European eHealth Area (April 2004); Communication on lead markets (December 2007); Recommendation on cross border interoperability of EHR systems (July 2008); Proposal for a Directive on patient's rights for cross border care (July 2008); Communication on "telemedicine and the benefit for patients, healthcare systems and society" (November 2008). Implementation, support to policies: Competitiveness Innovation Programme (CIP ICT PSP): Large Scale Pilot on Interoperability and Telemedicine + Thematic Networks.

A-218 12:40

Legal aspects of eHealth related to medical imaging

C. Dima; *Brussels/BE*

The best illustration of an eHealth service in the field of medical imaging is teleradiology. Teleradiology is a telemedicine service which involves the electronic transmission of radiographic images from one geographical location to another for the purposes of interpretation and consultation. The Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on telemedicine for the benefit of patients, healthcare systems and society [COM (2008) 0689 final] acknowledges the fact that teleradiology is currently the telemedicine service in

the most advanced stage of deployment. It is a way to optimize management of scarce resources. In the Communication the Commission undertook to publish, in cooperation with Member States, an analysis of the Community legal framework applicable to telemedicine services, including teleradiology. This was listed in the Communication as an action aimed to bring legal clarity to telemedicine. Several EU legal acts have been identified as being applicable to teleradiology. The challenge is to determine and clearly specify the scope, depth and borders of applicability of existing Community legal framework to teleradiology. It is both important and useful to analyse the case of teleradiology services by cross-reference to the relevant Community legislation in the main problematic areas, such as: freedom to provide telemedicine services, license/authorisation of health professionals providing telemedicine services, liability, personal data protection and jurisdiction.

A-219 12:55

Radiology's view on telemedicine communication

L. Donoso; *Barcelona/ES*

The European Society of Radiology (ESR) is closely monitoring EU legislation and EU affairs with a potential impact on medical imaging and has started to successfully build relations with relevant EU institutions and EU consulting and public affairs agencies. The ESR very much welcomes the Communication on Telemedicine issued by the European Commission as a document that brings to the attention of different stakeholders several important issues concerning telemedicine.
The ESR wants to make sure that: 1. Although staff shortages are expected in the future, a radiological act must always be defined as a medical act. 2. Standardised European training curricula and structures for all radiologists are established. 3. Reporting radiologists are registered, including adequate monitoring and accreditation mechanisms. 4. Special attention is given to the challenges new technologies pose for the radiologist profession.
The ESR demands that a future legislation on Telemedicine shall provide the following: 1. Teleradiology has to be defined as medical act in its own right. 2. Establishment of accreditation criteria for teleradiology providers that are homogenous throughout the EU. 3. Emphasis on the importance of delivering high-quality healthcare to the patient. 4. International quality standards and careful monitoring of service providers. 5. Regulation of telemedicine and teleradiology should be the responsibility of the member state where the patient undergoes the imaging procedure or telemedical referral. 6. Full information of patients and informed consent.

A-220 13:05

eHealth: Technical aspects

D. Caramella; *Pisa/IT*

Broadband access and the ability of providers to enable full connectivity is a prerequisite for the deployment of teleradiology. However, the geographical areas that may be more in need of teleradiology (scarcely populated areas) usually have more difficult or limited access to the high-performance connections that are needed. Moreover, it is hard to underestimate the importance of interoperability and standardisation. In Radiology there has been formidable progress in this field with the development of DICOM and IHE. However, fine tuning of existing standards is still needed to cope with the specific issues that are relevant to teleradiology. For example, an EU wide consensus on specifications for transfer protocols, encryption, digital signatures and providing a Public Key Infrastructure service would improve the practical access to teleradiology and the interoperability between different partners in healthcare. Another important aspect is that interoperability has to include all information systems in which the remote radiologist may find the complete clinical information (images and data) that is necessary for the diagnosis. Therefore, access to prior imaging examinations as well as to the Electronic Patient Record must be available in teleradiology applications in order to ensure the same quality of radiological diagnosis that is obtainable in the HIS-PACS environment at the hospital level. Even if current state-of-the-art technology has reached a mature stage when it can really help to fulfil the aim of realising teleradiology, a serious deployment programme will never be possible unless other development points (namely legal and organizational issues) are tackled and fixed as well.

Discussion 13:15

16:00 - 17:30 **Room A**

Radiology in Abdominal Emergencies

CC 1017

Missing perfusion: Abdominal ischemic disease

Moderator:
N. Gourtsoyiannis; Iraklion/GR

A-221 16:00

A. Mesenteric angiography: Diagnostic and therapeutic approach

J. Lammer; *Vienna/AT (johannes.lammer@akhwien.at)*

Acute abdominal organ ischemia may be caused by hypovolaemic shock, spasm (ergotism), embolization and aortic dissection. Embolization is the most common cause. It occurs typically in elderly patients with atrial fibrillation, after myocardial infarction or due to a thoracic aortic aneurysm (TAA). The primary diagnosis is made by CT with contrast enhancement which also can demonstrate cardiac thrombi or a TAA. Interventional treatment can be performed with a thrombectomy device or fibrinolysis with recombinant tissue plasminogen activator (rt-PA; 10 mg loading dose, 5 mg/hr infusion dose). Acute aortic dissection may cause dynamic compression of the true lumen with occlusion of the ostium of the visceral arteries (floating visceral sign). The primary diagnosis is made by CT. Occlusion of the primary entry tear with a thoracic aortic stentgraft may decompress the true aortic lumen followed by reperfusion of the visceral arteries. Chronic abdominal ischemia in younger patients may be due to fibromuscular dysplasia, Takayasu arteritis or neurofibromatosis. In the elderly, it is usually caused by arteriosclerosis. The patient may have post prandial abdominal pain (angina abdominalis), diarrhea and/or weight loss. Due to the collateral circulation, symptoms usually occur only if more than one of the major arteries (celiac trunk, superior and inferior mesenteric artery) is narrowed. The diagnosis can be made by color Doppler ultrasound (CDUS), CT and MR with contrast enhancement. Endovascular treatment is done by PTA and stent placement.
Learning Objectives:

1. To learn the different causes of ischemic abdominal emergencies and principles for treatment by interventional radiology.
2. To learn the causes and the optimal imaging strategy for preparing treatment.
3. To understand the principles, techniques and results of interventional radiology for the treatment of acute abdominal bleeding.

A-222 16:30

B. The black bowel

P. Rogalla; *Berlin/DE (rogalla@charite.de)*

Ischemic bowel disease represents a live threatening disease that requires immediate clinical attention once diagnosed. Expansion of cardiac surgery, surgical interventions in elderly and high-risk patients have created an increasing demand for early diagnostic workup if bowel ischemia is clinically suspected. Multi-row detector CT with multiplanar refomations including further projection techniques plays a leading role in early detection of bowel ischemia if blood work and clinical presentation are equivocal or contradictory. Optimal sequencing of intravenous contrast media injection and the scanning delay represents a prerequisite for reliable diagnostic outcomes. Knowledge of typical patterns of the disease, early and late signs of ischemic bowel disease is mandatory for radiologist in charge. The course will help to understand physiological principles and causes of ischemic bowel disease. Diagnostic performance of current imaging tests and how to integrate them into clinical practice will be discussed.
Learning Objectives:

1. To understand the underlying physiological principles and causes of ischemic bowel disease.
2. To become familiar with typical signs of bowel ischemia and how to use them.
3. To discuss the diagnostic performance of current imaging tests and how to integrate them into clinical practice.

A-223 17:00

C. Clinical management: What you need to know

D.E. Malone; *Dublin/IE (dmalone@ucd.ie)*

Acute mesenteric insufficiency (AMI) is due to arterial or venous occlusion. Arterial AMI is an emergency. The typical patient is elderly, may have atrial fibrillation and has recent onset intense visceral pain disproportionate to clinical signs. CT is the mainstay of diagnosis and may be supplemented by CT angiography (CTA). Waste no time if arterial AMI is suspected. Average mortality rates of 71% (59-93%) have been reported

and symptom duration before therapy is an independent predictor of mortality. Age > 70 years, metabolic acidosis and renal failure are other danger signs. Interrupt routine CT lists; ensure that these patients are scanned as soon as possible - neutral oral contrast and high-dose IV contrast are essential. CT appearances should be correlated with serum lactate as acute arterial occlusion without reperfusion may produce falsely 'normal' bowel wall thickness. Early diagnosis and aggressive surgical intervention combining bowel resection with revascularisation offer the best prognosis. Venous AMI may present with a more chronic, intermittent course of pain, fever, abdominal tenderness and ascites. Therapy is bowel resection and anticoagulation. Ischaemic colitis occurs in elderly patients with atherosclerosis spontaneously or after aortic aneurysm repair. There are fewer systemic manifestations, bloody diarrhoea predominates; it may spontaneously resolve. CT or contrast enema is established imaging options. Chronic mesenteric ischaemia presents with 'intestinal angina' and weight loss. Doppler US, CTA/MRA are diagnostic. Surgical or interventional therapy is feasible; the correct choice varies with individual patient anatomic and comorbidity considerations. Endovascular therapy may have higher re-intervention rates, reducing cost-effectiveness.
Learning Objectives:
1. To discuss the clinical signs of ischemic bowel disease.
2. To analyse the clinical management of patients with suspected bowel ischemia with focus on workflow.
3. To analyse cost-effectiveness and clinical outcome of early diagnosis and interventional treatment options.

16:00 - 17:30 **Room B**

Radiology of the Spine in 2010

CC 1016

Bones: What you should know!

Moderator:
V.G. Hadjidekov; Sofia/BG

A-224 16:00

A. Primary and secondary tumors of the bony spine
J.W.M. Van Goethem, L. van den Hauwe, C. Venstermans, F. De Belder, P.M. Parizel; *Antwerp/BE (johan.vangoethem@ua.ac.be)*

Spinal tumors are uncommon lesions and affect only a minority of the population. However, these lesions can cause significant morbidity in terms of limb dysfunction and can be associated with mortality as well. In establishing the differential diagnosis for a spinal lesion, location is the most important feature. In general, extradural lesions are the most common (60% of all spinal tumors), with the majority of lesions originating from the vertebrae. The most frequent extradural tumor is metastasis, while primary bone tumors are much less common. Solitary vertebral lesions are less common than tumors with multiple locations. Benign lesions are usually asymptomatic, incidentals findings, malignant vertebral tumors give back pain and sometimes manifest neurologic symptoms, especially in children. MR imaging is the best imaging modality, but bone scintigraphy is useful in detecting multiple lesions and distant metastases. CT is also important in imaging these lesions and sometimes shows typical patterns of bone destruction, sclerosis and/or remodeling. The most frequent malignant extradural tumor is metastasis. Other malignant tumors include lymphoma - multiple myeloma, chordoma, Ewing sarcoma and chondrosarcoma. The most frequent benign lesions are hemangioma, enostosis (simple bone island), osteoid osteoma - osteoblastoma, aneurismal bone cyst, giant cell tumor, eosinophilic granuloma (histiocytosis) and osteochondroma. Besides imaging findings, the age of the patient and the multiplicity and location of the lesion (s) are most important in the differential diagnosis.
Learning Objectives:
1. To review the most common primary tumors of the bony spine.
2. To learn how to analyse imaging patterns of neoplastic bone lesions in the spine.
3. To re-evaluate the necessity of CT and/or MR in evaluation of tumors of the bony spine.

A-225 16:30

B. Traumatic bone injury
M. Stajgis; *Poznan/PL (stajgis@o2.pl)*

Traumatic bone injury of the spine presents a great clinical and social problem as it often affects young and previously healthy patients. The role of radiologist is to detect and precisely indicate the areas of the spine which have been affected by the trauma. The knowledge of normal anatomy of the spine and the most common anatomical variants are absolutely necessary to make the correct diagnosis. Also, the mechanism of injury is important - its understanding helps and simplifies the diagnostic pathwork. Crucial for the patient is to distinguish between stable and unstable fractures; this enables the optimal treatment (surgical vs. nonsurgical) - Denis concept of three columns of the spine is one of examples of common language between radiologist and neurosurgeon. Spinal injuries are divided into minor and major ones. Minor injuries include fractures of transverse and spinous processes, facets and interarticular parts. The most common major injuries are compression and burst fractures with anatomic dislocations. The role of radiograms will be presented. Without doubt, MDCT with reformats is the 'gold standard' method in evaluation of traumatic bone injury and must be implemented in routine protocol in every patient with neurological or other clinical symptoms. Also, MRI plays a very important role - it can detect the subtle injury symptoms like posttraumatic bone marrow oedema, evaluate the degree of spinal cord compression with its consequences and determine the injury of soft tissues (e.g. ligaments). Finally, the disadvantages and traps of different imaging modalities will be presented.
Learning Objectives:
1. To understand the mechanisms of traumatic bone injury.
2. To learn about MR imaging findings in different traumatic abnormalities of the spine.
3. To become familiar with the advantages and disadvantages of different imaging techniques in spinal trauma.

A-226 17:00

C. Spinal infections: More common than expected?
E.T. Tali; *Ankara/TR (turgut.tali@gmail.com)*

Skeletal manifestations of TB remain a major problem in the world. The incidence is rising with increasing AIDS, immunosuppressive drugs or substance abuse. WHO declared TB a global health emergency. Drug-resistant TB infections (multi-drug resistant TB (MDR-TB), which is defined as resistance to the two most effective first-line TB drugs: extensively drug-resistant TB (XDR-TB) and extremely drug-resistant TB (XXDR-TB) that have resistance to every anti-TB drug are also increasing recently. TB of the spine accounts for 1% of all TB infections and 25-60 of all bone and joint TB infections. It generally affects adults in the fourth and fifth decades. TB spondylitis is more indolent with a more gradual onset of symptoms over months to years. Lower thoracic and upper lumbar vertebrae are the most common sites. Multiple vertebral body involvement is the rule and skip lesions occur. Vertebral body is eventually destroyed with loss of cortical definition and fragmentation, large paravertebral abscess and epidural infection are frequently seen. Reactive sclerosis, vertebral body collapse, gibbous deformity and vertebral body fusion are findings of advanced cases. The incidence of TB meningitis with meningeal enhancement, adhesions, loculations and TB myelitis with focal cord swelling, edema, nodular lesions are low. Despite the advent of advanced diagnostic technology, neither clinical examination nor radiological findings may be reliable in differentiating atypical forms of spinal TB from other infections or from neoplasms. Generally, longer treatment with expensive drugs, with or without percutaneous spinal interventional procedures or surgical interventions, is required.
Learning Objectives:
1. To review different forms of spinal infection.
2. To understand pathophysiology and imaging features of tuberculous spondylodiscitis.
3. To know about imaging findings in leptomeningeal and intramedullary infections.

16:00 - 17:30 **Room C**

Special Focus Session

SF 10a

New insights in breast imaging

Moderator:
E. Azavedo; Stockholm/SE

A-227 16:00

Chairman's introduction
E. Azavedo; *Stockholm/SE (edward.azavedo@ki.se)*

This Special Focus session will bring to you updated information in the field of breast imaging. During the last few decades, breast imaging has been the single most important contributor to decrease in breast cancer mortality. This, in turn, has been much due to our increased knowledge of image interpretation but also due to the tremendous improvements in the technology of breast imaging. In this session, we will learn about most of the new developments in the field of breast ultrasound, nuclear medicine,

physics behind the new technology etc. Each of the presenters will provide a thorough insight in their fields of expertise and time will be made available to discuss things that need clarification. We look forward to welcome you all to get an updated information about radiological information that could directly be implied in your clinical services.
Session Objectives:
1. To update knowledge of new technologies.
2. To understand the physics and radiation dose of the new methods.
3. To understand the possible role of new techniques in clinical practice.

A-228 16:05

Tomosynthesis in breast imaging: Tomorrow's mammography?
K.C. Young; *Guildford/UK (ken.young@nhs.net)*

The introduction of high quality digital full-field detectors for mammography has facilitated the development of digital breast tomosynthesis (DBT). Currently, a number of manufacturers have DBT systems either available for purchase or in clinical evaluation. However, there are significant variations in the approach adopted by each manufacturer. This presentation will review the underlying physics of tomosynthesis as well as discussing the differences between the approaches favoured by different manufacturers. A method of extending the current European dosimetry protocol for mammography to include DBT systems will be described and the current dose levels for DBT systems reviewed. While there is evidence that DBT may improve the detection of breast lesions, and particularly masses, some unresolved questions about how to use this new technology are discussed. These include whether DBT can replace 2D imaging or whether both are a needed. Does one still need two views with DBT? Is a narrow or wide tomo angle preferable? Are movement artefacts a significant problem? Is micro-calcification detection adequate in DBT?
Learning Objectives:
1. To understand the physics of the method.
2. To appreciate its capabilities and limitations.
3. To learn about the radiation dose levels.
4. To become familiar with image interpretation.

A-229 16:28

Advances in breast ultrasound
T.J. Popiela; *Krakow/PL (msjpopie@cyf-kr.edu.pl)*

Breast ultrasound (US) is a diagnostic tool complementary to mammography that increases the detection of malignant breast lesions. B-mode US is a method of choice for differentiating solid from cystic lesions. To make the examination more objective, the set of individual sonographic features used for US breast diagnosis together with US-BIRADS lexicon were implemented. Recent results of computer-aided diagnosis (CAD) are encouraging even though they can be used only to static images. Real-time compound imaging is the best technique for evaluation of the margin and internal echotexture of nodules, while tissue harmonic imaging has a significant role in the visualization of a lesion against a fatty background. Both techniques are complementary to B-mode imaging. To reliably evaluate tumor vascularization, a Doppler technique was implemented into breast US. Contrast agents with microbubbles used with this technique enhance signal from tumoral vessels in breast lesions. It helps to evaluate benign and malignant breast masses and tumor response especially in patients receiving neoadjuvant chemotherapy. Three-dimensional real time US allows more reliable evaluation of breast lesion than standard 2D mode. It accurately assesses contours and interaction with surrounding tissue. It is helpful in guiding the biopsy needle, especially in small-size lesion. Breast cancer tissue is harder than surrounding healthy stroma, and this criterion is used in the analysis of US elasticity images that consist mainly of an image of strain in response to force. Breast mass elastography is another method with potential for enhancing the specificity of US cancer detection.
Learning Objectives:
1. To be informed of the latest innovations including elastography, 3D and contrast enhanced US.
2. To understand how high resolution and "functional" US impacts on clinical practice.
3. To learn techniques that may improve users skill.

A-230 16:51

Breast specific gamma imaging: A novel, physiologic approach to breast cancer diagnosis
R.F. Brem; *Washington, DC/US (rbrem@mfa.gwu.edu)*

Breast specific gamma imaging is a novel, physiologic approach to molecular imaging of the breast which uses Tc sestamibi and a dedicated high resolution breast specific gamma camera for the diagnosis of breast cancer. This discussion will discuss the scientific basis for breast specific gamma imaging and will review the literature regarding the use of breast specific gamma imaging. Comparison of breast specific gamma imaging to other physiologic approaches to breast imaging including MRI will be discussed. Approaches to integration of breast specific gamma imaging in clinical practice as well as proper use in clinical practice will be reviewed. Finally, ongoing research and developments using breast specific gamma imaging will be discussed including dedicated gamma guided minimally invasive breast biopsy.
Learning Objectives:
1. To understand a new scintimammography method.
2. To learn to appreciate diagnostic information.
3. To learn about its position in relation to competing methods.
4. To learn about its possibilities and limitations.

Panel discussion:
How should we integrate modern technology into our clinical diagnostic routines 17:14

16:00 - 17:30 **Room D**

Imaging in Lung Diseases

CC 1018

Beyond morphological analysis of lung tumors

Moderator:
C. Beigelman; Paris/FR

A-231 16:00

A. New therapeutic horizons: What do radiologists need to know?
E.F. Patz, Jr.; *Durham, NC/US (patz0002@mc.duke.edu)*

Radiology plays a fundamental role in every aspect of clinical oncology. Imaging tumors provides invaluable information in establishing a diagnosis and directing patient management. It is also used to suggest appropriate treatment, determine prognosis, assess disease status following therapy, and guide interventional procedures. The conventional imaging appearance of lung cancer has been well described, but does not correlate with the ultimate phenotype. Lung cancer cells result from abnormal genes, which generate a complex host response. This creates a primary mass consisting of a spectrum of cells including tumor cells, inflammatory cells, fibroblasts, macrophage, and hematopoietic progenitor cells. Therefore, if diagnostic imaging is to reflect tumor biology it must learn to incorporate fundamental molecular properties of the disease and move beyond traditional anatomic and morphologic descriptions. The genesis of a molecular imaging initiative occurred in the early 1990s, with the use of positron emission tomography (PET) imaging and the glucose analog probe, 18 F 2-fluoro-2-deoxy-D-glucose (FDG). FDG-PET imaging has become one of the most important tools to evaluate cancer patients. As a move toward molecular imaging continues, the development of new targets, techniques, and tumor-specific imaging probes should provide more accurate diagnostic information. In the future, imaging may be able to address many current, unresolved diagnostic issues in oncology. Imaging studies that elucidate basic molecular events would increase our understanding of malignancies, and ultimately influence clinical practice and outcomes.
Learning Objectives:
1. To understand fundamental limitations in anatomical/morphological imaging of tumors.
2. To describe biological features of lung tumors.
3. To describe new approaches to imaging lung tumors.

A-232 16:30

B. Tumoral angiogenesis with CT
N. Tacelli; *Lille/FR (n-tacelli@chru-lille.fr)*

Highly vascularised tumours have been shown to be associated with a poor outcome for many types of cancers, including lung carcinomas. In this latter group, the prognosis remains poor with a 5-year survival rate of only 15%. The necessity for new approaches in the assessment of this type of cancer has triggered major interest in biologic parameters among which angiogenesis factors that are known to play an important role in the process of tumor growth and metastasis dissemination. An in-vivo marker of angiogenesis, obtained through non-invasive imaging, can provide an independent indicator of prognosis, enabling risk stratification for patients with cancer. Following the advent of fast scanning technology, there has been a resurgence of interest in tumour perfusion analysis with CT, initially focused on the degree of contrast enhancement during dynamic contrast material-enhanced

examinations over a limited volume-of-interest. However, tumour vasculature exhibits both spatial and temporal heterogeneity that does not make perfusion assessment straightforward. Recent technological advances of perfusion analysis now allow quantifying spatial changes in blood flow but also in capillary permeability throughout the entire tumour height. The purpose of this lecture is to review the new trends in evaluating tumoral perfusion and to investigate the potential of functional MDCT technology to monitor the efficacy of newly introduced antiangiogenesis drugs.
Learning Objectives:
1. To describe the CT parameters that enable characterisation of tumoral angiogenesis.
2. To learn about the current results of tumoral angiogenesis assessment with MDCT.
3. To describe the clinical impact of this novel evaluation of oncologic patients.

A-233 17:00
C. Nuclear imaging
N. Howarth; *Chêne-Bougeries/CH (nigel.howarth@grangettes.ch)*

Integrated PET/CT imaging has an established role in the management of cancer patients and is now recommended for all patients with curative non-small cell lung cancer. PET/CT provides information essential for staging and prognosis, for choice of management and monitoring of treatment and for the detection of recurrence. Recent technical developments in PET/CT permit rapid examinations with improved resolution. Compared with standard CT or stand-alone PET, the added value of fused imaging is uncontested. The clinical influence of preoperative PET/CT is currently undergoing extensive evaluation. Radiologists should benefit from an understanding of important aspects of molecular imaging to improve their contribution to patient management. With the increasing use of PET/CT in the management of cancer patients, imaging pitfalls must be recognized to avoid both false-positive and false-negative interpretation. The principles and good practices of PET/CT will be explained. Normal distribution of FDG, pitfalls and normal variants will be presented. Specific examples will be discussed to demonstrate how the combined information of images of human anatomy upon which biological information within body structures is added improves delineation of disease, can guide surgical and radiation planning and biopsy. Advances in technology result in new training requirements for radiologists who should promote close collaboration with nuclear medicine specialists.
Learning Objectives:
1. To understand how the combination of functional and morphologic data provides added value, helping patient management.
2. To learn the common pitfalls in PET/CT interpretation of lung cancer.
3. To emphasise the importance of a strong collaboration between nuclear medicine specialists and radiologists.

16:00 - 17:30 **Room E1**

Musculoskeletal

RC 1010

Hip through the ages

Moderator:
M. Padrón; Madrid/ES

A-234 16:00
A. The pediatric hip
D.J. Wilson; *Oxford/UK (david.wilson@noc.anglox.nhs.uk)*

Depending on the age of the child, hip symptoms may predict a variety of diseases. In the infant, developmental dysplasia and infection should be considered. After the age of 4, irritable hip most commonly due to transient synovitis is the commonest disease but infection is the more worrying condition. Perthes disease affects some and this condition overlaps into those over 8 who may have a slipped upper femoral epiphysis. Fractures and rare cases of osteonecrosis and chondrolysis are a concern in the adolescent. In the young and indeed in most cases, ultrasound provides a useful first line test. Aspiration of effusion may be both diagnostic and therapeutic. In the older child and, especially when SUFE is a risk, conventional radiographs with an external rotated “frog leg” view is very important. Despite the logistics problems in children, there is an important role for MRI especially in cases where the initial imaging does not explain the symptoms. I will review the imaging pathways and provide examples of common diseases. I will also discuss how to manage the difficult case and show recent audit data on detection rates and clinical management.
Learning Objectives:
1. To understand the age-specific diseases of the hip in children.
2. To appreciate the strengths and weaknesses of each imaging method.
3. To understand how imaging is used in the management of children’s hip problems.

A-235 16:30
B. The hip in the young athlete
C.W.A. Pfirrmann; *Zurich/CH*

Femoroacetabular impingement (FAI) is a common condition in the young athlete. FAI refers to a conflict between the proximal femur and the acetabulum. Both an abnormal shape of the proximal femur (FAI of the „Cam-Type“: Aspheric femoral head and/or a waist deficiency of the femoral neck) and the acetabulum (FAI of the „Pincer-Type“: Acetabular retroversion or a deep acetabulum) or a combination of the two may be present. For a long period, the FAI may be asymptomatic and the only clinical finding will be an impaired internal rotation of the hip joint. Later cartilage damage (outside-in abrasion of acetabular cartilage/delamination) and labral tears occur. Labral tears are most common in the anterosuperior aspect of the acetabulum. Anatomic variants like a sulcus may be present and should be distinguished from tears. A sulcus is common at the junction of the labrum with the transverse ligament and is generally located beyond the equator of the hip joint. Insufficiency fractures about the hip commonly occur in the region of the femoral neck. Another site vulnerable to overuse is the symphysis pubis. Often, a bone marrow edema pattern around the symphysis pubis is observed. This reflects the stress reaction of bone. Injury to tendon attachments in the young athlete occurs frequently about the adductor tendons. A characteristic finding is the „secondary cleft sign“, which reflects a partial tear of the adductor tendon aponeurosis. Injury to other tendon attachments such as the abductor tendons may occur, but tend to be less common.
Learning Objectives:
1. To understand the mechanisms of injury of the hip.
2. To recognise the imaging pattern of abnormalities of the hip.
3. To become familiar with femoroacetabular impingement.
4. To learn about the typical injuries to tendon attachments around the hip.

A-236 17:00
C. The ageing hip
A.H. Karantanas; *Iraklion/GR (akarantanas@gmail.com)*

Understanding age-related changes is essential for interpretation of imaging studies. Age is a risk factor strongly correlated with osteoarthritis (OA), which is the most common hip joint disease seen in adults. The diagnosis of OA is based on a combination of radiographic findings and characteristic subjective symptoms. The lack of a radiographic consensus definition has resulted in a variation of the published incidences and prevalence of OA. The progression of OA traditionally has been measured using radiographic joint space width (JSW). Weight-bearing radiographs centered on the hip are the most reproducible and reliable ones. The sequence of degeneration includes the following radiographic findings: joint space narrowing, osteophyte formation, subchondral sclerosis, and cyst formation. Current definitions of radiological OA based on reduced JSW and osteophytes display predictive validity for clinical hip OA. Radiographs are also useful for assessing developmental dysplasia and other congenital disorders which may lead to early OA. There are cases though that radiographs show minor changes and the clinical suspicion of early disease can be confirmed with more sophisticated imaging methods, such as CT and MRI. CT is helpful for additional measurements such as femoral and acetabular abnormal version which might lead to OA. Femoroacetabular impingement has been shown to cause labral and chondral lesions and leads to OA. Prompt recognition of abnormal head-neck junction on radiographs enables proper conservative or surgical treatment planning. MR arthrography is the method of choice for assessing the labra whereas CT arthrography might be used as an alternative for articular cartilage assessment.
Learning Objectives:
1. To become familiar with the radiographic assessment of the ageing hip.
2. To discuss the MRI findings of degenerative hip disease.
3. To review the various disorders which predispose for early osteoarthritis.
4. To recognise the advantages and disadvantages of CT and MR arthrography of the ageing hip.

16:00 - 17:30 **Room E2**

Extremity Joint MRI

MC 1025

Lower extremity: Anatomy, variants and pitfalls

Moderator:
M. Shahabpour; Brussels/BE

A-237 16:00

A. Hip

E. Llopis; *Valencia/ES (ellopis@hospital-ribera.com)*

Hip joint is designed for stability, supports the body weight and shifts mechanical loads during ambulation and activity to the lower extremities. Surrounded structures of the hip can be divided into static and dynamic and help to stability. The hip capsule, labrum and ligament, and primary iliofemoral ligament act as static stabilizers. The dynamic stabilizers are the surrounding muscles and their tendinous attachments, with the most significant group being the abductors. Hip musculature can be divided by anatomic location, quadrants (anterior, lateral, and posterior) or by functional groups (flexors, abductors, external rotators, and adductors). The hip has a ball and socket configuration, where the sphere of the femoral head moves free in the round cavity of the acetabulum. When there is abnormal contact between the femur and the acetabulum, premature degenerative changes might develop. There are some anatomic normal structures that should not be confused with injuries, the acetabular notch, transverse ligament, ligament teres normal variants of the labrum absence or partial deficiency of the labrum, normal perilabral recess between the attachment of the capsule and the labrum and sublabral sulcus. Also, communication between the joint and ileopsoas bursa or less frequently to the obturador bursa is present in a small percentage of the normal population. However, there are other anatomical variants that have increased incidence on symptomatic patients or early degenerative disease, such as cystic changes in the femoral neck, os acetabuli or inverted labrum; these findings should be carefully correlated with other injuries and with patient's symptoms.
Learning Objectives:

1. To describe normal hip anatomy, bone, labral, and musculotendinous structures.
2. To understand pelvis alignment and basic hip biomechanics.
3. To provide helpful clues to distinguish pitfalls from pathological conditions.
4. To review normal anatomy variants and their relationships with symptoms and syndromes: Causes or consequences?

A-238 16:30

B. Knee

B. Vande Berg; *Brussels/BE (bruno.vandeberg@uclouvain.be)*

Knee MR imaging represents an everyday challenge to many radiologists: What is the importance of MR imaging in patient management? How can we avoid false positive diagnoses? How can we optimise lesion characterization? This lecture will focus on normal anatomy of the meniscus and on variants that may simulate surgical lesions. The importance of displaced meniscal fragment will be demonstrated and several lesions that may mimic fragments will be displayed. Common ligament variant will also be described. We will also provide in-depth analysis of incidental bone and marrow changes frequently observed on knee MR images (red marrow hyperplasia, bone islands, enchondroma); although they have less diagnostic importance, over-diagnosis may cause unnecessary anxiety to the patients. Finally, we will demonstrate the venous anatomy of the knee with implications on knee imaging. We will not describe muscle variants.
Learning Objectives:

1. To provide an overview of the anatomy of the meniscus and ligaments with emphasis on variants that may simulate lesions.
2. To provide in-depth analysis of incidental bone and marrow changes frequently observed in knee MR images.
3. To demonstrate the venous anatomy of the knee with implications for knee imaging.

A-239 17:00

C. Foot and ankle

N. Saupe; *Zurich/CH (nadja.saupe@balgrist.ch)*

The purpose of this talk is to highlight anatomical variants of foot and ankle in the asymptomatic population as well as borderlands of normal and early pathological findings and also to discuss technical pitfalls in magnetic resonance imaging of foot and ankle. Special attention should be drawn to the complex ligament anatomy of the medial collateral ligaments (superficial tibionavicular ligament, tibiospring ligament, tibicalcaneal ligament and the deep anterior and posterior tibiotalar ligaments) and the tendon insertion of anterior and posterior tibial tendons. Technical pitfalls such as the influence of foot positioning on prevalence of the magic angle artifact (MAE) in ankle tendons and inhomogeneous fat suppression will be discussed. Additionally, various features of anatomic variants that are potentially associated with peroneal tendon disorders such as peroneus quartus muscle, low lying peroneus brevis muscle belly, size of peroneal tubercle and size of retrotrochlear eminentia as well as the shape of the fibular groove will be explained. The prevalence, pattern and size of bone marrow changes on short-tau inversion recovery (STIR) magnetic resonance images in asymptomatic feet and ankles such as cysts just inferior to the angle of Gissane and tiny bone marrow spots (vascular remnants) will be highlighted as well as plantar fat pad (PFP) signal intensity alterations under the metatarsal heads and their histological correspondence to fibrosis and adventitious bursae. This knowledge should prevent inaccurate interpretations and prevent unnecessary diagnostic work-up and treatment.
Learning Objectives:

1. To become familiar with the anatomy of foot and ankle.
2. To know the prevalence of anatomic variants that can be associated with pathologic conditions in the foot and ankle.
3. To understand the influence of foot positioning on prevalence and site of the magic angle effect in ankle tendons.

16:00 - 17:30 **Room F1**

Genitourinary

RC 1007

Kidney: Imaging and intervention

Moderator:
R. Stern Padovan; Zagreb/HR

A-240 16:00

A. Angiomyolipoma: A review

N. Grenier; *Bordeaux/FR (nicolas.grenier@chu-bordeaux.fr)*

Angiomyolipomas (AML) are benign tumors derived from the perivascular epithelioid cell (PEC) characterized at pathological examination by expression of melanocytic marker HBM-45. They contain various proportions of the three components: vascular, fatty and muscular. An epithelioïd variant with a malignant potential is exceptional. 80% are sporadic and 20% integrated to tuberous sclerosis. The association with a lymphangioleiomyomatosis is always possible: chest CT will be performed in TS and sporadic AML if large or associated with respiratory troubles. Characterization of AML is possible, based on identification of its fatty content mainly using CT. When microscopic, this component may be missed and biopsy is required with immunostaining. MR imaging may be helpful using chemical-shift sequences but thresholds, to rule-out clear cell carcinoma, have to be better defined. Presence of necrosis or calcifications rules-out diagnosis of AML. AMLs must be treated if hemorrhagic, painful or if diameter exceeds 4 cm. Embolization is the main nonsurgical method, using microparticles, alcool and/or coils but postembolization syndrome must be prevented. Volume regression may require all agents whereas aneurysm occlusion requires coiling. The effect on volume and on hemorrhagic risk is substantial making surgery as an alternative method for nephron sparing purposes. Secondary surgery is required in less than 10% of embolization. RF ablation is also possible but its efficacy is still under evaluation.
Learning Objectives:

1. To learn the high frequency of angiomyolipoma, and the possibility of complication.
2. To review the imaging appearance of typical and atypical angiomyolipoma.
3. To understand the higher incidence of angiomyolipoma in certain phakomatoses.
4. To learn about the possibilities of intervention and to discuss the indications and results.

A-241 16:30

B. The (not so) rare malignant tumors of the kidney

P. Hallscheidt; *Heidelberg/DE (Peter.Hallscheidt@med.uni-heidelberg.de)*

Caused by the hugh amount of ultrasound studies, by CT and MR scans many renal tumors are detected without symptoms. The radiologist has the duty to differentiate renal lesion and to diagnose malign tumours in adults and children. Modern imaging modalities like CT and MRI have the capability to differentiate renal tumours because of different attributes. Besides the benign tumors, the malign tumors like renal cell

carcinoma, complex cysts, metastasis of other malignomas and lymphomas of the kidneys have to be differentiated. Whereas CT has very high spatial resolution and the capability to detect calcifications, MRI with its high soft tissue contrast showed to be superior in detection of complex cysts and delineation of tumor thrombus. The most common and not so common renal tumours are demonstrated and typical findings are discussed.
Learning Objectives:
1. To review the malignant tumors of the kidney beyond renal cell carcinoma: Bellini duct carcinoma, chromophobe renal cell carcinoma, lymphoma, sarcoma, renal medullary carcinoma and metastases.
2. To learn how imaging can provide some clues for the diagnosis.

A-242 17:00

C. Radiofrequency and cryotherapy of renal tumors: Techniques, results and complications

J.-M. Correas, M.-O. Timsit, A. Méjean, O. Hélénon; *Paris/FR (jean-michel.correas@nck.aphp.fr)*

Conservative treatment is increasingly used for the treatment of small renal tumours in order to limit the renal function deterioration. The surgical procedure remains standard but minimally invasive therapy has been developed particularly for patients with multiple comorbidity factors (including age), hereditary renal cancer, chronic renal failure, and solitary functioning kidney. Multiple techniques can be applied including radiofrequency ablation, cryotherapy, microwave ablation and high-intensity focused ultrasound. Renal tumour ablation is facing some specific issues compared to the liver tumour ablation due to the high blood flow of both renal lesion and normal parenchyma, the limited amount of normal parenchyma for both preservation of the renal function and for the stabilization of the electrodes, and the sensitivity to heat of the collecting tubes in the renal sinus. The tumor size (over 4 cm) and the central position of the renal tumor seem to be the major limiting factors. The principles, indications and results of each technique will be discussed.
Learning Objectives:
1. To learn the technique and results of radiofrequency ablation of renal tumors.
2. To learn principles, indications and results of cryotherapy, microwave ablation and high-intensity focused US (HIFU).

16:00 - 17:30 **Room F2**

Special Focus Session

SF 10b

Breast cancer: How to evaluate response to treatment

Moderator:
T.H. Helbich; Vienna/AT

A-243 16:00

Chairman's introduction

T.H. Helbich; *Vienna/AT (Thomas.Helbich@meduniwien.ac.at)*

Neoadjuvant treatment has become a standard of care in locally advanced as well as in operable breast cancer. Response rates are high. There is, however, a lack of information on which modality is the best to evaluate response to treatment. Several modalities are offered such as imaging, blood probes, biological markers or a combination of all. The goal of this session is to discuss the value of imaging techniques like mammography, ultrasound, MRI, PET and other non imaging modalities, which evaluate response to treatment in breast cancer. Participants will learn to apply these different modalities; in addition, they will get an overview about limitations as well as success rate with respect to the response rates during neoadjuvant treatment. We look forward to welcome you all to get updated information, which could directly be implied in your clinical services.
Session Objectives:
1. To give a basic understanding of how breast cancer responds to treatment.
2. To explain how to evaluate response to treatment from an oncologic/surgical perspective.
3. To show how response to treatment is assessed with imaging techniques.

A-244 16:03

From genes to surgical outcome

M. Gnant; *Vienna/AT (michael.gnant@meduniwien.ac.at)*

Surgical strategy in breast cancer treatment greatly depends on tumor size, patient's anatomy, and breast tumor biology. Neoadjuvant treatment has become in standard of care in locally advanced cancer, but also in operable breast cancer where breast conservation may not be achievable without oncological or cosmetic compromises. Pre-treatment confirmation of malignancy is mandatory. Response rates are high, and overall response rates are usually reported between 60 and 90%. Complete pathological remission is optimal, and occurs between 3 and 60% of cases, greatly depending on tumor biology. Multimodality approaches require intense interaction between surgeons and diagnostic specialists. Both planning as well as definitive surgical strategy depend heavily on accurate response monitoring and assessment as well as localisation procedures. Breast conservation rates of 90% and more can be achieved in experienced interdisciplinary teams.
Learning Objectives:
1. To stress the multidisciplinary approach to therapy.
2. To report the response rate to neoadjuvant therapy.
3. To demonstrate whether surgical strategy is affected by radiological monitoring of neoadjuvant treatment.

A-245 16:21

Mammography and ultrasound

S. Delorme; *Heidelberg/DE (s.delorme@dkfz-heidelberg.de)*

Ultrasound and mammography are frequently used tools to follow-up breast cancer during neo-adjuvant chemotherapy. Although non-invasive and cost-effective, the results obtained with either method must be viewed with caution for several reasons: • Since necrotic cell death, rather than apoptosis, is the predominant mechanism of tumour response, an early shrinkage of a lesion is unlikely, even in responders. Furthermore, persistent stroma may be difficult to discriminate from vital tumour. This is of particular concern with mammography, since the stromal reaction, which is often marked, contributes greatly to the imaging features of breast cancer. • Ultrasound is examiner-dependent and so are all measurements. Even with a single examiner, the probe position may be impossible to be exactly reproduced. • With most probes being approximately 5 cm long, large or multicentric tumours may be difficult to measure in toto. • After a tumour has partially responded to chemotherapy, its overall size may be underestimated if isolated, small residual islets or intraductal components at its extremes are missed. Its size may be overestimated due to inflammatory changes or persistent stromal components. • In studies comparing ultrasound, X-ray mammography, and contrast-enhanced MRI with the results of the histopathological workup, the sizes measured on MRI scans were best correlated with the diameter of the pathologic specimen. In summary, ultrasound or mammography may be used to identify early those patients whose disease progresses despite treatment, but for planning of breast-conserving surgery, an additional contrast-enhanced MRI should be considered.
Learning Objectives:
1. To recognise treatment-induced changes.
2. To recognise the limitations of each method in assessing treatment response.
3. To understand the predictive value of US and mammography for the response to treatment.

A-246 16:39

MRI and more

F. Sardanelli; *Milan/IT (f.sardanelli@grupposandonato.it)*

A PubMed/Medline search found 59 original articles published from 06/1996 to 06/2009 reporting MRI in the neoadjuvant chemotherapy (NAC) setting in 2,355 patients. Of 40 studies (1,513 patients) on prediction of pathological response, 36 (1,385 patients) concluded in favor of MRI with a good-to-excellent correlation between size of residual disease (RD) at MRI and pathology (r=0.65-0.98). However, MRI underestimation/overestimation of RD and false negatives were highlighted. Patients with mass lesions presenting concentric shrinkage are good candidates to conserving surgery while multifocal/multicentric cancers or unique masses presenting dendritic shrinkage or fragmentation should undergo mastectomy. For non-mass lesions, the probability of underestimating RD is higher than for mass-lesions. NAC type should be considered: RD was frequently underestimated in patients treated with taxanes and in HER-2 negative patients treated with bevacizumab. MRI early prediction of treatment efficacy was reported by studies resting on MRI volumetric changes and/or kinetic analysis. Importantly, initial experience was retrospectively described that when NAC is switched if the reduction in the largest diameter is

< 25% at MRI, > 70% of nonresponders show a favorable clinical response, increasing the rate of conserving surgery. MRI is cost-effective if an early shift from an ineffective to a more effective NAC has a measurable benefit in the cure rate. MRI was also shown to predict disease-free and/or overall survival. Initial but promising results were shown using proton MR spectroscopy or diffusion weighted imaging. The ultimate benefit on survival in patients monitored with breast MRI in the NAC setting is not yet established.

Learning Objectives:

1. To demonstrate the potential of CE-MRI for evaluating response to treatment.
2. To understand the predictive value of CE-MRI for the response to treatment.
3. To introduce non-contrast MR techniques for evaluating response to treatment: DWI and spectroscopy.

A-247 16:57

PET, PET/CT and more

B. Sharma; *Sutton/UK (bhuey.sharma@rmh.nhs.uk)*

Anatomical techniques including CT and MRI, together with bone scan are generally used for breast cancer metastatic disease evaluation and treatment response assessment. Functional imaging, particularly PET/CT, is a powerful modality in breast cancer, indeed being useful for early response evaluation, prognostication, response assessment at 'difficult to image sites' and bone response. This talk will detail the strengths and weaknesses of 18 FDG PET/CT compared with all other conventional and new (including MRI Diffusion) imaging techniques with regard to assessing all different body systems/organs. Bone response is an especially difficult and exciting area for functional imaging techniques; SUV analysis will also be discussed as will the relative sensitivities of PET compared to other techniques - this being an important aspect for clinicians to understand. Hormone, chemotherapy, radiotherapy, the new entities of both 'pre and post liver Radiofrequency Ablation' and 'intracranial Gamma Knife' response evaluation will all be discussed, with practical guidance regarding appropriate imaging in patients in order to enable optimal patient management. PET/CT providing patient prognostication regarding treatment regimens will be detailed. The use of novel targeted radiotracers, such as ER PET imaging, will also be addressed.

Learning Objectives:

1. To understand the role of PET/CT relative to other modalities in staging primary and metastatic breast cancer.
2. To show the role of PET/CT in response evaluation (hormone and other treatments).
3. To focus on the strengths and weaknesses of PET/CT or other techniques (such as MRI/PET or optical imaging).

Panel discussion:
Can we still trust oncologists' fingers? 17:15

16:00 - 17:30 **Room G/H**

Neuro

RC 1011

Focal brain lesions

Moderator:
J. Walecki; Warsaw/PL

A-248 16:00

A. Differential diagnosis of T2 hyperintense lesions

A. Rovira-Cañellas; *Barcelona/ES (alex.rovira@idi-cat.org)*

Focal white matter T2 hyperintense lesions (THL) are commonly observed MRI abnormalities not only in the elderly, but also in middle age and young patients. In addition to physiological ageing brain changes, a large list of different disorders should be considered in patients presenting with THLs such as hypoxic-ischemic vasculopathies (atherosclerotic and hypertensive small vessel disease, CADASIL, Fabry's disease, Susac's syndrome), multiple sclerosis and variants, primary and systemic vasculitis, sarcoidosis, adult forms of leukoencephalopathies (metachromatic leukodystrophy, globoid cell leukodystrophy, adrenomyeloneuropathy, mitochondrial disorders, vanishing white matter, and cerebrotendinous xanthomatosis), trauma and radiochemotherapy, and acquired metabolic conditions (hepatic encephalopathy, alcoholism), among others. While it is recognized that a combination of findings from clinical history, physical examination, and laboratory tests is commonly required to correctly establish a firm and clear etiological diagnosis of THLs, a detailed analysis of different MRI features should also be considered essential: e.g. lesions shape, size, and distribution; contrast-uptake; associated structural lesions (microbleeds, infarcts, spinal cord, brainstem and cerebellar involvement, large-vessel disease). In addition to these conventional MRI-based features, non-conventional MR techniques (diffusion, MR spectroscopy, perfusion) may also provide in some cases useful diagnostic information. Knowledge of these features will assist the diagnostic work-up of patients presenting with THLs, and should be considered a first step to take full advantage of the potential of MRI, and in doing so should result in a reduced chance of misdiagnoses and facilitate the correct diagnosis of sometimes treatable disorders.

Learning Objectives:

1. To be aware of the limited specificity of brain multifocal T2 abnormalities.
2. To learn about recognition patterns that might be helpful in suggesting the most likely etiology of brain multifocal T2 lesions.
3. To learn about the role of spinal cord imaging and advanced neuroimaging techniques in the differential diagnosis of brain T2 hyperintense lesions.
4. To be able to establish a neuroimaging diagnostic strategy in patients with multiple brain T2 lesions of unknown origin.

A-249 16:30

B. Neoplasm or not? Decision making in focal mass lesions of the brain

Z. Rumboldt; *Charleston, SC/US (rumbolz@musc.edu)*

A variety of diseases including neoplasms, but also infectious, inflammatory, vascular and traumatic processes, may present as focal intracranial mass lesions. Modern neuroimaging, primarily with MRI, enables differentiation of these entities allowing for accurate diagnosis in almost all cases. The requirements are appropriate image acquisition and detailed analysis of imaging findings, while pertinent clinical information may be very helpful in certain cases. The distinction is frequently broad, between different disease processes, such as with tumefactive demyelination versus neoplasm, which is often sufficient for clinical decision making and patient management; at times this may be more specific, approaching histological diagnosis, such as with pilocytic astrocytoma versus medulloblastoma. This presentation will go briefly over the imaging techniques and various disease processes, while heavily concentrating on the differentiating imaging features and decision making process. Helpful clinical information will also be mentioned and emergent conditions stressed. The emphasis will be on the key distinguishing features, such as presence or absence of vasogenic edema, intra or extra axial location, signal intensity characteristics, presence and pattern of contrast enhancement, as well as diffusion and perfusion features. A number of cases with intracranial masses will then be reviewed and analyzed, using a step by step approach, accentuating the most reliable distinguishing findings.

Learning Objectives:

1. To list various pathologic processes that present as focal brain masses.
2. To define the differentiating imaging and clinical features of those processes.
3. To recapitulate the role of imaging techniques for differentiation of brain mass lesions.

A-250 17:00

C. Adult glioma: Advanced neuroimaging for treatment planning

C. Calli; *Izmir/TR (cemcalli@superonline.com)*

The role of MR imaging in gliomas consists of many steps. 1. Is there a lesion in the brain? 2. Is the lesion a tumor? 3. Is the tumor a glioma? 4. Is it a high- or low-grade glioma? 5. If there is a suspicion and a biopsy is planned, which part of the tumor should be targeted at biopsy? 6. How should the surgery be performed to avoid injury to functional areas of the brain (e.g., motor cortex)? 7. If there is need for adjunctive radiotherapy, how should the extent of the tumor be defined to be targeted for radiation? 8. After radiotherapy, if a new enhancing lesion occurs, is it a recurrent glioma or radiation necrosis? Conventional anatomical MR imaging is not always powerful enough to answer these questions. However, with advanced MR imaging techniques like diffusion MR (including tractography), perfusion MR, MR spectroscopy and functional MRI (fMRI), we can answer the above questions reliably in most cases.

Learning Objectives:

1. To emphasise different treatment protocols for different types of adult gliomas.
2. To give brief information about the advanced neuroimaging techniques, which may aid further pre-operative characterisation of adult gliomas.
3. To discuss the roles of various advanced neuroimaging techniques for glioma treatment planning.

16:00 - 17:30 **Room I**

Physics in Radiology

RC 1013

High field MRI: Beyond 3 T

Moderators:
E. Atalar; Ankara/TR
H. Köstler; Würzburg/DE

A-251 16:00

A. Challenges of high field MR

M. Bock; *Heidelberg/DE (m.bock@dkfz.de)*

Over the recent years the clinical MRI field strengths have gradually been increased to 3 Tesla; however, whole body MRI systems with higher fields of up to 9.4 Tesla have become available in experimental settings. Compared to clinical field strengths, MRI at very high magnetic fields has several advantages but also some unique challenges. With increasing field strength, the signal-to-noise ratio increases, which can be used to either increase the spatial resolution in the images, or to acquire the images more rapidly. Unfortunately, the energy deposited in the human body via the RF excitation scales quadratically with the field strength. Thus, the specific absorption rate (SAR) is a critical factor in all rapid imaging protocols and requires the design of RF pulses with low SAR, (e.g. VERSE pulses). Inhomogeneities of the RF field which are induced by standing wave phenomena have to be compensated, and make the design of efficient spin echo pulse sequences very difficult. At higher field also, the field inhomogeneities become larger and stronger imaging gradients are required to overcome the susceptibility-induced image distortion. Stronger gradient systems are difficult to manufacture, and the usable gradient slew rate is limited by peripheral nerve stimulation thresholds. Furthermore, stronger and faster gradients become very loud at high fields, and special measures for sound protection are required. Despite these limitations, high field MRI offers image with very high resolution, it provides unique contrasts, a better spectral separation of the resonance lines and high signal for non-proton applications.
Learning Objectives:

1. To explain how the increased field strength affects exposure and image quality characteristics.
2. To describe MR imaging protocols developed for ultra-high field MRI.
3. To become familiar with technology for specific absorption rate reduction.

A-252 16:30

B. A complicated solution to a complicated problem: Transmit array

K.P. Pruessmann; *Zurich/CH (pruessmann@biomed.ee.ethz.ch)*

Clinical MRI usually aims to depict anatomic regions of interest with uniform coverage and contrast behavior. To this end it is essential to use suitably homogeneous radiofrequency (RF) magnetic fields for spin excitation, refocusing, and saturation. Traditionally, such uniform transmit fields are generated by volume resonators based on quasi-stationary electrodynamics, which, however, gradually cease to apply as clinical MRI explores high field strengths of 3T and beyond. The concomitant increase in operating frequency entails shorter RF wavelength and increasing tissue interactions, which render the tayloring of RF fields substantially more complex and patient-dependent. One promising response to this challenge is to depart from volume resonators and perform RF transmission by multiple, individually fed transmitter elements. With such transmit arrays the effective RF field can be taylored on a per-patient and per-scan basis by adjusting the relative magnitude and phase of driving the elements (RF shimming). In advanced implementations the phase and magnitude relations are even varied during RF pulses. In combination with equally dynamic gradient waveforms such fully individual control permits particularly fast spatially taylored RF pulses (Transmit SENSE). Array transmission entails a generalization of RF pulse design, for which a range of efficient mathematical mehods have been developed. One important challenge that remains, however, is the need to calibrate array transmitters in terms of the individual channels' RF field contributions, both magnetic and electric. The latter, in particular, underlie power deposition in the tissue and hence need to be closely controlled to enforce strict SAR limits.
Learning Objectives:

1. To learn about the need to control radio-frequency fields, particularly at high B0.
2. To understand the principles of doing so by multiple-channel transmission.
3. To get acquainted with the methods of obtaining uniform and tailored excitation within SAR limits.

A-253 17:00

C. Is 7T ready for clinical use?

R.W. Bowtell; *Nottingham/UK (richard.bowtell@nottingham.ac.uk)*

The availability of magnetic resonance (MR) scanners operating at 7T and above has already proved beneficial for MR imaging and spectroscopy of the human brain and promises similar benefits in the human body. These advantages result from the increases with the magnetic field of the intrinsic signal-to-noise ratio, blood oxygenation level dependent (BOLD) contrast, which forms the basis of the vast majority of functional MR imaging (MRI) experiments, and chemical shift dispersion. These gains can be exploited in improving the spatial and/or temporal resolution of anatomical and functional MRI experiments and in increasing the spectral resolution in volume selective spectroscopy or chemical shift imaging. Operation at the increased magnetic field also offers easier access to T_2^*-contrast and improved implementation of susceptibility-weighted imaging (SWI) in which the phase of gradient echo images provides information about local variation of magnetic susceptibility. In the brain, such variation appears to be dominated by differences in iron concentration and myelin content, so that high-field SWI may provide useful information about the progression of neurodegenerative disease. The elevated T_1- relaxation times at 7 T also offer benefits for arterial spin labelling and time of flight angiography. Current and potential future applications of high-field MRI in clinical and pre-clinical studies in a number of areas will be discussed in this presentation, along with the barriers to wider usage of 7 T systems in clinical studies.
Learning Objectives:

1. To categorise the advantages that 7T provides for magnetic resonance imaging and spectroscopy.
2. To identify the areas of clinical application where 7T already offers significant benefits over lower fields.
3. To highlight the barriers to clinical usage of 7T.
4. To recognise the technical developments that will help to overcome these barriers and allow wider clinical usage of 7T.

16:00 - 17:30 **Room L/M**

Radiographers

RC 1014

Administrative issues

Moderators:
K. Åhlström Riklund; Umeå/SE
S. Braico; Rome/IT

A-254 16:00

A. Lean project at OUH

L. Tarp; *Odense/DK (lene.tarp@ouh.regionsyddanmark.dk)*

Purpose: We will illuminate how lean can be used in a Department of Radiology and how we can optimize patient journey and decrease non-value-added waste with existing resources. The main goal is to create a high quality system by eliminate waste and increase patient safety and worker satisfaction in order to make a lean culture. The first goal is to comply with the department's targets for waiting time for the patient journey within our whole working process. The second goal is to optimize the daily production to reduce the wasting time and waiting time for every patient journey. A third goal is to get the staff involved and make better working environment for them.
Methods and Materials: We have meetings in every team on a weekly basis to discuss measurement and development in the team. We made analysis of patient journey in every team and we made analysis of working - to reduce/eliminate waste and increase efficiency.
Results: 1. Optimization of patient journey; Waiting time can now be met on the examination. 2. Optimization of production, better workflow gives organized and more efficient rooms. 3. Working environment for staff, time for training and development of staff was found.
Conclusion: Creating a lean culture will increase production, improve the patient journey and make better working environment for staff. It will change the organization by allowing the basis staff to get involved in organizing their part of the work within the team and also to put the focus on the patient's expectation for service.
Learning Objectives:

1. To learn about lean thinking and how lean tools can be used in a radiology department.
2. To understand how different lean tools can improve the patient journey.
3. To learn about improving the working environment for staff.
4. To understand how a lean culture can increase job satisfaction.
5. To understand the challenges of how to get people involved.

A-255 16:45

B. Lean project at the NHS Lothian Edinburgh

L. Hudson; *Edinburgh/UK (lorraine.hudson@luht.scot.nhs.uk)*

NHS Lothian required improvement in its capacity and capability by significant service redesign. A Lean programme was implemented in 2006.The initial project was to reduce CT waiting times for cancer patients. The CT service consisted of 6 scanners spread across 4 sites in Lothian. Each department worked as a stand-alone service with little collaboration. Administration processes and waiting times varied in each department. The longest wait for an appointment was 21 weeks. A large, multidisciplinary staff group worked together during a 'Kaizen' (Japanese for change for the better) week. A two month period of intense preparatory work gathering information and data from key staff was necessary prior to the event. Good communication with staff was essential through introductory meetings to alleviate fears and suspicion of change. Work practices were analysed through process mapping with an aim to reduce waste and increase value for patients and staff. Referral pathways were streamlined, reducing delays and inappropriate referrals. Information was improved increasing the effectiveness of patient understanding of examination procedure and preparation. Waiting lists were pooled across Lothian with agreed protocols and scheduling. At the end of the Kaizen week, the booking turnaround time was reduced from 31 days to 24 hrs and the maximum waiting time reduced from 21 to 6 weeks, the average being 2-3 weeks. The commitment of time and support from senior management empowered staff to take ownership of the service they provided. Staff identified areas for improvement and found their own solutions, achieving dramatic and sustained benefits for patients.

Learning Objectives:

1. To learn how we identified diverse practices across the 4 CT sites within Lothian.
2. To gain knowledge on how we improved waiting times, communication and identified and removed waste in our systems by using 5 Sigma, Kaizen, and Work Out.
3. To understand the obstacles to the implementation of change due to diverse personalities and processes across our radiology departments.
4. To appreciate the importance of communication and support of our Health Board and Executive management team and the requirement to involve the whole multidisciplinary team.

16:00 - 17:30 **Room N/O**

Head and Neck

RC 1008

Suprahyoid neck

Moderator:
C. Czerny; Vienna/AT

A-256 16:00

A. Neck spaces: What you need to know

S. Bisdas; *Tübingen/DE (sotirios.bisdas@med.uni-tuebingen.de)*

The rational analysis of the masses and pathologies arising in the suprahyoidal neck necessitates an exact localization. There is a certain overlap, sometimes resulting in confusion, between the anatomical and surgical borders and definitions of the neck spaces. It is necessary for the clinical radiologist to elucidate the complex anatomical relationships from a radiological point of view and to present the critical contents of each space. Thus, a space-orientated differential diagnosis may be facilitated. According to the localization and the typical CT and MR imaging appearance of various lesions, the differential diagnosis may be narrowed down to specific pathologies. Common pathologies in the vicinity of the critical contents as well as pathologies extending beyond one anatomical space are also of major interest for the radiologist and crucial for the patient's treatment. Therefore, CT and MR surveys should be meticulously read for such imaging findings.

Learning Objectives:

1. To identify the CT and MR imaging landmarks of the suprahyoid neck spaces.
2. To identify the common diseases and their typical appearance in each suprahyoid neck space.
3. To use the neck spaces as a basis for differential diagnosis in the suprahyoid neck.

A-257 16:30

B. How to ruin or improve your head and neck study

V. Chong; *Singapore/SG (dnrcfhv@nus.edu.sg)*

The anatomy of the suprahyoid neck is complex and the spectrum of diseases is wide. To improve studies of the neck, radiologists should become increasingly more familiar with the anatomy and expected pathology in the various spaces. This familiarity provides crucial information required for the selection of treatment options and therapeutic planning. In addition, radiologists should be aware of situations when diagnostic inaccuracies may lead to serious consequences and complications. For example, surgical approach to a deep lobe parotid tumour as though it is a parapharyngeal lesion will in all likelihood result in facial nerve injury. MRI artifacts such as complex flow-induced increase in signals may be mistaken as a lesion prompting an unnecessary operation. An awareness of such pitfalls helps to improve the quality of imaging studies. This presentation highlights some pertinent anatomical knowledge that may help improve the diagnostic accuracy of neck studies and at the same time explain the existence of pitfalls that may ruin imaging studies.

Learning Objectives:

1. To learn the anatomic basis of imaging abnormalities.
2. To understand the pathologic basis of image interpretation.
3. To learn the potential pitfalls of radiologic diagnosis.

A-258 17:00

C. Tips and tricks in the parapharyngeal space

A. Trojanowska; *Lublin/PL (agnieszka30@yahoo.com)*

Parapharyngeal space (PPS) belongs to the deep spaces of the neck and it has a shape of inverted pyramid. The base of the pyramid is attached to the skull base and the apex reaches the level of hyoid bone. Primary neoplasms arising in this space are very rare, and parapharyngeal space becomes the most frequently invaded or displaced by processes growing in adjacent spaces. Based on the direction and pattern of PPS and its vessels' displacement, a detailed differential diagnosis can be made. Both MRI and CT are frequently used for imaging of PPS pathological conditions, and the introduction of functional imaging has given also some benefits. Primary and secondary, benign and malignant processes of PPS will be discussed in detail. These will include: cysts, salivary gland tumors, schwannomas, paragangliomas, squamous cell carcinomas, enlarged lymph nodes, lymphomas, vascular malformations, and inflammatory diseases. Since correct diagnosis requires close collaboration with ENT surgeons; clinical findings will be also discussed, together with principal information which should be included into report.

Learning Objectives:

1. To become familiar with the anatomy and pathology of the parapharyngeal space.
2. To review the proper imaging technique to examine parapharyngeal space lesions.
3. To learn how to differentiate between benign and malignant lesions.
4. To provide a template of the 'perfect' report.

16:00 - 17:30 **Room P**

Chest

RC 1004

Chest in the emergency room

Moderator:
A.P. Parkar; Bergen/NO

A-259 16:00

A. Can chest radiography tell you the whole truth?

K. Malagari; *Athens/GR (kmalag@otenet.gr)*

Chest radiography is the most frequently performed imaging examination performed in the emergency room. It allows a first assessment of the bony cage and lungs. Mediastinal emergencies are not feasible to appreciate; however, a normal chest X-ray has a high negative prognostic accuracy. Entities that may be missed will be discussed in this session. Positive intrathoracic findings include pleural effusion, diffuse or focused alveolar opacities, and signs of extraalveolar air. Fractures and dislocations are also feasible to recognise on the chest radiogram - but further evaluation is only possible with CT imaging. The signs of pleural effusion and extraalveolar air in the supine and erect position are going to be discussed in detail. The various causes of local «alveolar» opacities in the emergency setting most

frequently include aspiration, infection, atelectasis, contusion, and laceration. The differential diagnosis of these findings is going to be discussed thoroughly. At the end of the session, the audience will be able to take full advantage of the findings of chest X-ray and appreciate what is the best imaging algorithm to further proceed with the diagnosis.

Learning Objectives:

1. To describe potential pitfalls of plain film in the emergency department.
2. To present the negative and positive predictive value of chest films in the emergency setting.
3. To become familiar with imaging features of the spectrum of emergency conditions.

A-260 16:30

B. Triple rule-out CT in atypical chest pain: Must or luxury?

G. Savino; *Rome/IT (gsavino@sirm.org)*

A variety of pathologies such as pneumonia, pneumothorax, pericarditis or more life-threatening conditions such as acute coronary syndrome, acute aortic syndrome or pulmonary emobolism may present with the same clinical condition: chest pain. It has been estimated that each year in the United States, approximately 5 million patients present to emergency department (ED) with acute chest pain and over more than 1.5 million are admitted after the standard diagnostic work-up. For most of these patients, no cardiac pathology is detected. Hospitalization is mandatory for patients with typical signs of myocardial ischemia, whereas those without risk factors for coronary heart disease, without typical cardiac chest pain and with a normal electrocardiogram, are usually discharged. Diagnostic uncertainty arises, however, for a substantial number of subjects who are usually subjected to further investigations, with the result of longer hospitalization and higher costs. The advent of 64-slice MDCT scanners has made it possible to perform a non-invasive high-resolution study of the thorax, allowing evaluation of the coronary arteries, aorta and pulmonary arteries. The aim of this lecture is to discuss the utility of MDCT angiography of the thorax as triage tool in patients with acute chest pain and to examine the impact of this modality on patient and hospital management as well as in the clinical-decision making. The technical principles and the diagnostic algorithms for using a single ECG-gated 64-slice CT scan in ED for triple-rule-out of acute pulmonary embolism, aortic dissection, acute coronary syndromes and other diseases of the chest are discussed.

Learning Objectives:

1. To learn how to perform a triple-rule-out scan by MDCT.
2. To understand how to select patients with typical chest pain.
3. To present clinical cases and to review the evidence data.

A-261 17:00

C. Imaging of chest trauma

A. Oikonomou; *Alexandroupolis/GR (aoikonom@med.duth.gr)*

Thoracic injury overall is the third most common cause of trauma following injury to the head and extremities. More specifically, penetrating thoracic injury is the cause of 4-15% of admission to major trauma centres. Blunt and penetrating thoracic trauma has a high morbidity and mortality accounting for approximately 25% of trauma-related deaths, second only to head trauma. More than 70% of cases of blunt thoracic trauma are due to motor vehicle collisions with the remaining caused by falls or blows from blunt objects. Penetrating thoracic injury is mainly caused by knives and handgun bullets. Mechanisms of injury are discussed and spectrum of abnormalities and radiologic findings encountered in blunt and penetrating thoracic trauma are categorized in injuries of pleural space (pneumothorax, hemothorax), lungs (pulmonary contusion, laceration, herniation), airways (tracheobronchial lacerations, Macklin effect), esophagus, heart, aorta and great vessels (injury to thoracic aorta, internal mammary artery and aortic arch branches), diaphragm and chest wall (rib, scapular, sternal fractures and sternoclavicular dislocations). The possible coexistence of multiple types of injury in a single patient is stressed and therefore systematic exclusion after thorough investigation of all types of injury is warranted. The superiority of CT over chest radiograph in diagnosing chest trauma is well documented. Moreover, with the advent of MDCT the time of scanning the trauma patient has significantly reduced to several seconds allowing more time for post-diagnosis appropriate care. Finally, high-quality multiplanar and volumetric reformatted CT images greatly improve detection of injury and enhance the understanding of mechanisms of trauma-related abnormalities.

Learning Objectives:

1. To discuss epidemiology, mortality - morbidity, significance, pathophysiologic features and mechanisms of injury in blunt chest trauma.
2. To discuss the typical radiologic findings as well as pitfalls associated with the wide spectrum of types of injury in the thorax, including injury of the lung parenchyma, trachea and airways, aorta (and aortic vessels), heart and pericardium, esophagus, pleura, diaphragm and thoracic wall. Possible coexistence of multiple types of injury is stressed.
3. To review the advantages and diagnostic impact of CT/MDCT for selected injuries over other modalities and discuss recommended imaging protocols and algorithms.

16:00 - 17:30 **Room Q**

Professional Challenges Session

PC 10

PET/CT in oncologic imaging

Moderators:
E. Breatnach; Dublin/IE
A. Chiti; Milan/IT

A-262 16:00

Chairmen's introduction

E. Breatnach[1], A. Chiti[2]; [1]*Dublin/IE*, [2]*Milan/IT*

This combined session from European Society of Radiology (ESR) and European Association of Nuclear Medicine (EANM) representatives is intended to illustrate the complementary role of techniques from both specialties in patient investigation, focussing on specific topics in oncologic PET/CT. The session will highight areas of knowledge which are necessary for good quality reporting of PET/CT, and where the benefits of knowledge of principles in the complementary specialty are illustrated. For the radiologist, updates on newer tracer elements and their application will be presented, and for the Nuclear Medicine physician and radiologist the CT correlates of benign processes which may mimic abnormality in oncologic patients on PET/CT will be illustrated.

Session Objectives:

1. To familiarise radiologists and nuclear medicine physicians with the causes and imaging features of common false positive and false negative PET/CT findings.
2. To describe new possibilities to increase specificity and sensitivity of PET/CT.
3. To give a practical update on the development of newer tracers in PET/CT.

A-263 16:05

New probes to increase specificity and sensitivity of PET/CT in oncology

W. Weber; *Freiburg/DE*

PET is currently almost exclusively performed with the glucose analog fluorodeoxyglucose (FDG). While FDG allows a surprisingly sensitive and specific diagnosis of many human cancers, there is a clear need for a further characterization of malignant tumors and for even more sensitive and specific detection of metastases. Radiolabeled ligands binding to specific receptors on the surface of cancer cells offer the opportunity to improve the diagnostic accuracy of PET for these applications. PET with such radioligands can also identify patients who will benefit from radionuclide therapy targeting these receptors. The use of receptor PET is most advanced in the area of for neuroendocrine tumors (NETs) which frequently express somatostatin receptors (SSTRS). This receptor class can be targeted by a variety of radiolabeled octreotide derivatives such as tetraazacyclododecane-tetraacetic acid tyrosine octreotid (DOTATOC). PET with these radioligands allows highly accurate diagnosis of NETs, but is also used to select patients for treatment with Yttrium-90 DOTATOC. Ligands for the integrin alpha-v beta-3 can be used to assess the expression and function of this integrin. These ligands (RGD peptides) are being tested in clinical studies for planning and monitoring of therapies targeting angiogenesis or tumor cell invasiveness. Another target being investigated is the GRP (gastrin releasing peptide) receptor, which is expressed on the majority of breast and prostate cancer cells. In conclusion, PET with receptor ligands provides a unique opportunity to improve the sensitivity and specificity of PET/CT.

Learning Objectives:

1. To learn about receptors that are being studied as targets for PET imaging probes.
2. To understand the strengths and limitations of receptor PET imaging.
3. To appreciate the potential clinical applications of receptor PET.
4. To become familiar with the current status of research on PET ligands for somatostatin receptors, gastrin releasing peptide receptors and integrins.

A-264 16:23

The added value of contrast-enhanced PET/CT

T.F. Hany; *Zurich/CH*

Anatomical information is an additional benefit in co-registered PET/CT imaging and improves localization of pathological FDG uptake. Different CT systems (single or multi-slice spiral CT scanner) are used in hybrid PET/CT system. Since the application of contrast media is a standard procedure in CT, application of contrast has been also mandated in co-registered imaging. The beneficial use of intravenous contrast is dependent on tumor type, e.g. for certain indications like melanoma or lymphoma, intravenous contrast is not needed. For other malignancies, especially abdominal malignancies, single - up to triple phase intravenous contrast enhanced CT protocols including arterial, portal venous and late phase imaging are implemented depending on the tumor type. Especially in the evaluation of the liver in primary liver tumors like hepatocellular carcinoma or metastases from neuroendocrine carcinoma of the gastrointestinal tract (GIT) as well as in the evaluation of pancreatic cancer, arterial phase imaging is a standard procedure. Also in the ENT-tract, intravenous enhanced CT helps to delineate the primary tumor and especially necrotic, cystic lymph node metastases. Positive as well as negative oral contrast agents are used for delineation of the gastro-intestinal tract (GIT) from adjacent structures. Recently, liquid low density oral contrast agents as a mixture of locust bean gum and mannitol for CT have been demonstrated to be favorable in the use for PET/CT. Technical issues, indications and implications in the use of positive as well as negative oral contrast agents and intravenous contrast enhancement in PET/CT imaging are discussed.

Learning Objectives:

1. To understand the technical application of contrast agents in PET/CT.
2. To know the indications and limitations for intravenous contrast enhanced PET/CT.
3. To learn new combined functional applications from CT imaging like CT-perfusion imaging integrated into a PET/CT protocol.

A-265 16:41

Causes and imaging features of false positives/false negatives on PET/CT in oncologic imaging

C. Smith; *Dublin/IE*

F18-FDG is a glucose analogue that is taken up and retained by a wide range of malignancies. F18-FDG PET/CT is now firmly established as an accurate method for the staging and restaging of various cancers. It is however well recognised that many false positive and false negative results can occur when interpreting oncology PET/CT scans. F18-FDG accumulates in normal tissue and other non-malignant conditions and some malignancies do not take up F18-FDG or have a low affinity for the tracer. PET/CT allows for the correlation of two separate imaging modalities, combining both morphological and metabolic information. The CT component is routinely used for attenuation purposes and to accurately locate the FDG uptake. We should however also use the CT to help interpret the PET findings. In this talk we will highlight specific false negative and false positive findings that would one should be aware of when interpreting staging scans for individual cancers. One such example is osteoblastic breast metastases, which can be PET negative. We aim to highlight specific conditions such as radiation changes, drug toxicities, thymic hyperplasia, flare response that are encountered routinely on restaging scans that can lead to false positive interpretations. We will emphasise the importance of using the CT component to help recognise these entities to allow improved diagnostic accuracy. In light of the increased use of PET/CT, it is important that nuclear medicine physicians and radiologists be aware of these conditions and correlate the PET and CT components to avoid misdiagnosis, over staging of disease and unnecessary biopsies.

Learning Objectives:

1. To describe and discuss the common false positives and false negatives encountered by interpreting physicians on routine oncologic F18-FDG PET/CT.
2. To identify the pitfalls of F18-FDG PET/CT in imaging specific cancers.
3. To emphasise the importance of interpreting the PET images in conjunction with the CT images to give an accurate diagnosis.

A-266 16:59

New tracers in oncologic PET/CT

H. Schoder; *New York, NY/US*

New PET tracers in oncology can be characterized by their chemical structure, their mechanism of uptake and retention, and the "hallmark of cancer" they visualize. This presentation discusses some agents currently used in clinical trials. Choline (^{11}C or ^{18}F) uptake reflects choline kinase activity (enzyme up-regulated in cancer) and membrane synthesis. Accumulating data show promise for the imaging of brain tumors and recurrent prostate cancer (PSA relapse). ^{18}F FLT is a marker of cellular proliferation. Its cellular uptake is proportional to thymidine kinase 1 activity. Since FLT uptake in most primary malignancies is low (lower than FDG uptake), it is not a suitable tracer for tumor staging. Instead, FLT may provide prognostic information, serve for treatment monitoring, and possibly differentiate radiation necrosis from recurrence in treated gliomas. Many current clinical trials incorporate FLT PET as an exploratory response measure. Antigens and receptors, expressed on the surface of tumor cells, can be targets for PET. Imaging of estrogen and Her2 receptors in breast cancer (^{18}F FES; ^{68}Ga/ ^{64}Cu herceptin) may be useful in predicting and monitoring the response to hormonal therapy or trastuzumab. In prostate cancer, imaging of the androgen receptor (AR) with ^{18}F FDHT provides insights into tumor biology. In contrast to widespread believe, AR is expressed and important for tumor growth and survival in all clinical states, including castrate-resistant metastatic disease. AR imaging appears useful in predicting and monitoring the response to novel anti prostate cancer drugs.

Learning Objectives:

1. To briefly discuss new PET tracers already in clinical use and other tracers with likely clinical utility in the next 3-5 years for selected disease settings.
2. To discuss how new PET tracers can aid in moving the field of oncologic imaging from merely visualising the extent of disease to an improved understanding of tumor biology.
3. To provide examples of how new PET tracers can impact the clinical management of cancer patients.

Panel discussion 17:17

Sunday, March 7

08:30 - 10:00 **Room A**

Radiology in Abdominal Emergencies

CC 1117

The hole in the guts

Moderator:
S.K. Puri; New Delhi/IN

A-267 08:30

A. Wasting time with plain radiography?
M. Laniado; *Dresden/DE*

In recent years, continuing trends in radiology have diminished the importance of plain films of the abdomen significantly. Ultrasonography and MDCT are applied with enormous success to the investigation of many abdominal conditions in the emergency setting. In the eyes of the radiologist, plain films, therefore, seem irrelevant in the presence of such powerful imaging procedures. Surprisingly, referring physicians, mostly surgeons, gastroenterologists and urologists, still request plain films although the potential of MDCT is obvious to them as well. In their perception, the plain film is either a definitive examination before initiation of treatment (e.g. stone at the ureteropelvic junction in US proven hydronephrosis) or a preliminary study prior to MDCT or surgery (exclusion of pneumoperitoneum or ileus). In the present climate of cost and radiation consciousness this trend may continue. Moreover, many surgeons, gastroenterologists, urologists, etc. have greater skills in reading plain films than in understanding MDCT. Therefore, the radiologist should be as much familiar as the referring physician with plain film appearances of many types of abdominal pathology and established roentgen signs. The purpose of the presentation is to review remaining indications for abdominal plain films and to revisit common imaging findings.
Learning Objectives:
1. To review the most common causes of hollow organ perforation.
2. To know the optimal technique for plain film of the abdomen in the emergency setting, signs of perforation.
3. To discuss if there are still indications for plain film of the abdomen in the era of US and CT.

A-268 09:00

B. Defining the role of US
J.B.C.M. Puylaert; *The Hague/NL (dr.jbcmpuylaert@wxs.nl)*

When a defect occurs in the bowel wall, air will appear within the peritoneal cavity, most frequently due to perforated peptic ulcer and perforated sigmoid diverticulitis. In most perforating gastrointestinal conditions, however, the -imminent- perforation is walled-off by neighboring bowel loops, mesentery and especially by the omentum, nick-named “policeman of the belly”. If this walling-off process occurs timely and effectively, no or only minimal free air will appear. The most important causes of walled-off gastrointestinal perforation are appendicitis, peptic ulcer disease, sigmoid diverticulitis, bowel malignancy, Crohn’s disease and - often underdiagnosed - accidently ingested sharp foreign bodies, as toothpicks, fish bones, chicken bones, etc. The extent to which the perforation is walled-off, determines the eventual course of the disease. The US hallmark of - imminent - perforation is inflamed fat around the involved bowel structure. Inflamed fat on US corresponds to what is often called “dirty fat” on CT scan: hypodense fat is interspersed with hyperdense streaks. This represents edema or cellular infiltration of the fatty mesentery and omentum, which have migrated towards the site of the imminent perforation in an attempt to seal it off. On US, inflamed fat is recognized as hyperechoic, non-compressible fatty tissue often interspersed with hypoechoic streaks. If fluid collections occur within the inflamed fat, this implies abscess formation. Inflamed fat is an important and valuable sign in perforating gastrointestinal conditions. If found in the absence of bowel pathology, the diagnosis is usually epiploic appendagitis or omental infarction.
Learning Objectives:
1. To understand the strength of US as the primary imaging modality.
2. To know typical signs of bowel perforation.
3. To be aware of the limitations and pitfalls of US.

A-269 09:30

C. In search of the hole: CT
A. Laghi; *Latina/IT (andrea.laghi@uniroma1.it)*

MDCT is an extremely powerful tool when the search for a GI perforation is required. In fact, the high spatial and contrast resolutions, much higher than conventional X-ray, make MDCT the most accurate imaging method to identify even small amount of free intraperitoneal air. There is general consensus about the acquisition of a contrast-enhanced scan acquired during the portal venous phase of enhancement (delay of around 60-70 sec). Controversies are still present in the literature about the utility of a pre-contrast scan as well as the need for a preliminary administration of an oral soluble iodinated cm or for an enema or gaseous distention of the distal GI tract. Image reviewing needs the use of a workstation since multiplanar reformations have been demonstrated to improve the detection of small amount of free air. An appropriate window setting (in particular the use of wide windows, i.e. lung window) is mandatory and it makes MDCT 100% accurate for identification of free air and almost 90% accurate in the identification of the precise site of perforation. In fact, the aim of the examination is not only to assess the presence of free air, but also to detect the site of perforation: this is extremely useful clinical information especially if surgeons decide to perform a laparoscopic repair. Several CT signs have been described, able to guide the diagnosis and to differentiate between a perforation originating in the upper GI tract (stomach and duodenum), in the small bowel or in the colon.
Learning Objectives:
1. To learn the appropriate imaging protocols in patients with suspected bowel perforation.
2. To learn useful signs for the detection and localisation of perforation.
3. To discuss imaging strategies in case of clinical suspicion of bowel perforation.

08:30 - 10:00 **Room B**

Radiology of the Spine in 2010

CC 1116

Advanced imaging techniques in the spine

Moderator:
M. Leonardi; Bologna/IT

A-270 08:30

A. Benign vs malignant fracture in the spine
A. Baur-Melnyk; *Munich/DE (Andrea.Baur@med.uni-muenchen.de)*

Vertebral collapse is common in the elderly population. The underlying condition is osteoporosis or metastases. Signal characteristics are the same for benign as well as for neoplastic disease, e.g. hypointense on T1 and hyperintense on STIR. Both show contrast uptake. Therefore, the knowledge of morphological signs are important to know to better discriminate these entities. New imaging techniques, such as diffusion and perfusion of the spine, can help in differential diagnosis. Diffusion-weighted imaging has been especially used for the differentiation of benign and neoplastic vertebral collapse. Different sequences have been explored. Qualitative analysis can be done reliably with steady state free precession sequences (SSFP-Siemens, Erlangen). Hypointense or isointense signal is associated with benign edema, whereas tumor shows hyperintensity in contrast to normal surrounding marrow. Several studies applied quantitative DWI to normal and pathological vertebral bone marrow. Pathological bone marrow exhibits much higher diffusivities, ranging from about 0.7 to 1.0×10^{-3} mm²/s in metastases as well as malignant fractures. In acute osteoporotic and traumatic fractures ADCs of 1.0 to 2.0×10^{-3} mm²/s were found. Although a certain overlap of ADC ranges can be seen, ADC measurements can be useful for the differentiation of benign vertebral fractures and metastatic lesions. Perfusion of vertebral fractures might also be a potential for the discrimination of acute benign and neoplastic fractures. In first studies, FDG PET/CT can help for the differentiation of benign and malignant conditions of spinal fractures. Increased FDG uptake (> 3-4 SUV) usually is seen in malignant fractures.
Learning Objectives:
1. To understand the pathophysiological principles of vertebral body fractures.
2. To describe the use of diffusion-weighted MR imaging in differentiation of benign and malignant fractures.
3. To set up an optimal clinical MR protocol for evaluation of vertebral body fractures.

A-271 09:00

B. Imaging in low back pain
A. Stäbler; *Munich/DE (info@radiologie-muenchen-harlaching.de)*

Degenerative diseases of the spine include degeneration of the intervertebral discs and endplates as well as degenerations of the intervertebral joints. Degeneration of the intervertebral disc can result in anular tears and in disc herniation with compromise or compression of nerve roots. Disc herniation (disc prolapse) is defined

as dislocation of nucleus pulposus material through a defect of the anulus fibrous (anular tear) bejond the outer part of the anulus fibrosus (non-contained disc) or as a dislocation of nucleus pulposus material inside the disc in areas of the anulus fibrosus with dislocation of the outer part of the anulus fibrous (contained disc). The location and morphology of the anular tear pedicts the direction of migration/ sequestration of a disc hernia. Dehydration and disintegration of the disc tissue leads to increased segmental mobility. Instability with symptomatic osteochondrosis named activated erosive intervertebral osteochondrosis can develop, characterized by bone marrow edema, disc vascularity and hyaline cartilage proliferations in erosions on MRI. Activated intervertebral or facet joint osteoarthrosis may become symptomatic due to synovitis and fibrovascular tissue. Facet joint osteoarthrosis can also be responsible for central spinal canal stenosis, stenosis of the recess or narrowing of the neuroforamen. Signs of symptomatic spinal stenosis on MRI are root redundancy and root edema with swelling. There exist mechanisms to recognize dynamic worsening of spinal canal stenosis by weight bearing on MRI in prone position.

Learning Objectives:

1. To understand the aetiology and pathomechanisms of low back pain.
2. To identify key imaging findings in low back pain.
3. To describe the imaging protocol and strategy in patients with failed back surgery syndrome.

A-272 09:30

C. 3 T spinal imaging

M. Law; *Los Angeles, CA/US (meng.law@usc.edu)*

Image quality in spine MR imaging is dependent on five major factors: 1. Spatial Resolution, 2. Signal to Noise (SNR), 3. Contrast to Noise (CNR), 4. Temporal Resolution, and 5. Artifacts.

Artifacts: a) Susceptibility artifact and geometric distortion, b) Chemical shift artifact-from the existence of multiple resonance frequencies, c) CSF partial volume effects, d) Truncation artifact - insufficient phase-encoding sampling, e) B_0- inhomogeneity of surrounding neck/airway structures, f) Physiologic motion- vascular/ CSF pulsation, respiratory, swallowing motion, g) Non physiologic motion - gross neck motion, h) Dielectric artifact, and i) Increased specific absorption rate (SAR). Most of these artifacts are in part dependent on magnetic field strength. There is substantial susceptibility and signal loss in the spine from signal dephasing at the tissue-bone and tissue-air interfaces. Similarly, increasing the TE to increase T2-weighting for the cord, will result in increased CSF signal dephasing from pulsatile motion. These susceptibility effects can be decreased by using thinner sections as well as using multiple receiver coils with parallel imaging techniques. By the same token, combining phase array coil technology with higher field strengths can have a beneficial effect on other artifacts such as the dielectric effect and reducing the SAR. Modifying the shape of the RF pulse using a VariablE Rate Selective Excitation (VERSE) pulse will also reduce SAR and improve image quality. Chemical shift effects are inversely proportional to received bandwidth. Hence, increasing the receiver bandwidth will decrease chemical shift; however, this comes at a cost of reducing SNR.

Learning Objectives:

1. To learn about the factors affecting image quality for spine imaging at 3 T.
2. To become familiar with sequence and parameter choices for spine imaging at 3 T.
3. To understand artifacts and solutions in spine imaging at high field.

08:30 - 10:00 **Room C**

Neuro

RC 1111

Stroke

Moderator:
R. Siemund; Lund/SE

A-273 08:30

also EPOS

A. CT or MRI in the acute ischemic stroke?

G. Krumina; *Riga/LV (gaida.krumina@apollo.lv)*

Early signs of hyperacute stroke on native CT are hypoattenuation of gray matter structures, hyperdense arteries, and mass effect. Insular ribbon sign reflects cytotoxic edema and relates to specificity of arterial anatomy. Two types of insular stroke with different functional outcomes have been distinguished: the minor and the major insular stroke. ASPECTS is a standardised quantitative CT grading system in acute anterior circulation ischemic stroke. Baseline ASPECTS value predicts response to intraarterial and intravenous thrombolysis functional outcome and incidence of secondary hemorrage within 3 and 6 hours of stroke onset. Hyperdense artery sign represents stasis of flow due to arterial thrombus. Proximal hyperdense MCA sign is associated with poor short and long-term prognosis; intravenous thrombolysis is ineffective. Distal hyperdense MCA sign does not implicate poor outcome; patients are applicable to thrombolytic therapy. Hyperdense PCA sign is associated with thalamic infarction, large PCA territory ischemia, more severe neurology and higher risk of hemorrhagic transformation. Hyperattenuating artery sign correlates positively with angiographic finding of occlusion. CTA is essential for evaluating of intra- and extracranial dissections, and intravascular thrombi. MRI protocol in acute stroke includes DWI, T1 SE, T2 FSE, FLAIR, T2* GE, PWI, MRA. DWI is most sensitive tool for detection of hyperacute stroke at first 6 hours. In patients with TIA, DWI has discriminative value in predicting risk of new TIA or future stroke. To correctly estimate the infarct age, it is important to examine DWI in comparison with ADC maps.

Learning Objectives:

1. To learn how to recognise the early CT signs of hyperacute stroke.
2. To compare the sensitivity and specificity of CT and MRI for the diagnosis of acute stroke.
3. To discuss the practical aspects of the use of CT and MRI in the management of acute stroke patients.

A-274 09:00

B. DWI, CT/MR PWI, and/or CTA/MRA: What is necessary?

A. Dörfler; *Erlangen/DE (arnd.doerfler@uk-erlangen.de)*

The goals of stroke imaging are to establish a diagnosis as early as possible to obtain accurate information about intracranial vasculature and brain perfusion to select the appropriate therapy. Comprehensive evaluation may be performed with a combination of CT or MRI. Unenhanced CT helps to rule out hemorrhage and may identify early signs of ischemic stroke, respectively. In addition, CT angiography and CT perfusion imaging may depict major vessel occlusion and perfusion disturbances indicating tissue at risk. Diffusion-weighted MR imaging is more sensitive in the detection of hyperacute ischemia. MR angiography reveals the status of extra- and intracranial vessels, and a mismatch between findings on diffusion and perfusion MR images may be pragmatically used to predict the presence of a penumbra. Regarding our own experience, “multimodal MR imaging” provides substantially greater information about brain ischemic pathophysiology and overall a more sensitive diagnosis for acute stroke, especially in patients with an uncertain time window of symptom onset and vertebrobasilar ischemia. Thus, combining various imaging techniques may help to differentiate patients who may profit from intravenous or interventional therapy in an even extended time window from those who do not. Thus, we think that MRI should replace CT as the primary neuroimaging technique, at least in patients suspicious for vertebrobasilar ischemia or presenting in an extended time window. In our institution, we use a multimodal CT protocol when acute stroke patients present within 4.5 hours (ECASS III time window); patients presenting beyond this time window are examined with a multimodal MRI protocol.

Learning Objectives:

1. To delineate the objectives of stroke imaging in the context of available stroke therapies.
2. To introduce the basic concepts of DWI, PWI, and MRA.
3. To discuss the strategies of multimodal CT and MR stroke imaging.
4. To discuss the differential diagnosis of stroke.

A-275 09:30

C. Nontraumatic intracranial hemorrhage

L. van den Hauwe[1], M.H.J. Voormolen[2], C. Venstermans[2], F. De Belder[2], J.W.M. Van Goethem[2], P.M. Parizel[2]; [1]*Brasschaat/BE*, [2]*Antwerp/BE (lucvdhauwe@mac.com)*

Non-traumatic intracranial hemorrhage is a common cause of an acute neurological deficit and represents up to 20% of patients presenting with stroke. Stroke is a medical emergency and CT should be performed as soon as possible to rule out intracranial hemorrhage and to exclude other intracranial pathology such as brain tumors. Once intracranial bleeding is ruled out, thrombolytic therapy may be considered. CT also allows to look for potential complications such as increased intracranial pressure and brain herniation. Intraparenchymal hemorrhage at the level of the basal ganglia is typically seen in older patients with hypertension, but may also be observed in younger patients with sinus thrombosis. Extra-axial hemorrhages may be found in the subarachnoid space as well as in the epidural and subdural compartments. Subdural hematomas are frequently observed in elderly people with brain atrophy and typically occur in patients taking anticoagulant medication

suffering a minor trauma. When CT demonstrates the presence of subarachnoid hemorrhage, CT angiography should be performed to rule out a cerebral aneurysm or vascular malformation, before going into catheter angiography. MRI, including T2* and Susceptibility Weighted Imaging (SWI), may be used to look for more subtle causes of bleeding such as cerebral amyloid angiopathy.
Learning Objectives:
1. To review the different types of nontraumatic intracranial hemorrhage in patients presenting with stroke.
2. To discuss imaging strategies in the diagnostic work-up of hemorrhagic stroke.
3. To illustrate the optimal imaging techniques for the detection of nontraumatic intracranial hemorrhage.

08:30 - 10:00 **Room D**

Abdominal and Gastrointestinal

RC 1101

Rectal cancer

Moderator:
H. Trillaud; Bordeaux/FR

A-276 08:30

A. Staging with US and CT
A. Maier; *Vienna/AT (andrea.maier@meduniwien.ac.at)*

For rectal cancer surgery, a variety of alternative operations are currently possible, including low anterior resection, total mesorectal excision and local, transanal resection. Furthermore, there is an increasing trend toward treating patients with radiotherapy before surgery to improve local control. The choice of operation and the decision whether to employ radiotherapy is based on preoperative staging. In patients with primary rectal cancer, accurate assessment of tumour extent within and beyond the rectal wall and the presence or absence of lymph node invasion are factors for determining prognosis and risk of tumour recurrence. Endorectal ultrasound (EUS) is effective for T-staging, although it is least accurate for T2 and T4 tumours. It has been recommended as the investigation of choice in the selection of potentially curative local excision. Distinguishing between T1 and T2 tumours may be a problem. Lymph node staging by this method is less precise than tumour staging. Initial reports of the use of CT for tumour staging were encouraging. However, studies which compare CT with EUS staging consistently show the latter to be more accurate for both tumour stage and lymph node stage. Thus, the usefulness of CT for rectal cancer is disappointing. Tumours within the rectal wall and slight invasion through the wall cannot be assessed. Accurate assessment of local spread can only be achieved in advanced tumours. The value of CT as an investigation tool for staging rectal cancer has to be seen in the detection of distant metastases.
Learning Objectives:
1. To learn exam technique of endorectal US.
2. To describe morphology and staging of rectal cancer.
3. To understand the role of CT for local and distant staging.

A-277 09:00

B. Staging with MRI
C. Hoeffel; *Reims/FR (choeffel-fornes@chu-reims.fr)*

Advancements have been made in multiple aspects of diagnostic and therapeutic approaches to rectal cancer. Therapeutic advances include total mesorectal excision, transanal excision, and adjuvant treatments such as chemotherapeutic agents and refined radiotherapy techniques. The accurate identification of patients who are candidates for combined modality treatment depends on multidisciplinary approach and is particularly essential to optimize outcomes. The ability of MRI to accurately image the relevant structures of the mesorectum in rectal cancer has become increasingly evident. Advances in the method and technique for obtaining these scans have resulted in improved image acquisition. Interpretation of preoperative MR images in patients with rectal cancer allows the identification of several prognostic factors that will enable better selection of patients who may benefit from more intensive treatment without subjecting those who will not to unnecessary treatment. We will describe the MRI staging of rectal tumors, and how this information can be used to optimize management of these cancers, and will outline the added values of new techniques.
Learning Objectives:
1. To demonstrate the techniques for accurate magnetic resonance imaging assessment of rectal tumors.
2. To understand the anatomy of the mesorectal margin in relation to total mesorectal excision surgery and the anatomy of the lower third of the rectum.
3. To understand the role of the radiologist in identifying prognostic factors preoperatively and preventing margin positive disease.
4. To discuss the impact of modern MR imaging (3 Tesla, diffusion-weighted MRI, ...).

A-278 09:30

C. Follow-up
G. Brown; *Sutton/UK (gina.brown@rmh.nhs.uk)*

Defining patterns of recurrence is crucial in the overall assessment of efficacy of treatment strategies. In particular, patterns of local recurrence can identify areas for locally directed therapy and the early detection of distant relapse is also essential in enabling early and effective treatment of relapse. For the radiologist, knowledge of the patterns and outcomes from recurrence is essential for effective surveillance strategies and in this lecture the patterns of local relapse based on an understanding of their aetiology will be covered. At present, CT scanning of the thorax abdomen and pelvis remains the most common method of surveillance of patients following colorectal surgery. The majority of patients develop metastatic disease within the first two years of surgery and therefore six monthly post operative surveillance is common place for patients who are at a high risk of developing metastatic disease. In approximately 10% of cases, a cause for a rising CEA will not be found on conventional CT; in these circumstances, PET/CT can be helpful. Early detection of metastatic disease or recurrent disease in colorectal cancer has been shown to benefit patients and in up to 40% of patients resection of local or distant recurrence can result in long term cure. The following patterns of local recurrence will be discussed: • Marginal; • Pelvic side wall; • Peritoneal; • Perineal; • Anastamotic; • Krukenberg; and Knowledge of the compartmental distribution of recurrent disease will also enable planning for radical pelvic exenteration.
Learning Objectives:
1. To understand the evidence base for follow-up of primary rectal cancer.
2. To understand the patterns of recurrent disease.
3. To review the guidelines for imaging of local and distant recurrent disease.

08:30 - 10:00 **Room E1**

Musculoskeletal

RC 1110

Shoulder

Moderator:
C. Masciocchi; L'Aquila/IT

A-279 08:30

A. Rotator cuff and impingement
J. Kramer; *Linz/AT (kramer@ctmri.at)*

MR imaging findings of a normal shoulder joint, its variants and pathologic alterations have to be known for enabling an exact diagnosis. Mostly rotator cuff lesions are observed in patients with more or less degenerated tendinous structures who had suffered not rarely a minor trauma only. In case the tendons basically are not degenerated, osseous lesions occur more likely. Especially long-standing impingement may cause rotator cuff lesions (degeneration/fraying of tendons, partial or full thickness tears). There are several forms of impingement: "Primary external impingement" is caused by subacromial or subcoracoid impingement (e.g. spurs, variations of the acromial morphology, etc). Chronic or long standing glenohumeral instability, mostly observed in athletes who participate in sports that require repetitive overhead or throwing motions, may lead to "secondary external impingement". In these cases, clinical symptoms may mask signs of underlying glenohumeral instability and point directly to rotator cuff lesions. "Internal impingement" is caused by abnormalities due to friction between the posterosuperior or anterosuperior labrum and glenoid, and rotator cuff. In this presentation, the different forms of impingement and MR imaging findings of rotator cuff pathology are demonstrated.
Learning Objectives:
1. To become familiar with MRI of normal rotator cuff structures.
2. To understand the etiology of impingement.
3. To recognise imaging findings in different forms of impingement.
4. To become familiar with MR findings in rotator cuff lesions.

A-280 09:00

B. Instability

M. Reijnierse; *Leiden/NL (m.reijnierse@lumc.nl)*

Stability of the glenohumeral joint is based on multiple factors. These include the rotator cuff, the glenoid labrum, the coracoacromial arch and the glenohumeral ligaments. Instability of the glenohumeral joint can be divided in two major categories: traumatic and atraumatic. Acute anterior dislocation is most frequently seen and often results in unidirectional instability of a shoulder. Atraumatic instability can be congenital or the result of repetitive microtrauma e.g. swimming and throwing. This instability is often multidirectional and may be bilateral. Three glenohumeral ligaments (GHL) have been described, the superior GHL, the middle GHL and the inferior GHL complex, formed by an anterior band, a posterior band and an axillary recess of the joint. The number of ligaments is variable in any person and their size varies considerably. The SGHL is present in 90-97% of shoulder studies and is variable in origin. The MGHL is present in 73-92% and the IGHL is present almost 100% of shoulder studies. Ligamentous abnormalities can be seen in isolation; however, since stability is based on multiple factors, coexisting structural abnormalities are frequently found. For accurate assessment of the glenohumeral ligaments, the use of MR arthrography is essential. With joint distension, these intra-articular ligaments can be evaluated. MR arthrography is indicated to find additional abnormalities in case of clinical significant glenohumeral instability and is an essential part of presurgical planning.

Learning Objectives:

1. To appreciate the role of MR imaging in glenohumeral instability.
2. To understand the anatomy and normal variations of the glenohumeral ligaments.
3. To recognise pathology due to instability.

A-281 09:30

C. The post-operative shoulder

M. Zanetti; *Zurich/CH (marco.zanetti@balgrist.ch)*

Standard radiographs are essential in the evaluation of the postoperative shoulder. Radiographs allow giving an overview of the position of humeral head and glenoid (acromiohumeral distance, anterior or posterior dislocation) in a physiologic upright standing position. Dislocation of metallic implants can be recognized on CT images. CT has its advantages in the assessment of extraanatomical glenoid reconstructions (Latarjet or Bristol procedures). Hidden fractures after shoulder prosthesis surgery at the coracoid process or acromion are often visible only on CT images. MR imaging after shoulder surgery is used to assess muscles and tendons. The direct MR arthrography is used to assess labrum or cartilage lesions. However, the diagnostic value of direct MR arthrography after rotator cuff reconstruction is limited by the fact that the rotator cuff is not watertight after surgery. Partial thickness rotator cuff tears cannot be discriminated from a normal postoperative scar. Therefore, standard MR imaging provides similar results. Ultrasound can be used alternatively for the postoperative assessment of the rotator cuff. Subacromial bursitis diagnosed on MR STIR images is most commonly (98%) a normal postoperative finding. The postoperative MR protocol differs minimally (no gradient echo sequences, susceptibility artefact along the frequency direction, turbo spin echo instead spin-echo, short TE, large bandwidth, large echo train length, STIR instead fat sat) from the preoperative MR protocol.

Learning Objectives:

1. To become familiar with surgical techniques in patients with impingement, instability-related disorders, and osteoarthritis.
2. To differentiate between normal and abnormal findings after shoulder surgery.
3. To learn about MRI after shoulder surgery.

08:30 - 10:00 **Room E2**

Interactive Teaching Session

E³ 1120

Colorectal cancer: Diagnosis, staging and follow-up

Moderator:
M. Marotti; Zagreb/HR

A-282 08:30

Colorectal cancer: Diagnosis, staging and follow-up

R.G.H. Beets-Tan[1], A.H. Freeman[2]; [1]*Maastricht/NL*, [2]*Cambridge/UK (r.beets.tan@mumc.nl)*

Colorectal cancer is common. Approximately 280,000 new cases occur each year in the 500 million population of the 27 states which comprise the EU. After lung, it is the second commonest cause of cancer death resulting in approximately 140,000 deaths per annum. These relatively high mortality figures are a reflection of the fact that the disease is often advanced at the time of presentation. Efforts to reduce mortality, therefore, centre on early detection as well as accurate staging. The latter is particularly important in rectal cancer-the commonest site for colonic cancer. Detection depends on presentation, which is often protean or non-existent; hence, the introduction of screening programs. Typical diagnostic tools include the barium enema, optical colonoscopy and CT colonography. The limitations of the barium enema have been exposed by optical colonoscopy and it can no longer be advocated in this role. CT colonography, however, rivals optical colonoscopy in the detection of polyps and tumours, although of course has no therapeutic potential. Major advances in the treatment of rectal cancer include total mesorectal excision (TME) of the rectum as well as neo-adjuvant therapies such as chemo-radiation. Their use depends on highly accurate staging of the primary disease, which can only be achieved by MR examination, although of course CT or PET/CT is required for the assessment of more distant metastatic disease. Finally, once treated, it is essential that these patients are followed-up; usually by a regime of colonoscopy and CT. These issues will be discussed in an interactive lecture.

Learning Objectives:

1. To review the genetic and environmental factors predisposing to colorectal cancer and to consider the significance of colorectal cancer in overall health terms.
2. To understand the rationale of screening and to discuss the role of CT colonography and its relation to other screening tests such as FOB test and colonoscopy.
3. To learn the principles and rationale for accurate preoperative imaging of rectal cancer.

08:30 - 10:00 **Room F1**

Organs from A to Z: Liver

MC 1119

Anatomy and techniques

Moderator:
S.C. Efremidis; Ioannina/GR

A-283 08:30

A. Essentials of liver anatomy and multimodality display

W. Schima; *Vienna/AT (Wolfgang.Schima@khgh.at)*

Knowledge of the normal anatomy and of the most frequent variants and anomalies of liver segments, vascular, and biliary anatomy is of major importance for hepato-biliary surgery and interventional procedures. Radiologic studies to evaluate anatomy include color Doppler ultrasound and contrast-enhanced MDCT and MRI. Analysis of 3D data sets obtained with MDCT or MRI is most helpful for evaluation of complex anatomy. Radiologic classification of liver segments according to Couinaud can be reliably achieved with MDCT and MRI data sets with vascular opacification. Arterial-phase MDCT imaging is the best non-invasive technique to demonstrate variants of the hepatic artery, including accessory and replaced right and left hepatic arteries. For preoperative demonstration of biliary ductal variations and anomalies, MRCP has become the standard imaging technique. It reliably shows dystopic biliary radicles, which are at risk of inadvertently being clamped during surgery. The development of MRCP with liver-specific MR contrast agents has further increased the diagnostic yield to show normal-sized bile ducts.

Recently, multi-phasic MDCT with intravenous and biliary contrast agent has been shown to be a reliable tool for demonstration all aspects of surgically relevant liver anatomy in one-stop-shopping. Accurate assessment of liver segmental anatomy and vascular and biliary variants and anomalies is crucial to help pre-therapeutic planning and to avoid surgical complications.
Learning Objectives:
1. To understand the segmental anatomy of the liver as seen with US, CT, and MRI.
2. To become familiar with vascular and biliary anatomy including anatomic variations.
3. To understand why US, CT and MRI are complementary and to learn the advantages of multimodality display.

A-284 09:00
B. The correct protocols for CT and MR
B. Marincek; *Zurich/CH (Borut.Marincek@bluewin.ch)*

Liver MDCT protocols are adapted to the clinical situation. Routine abdomen-pelvis scans are acquired during a portal-venous phase only and visualize hypovascular liver parenchyma lesions. In target-oriented liver scans, early arterial phase images provide a purely arterial road map. Dedicated triphasic protocols include a late arterial phase for the detection of hypervascular lesions, a portal-venous phase and an anytime between 2 and 5 minutes delayed phase for improving the demonstration of cholangiocarcinoma and cysts. Non-enhanced scans are helpful to depict intrahepatic biliary stones or to differentiate retained chemo-infused material from contrast enhancement. Tube current modulation techniques should be applied for dose reduction. In obese patients, 140 kV tube voltage is recommended (standard: 120 kV). Liver MRI is mostly performed to evaluate focal disease. The protocol should include as a minimum precontrast T1w gradient echo (GE) in- and opposed-phase images to identify intracellular fat and T2w fat-suppressed spin echo sequences for the characterization of fluid-containing lesions (e.g. cyst, hemangioma). Non-specific extracellular Gd-chelates are routinely used for dynamic multiphase (late arterial, portal-venous, delayed phase) T1w fat-suppressed GE sequences. They are adequate for detection and characterization of the majority of focal lesions. Contrast agents with combined extracellular dynamic enhancing and hepatocyte-selective properties (hepatobiliary imaging window duration of 60-120 minutes) are excreted into blind-ending bile ducts typical of FNH, but do not accumulate within an adenoma, HCC, or hypervascular metastases, facilitating differentiation. Reticuloendothelial system-specific contrast agents are taken up by functioning Kupffer cells, but lack dynamic enhancement information, reducing the ability to characterize lesions.
Learning Objectives:
1. To learn about the MDCT protocols for detecting and characterising liver lesions.
2. To consolidate knowledge of standard MRI protocols for lesion detection and characterisation.
3. To become familiar with the use of contrast media for MRI, including liver-specific agents.

A-285 09:30
C. Imaging the function and structure in clinical practice
Y. Menu; *Paris/FR (yves.menu@sat.aphp.fr)*

Beyond the traditional role of anatomical display, imaging extends now to functional and structural imaging. Because liver tumours, both primary and secondary, are so frequent, and because chronic liver disease is a real public health problem, liver imaging is a natural target for advances in organ evaluation. Perfusion studies can be made using US, CT and MRI after intra venous tracer injection. Bio-distribution of the tracer, either intra vascular or intra and extra vascular, should be understood, as well as main methods for extraction of parametric images anq quantitative parameters. The main role of perfusion studies is to evaluate angiogenesis and more over its evolution after administration of chemotherapy or targeted therapy in case of tumour. Hepatocyte uptake can be evaluated using specific tracers, providing functional information useful for tumour characterization. Structural analysis can be done using Diffusion Weighted MRI (DW-MRI). Advantages (fast acquisition, intra observer reproducibility, feasibility on virtually all installed machines) and drawbacks (absence of standardization, inter observer variability) should be fully understood. DW-MRI can be helpful in predicting and evaluating tumour response to treatment, as well as grading the severity of liver fibrosis. Other methods, like elastography, may play an increasing role in the evaluation of diffuse liver disease, and possibly of tumours. Spectroscopy is unlikely to become a routine clinical tool in the very near future. In this lecture, protocols for functional and structural examinations will be provided, and a tentative synthesis of their practical or potential role will be presented.
Learning Objectives:
1. To understand how imaging can approach structure and function.
2. To learn the CT and MRI protocols for the exploration of liver structure and function.
3. To understand how diseases can impair structure and function and to learn the consequences on imaging.

08:30 - 10:00 **Room F2**

Breast

RC 1102

Interventional techniques

Moderator:
R. Schulz-Wendtland; Erlangen/DE

A-286 08:30
A. US-guided core biopsy
L. Apesteguía, L.J. Pina Insausti; *Pamplona/ES*

US-NCB under local anaesthesia is nowadays the most widespread system of percutaneous biopsy, because of the excellent control we can achieve with the needle and the ability to reach lesions located in difficult places such as axylla or near the nipple. It is a safe, comfortable and economical technique although it requires a notable level of experience. The length of needle and core can be selected according to lesion size, location, depth and other circumstances. The skin access point must be separated from the US probe because the needle must be orientated parallel to the chest wall. Three to five specimens are recommended to get the maximum accuracy and the lowest grade of infra-estimation. The number of samples should be greater for lesions with complex radiological features. The colour, consistence and grade of immersion of the cylinders in formaldehyde are useful criteria to know their suitability for diagnosis. This is the elective technique for BI-RADS-4-5 lesions properly identified by US. In particular situations, BI-RADS-3 lesions can be managed similarly. Only lesions not clearly seen by US should be punctured under stereotaxic or MR control. FNA-Cytology is reserved for special situations such as some BI-RADS-3 nodules or when the objective is evacuation. The extensive use of US-NCB has drastically reduced the number of surgical procedures due to false positive radiological findings. Correlating histological and radiological features is extremely important. In cases of disagreement, vacuum-assisted systems or surgical biopsy are recommended. All breast radiologists should be encouraged to get experience in US-NCB.
Learning Objectives:
1. To review the principles of biopsy techniques.
2. To learn pros and cons of these interventions.
3. To update the indications in order to reduce false positives.

A-287 09:00
B. Stereotactic large core biopsy
P.D. Britton; *Cambridge/UK (peter.britton@addenbrookes.nhs.uk)*

Stereotactic breast biopsy has a long-established role in breast diagnosis for identifying lesions not detectable by ultrasound. Technical advances in ultrasound have meant that stereotactic biopsy is now almost exclusively performed on screen-detected microcalcification and small parenchymal deformities. Such lesions present the greatest diagnostic challenges confronting the breast radiologist. Abnormalities are frequently small, hard to target and encompass most borderline and in-situ pathologies encountered. Compared with lesions targeted by ultrasound, diagnostic performance has lower sensitivity, higher false negative and cancer upgrade rates. To tackle these challenges, digital equipment is essential whether prone biopsy or upright. Fine needle aspiration cytology (FNAC) has been superseded by devices harvesting larger amounts of tissue such as core biopsy (CB) and vacuum-assisted biopsy (VAB). Are better results achieved with VAB, and if so, does it justify the considerable extra expense? Whatever targeting method or biopsy device is used, a meticulous approach to technique, adequate sampling and correlation with pathology at multidisciplinary team meetings are essential for best and safe patient-care.
Learning Objectives:
1. To understand the indications for stereotactic intervention.
2. To discuss different available systems.
3. To learn tricks and tips for needle and clip placement.
4. To understand the pros and cons of stereotactic core and vacuum-assisted biopsy.

A-288 09:30

C. An update on MR-guided wide excision biopsy

S.H. Heywang-Köbrunner; *Munich/DE*

Breast MRI is capable of visualizing lesions not visible by other methods. Depending on patient preselection, 20-30% of these lesions may be malignant. Indications: Lesions classified as BIRADS 4 or 5 which are visualized by MRI alone (as counter-checked by retrospective ultrasound) need to be biopsied under MR guidance. Even though MR-guided percutaneous breast biopsy is the more demanding procedure, it should be preferred to wire localisation and surgery; among percutaneous breast biopsy methods, MR-guided vacuum-assisted breast biopsy appears the method of choice with proven accuracy and reporducibility (1). Techniques: Meanwhile, coils and software for MR-guided targerting are commercially available. An overview will be given of the procedure, available equipments and oneway material for MR-guided biopsy. Usefulness: MR guided interventions are indispensable to correctly assess lesions visible by MR alone. Following the European guidelines, minimal invasive breast biopsy should be performed for imaging detected lesions whenever possible (> 70%, optimum > 90% of the lesions). In case of benign lesions, unnecessary surgery can be avoided. In case of malignancy, treatment planning is optimized. An overview of existing literature data will be given.

Learning Objectives:

1. To update the indications for this approach.
2. To learn basic techniques of present systems.
3. To explain its usefulness in multicentric cancers.

08:30 - 10:00 **Room G/H**

New Horizons Session

NH 11

MRI of the lungs: Light at the end of the tunnel?

Moderator:
H.-U. Kauczor; Heidelberg/DE

A-289 08:30

Chairman's introduction

H.-U. Kauczor; *Heidelberg/DE (hans-ulrich.kauczor@med.uni-heidelberg.de)*

MRI of the lung has experienced an impressive series of ground-breaking technological developments. Almost all of them are related to imaging speed, gating and signal enhancement. The potential of visualizing pulmonary vasculature, pathological structures and probing pulmonary microstructure rivals CT. However, the capability of MRI to assess "function" in a broader sense is its biggest advantage over CT beyond the mere lack of ionizing radiation. Functional MRI of the lung includes: perfusion, ventilation, gas exchange, vascular permeability, flow, shunt, hemodynamics, right heart function, lung volumes and mechanics, motion. As such, the broad spectrum of functional MRI of the lung is capable to replace a series of different diagnostic procedures, such as pulmonary function tests, ventilation and perfusion scintigraphy, echocardiography, and fluoroscopy. Clinical indications for MRI of the lung are congenital cardiovascular and cardiopulmonary abnormalities; cystic fibrosis; pulmonary hypertension; lung cancer: differentiation between T3 and T4 tumors; mediastinal tumors; and malignant pleural mesothelioma. Current recommendations for a standard protocol are focused on quality, workflow and speed, and allow for completing a MRI of the lung within less than 30 minutes. The structural and functional components of MRI of the lung can also be regarded as a part of whole body MRI, which gains more and more attention in diagnosis of congenital anomalies and diseases; thromboembolic disease; staging in oncology, and systemic inflammatory diseases, such as tuberculosis or COPD.

Session Objectives:

1. To learn about indications of when to use MRI of the lung.
2. To understand the rationale of using MRI of the lung, especially with regard to CT.
3. To focus understanding of MRI techniques towards a clinical protocol.

A-290 08:33

Challenges for MRI of the lung

J.M. Wild; *Sheffield/UK (j.m.wild@sheffield.ac.uk)*

The talk will be primarily from a technical perspective, focusing on how best to image the lungs with MRI at present an how the speaker envisages improvements in the years to come. It will cover state-of-the-art imaging methods for 1H MRI of lung morphology including the role of parallel imaging. Review of current functional imaging methodology with 1H MRI will be given with an overview of pulse sequences for ventilation, oxygen enhancement, perfusion (CE and endogeneous) and lung dynamics. Discussion includes the role of hyperpolarised gas MRI - technical methods and functional sensitivity of 3He and 129Xe MRI in respiratory research. The talk will be illustrated with images from Sheffield and other leading lung MRI research groups.

Learning Objectives:

1. To learn about state-of-the-art imaging methods for 1H MRI of lung morphology.
2. To understand functional imaging methodology with 1H MRI (ventilation, O2 enhancement, perfusion (CE and endogeneous), lung dynamics).
3. To appreciate functional lung imaging methodology with hyperpolarised gases (3He, 129Xe).

A-291 08:51

MRI of neoplastic and inflammatory lung disease

J. Biederer; *Kiel/DE (juergen.biederer@rad.uni-kiel.de)*

Combining fast breath-hold acquisitions with parallel imaging, shared echo-technique and rotating phase encoding, MRI of the lung has overcome its former well-known limitations. Comprehensive protocols with fast sequences can be recommended for a number of indications including neoplastic and inflammatory lung disease. The non-contrast-enhanced basic protocol (in-room time 15 min). comprises a coronal T2w single-shot half-Fourier TSE (HASTE) sequence with a high sensitivity for infiltrates and a transversal T1w 3D-GRE (VIBE) sequence with a high sensitivity for small nodular lesions. A motion compensated T2w TSE improves depiction of masses with chest wall invasion. This is followed by a coronal steady-state free precession sequence (TrueFISP) in free breathing, which is highly sensitive for central pulmonary embolism and gross cardiac or respiratory dysfunction. A final multi-breath-hold transversal fat-saturated T2w-TSE visualizes enlarged lymph nodes and skeletal lesions. Unclear masses, consolidation or pleural effusion detected in the basic protocol warrant an additional contrast-enhanced fat-saturated 3D-GRE (VIBE) sequence (plus 5 min). Detection rates for pulmonary infiltrates with the basic protocol match CT making it a valuable alternative in particular for children, young patients and pregnant women. The sensitivity for lung nodules reaches 80-90% for lesions > 4 mm (100% for > 8 mm). Both capacities are appreciated in cystic fibrosis patients for follow-up using dedicated scores of the extent of disease. In lung cancer patients, MRI contributes to staging and radiotherapy planning by superior soft tissue contrast, e.g. to separate tumour from atelectasis. Administration of contrast material contributes to detect tumour necrosis, chest wall or mediastinal invasion and pleural reaction/carcinosis.

Learning Objectives:

1. To outline a basic push-button protocol for 1H MRI of the lung with clinical 1.5 T scanners.
2. To learn about the scope of MRI for solid and infiltrative lung disease using a standard protocol.
3. To become familiar with potential clinical applications and particular advantages compared to CT.
4. To observe limitations and pitfalls of 1H MRI.

A-292 09:09

MRI of pulmonary vascular disease

S. Ley; *Heidelberg/DE (ley@gmx.de)*

Visualization of the pulmonary arteries can be performed using steady-state free precession (SSFP) or contrast-enhanced 3D-GRE sequences (ce-MRA). SSFP techniques allow for evaluation of the main and lobar pulmonary arteries. Sensitivity on a lobar level was 79% in patients suffering from PE. As these sequences are performed in less than a minute, they should be used by default as initial sequences of a thoracic examination. High spatial resolution ce-MRA can be acquired in a breath-hold of less than 20 s with a spatial resolution in the range of 1.2-1.4 mm^3. This allows for evaluation of the pulmonary arteries down to a segmental level. Even patients with mild to moderate shortness-of-breath are capable of breath-holding for this period of time. Therefore, this technique is well suited to rule out central PE or any other obstructive disease. One approach to reduce the breath-hold time is to acquire two sagittal image slabs (each 10-12 s), one for each lung. In patients with chronic thromboembolic disease, this technique showed more pathological findings than one coronal acquisition. Reducing the acquisition time to 1-1.5 s, a 3D perfusion-weighted (ce-perfusion) dataset can be acquired. Analysis can be done visually i.e. by image subtraction revealing perfusion deficits. Obvious perfusion defects, either focal or wedge-shaped, can be differentiated from a heterogeneous reduction. This basic analysis already allows for characterization of different vascular pathologies or diseases of parenchymal origin. Detailed functional information can

be gained from quantitative analysis of pulmonary blood flow, pulmonary blood volume and mean transit time.
Learning Objectives:
1. To consolidate knowledge of state-of-the-art imaging methods for high-spatial and temporal resolution, contrast-enhanced and non-contrast-enhanced MR agiography of the pulmonary vasculature.
2. To become familiar with the clinical application of MRA of the pulmonary vasculature and its comparison to CTA.
3. To appreciate functional imaging of the pulmonary circulation using time-resolved MRA.

A-293 09:27

MRI of ventilation and gas exchange in airway disease

F. Molinari; *Rome/IT (fmolinari@rm.unicatt.it)*

The management of patients with chronic airway disorders, such as asthma and COPD, is generally based on the assessment of clinical data and pulmonary function tests (PFTs). Although PFTs are recommended for diagnosing airway disease and grading airflow limitation, their use as a comprehensive tool for evaluating lung function has been debated. An individual susceptibility of airway response (i.e. inflammation) to external noxae is thought to influence the natural history of both asthma and COPD, leading to a considerable heterogeneity of clinical expression and patient outcome. Different pathogenetic and clinical phenotypes may be included in one single category of global lung function damage as determined by PFTs. CT and MRI show the regional pulmonary anatomy three-dimensionally. Quantitative data regarding lung structure and function can also be obtained from both modalities. The high spatial resolution of CT and intrinsic contrast difference between lung structures and air guarantees excellent definition of small changes of airways and lung parenchyma, such as bronchial wall thickening and obstruction, air-trapping and centrilobular emphysema. While limited in the ability to visualize small-scale lung anatomy, MRI has been used with gaseous contrasts to depict pulmonary airspaces and provide information on alveolar gas exchange. The possibility to perform longitudinal and interventional studies without radiation exposure has added to the understanding of the pathogenesis of asthma. Pulmonary vasculature changes and respiratory muscle dysfunction have been studied in COPD using dynamic MRI techniques. All these imaging tools are available to identify new morphologic and functional patterns of alterations in airway diseases.
Learning Objectives:
1. To summarise the clinical needs for imaging lung ventilation and gas exchange in airway disease.
2. To appreciate advantages and limitations of MRI in assessing changes of lung function related to airway obstruction.
3. To understand how CT and MRI can provide clinically relevant information in patients with airway disease.

Panel discussion:
MRI of the lung: Can it beat CT? 09:45

08:30 - 10:00 **Room I**

Physics in Radiology

RC 1113

Diagnostic radiology and pregnancy

Moderators:
H. Bosmans; Leuven/BE
E. Vaño; Madrid/ES

A-294 08:30

A. Conceptus doses and risks from maternal diagnostic X-ray examinations

J. Damilakis; *Iraklion/GR (damilaki@med.uoc.gr)*

Whenever a diagnostic X-ray examination of a pregnant patient is considered to be necessary, conceptus dose estimation is an important step in assessing the risks to the unborn child. Accurate estimation of conceptus dose is also needed after inadvertent irradiation of a pregnant patient from a diagnostic X-ray procedure. Several methods have been developed to estimate conceptus dose from radiologic examinations. When the uterus is remote from the directly exposed tissues, the conceptus is exposed to scattered radiation and its dose is negligible (< 1 mGy). Examinations involving the abdomen-pelvis may deliver higher dose to the child. Variations in maternal body size and uterus position should be taken into account to obtain accurate conceptus dose estimation. Multidetector CT (MDCT) scanners have replaced conventional CT technology. Conceptus doses from abdominal MDCT range from about 11.0 mGy to about 27.0 mGy during the first post-conception weeks for a scan acquired at 120 kVp, 200 mAs with a pitch of 1.0, depending on maternal body size and uterine position. Multi-phase abdominal MDCT examinations may deliver relatively high doses to the unborn child. Doses to the conceptus below 100 mGy should not be considered a reason for termination of pregnancy. The risk to the embryo/fetus for stochastic effects is assessed on the basis of dose using appropriate risk factors. Although these risks from a single diagnostic procedure are low for the majority of diagnostic X-ray examinations, it is important to ensure that doses are kept as low as reasonably achievable.
Learning Objectives:
1. To learn how to manage and counsel pregnant patients in case of (a) intentional and (b) accidental exposure.
2. To learn how to estimate conceptus radiation dose from diagnostic X-ray examinations.
3. To learn how to assess the radiogenic risks to the embryo/fetus from diagnostic X-ray examinations.

A-295 09:00

B. X-ray imaging and pregnancy: Justification and optimisation of exposure

P. Vock; *Berne/CH (peter.vock@insel.ch)*

As outside pregnancy, justification and optimisation are the main steps to be done when an imaging examination using ionising radiation is considered during pregnancy. However, the risk concerns the embryo/fetus in addition to the mother which means that justification has to be more critical whenever the uterine dose is not neglectable. The practical approach to an examination in any woman of child-bearing age starts by ruling out pregnancy, whether by history taking or by a laboratory test. When pregnancy cannot be ruled out, further steps will depend on the type of examination needed and the urgency of diagnostic clarification. Ultrasound is the alternative to be preferred when it can answer the clinical question. But even among X-ray examinations, the uterine dose is varying widely which asks for a careful selection, optimisation and, maybe, for postponing the test. Once pregnancy is confirmed, the major question is whether the specific type of diagnostic examination will include the uterus in the primary radiation field. Examinations not involving the uterus by direct radiation, despite a potentially significant exposure by scattered radiation, can usually be performed without a relevant risk to the embryo/fetus. The situation is more critical when the uterus is within the examination field and when therapeutic interventions are considered. The presentation will discuss the practical approach to these different situations, the influence of the stage of pregnancy, optimisation methods and the choice between alternative methods in some frequent clinical situations.
Learning Objectives:
1. To become familiar with the radiologist's practical approach to justification during pregnancy.
2. To learn how to optimise imaging protocols for X-ray examinations performed on pregnant patients.
3. To present the role of imaging modalities in the evaluation of pregnant patients.

A-296 09:30

also EPOS

C. Pregnancy and MRI: Risks to the unborn child

J. De Wilde; *Edinburgh/UK (jdewilde@staffmail.ed.ac.uk)*

This paper explores the risks to the fetus when Magnetic Resonance Imaging (MRI) is used. MRI uses three main components to produce images from inside the body, 1. A static magnetic field, 2. Pulsed radio-frequency (RF) fields and 3. Time-varying gradient electromagnetic fields. The exact frequencies of these fields depend on the MRI system purchased, for example; a 0.5T scanner uses 21 MHz RF, a 1.5 T system uses 63 MHz and a 3 T system uses 127 MHz RF. There are a wide range of options for gradient strengths and slew rates to be considered as well. The overall exposure for the fetus depends ultimately on the imaging sequence used. This paper will discuss particular hazards that need to be addressed for pregnant women including biological effects of the static and time-varying magnetic fields, heating effects of the RF pulses and acoustic noise generated by the spatial encoding gradients. The circumstances for fetal exposure in MRI will also be discussed including the following situations: the patient may not be aware she is pregnant, likely to be in the first trimester; the mother is referred for direct fetal imaging after ultrasound (normally 2nd or 3rd Trimester); the expectant mother may need diagnosis; research on pregnant volunteers. The exposure for pregnant staff working in MRI is also an essential consideration. Finally, how to minimise the exposure for the fetus during MR imaging will be discussed.

Learning Objectives:
1. To understand the risks to the fetus in MRI from static and time-varying magnetic fields, with particular reference to the radiofrequency field.
2. To consider the exposure of the fetus to noise during MRI.
3. To understand how to minimise the exposure for the fetus during MR imaging.

08:30 - 10:00 **Room K**

Pediatric

RC 1112

Advanced brain MR imaging: Why and when

Moderator:
J.-F. Chateil; Bordeaux/FR

A-297 08:30

A. Diffusion tensor imaging

A. Righini; *Milan/IT (neurorad@icp.mi.it)*

Diffusion Tensor Imaging (DTI) studies demonstrate progressive Apparent Diffusion Coefficient (ADC) decrease within gray and white matter areas starting from fetal life as sign of brain maturation; at the same time, Fractional Anisotropy (FA) increases in some white matter structures. Changes in FA and ADC, together with radial and axial diffusivity values, during cell proliferation-migration and during myelination, well correlate with modifications known from developmental histology studies. Acute ADC decrease (i.e. ischemia) can be detected already in fetal stroke and its measure is pivotal in monitoring neonatal hypoxic-ischemic encephalopathy. ADC calculation allows also to assess acute osmotic and metabolic anomalies in neonate (i.e. hypernatremia, hypoglycaemia, etc). Early FA decrease, with radial and axial diffusivity changes, is observed in white matter areas as sign or early wallerian degeneration after acute brain damage. Chronic regional white matter FA reduction is detectable in sequelae of periventricular leukomalacya or adjacent to malformative cortex, but also in older children with neurodevelopmental delay (mostly in statistical quantitative studies on autism, ADHD, dyslexia, etc). Finally, the building of Fiber Tracking and Color coded (RGB) maps from DTI data may help in better characterizing suspected structural anomalies on a single case basis (i.e., corpus callosum, hippocampal fornix, optic radiation, cerebellar peduncles malformations, etc). However, the potential of Fiber Tracking applications still needs to be fully exploited, especially in view of future higher spatial resolution acquisitions.
Learning Objectives:
1. To learn about the correlation between ADC-FA values and structural characteristics of a normal developing brain.
2. To learn about pathology-tissular correlations with ADC-FA value changes in CNS pediatric diseases.
3. To learn about the potential impact of fiber tracking in clinical pediatric neuroradiological practice.

A-298 09:00

B. Spectroscopy

L. Astrakas; *Ioannina/GR (astrakas@cs.uoi.gr)*

In vivo proton MR spectroscopy (MRS) is a non-invasive MR technique that is routinely used to assess a number of pediatric neurologic conditions. It is based on the fact that protons belonging to different metabolites have slightly different resonance frequencies (chemical shift). Using water suppression and volume localization techniques, we can obtain either one spectrum (single voxel) or multiple spectra (SI) containing metabolite peaks corresponding to predetermined anatomical site (s). In pediatrics, the majority of spectroscopy is performed in the brain and the metabolites detected usually are: N-acetyl aspartate, N-acetyl aspartyl glutamate, creatine and phosphocreatine, choline containing compounds (free choline, acetylcholine, phosphocholine, cytidine diphosphate choline, and glycerophosphocholine), Myoinositol, myoinositol monophosphate, and glycine, aminoacids (glutamine, glutamate, GABA), lactate, lipids and macromolecules. These metabolites participate in important metabolic pathways and their levels are being disturbed by various pathologies. Thus, MRS has a vast field of applications including tumors, infarction, hypoxia, ischemia, infection, inflammation, metabolic disorders, neurological disorders and trauma. In many cases, it can redirect or narrow differential diagnoses; in selected instances, it may provide the key finding that points to a final diagnosis. MR spectroscopy alone is usually not specific, but can be very helpful especially in combination with other clinical, diagnostic and other MR methods. Particular caution is needed in data evaluation because spectral appearance and concentrations of the metabolites are affected by: a) proper selection of experimental and preprocessing factors and b) brain development.
Learning Objectives:
1. To become familiar with the basic principles of proton MR spectroscopy.
2. To learn what proton MR spectroscopy can offer to the diagnosis and monitoring of various pediatric diseases.
3. To learn how MR spectroscopy combines with other MR techniques.

A-299 09:30

C. Functional MRI

L. Hertz-Pannier; *Gif sur Yvette/FR (lucie.hertz-pannier@cea.fr)*

Functional MRI (fMRI) has become the tool of choice for studying the cerebral organization of children, due to its non-invasiveness allowing repeat unsuccessful studies in patients, and the study of healthy children (by contrast to radionuclide studies). However, several technical and physiological issues must be considered in order to use fMRI in the pediatric population, pertaining to the developing brain (cortical immaturity, ongoing myelination) and to the developmental age (adapted tasks, control of performance, reference state). The main difficulty remains to obtain the child's cooperation and avoid head motion. When cooperation cannot be fully obtained, «passive» tasks can be used to test perceptual functions and receptive language. A comprehensive assessment of brain organization can thus be achieved through the combination of neuropsychology and MR techniques (anatomical MRI, diffusion tensor imaging and fMRI). Motor, language and visual fMRI paradigms are now being used successfully in children, which show activation patterns comparable to adults, with a trend toward more diffuse and scattered activation. The main clinical application is the assessment of reorganization (plasticity) of eloquent cortices in the presurgical workup of epileptic foci or brain tumors near the central or perisylvian regions and to tailor resections to avoid postoperative deficits. Nowadays, fMRI can replace the invasive Wada test in about 85% of epilepsy surgery patients and shows good colocalization of activated cortices when compared with electrical cortical stimulation. Further research is needed to outline the clinical contribution of fMRI to the management of developmental disorders with specific cognitive impairment.
Learning Objectives:
1. To understand the basic mechanisms, advantages and limitations of fMRI in children.
2. To describe the anatomo-functional organisation and plasticity of the developing brain.
3. To describe the main clinical applications of fMRI in children.

08:30 - 10:00 **Room L/M**

Radiographers

RC 1114

Patient interaction

Moderators:
P. Blackburn Andersen; Kolding/DK
C. Garvey; Liverpool/UK

A-300 08:30

A. Interaction between patient and radiographer during radiological examinations

B.T. Andersson; *Lund/SE (Bodil-T.Andersson@med.lu.se)*

Aim: To examine the interaction in encounters in the course of radiographic examinations and to be able to understand advantages and difficulties involved.
Background: When a patient attends the hospital in order to undergo a radiographic examination he/she is in a need of professional care and support. For many patients within the context of diagnostic radiology, concern about the result and insecurity pertaining to what will come next can be a major issue. The radiographer has a central role as he/she meets the patient before, during and after the radiographic examination. It is of paramount importance that the radiographer is familiar with the problems involved and can give support during the entire radiographic procedure.
Method: A descriptive design with a qualitative approach was chosen. Data were collected through interviews with radiographers and female patients.
Results: Four different types of encounters were expressed; the empowering, the empathetic, the mechanical and the neglectful. The empowering and the empathetic encounter gave rise to positive feelings within the patient while the mechanical and the neglectful engendered negative feelings. Radiographers' competence was manifested by openness, active listening and by being present in the very short and intensive encounter with the patient.

Conclusion: The quality of the interaction is of great importance to the whole radiographic procedure. The challenge for a radiographer in a diagnostic radiology department is to have knowledge of when the technology should be in focus and how to devote time to the patient and deal with the ambiguity and inseparability between them.

Learning Objectives:

1. To gain knowledge about the interaction in the encounter.
2. To learn more about different types of encounters in the course of radiographic examinations.
3. To be able to understand advantages and difficulties involved in the interaction in the encounter.

A-301 09:00

B. The role of the radiographer in patient advocacy

V. Challen; *Lancaster/UK (val.challen@cumbria.ac.uk)*

Patient advocacy can be seen to be primarily concerned with both promoting and protecting the interests of patients; yet there is no single consistent definition of the term. A wide variety of patient advocacy models have been developed for the nursing profession and more recently five elements of advocacy have been identified as a guide for the radiography profession in the UK. Some radiographer job descriptions and quality benchmarks often refer to the requirement of the radiographer to act as patient advocate; yet often the reality is that the radiographer is not empowered to take on such a role either by the employing authority or through self motivation. A recent study has shown that advocacy is seen by the majority of radiographers as a professional requirement particularly in relation to radiation safety; however, most are unwilling to discuss potential radiation doses with patients despite requests from patients and carers. Championing ethical and social justice in the healthcare environment plus support for patients' autonomy appears to be underdeveloped in many radiographers. These factors could be addressed through appropriate education and training in addition to the further development of assertiveness and communication skills. Advantages for both patient and radiographer in the undertaking of such roles must be tempered by any perceived limitations whilst at the same time acknowledging the changing public expectations of healthcare professionals.

Learning Objectives:

1. To understand the meaning of patient advocacy in its broadest term.
2. To appreciate the ethical and social factors involved in supporting the individual's autonomy and championing patients' rights.
3. To identify those factors that may influence and motivate radiographers in undertaking patient advocacy.
4. To analyse a number of scenarios involving an advocacy role and investigating the feelings and perceptions of radiographers undertaking such a role.

A-302 09:30

C. Measuring short and long-term consequences of a false-positive mammography among women attending breast cancer screening programmes

A. Bolejko; *Malmö/SE (anetta.bolejko@skane.se)*

Numerous studies have shown significant short-term negative psychological consequences of a false-positive screening mammography. The consequences may for instance appear as increased anxiety, fear, and feeling certain about heaving breast cancer. The results regarding long-term psychological effects are, however, contradictory. The psychological consequences of a false-positive screening mammography are difficult to measure. Up to now, generic instruments with additional ad hoc scales have been used. The generic questionnaires, although with established psychometric properties, are developed in general settings or patient populations, and as such they may not be sensitive enough to capture all psychological impact of a false-positive screening mammography. Results from studies using such measures can therefore be viewed as incomplete and remain tentative. Results from ad hoc scales are even more ambiguous, as these have not been tested regarding validity and reliability at all. The outcome measures conducted must be based on a model of the construct being measured, have high content validity, and the psychometric properties should be determined in the target population. Recently, a condition specific self-report instrument measuring consequences of a false-positive screening mammography has been established in Denmark. Initial evidence supports its reliability and validity, which provides an opportunity to measure such consequences in a more accurate and sensitive way. The questionnaire has just been adapted to a Swedish context and its content validity in a target population has been determined since the equivalence of content relevance and content coverage to the original version should be shown prior to use in another culture.

Learning Objectives:

1. To learn about what is known so far from the literature about short and long-term consequences of false-positive mammographic screening - truths and pitfalls.
2. To be aware of how to test, use and interpret available instruments for measuring short and long-term consequences of false-positive mammographic screening.
3. To be familiar with the field through examples from Sweden and Denmark.

08:30 - 10:00 **Room N/O**

Head and Neck

RC 1108

Infrahyoid neck

Moderator:
A.A.A. Abdel Razek; Mansoura/EG

A-303 08:30

A. Hypopharyngeal cancer: What you need to know

C.R. Habermann; *Hamburg/DE (c.habermann@uke.uni-hamburg.de)*

The hypopharynx, or laryngopharynx, is the most caudal portion of the pharynx that extent from the laryngeal surface of the epiglottis to the cricopharyngeus. Most authors divide the hypopharynx into the piriform sinuses, the posterior wall, and the postcricoid region. Occasionally, within the literature, a fourth area of the hypopharynx is described as the marginal area, represented by the lateral surface of the aryepiglottic folds. However, the larynx itself presents one of the true challenges of head and neck imaging. Consequently, the diagnostic approach to the hypopharyngeal neck is based on a brief understanding of the complex anatomy and function of the larynx. Congenital, inflammatory, neoplastic, and traumatic abnormalities all affect the larynx. Due to endoscopy the clinician mainly has a decided idea of the clinical problem. Although, the endoscopist is limited in the ability to define the deep extent of a certain pathology relative to precise landmarks. These landmarks determine whether the patient is a candidate for a pharyngolaryngectomy, a laryngectomy, a speech conservation therapy, or a radio- and/or chemotherapy. The exact knowledge of the different surgical approaches is mandatory for the radiologist to ascertain the necessary and most appropriate therapeutic approach and to obtain the best result for the patient. Anatomic landmarks and the radiologic appearance in a non-pathologic neck and a pathologic involvement of these landmarks will be reviewed extensively in a coherent manner.

Learning Objectives:

1. To understand the complex anatomy and function of the hypopharynx.
2. To become familiar with the TNM staging of hypopharyngeal neoplasm.
3. To recognise what the clinician needs to know for preoperative planning.
4. To provide a template for a valuable imaging report.

A-304 09:00

B. The suspected recurrence: How to deal with it

R. Hermans; *Leuven/BE (Robert.Hermans@uz.kuleuven.ac.be)*

Posttreatment imaging is done when a recurrent tumour is clinically suspected, and for confirmation and determining its extent. After radiation therapy, tumour recurrence appears on CT or MRI as a soft tissue mass at the primary site. After surgery, it appears as a mass along the resection margins. Imaging may also be used as a surveillance tool to try to detect recurrent tumour before it becomes clinically evident, possibly with a better chance for successful salvage. Early tumour recurrence may be difficult to distinguish from treatment-induced tissue changes. An early follow-up CT or MR study, best obtained about 3-6 months after end of treatment, documents treatment-caused changes. By comparing subsequent studies with this baseline study, tumour recurrences can be detected with more confidence, and often earlier than by clinical follow-up alone. Some authors recommend FDG-PET as the initial baseline study. If performed 3-4 months after treatment, PET has a high negative predictive value, but relatively low positive predictive value. A positive posttreatment PET study should be correlated with clinical findings and results from other imaging modalities, and histological confirmation is desirable. Diffusion-weighted MRI provides information about cell density, cell integrity and vascularity, and is applicable in the head and neck region. This technique is very sensitive to structural changes in pathologic tissue, even during their very early stages of development. Ongoing research suggests that this non-invasive technique, not requiring an external contrast agent, may be more specific than FDG-PET in the posttreatment evaluation of head and neck cancer.

Learning Objectives:
1. To review the expected tissue changes after therapy.
2. To learn the early signs of tumor recurrence.
3. To understand the value of post-treatment surveillance imaging.
4. To appreciate the relative value of different imaging modalities after therapy.

A-305 09:30
C. Lymph node imaging from A to Z
R. Maroldi; *Brescia/IT (maroldi@med.unibs.it)*

With the exception of distant metastases, the presence of cervical lymph node metastases is the single most adverse independent prognostic factor in patients with head and neck squamous cell carcinoma (HNSCC). This implies that staging of neck metastasis is a crucial step in treatment planning. As the sensitivity of ultrasonography, CT and MRI in identifying small lymphatic metastases is inadequate, many of the patients with no detectable metastases will receive elective treatment of the neck. Nor PET/CT presently fully addresses this clinical question. In fact, its sensitivity is strictly dictated by the size of the metastasis: excellent when size is 8-9 mm or more, very low when diameter is less than 5 mm. Should 'focused techniques', like FNAC (or functional MR, ADC-based), be applied to the most probable nodal site (s), according to primary tumor location? Unfortunately, this strategy does not appear practical, as lymphatic drainage patterns from HNSCC are not highly predictable. Nuclear medicine techniques such as the sentinel lymph node biopsy may improve the detection rate of the lymph-borne target-node. Its role in staging and management of HNSCC is yet to be fully established. A second critical issue is the detection of tumor spreading beyond the lymphnode capsule (ECS). Its presence reduces survival to 25 to 30%, and it is a significant predictor of the development of distant metastasis. The imaging features of ultrasonography, CT and MRI indicating extracapsular tumor spread, carotid and vertebral invasion should be well known to the radiologist because they have therapeutic and prognostic implications.
Learning Objectives:
1. To understand the patterns of nodal spread.
2. To review the role of morphological imaging techniques.
3. To review the role of PET/CT.

08:30 - 10:00 **Room P**

Chest

RC 1104

Bedside chest imaging

Moderator:
J. Neuwirth; Prague/CZ

A-306 08:30
A. Bedside chest radiography: Technical aspects and main results
E. Eisenhuber; *Vienna/AT (eisenhuber@gmail.com)*

Although bedside chest radiograph is one of the less elaborate imaging examinations in our diagnostic armamentarium, it remains the most frequent radiologic procedure performed in intensive care patients. Despite its limitations, chest imaging is an important tool in the management of the critically ill patient. Though the advent of digital radiography has vastly contributed to improved image quality of the bedside radiographs, optimal positioning and technique remain a real challenge for the performing technologist. Additionally, the interpretation of chest radiography in the critically ill patient poses a challenge for the radiologist, because findings are frequently unspecific and lung opacifications have similar appearances in a variety of different cardiopulmonary pathologies. Clinical information and an interdisciplinary approach are therefore crucial for optimal interpretation of these chest radiographs. The American College of Radiology has established expert recommendations for the use of bedside chest radiography. Current recommendations suggest that routine daily chest radiographs should be reserved for patients with acute cardiopulmonary problems and in patients receiving mechanical ventilation. Acquisition of a portable chest radiograph is recommended after insertion of endotracheal tubes, central venous catheters, pulmonary artery catheters, chest tubes, and nasogastric tubes. Therefore, knowledge of correct positioning of catheters, tubes, and monitoring devices and of various malpositions and associated complications is essential for the interpreting radiologist.
Learning Objectives:
1. To review the technical requirements of portable chest units.
2. To recognise the main patterns of acute pulmonary diseases.
3. To be aware of the limitations of bedside chest radiography.

A-307 09:00
B. Role of bedside ultrasonography of the thorax
K. Vidmar Kocijancic; *Ljubljana/SI (ksenija.kocijancic@kclj.si)*

Chest ultrasonography (CHUS) is a useful imaging tool, but limited (because of ultrasound physics) to the thoracic soft tissues, pleural space and adjacent processes in the lung parenchyma. This non-ionizing imaging method is unlike the radiography, CT or MRI, operator created and is very useful in patients at intensive care units because of its simplicity, reproducibility and being very useful for the clinicians, especially when performed by experts. The ICU patient can be examined in supine or sometimes in lateral or partly lateral position with the convex ultrasound (US) small radius probes using intercostal spaces as an acoustic window. Supine analysis of the anterior chest wall rules out pneumothorax, while lateral approach detects clinically relevant pleural effusion and parenchimal consolidations. CHUS is a method of choice in detection as well as in characterization and volume estimation of free and/or loculated pleural fluid. With CHUS, we can explore and characterize lung consolidations from the moment they reach the visceral pleura. They can be in contact with pleural line or can be observed through an effusion. Also, in the question of pulmonary embolisms in critically ill patients, CHUS could be contributive. Sometimes, small pleural effusion can be visible with some peripheral lung tissue consolidations indicating minute pulmonary infarction. Typical pulmonary infarction is triangular tissue consolidation with air bronchogram and absence of Doppler blood flow signals within consolidated lungs. CHUS exploration of the diaphragm can reliably evaluate respiratory movements since pleural effusion, even substantial, does not affect the amplitude of diaphragmatic excursion.
Learning Objectives:
1. To understand the role of US as a diagnostic tool in pleural and parenchymal diseases in critically ill patients.
2. To review the guidelines for estimation of pleural fluid volume.
3 To discuss the role of US as a guiding modality for bedside pleural/chest intervention.

A-308 09:30
C. Radiologic-guided bedside interventions of the thorax
F. Gleeson; *Oxford/UK (fergus.gleeson@nds.ox.ac.uk)*

This presentation will review the ultrasound appearances of pleural disease in ward and ITU based patients, and will discuss the indications for pleural procedures and the complications associated with them. The use of colour Doppler to aid the diagnosis of effusions will be discussed, as will the identification of septations and the need for intrapleural fibrinolytic therapy. The advantages of guided versus blind drain insertion will be presented, and the benefits of large versus small bore drains will also be discussed.
Learning Objectives:
1. To learn when ultrasound-guided thoracic intervention should be performed.
2. To understand how intervention should be performed.
3. To be aware of the complications that may arise from ultrasound-guided thoracic intervention.

08:30 - 10:00 **Room Q**

Interventional Radiology

RC 1109

Venous thromboembolism

Moderator:
O.M. van Delden; Amsterdam/NL

A-309 08:30
A. Which IVC filter?
D.K. Tsetis; *Iraklion/GR (tsetis@med.uoc.gr)*

Inferior vena caval (IVC) filters are effective devices for preventing pulmonary embolism (PE). The incidence of fatal recurrent PE is 20%, despite adequate anticoagulation, and typically occurs within the first 3 months after the initiation of anticoagulation therapy. The indications for IVC filtration are categorized as absolute, relative and prophylactic (absence of venous thromboembolism). Application of IVC filters has been expanded to include patients needing short-term IVC filtration. For this purpose, several types of optional, retrieval filters have been developed offering protection from long-term complications of permant filtratin such as IVC occlusion, caval penetration, filter migration or fracture. Conical type IVC filters are attractive designs, due to their ability able to trap large clots into the central part of the cava, allowing flow around

the periphery and thereby decreasing the chances of caval occlusion. In order to extend the retrieval window much longer than the initial recommendation of 10-14 days, new filters have been designed to minimise effects of endothelialisation on their elements which contact the wall of the cava. The majority of these modern devices are designed with linear longitudinal struts which are able to slide out from underneath caval wall endothelium covering them. Unfortunately, there is little opportunity to compare efficacy and complication rates of different filter types, as new designs replacing older ones are continuously brought onto the market.
Learning Objectives:
1. To know the principles of treatment and discuss the indications.
2. To learn about the different types of filters and their imaging appearances.
3. To discuss efficacy of different filters.

A-310 09:00
B. Complications of IVC filters and their management
A. Nicholson; *Leeds/UK (tonynick@tonynick.karoo.co.uk)*

Inferior vena cava (IVC) filtration devices were developed in the 1970s as an alternative to open caval ligation in patients perceived to be at high risk of pulmonary embolism (PE) where anticoagulation was contraindicated or ineffective. Despite over three decades of experience, the evidence for their efficacy is lacking, and is principally based on case control or observational studies; to date, there is only one randomized, controlled trial. Reported immediate complication rates for percutaneous filter insertion (and retrieval) are consistently low (in the region of 1%) but concerns relating to long-term IVC filtration persist, with reported IVC thrombosis rates of between 1 and 28%. There is evidence from the USA of increasing rates of IVC filter insertion over the last two decades, despite relatively stable rates of thromboembolic disease. Data from the US National Hospital Discharge Survey demonstrate increased filter use from 2000 insertions in 1979 to 49,000 in 1999. The development of smaller introduction systems and filters, which are potentially retrievable, has occurred contemporaneously with this increase. It is likely that the ease of insertion of percutaneous devices has reduced the perception of risk, driving increasing rates of filter insertion and a broadening of the categories of patients for whom a caval filter is considered. The development of retrievable devices may have reduced concerns relating to long term IVC filter safety and is likely to have contributed to increased rates of filter insertion in a similar manner. This has occurred despite evidence that only a proportion of retrievable filters are actually removed.
Learning Objectives:
1. To review reported complications of filters.
2. To learn strategies to deal with the various complications.
3. To discuss how these may be avoided.

A-311 09:30
C. Central venous occlusions in the chest
A. Basile; *Catania/IT (antodoc@yahoo.com)*

Radiological approaches in the diagnostic pathway for central venous occlusion disease comprise mainly CT/MR pulmonary angiography and flebography for superior caval system. Looking at imaging modalities, angiography has long been considered the reference standard that all other techniques have to be measured against. Advantages include the option of inducing a therapy, local fibrinolysis-therapy via the angiographic catheter in place, angioplasty and stenting etc. Pulmonary embolism leads to right ventricular dysfunction and compromised hemodynamics of the cardiopulmonary system requires more aggressive treatment than anticoagulation because survival depends on rapid recanalization of the pulmonary arterial obstruction and reduction of the right ventricular afterload. Percutaneous catheter based treatment is an alternative to surgical embolectomy in high-risk patients or in patients with contraindications to thrombolytic drugs. Catheter-based thrombolysis accelerates clot lysis and hastens the rees-tablishment of normal pulmonary artery circulation, furthermore combined techniques with percutaneous thrombectomy including thrombus removal with aspiration, extraction, or fragmentation, may enhance the efficacy. Symptomatic obstruction of the superior vena cava and innominate vein of the chest is a debilitating and potentially life-threatening condition. Conventional surgery and radiation therapy have a historical role in the management of patients with malignant superior vena cava obstruction. SVC stenting has become widely accepted in the management of SVCO and has also recently been advocated as the first line treatment option in patients with malignant obstruction. Outcomes and complications compare very favorably with standard therapies such as chemotherapy and radiotherapy, and although recurrent obstruction may occur, most patients can be treated by re-intervention.
Learning Objectives:
1. To review imaging modalities.
2. To discuss interventional radiological treatment options.
3. To learn about different indications and routes of treatment.

10:30 - 12:00 **Room E2**

Interactive Teaching Session

E³ 1220

Lung cancer: From plain film to sectional imaging

Moderator:
G.H. Mostbeck; Vienna/AT

A-312 10:30
Lung cancer: From plain film to sectional imaging
J. Cáceres[1], J. Vilar[2]; [1]*Barcelona/ES*, [2]*Valencia/ES (josecac@gmail.com)*

Bronchogenic carcinoma is a main cause of mortality from cancer in the western world. Lung cancers are commonly diagnosed in chest radiographs; while some are detected, many others are missed. Common and uncommon manifestations in the chest radiograph that suggest the diagnosis of lung cancer are thus important and must be recognized. Once the diagnosis is made, it is important to perform the proper radiological work-up to establish the stage and the adequate treatment. Staging is a key factor in lung cancer management and is important for selecting the proper imaging technique in individual cases. Finally, in treated patients, imaging is a main aspect of the follow-up. The radiologist must know how to evaluate signs of recurrence, which should be distinguished from subclinical diseases and post-radiotherapy changes.
Learning Objectives:
1. To optimise imaging procedures in diagnosing lung cancer.
2. To learn basic facts in staging lung cancer.
3. To detect complications and/or recurrence in treated lung cancer.

12:15 - 12:45 **Room A**

Plenary Session

HL 3

Maria Sklodowska-Curie - Honorary Lecture

Presiding:
M. Szczerbo-Trojanowska; Lublin/PL

A-313 12:15
Female urinary incontinence:
Is there still a place for radiology/radiologists?
A.P. Wieczorek; *Lublin/PL (rtg@dsk.lublin.pl)*

Urinary incontinence is an involuntary leakage of the urine. This simple definition describes medical condition concerning more than 30% of female population, with the incidence increasing with age and parity. This embarrassing complaint significantly worsens the quality of life becoming a major society problem. Introduction of new surgical achievements such as implanting plastic tapes and meshes has opened new therapeutic opportunities. However, still between 15 and 30% of surgeries do not bring expected outcome. Among the causes of unsuccessful surgeries, multifactor background of the condition must be mentioned, as well as improper qualification for the operation, which often is based on patient history, clinical examination and urodynamics and sometimes additionally on insufficient imaging studies. Percentage of failures in surgical treatment of urinary incontinence could be decreased involving in the diagnostic process modern imaging tools such as MR or high frequency ultrasonography, which are not even mentioned in any urogynaecological and proctological guidelines for the management of urinary dysfunctions. Precise assessment of pelvic floor organs is nowadays possible despite their complex anatomy and function. This, however, requires close cooperation between radiologists and clinicians to define the role and place of imaging techniques in modern urogynaecology in order to better understand incontinence and provide clinically useful information for treatment of women with urinary incontinence.
Learning Objectives:
1. To comprehend urinary incontinence in women as increasing social problem.
2. To understand the function of pelvic floor organs and modern imaging methods allowing their precise visualisation.
3. To become familiar with currently available imaging techniques in diagnostics and monitoring of treatment of urinary incontinence.

14:00 - 15:30 **Room A**

Extremity Joint MRI

MC 1325

Upper extremity: Anatomy, variants and pitfalls

Moderator:
M. Rupreht; Maribor/SI

A-314 14:00

A. Shoulder

K. Wörtler; *Munich/DE (woertler@roe.med.tum.de)*

The anatomy of the glenohumeral joint is not only complex but also highly variable. Anatomic variants are most frequently observed at the labral-bicipital complex (sublabral recess), the superior portion of the anterior glenoid labrum (sublabral hole, Buford complex), and the superior and middle glenohumeral ligaments (morphologic variations, absence). On cross-sectional imaging, these variants might be misdiagnosed as sequels of previous trauma, such as SLAP lesions, injuries of the anteroinferior labro-ligamentous complex, or pulley lesions. Other anatomic variants, particularly those of the bony elements of the shoulder (abnormal glenoid version, glenoid dysplasia, os acromiale) and the long head of biceps tendon, might however be associated with shoulder pathology, such as glenohumeral instability and subacromial impingement. This course reviews the normal cross-sectional anatomy of the shoulder, important anatomic variants and typical pitfalls in interpretation. Practical guidelines that might prove useful in distinguishing morphologic variants and pathologic conditions on the basis of imaging features will be presented.
Learning Objectives:

1. To become familiar with the anatomy of the shoulder joint.
2. To learn about anatomic variants of the labroligamentous complex, labral-bicipital complex, and bony elements of the shoulder.
3. To avoid misinterpretations of anatomic variants as pathologic conditions.
4. To learn about useful imaging features in order to distinguish variants from labral tears, SLAP lesions and other shoulder pathologies.

A-315 14:30

B. Elbow

M. Zanetti; *Zurich/CH (marco.zanetti@balgrist.ch)*

The anatomy of the elbow joint is complex. The common flexor (associated with Golfer elbow) and extensor origins (Tennis elbow) dominate the soft tissue supporting structures medially and laterally. Biceps and brachioradialis anteriorly and triceps posteriorly make up the other significant muscles. Several anatomical variants are important for MRI interpretation. Extraarticular variants are divided into abnormal signal changes and anatomical variation in normal structures. Magic angle signal phenomenon on short TE sequences account for a high proportion of ‚normal' signal variation. The biceps tendon and the flexor and extensor entheses are particularly prone. An increased signal in the ulnar nerve on fluid sensitive MR images is visible in 60% of asymptomatic elbows. The distal biceps tendon is commonly seen with two separate splits (-25%). Anatomical variations in ligaments are uncommon, though their anatomy is complex. The lateral collateral ligament is visible only in 85% of asymptomatic elbows but the other elbow ligaments are all visible. Three important nerves cross the elbow and all may be compressed by anatomical variants. The ulnar nerve may be compressed by an accessory anconeus epitrochlearis. The radial nerve may be compressed by fibrous bands, the vascular leash of Henry or between the two heads of supinator. The medial nerve may be compressed by an accessory supracondylar process or by the bicipital aponeurosis. Variants inside the elbow include joint surface pseudodefects, notably the capitellum and trochlea. Synovial folds (not thicker than 2 mm) are normal intraarticular structures. The posterolateral plica is seen in 98% asymptomatic elbows.
Learning Objectives:

1. To review in detail the MRI anatomy of the elbow joint and its relevance to disease processes.
2. To consider imaging protocols and techniques directed to the clinical problem.
3. To review the small number of anatomical variants that may be encountered.

A-316 15:00

C. Wrist

A.H. Karantanas; *Iraklion/GR (akarantanas@gmail.com)*

MRI has become an important diagnostic tool in the evaluation of wrist pain and functional impairment. MRI is able to depict various disorders such as avascular necrosis, occult fractures, inflammation, neoplasms, infections, and injuries of the triangular fibrocartilage (TFC) and interosseous ligaments. Normal anatomy demonstration by an optimized protocol is a prerequisite for depicting abnormalities. The increased SNR provided by high field MR systems (1.5-3.0 T) is important for obtaining high-resolution images. Patients should be placed in the prone position with the elbow extended overhead and the pronated hand in the center of a dedicated surface or phased array coil placed in the isocenter. The imaging protocol may include the following sequences using FOV of 8-10 mm and slice thickness 2-3 mm: coronal and transverse T1-w SE and fat suppressed PD-w TSE, coronal STIR and 3D-GRE and sagittal T1 and T2-w. Contrast-enhanced fat suppressed T1-w SE images are acquired in cases with clinical indication of inflammation, infections and neoplasia. The MR arthrogram is performed with fat suppressed T1-w SE (2 mm) in all three planes or with a transverse 3D-T1-w-GRE (1 mm) after intra-articular injection of Gd solution (1:200). Pitfalls of wrist MRI include inhomogenous fat suppression, magic angle effect often seen in the abductor pollicis longus and extensor pollicis brevis tendons, high signal of ligamentous attachments on hyaline cartilage, susceptibility artifacts from previous operations and partial volume effects. Variants in the wrist include variable ulnar length, presence of accessory muscles and TFC age-related changes and tears in asymptomatic individuals.
Learning Objectives:

1. To learn about a suggested updated MR technique for imaging the wrist.
2. To understand the normal imaging anatomy.
3. To become familiar with the most common pitfalls and variants that may simulate disease.

14:00 - 15:30 **Room B**

Chest

RC 1304

Airways evaluation

Moderator:
S. Matthews; Sheffield/UK

A-317 14:00

A. Volume CT assessment of diffuse diseases of the airways

G.R. Ferretti; *Grenoble/FR (GFerretti@chu-grenoble.fr)*

The diagnosis of airway disease is challenging for the clinician as it has no specific clinical or functional features. Volume CT has become the preeminent imaging modality for the assessment of the airways and is at the present time the radiological method of choice for investigating a patient suspected of airway disease. Volumetric HRCT of the entire lung combining end inspiratory, end expiratory, and dynamic expiratory acquisitions demonstrates localized functional information. The addition of postprocessing techniques such as maximum intensity projection, minimum intensity projection, and multiplanar reformations enhance the diagnostic capabilities of CT in showing characteristic findings of airway diseases. Moreover, volumetric HRCT assesses the extent and severity of disease. It may be repeated for assessing the response to therapy, and often avoid the need for histological evaluations. In the presentation, we will review the role of volume CT in patients suspected of bronchiectasis, chronic bronchitis, asthma, tracheobronchomalacia, and small airway diseases.
Learning Objectives:

1. To review the advantages of VCT for the diagnosis and characterisation of airway abnormalities.
2. To emphasise the post-processing techniques that may contribute to improving the visualisation of airway diseases.
3. To recognise the main patterns of small airway diseases on VHRCT.

A-318 14:30

B. Quantitative assessment of the airways

F. Laurent; *Pessac/FR (francois.laurent@chu-bordeaux.fr)*

Methods for noninvasively measuring airway dimensions have been a challenge since the site and nature of airway obstruction in chronic airway diseases have been recognized. In this respect, the role of Computed Tomography has been essential and this course will focus on both the technical aspects and major results obtained using this technique. Taking the advantages of the three-dimensional evaluation of airways using multidetector CT, recent advances in computer algorithms have made possible to measure airway wall and lumen of any visible bronchus on CT images at each bronchial generation. Various methods of segmentation of airways have been proposed and developed. They will be presented with their respective advantages and drawbacks as well as the potential effects of CT technical and visualisation

parameters and cardiovascular pulsations. So far, no consensus, however, has been found for establishing the most appropriate method for measuring airways. In addition, the limited spatial resolution of CT does not allow visualising and measuring small airways. Nevertheless, many investigators have compared morphometric bronchial parameters assessed by CT with functional and histological indexes in various chronic airway diseases, i.e. COPD, asthma and cystic fibrosis. Potential applications of these results are the definition of phenotypes, non-invasive assessment of airway remodeling and inflammation, evaluation of pharmacotherapy. During this course, these major features will be reviewed and their significance commented as well as discrepancies and contradictions amongst investigations. Finally, conditions of further developments including dynamic changes in airway caliber, a likely more appropriate method for assessing functional abnormalities, will be presented.
Learning Objectives:
1. To know the technical requirements of MDCT for a quantitative evaluation of large and small airways.
2. To comprehend the various post-processing methods that are useful in quantitative evaluation of large and small airways.
3. To understand the potential applications in airway diseases.

A-319 15:00
C. CT quantification of pulmonary emphysema
P.A. Gevenois; *Brussels/BE (pierre.alain.gevenois@ulb.ac.be)*

Multi-Detector Row CT (MDCT) provides information on the overall lung structure as it relates to diffuse pulmonary diseases such as pulmonary emphysema, which is characterized by lung destruction and reduced tissue mass. These changes are associated with a shift of the attenuation distribution curve toward negative values. As a consequence, indexes derived from this distribution - such as the relative area of lung occupied by attenuation coefficients lower than a particular threshold and percentile of this distribution - can be used as measurements of the extent of pulmonary emphysema. With MDCT, morphometrical comparisons have shown that the relative area of lung occupied by attenuation coefficients lower than -960 HU and the 1st percentile of the distribution curve are appropriate indexes to reflect both the macroscopic and microscopic extents of pulmonary emphysema but that indexes characterizing the size distribution of lung areas with attenuation lower than -960 and 1st percentile were not appropriate. In order to reduce radiation dose, the tube current-time product can be reduced (down to 20 mAs) but as the radiation dose has an effect on CT quantification, it should be kept constant in follow-up examination. For the same reason, slice thickness should also be kept constant. Based on quantification of pulmonary emphysema as part of COPD, MDCT makes now possible its phenotyping.
Learning Objectives:
1. To understand the morphological features of pulmonary emphysema and the basis of CT quantification of pulmonary emphysema.
2. To become familiar with the different CT quantitative indexes and the influences of CT parameters on these indexes.
3. To understand the potential role of CT in phenotyping chronic obstructive pulmonary disease.

14:00 - 15:30 **Room C**

State of the Art Symposium

SA 13

Lymph node imaging: Imaging is back!

Moderator:
J.O. Barentsz; Nijmegen/NL

A-320 14:00
Chairman's introduction: Can US, CT and MRI challenge PET/CT?
J.O. Barentsz; *Nijmegen/NL (J.Barentsz@rad.umcn.nl)*

The proposed coursed will discuss the various aspects of nodal imaging pertinent to cancer staging in the abdomen and pelvis. The anatomical distribution of lymph nodes along with the imaging appearance of normal lymph nodes will be discussed along with pathways of metastatic nodal spread in various abdominal tumors. The use of state-of-the-art imaging including US, MDCT, MRI, and PET-scanning for lymph nodes will be outlined. Recommendations for optimal imaging planes, optimal spatial resolution, appropriate use of contrast agents, and pitfalls will be made. The changing clinical role of imaging techniques in relation to nodal dissection will be assessed. Guidelines will be provided in which patient group nodal imaging should be performed and in the patients in whom imaging is less relevant. Finally, the increasing role of new techniques like multi detector high resolution CT, USPIO-MRI, advanced US, PET-scanning and 3D segmentation will be presented and discussed. Practical problems general radiologists may encounter using these new techniques will be addressed. After this course, the attendees will know where the various abdominal anatomical lymph nodes are located, how they can be found on cross-sectional images and, more in general, what the criteria are for metastatic nodes. They will be able to appropriately use cross-sectional techniques and will be aware of new developments and how they can potentially apply them.
Session Objectives:
1. To appreciate the importance of nodal staging in cancer.
2. To understand the advantages and disadvantages of the various imaging techniques.
3. To show which imaging modality should be used for different cancers.

A-321 14:05
How and where to use US for nodal diagnosis
L. Solbiati; *Busto Arsizio/IT*

Nodal staging is of crucial importance in the diagnostic work-up and in the follow-up of the majority of neoplastic diseases. Sonography (US) plays a fundamental role in nodal staging when superficial nodal chains (neck, axilla, groin) are involved, while for deep abdominal and retroperitoneal nodal chains CT or MRI provide much higher detection rate. US allows to detect superficial adenopathies as small as 2-3 mm, with a detection rate higher than that of cross-sectional modalities, but, particularly for very small lymph nodes, the critical issue is the differentiation between immunoreactive and pathologic (either inflammatory or metastatic) nodes. For this purpose, morphological criteria - such as size, shape, echogenicity of the cortex, presence of the hyperechoic hilum, calcifications and intranodal necrotic or cystic changes - and vascular patterns assessed by color-power Doppler (hilar or peripheral vessel distribution, focal absence of perfusion, presence of subcapsular, displaced and/or burnt vessels, etc ..) are generally used, with reported sensitivity range of 80-85% and specificity of 85-90%. Recently, contrast-enhanced US (CEUS) has been applied to superficial lymph nodes and further findings have been described, particularly for the characterization of metastatic nodes, i.e. disruption of hilar vascularity, replaced by cortical hypervascularity with tortuous and aberrant feeding vessels and intranodal focal areas with early wash-out, representing deposits of neoplastic cells or necrotic changes. However, significant limitations in the characterization of small metastases in normal-sized or slightly enlarged nodes are still encountered, and fine-needle aspiration biopsy (FNAB) remains the main diagnostic modality for the final diagnosis in doubtful cases. US can enable more accurate selection of nodes to submit to FNAB, reducing the number of pathologic assessments and is the modality of choice for the guidance of FNAB in all cases.
Learning Objectives:
1. To appreciate the importance of nodal staging in cancers.
2. To understand the potential and limitations of US in detecting lymph node metastases.
3. To show how nodes can be biopsied by US guidance.

A-322 14:28
Abdominal and pelvic nodes: Is morphological assessment using CT and MR useful?
D.-M. Koh; *Sutton/UK*

Nodal disease is an independent adverse prognostic factor in many cancers. Accurate nodal staging is important for treatment planning. Although nodal size measurement is still most frequently applied to distinguish between malignant and benign lymph nodes, there can be substantial overlap. As such, morphological assessment of lymph nodes using CT and/ or MR imaging can help to improve nodal staging. Morphological evaluation of nodal shape, nodal contour, presence of necrosis, nodal calcifications, nodal clustering, internal nodal heterogeneity, loss of fatty nodal hilum and nodal enhancement may improve the detection of malignant lymph nodes in patients with cancers prior to treatment. Nevertheless, the limitations and pitfalls of using these features for nodal assessment should be understood. Following chemotherapy, a change in nodal morphology may also suggest a response to treatment. Nodal assessment using nodal size and morphological appearances should be interpreted with the relevant clinical details, laboratory findings, as well as history of prior treatment. This combined approach can help to optimise nodal assessment using conventional CT and MR imaging.
Learning Objectives:
1. To appreciate the importance of nodal staging in cancers.
2. To understand the criteria used to assess lymph nodes for malignancy on CT and MR.
3. To learn how knowledge of tumor markers, the pathological features of the primary malignancy and the pathways of nodal spread can contribute to nodal assessment.
4. To identify pitfalls in nodal assessment by conventional CT and MR imaging.

A-323 14:51

Nodal staging: MR and beyond?

J.O. Barentsz; *Nijmegen/NL (J.Barentsz@rad.umcn.nl)*

A macrophage-specific magnetic resonance (MR) contrast agent allows the detection of small and otherwise undetectable lymph node metastases in patients with cancer. This has an important clinical impact as the diagnosis will be more precise and less invasive to obtain. Subsequently, this will reduce morbidity and health care costs. However, thorough knowledge of sequence parameters and planes, lymph node anatomy, appearance of normal and abnormal nodes, patterns of spread, and pitfalls is essential when using this novel MR-technique. This will be elaborated in this presentation.

Learning Objectives:

1. To show the value of MR imaging in detecting lymph node metastases.
2. To understand which new developments improve the recognition of pathologic nodes.
3. To compare the clinical prospects of these novel MRI techniques in relation to PET/CT.

Panel discussion:
Choosing the right modality: Clinical cases 15:14

14:00 - 15:30 **Room D**

Imaging in Lung Diseases

CC 1318

Lung perfusion imaging: CT or MR?

Moderator:
A. Larici; Rome/IT

A-324 14:00

A. Technological basis for lung perfusion with CT

B. Ghaye; *Liège/BE (bghaye@chu.ulg.ac.be)*

Assessment of pulmonary perfusion could be useful in various clinical settings, i.e. pulmonary embolism. In this setting, CT pulmonary angiography (CTPA) is able to identify clots within distal pulmonary arteries with 95% specificity. The clinical impact of PE depends not only on the embolus size but also on the underlying factors, including vasoactive agents, vasoconstriction reflex, systemic arterial hypoxemia, sequelae of previous episodes of PE, or associated disorders, such as chronic obstructive pulmonary disease. Assessment of the impaired microcirculation may provide additional information that may be more important for patient treatment than the direct visualization of emboli. CT assessment of pulmonary perfusion has been attempted by various techniques, including dynamic CM enhancement or a dual-phase subtraction technique. Radiation dose is one of the main drawbacks precluding the use of repeating acquisitions with CT. With the introduction of dual energy CT (DECT), the pulmonary microcirculation can be assessed in a single acquisition at acceptable radiation dose. Nevertheless, DECT does not allow a true perfusion assessment as vascular iodine content can only be assessed at one time-point. However, compared to scintigraphy and MRI, it is the only imaging modality able to provide high-quality morphological and functional information on the pulmonary circulation from the same data set, justifying the moderate increase in the overall radiation dose compared to single-source CT. The aim of this lecture is to review the CT techniques to evaluate lung perfusion with special emphasis on DECT and to provide the technological basis to understand, perform and optimize multi-energy CT scanning.

Learning Objectives:

1. To understand the technological basis of lung perfusion imaging with MDCT.
2. To describe the current protocols that enable lung perfusion imaging in routine clinical practice.
3. To review the various means of optimising image quality.

A-325 14:30

B. Clinical experience with CT

F. Pontana; *Lille/FR (fpontana@yahoo.fr)*

The assessment of the pulmonary microcirculation is clinically relevant in numerous thoracic disorders and is now accessible to CT. This new trend in evaluating the lung perfusion is driven by the technological developments of dual-source multidetector-row CT technology which offers the possibility to integrate the evaluation of the capillary level by means of dual energy CT (DECT). The analysis of the most distal portion of the pulmonary circulation is now available in routine clinical practice and requires, for proper interpretation of images, a basic knowledge of the lung perfusion physiology. With regard to the diagnosis of acute pulmonary embolism, DECT can detect perfusion defects, well known from scintigraphic perfusion studies. It can also contribute to recognize ground glass opacities of vascular origin when a nonspecific pattern of ground glass attenuation is depicted on diagnostic images. Alterations in pulmonary perfusion can also be integrated in the CT assessment of small airways diseases like asthma or COPD. Lung perfusion quantification by DECT can also be considered in the preoperative assessment of postoperative pulmonary function in patients with severe emphysema or lung cancer. The major clinical impact of these new scanning protocols is that morphology and function can be obtained from the same data set, with no restriction on the diagnostic performance of high-resolution CT angiographic images and with radiation doses below the legally required levels. The purpose of this lecture is to review these physiological perspectives offered by DECT in 2010.

Learning Objectives:

1. To learn about lung perfusion in normal subjects.
2. To describe the basic patterns of abnormal perfusion in clinically relevant situations.
3. To become familiar with the most frequently encountered interpretive pitfalls.

A-326 15:00

C. MR perfusion imaging

S. Ley; *Heidelberg/DE (ley@gmx.de)*

MRI of the chest is getting more and more accepted for the assessment of diseases of the lung parenchyma. Contrast enhanced pulmonary perfusion (ce-perfusion) is a key component of recommended MR examination protocols. Image acquisition is easy and can be rapidly performed. In principle volumetric datasets with a high-spatial resolution are acquired over time during a rapid injection of a contrast agent. These datasets can be reformatted as needed allowing for a good delineation of the lobar and segmental pulmonary anatomy. Analysis can be done visually i.e. by image subtraction revealing perfusion deficits. Obvious perfusion defects, either focal or wedge-shaped can be differentiated from a heterogeneous reduction. This basic analysis already allows for characterization of different vascular pathologies or diseases of parenchymal origin. Detailed functional information can be gained from quantitative analysis of pulmonary blood flow, pulmonary blood volume and mean transit time. These parameters show excellent agreement with perfusion scintigraphy and H (2)15O positron emission tomography (PET). Quantitative perfusion analysis should be applied in patients with pulmonary hypertension. Here, a good agreement with pressure measurements could be established. MRI of pulmonary perfusion is also well suited for follow-up examinations as this technique allows for regional and quantitative therapy monitoring.

Learning Objectives:

1. To review the practical approach of perfusion imaging with MRI.
2. To become familiar with the functional parameters evaluated with MRI.
3. To describe the advantages and limitations of MRI in comparison with MDCT in evaluating lung perfusion.

14:00 - 15:30 **Room E1**

Musculoskeletal

RC 1310

Knee

Moderator:
M. Maas; Amsterdam/NL

A-327 14:00

A. Menisci: Latest advances

S.J. Eustace; *Dublin/IE (seustace@iol.ie)*

This talk will review basic anatomy and function of meniscii and optimum imaging techniques using MRI. The talk will then review patterns of meniscal injury, types of meniscal tear, and review the concept of medical versus surgical meniscal injury. The talk will outline the role of radiology in the management of meniscal cysts and finally address current concepts in meniscal transplantation.

Learning Objectives:

1. To review imaging protocols and anatomy of the menisci.
2. To review MR appearances of commonly encountered meniscal tears.
3. To review implications of imaging appearances on patient outcome and management.

A-328 14:30

B. The posterior corners

J. Hodler; *Zurich/CH*

The posterolateral and posteromedial corners of the knee both consist of several structures which are important for stabilization. Unfortunately, they are not consistently defined in the literature. Many descriptions of the posterolateral corner include the lateral collateral ligament, the popliteal tendon, the popliteofibular ligament and the posterolateral capsule, which is reinforced by the arcuate ligament and the fabellofibular ligament. Descriptions of the posteromedial corner also vary. The superficial and deep medial collateral ligament as well as the posteromedial capsule serve as passive restraining structures. The popliteal oblique ligament may not be consistently found as an individual structure. If present, it has a close relationship with the posteromedial meniscus. The posteromedial corner has also been described as the "semimembranosus corner" because of the functional significance of the semimembranosus muscle. Up to five semimembranosus expansions have been described. Corner lesions are typically associated with injuries of the cruciate ligaments and the menisci. In the acute phase, clinical findings can be difficult to interpret due to pain and swelling. Missed injuries of the posterior corners may lead to chronic instability, chronic pain, and, eventually, to secondary osteoarthritis. They may also adversely affect the outcome of knee surgery such as cruciate ligament repair. MR imaging is the best diagnostic test in suspected corner lesions. It demonstrates corner injuries and associated lesions, including those that may be overlooked during clinical examination or arthroscopy.

Learning Objectives:

1. To learn about the anatomy of the posterior corners.
2. To consolidate knowledge about injuries to the posterior corners.
3. To appreciate the role of imaging methods in the diagnosis of posterior abnormalities.

A-329 15:00

C. The post-operative knee

C. Glaser; *Munich/DE*

As meniscal, ligament and cartilage repair procedures are more and more commonly applied there is also a need for post-OP MRI in the knee. This requires knowledge from the radiologist regarding the basic principles of repair procedures, what are to be considered regular anatomy and normal imaging findings post-OP, how to differentiate these from pathologic post-OP evolution. Technically, the MR imaging approach has to cope with artifacts arising mostly from magnetic foreign particles introducing local field inhomogeneities. The overarching goal of repair procedures is to prevent future premature osteoarthritis. Principally, ligament repair aims at restoring a stable joint and at providing a quick return to activity. Meniscal surgery tries to preserve as much of a stable meniscal substance as possible because of the significant meniscal contribution to load bearing. Cartilage repair procedures target joint surface congruity. Technically, relaxation time dependent inversion recovery sequences provide a much more robust fat suppression than frequency based saturation techniques. As simple as it is, careful selection of frequency and phase encoding directions with respect to the location of foreign metallic objects versus the area of interest are indispensable to help avoid or at least greatly reduce artifacts. In addition, use of turbospinecho sequences with short echo spacing, short echo times in general, high spatial resolution, high bandwidth contribute to artifact suppression. Direct and indirect MR arthrography may be useful to detect recurrent/residual meniscal tears and fragmentation/early loosening after meniscal/cartilage surgery.

Learning Objectives:

1. To review principles of repair procedures in the knee.
2. To appreciate technical aspects of imaging the post-operative knee.
3. To discuss normal and pathologic findings when imaging the post-operative knee.

14:00 - 15:30 **Room E2**

Interactive Teaching Session

E³ 1320

Imaging in common clinical problems: Acute abdomen

Moderator:
F. Takis; Keratea/GR

A-330 14:00

Imaging in common clinical problems: Acute abdomen

A. Palkó[1], P.-A. Poletti[2]; [1]*Szeged/HU*, [2]*Geneva/CH (palkoand@gmail.com)*

In a general hospital, acute abdomen accounts for 30 to 40% of all emergency surgical admissions, and the abdomen is involved in approximately 25% of multi-trauma patients. Recent technological advancements have brought to the forefront the importance of imaging in the initial assessment and subsequent management of patients admitted with acute abdominal conditions. Thus, the role of clinical examination, laboratory data and imaging is constantly redefined in new management algorithms, in the strive to achieve the highest level of efficiency and to spare medical resources. Abdominal traumatic injuries, either isolated or part of more extensive trauma, require immediate and reliable imaging evaluation after stabilization of the patient's condition in order to make fast therapeutic decision to reduce mortality to a minimal level. In both traumatic and non traumatic acute abdominal conditions, the routine diagnostic work-up scheme (plain abdominal X-ray + ultrasound) is more and more frequently replaced by abdominal multidetector CT examination extended to other regions if necessary. It is of utmost importance for an emergency radiologist to get familiar with the classical signs and pitfalls encountered in common traumatic and non-traumatic acute situations, as well as to understand the current role and diagnostic efficacy of the different imaging modalities.

Learning Objectives:

1. To highlight the role of different imaging methods in the radiological work-up of patients with acute abdominal pain.
2. To discuss the radiological signs of the most frequently encountered acute abdominal pathologies.
3. To present pitfalls in imaging patients with acute abdominal pain.

14:00 - 15:30 **Room F1**

Organs from A to Z: Liver

MC 1319

Diffuse liver diseases

Moderator:
A. Besim; Ankara/TR

A-331 14:00

also EPOS

A. Assessment of diffuse liver disease (including cirrhosis)

L. Martí-Bonmatí; *Valencia/ES (marti_lui@gva.es)*

The different MR approaches used to make a clear initial qualitative evaluation in diffuse liver disorders will be commented on and complemented with the implementation of imaging biomarkers to accurately quantify the degree of liver abnormalities. MR is unique in its ability to extract information on tissue components and functional status. This information has transformed the way imaging interacts in clinical scenarios of liver disorders. MR can accurate evaluate the degree of liver steatosis with the use of chemical shift and TSE fat suppression imaging. New tools (separation of water and fat signals with gradient asymmetric echo and spectroscopy) may be even more precise. Also, non-invasiveness iron concentration can be now calculated with multiecho T2* relaxometry techniques and even with simple monoexponential T2 decay signal intensity calculations. The degree of water in the parenchyma can be also inferred with the use of STIR images, thereby, allowing the diagnosis of steatohepatitis and grading the necroinflammatory infiltrate in cirrhosis. The presence of liver fibrosis directly affects the isotropy conditions of the water molecules, suffering from a higher restriction to movement. With IVIM, a restricted diffusion in patients with cirrhosis is mainly related to variations in the perfusion component as well as alterations in pure molecular water diffusion in cirrhotic livers. The liver perfusion characteristics may be also of interest in the evaluation of fibrosis and inflammation. MR Elastography and MR Spectroscopy with metabololomic quantitation will also play a role in the grading of chronic liver diseases.

Learning Objectives:
1. To learn the imaging features of cirrhotic diffuse liver disease.
2. To learn the imaging features of non-cirrhotic diffuse liver disease.
3. To learn how imaging can help in the quantification and follow-up of diffuse liver disease.

A-332 14:30

B. Infectious diseases of the liver

O. Akhan; *Ankara/TR (akhano@tr.net)*

Infectious diseases of the liver include pyogenic and amoebic abscesses, parasitic diseases such as hydatid diseases and schistosomiasis, fungal, viral and granulmatous diseases such as tuberculosis. Infectious organisms may enter into the liver by hematogenous spread via the hepatic artery or portal vein, ascension of the infection from biliary tract or direct extension from penetrating trauma. The number of the patients with liver infections is increasing in the daily practice because of the increases in immigration and travel worldwide besides higher rate of immunocompromised patients. Imaging modalities such as ultrasonography, computed tomography and Magnetic resonance imaging play important roles in the detection and differential diagnosis of liver infections. Features of imaging modalities with appropriate clinical information are needed to obtain the most likely diagnosis in most of the cases with liver infections. However, percutaneous biopsy is indicated to achieve the correct diagnosis in the others. Characteristic imaging features demonstrated in different liver infectious diseases may lead to early diagnosis, so that appropriate treatment can be performed accordingly. Besides the advances of the diagnosis, percutaneous treatment techniques under imaging guidance have already gained a major role in the treatment of liver abscesses and liver hydatid diseases. Percutaneous approach has already become the first choice in the treatment of liver pyogenic abscesses and hydatid cysts.

Learning Objectives:
1. To learn relevant epidemiology of infectious diseases of the liver.
2. To appreciate imaging findings of infectious disease in both immunocompromised and non-immunocompromised patients.
3. To understand the technique, indications and results of image-guided procedures in the management of infectious diseases of the liver.

A-333 15:00

C. Vascular diseases of the liver: Detection and role of transplantation

V. Vilgrain; *Clichy/FR (valerie.vilgrain@bjn.aphp.fr)*

There are three different vascular systems in the liver. Arterial diseases are uncommon and mostly observed after transarterial chemo-embolisation or liver transplantation. These abnormalities will not be covered it this lecture. Portal venous obstruction may be due to tumoral obstruction mostly related to hepatocellular carcinoma or clotting (portal venous thrombosis). Risk factors for portal vein thrombosis (PVT) are liver cirrhosis, intra-abdominal infection, and thrombophilic disorders including myeloproliferative diseases. Diagnosis of PVT is based on imaging-studies and among them computed tomography plays an important role. Imaging is also helpful to differentiate acute stage from chronic stage and to evaluate the complications related to PVT including portal hypertension. Anticoagulation is strongly indicated in acute PVT as complete or partial repermeation can be achieved in most patients. Other treatments are exceptional. On the other hand, if extrahepatic PVT is present, liver transplantation is much more complicated. The hepatic venous system extends from the central veins of the hepatic lobule, up to the hepatic vein ostia into the inferior vena cava. Most of the other disorders of the hepatic venous system eventually cause its obstruction. The so-called Budd-Chiari syndrome is the liver disease resulting from the hepatic venous outflow block. Primary BCS relates to the primary venous lesions including phlebitis, thrombosis or fibrosis. Diagnosis of PVT is based on imaging-studies and among them Doppler ultrasound and MR imaging play an important role. Anticoagulation and therapy for underlying disease are crucial. Portosystemic shunting and liver transplantation are discussed in symptomatic patients after anticoagulation.

Learning Objectives:
1. To understand the imaging findings associated with vascular abnormalities within the liver.
2. To learn the indications of liver transplantation in vascular diseases.
3. To learn the importance of vascular assessment before liver transplantation and to recognise vascular abnormalities that may render difficult or even contra-indicate liver transplantation.

14:00 - 15:30 **Room F2**

Breast

RC 1302

Screening programmes: New challenges

Moderator:
S.B.G. Grover; New Delhi/IN

A-334 14:00

A. Digital mammography screening

M.J. Yaffe, R.A. Jong; *Toronto, ON/CA (martin.yaffe@swri.ca)*

In the DMIST trial of mammography screening, conducted in North America, digital mammography was demonstrated to provide superior accuracy to screen film mammography, but only for certain overlapping subgroups, women with dense breasts and women under the age of 50. The performance of digital mammography is achieved through an interplay of new technology and image processing software, interfaced to a digital archiving system (PACS). The hardware consists of the X-ray detector system and the high-resolution computer image display. The software includes several types of image processing designed to facilitate interpretation of the examination and to improve performance at detection and characterization of lesions. Interestingly, unlike screen-film mammography, where the technology is fairly homogeneous, in digital mammography there is considerable diversity in the designs of the detector systems and variation in their physical performance characteristics including spatial resolution and noise. Most mammographic signs of cancer provide subtle contrast and in general digital mammography systems are designed to amplify these contrasts at the expense of spatial resolution. Depending on the technology used, they may also provide advantages in terms of dose reduction and improved throughput of imaging. In this presentation, some of the technical factors (detector, display, software and PACS) and their influence on the diagnostic performance and practicality of digital mammography in the context of screening will be discussed.

Learning Objectives:
1. To describe conditions for digital screening.
2. To describe different systems.
3. To discuss the influence of digital screening on outcomes.

A-335 14:30

B. Are CAD systems of any help in screening?

P.A.T. Baltzer; *Jena/DE (pascal.baltzer@med.uni-jena.de)*

The basic concept of “Computer Assisted Diagnosis” (CAD) in radiology is to simplify data analysis by use of computer techniques. The reader of a study is assisted by semiautomated analyses, which can be detection or characterization of suspicious areas. Prospective use of statistical models derived from a previously analyzed representative case database or implementation of machine learning methods lead to the more sophisticated concept of “Computer Diagnosis”. In such a setting, the computer is able to detect lesions and calculate their respective probability of malignancy, acting as a second reader opinion. Up to now, only CAD systems are available commercially. The use of CAD in X-ray mammography is quite well analyzed. Most of these systems assist the reader by detecting suspicious lesions or microcalcifications. A high computer sensitivity is controlled for specificity by a human reader. In MR-mammography, CAD systems so far focused on semiquantitative analysis of dynamic enhancement features. A threshold for initial enhancement is used to segment dynamic volume data. All image voxels passing the initial enhancement threshold are further differentiated by their enhancement characteristics. Parametric maps visualize results as a color-coded overlay. Furthermore, enhancement characteristics as well as lesion volumes can be assessed quantitatively. Results can be integrated into a BIRADS based report mask. The idea is to standardize and simplify reporting of MR-mammography and thus to improve the diagnostic workflow. This talk will discuss possibilities of CAD in clinical workflow considering different CAD concepts and critically evaluate the possible value of CAD in screening with MR-mammography.

Learning Objectives:
1. To discuss CAD in clinical workflow.
2. To discuss different types of CAD in MRI.
3. To evaluate the value of CAD in screening with breast MRI.

A-336 15:00

C. Screening with MRI: The future?

H. Dobson; *Glasgow/UK (hilary.dobson@ggc.scot.nhs.uk)*

Population base screening for breast cancer with mammography has a strong evidence base and is used widely throughout the world. Since its inception, refinements of the mammographic process e.g. with the introduction of digital mammography and extension of policy to include younger and older women from the initial cohort of 50-74, have been introduced. In the U.K., recent mortality evaluations have shown generalised improvement, in part due to the contribution by screening as a result of the detection of "earlier" disease. More recently, MRI has an established role in improving cancer detection in populations deemed to be at high risk as a result of familial history/genetic mutation. This evidence base has resulted in a revision to the surveillance guidelines in the U.K. Conflicting evidence, however, exists with regard to the use of MRI "screening" of women recently diagnosed with breast cancer but being assessed for surgical conservation and a review of the literature (including ACRIN6667 and COMICE) will be presented. Evidence fails to show a cost effectiveness basis for the use of MRI as a "screening" modality undergoing follow-up following treatment for breast cancer. A recent study evaluating the use of MRI as a screening tool in young women have identified a potential increase in detection rate of ductal carcinoma in situ (DCIS) but further work is required. MRI screening of general population will be discussed in a cost effectiveness context.

Learning Objectives:

1. To give an overview of where we are now.
2. To discuss the role of conventional imaging in screening together with MRI.
3. To discuss the future role of screening with MRI.

14:00 - 15:30 **Room G/H**

Neuro

RC 1311

Neurodegenerative disorders

Moderator:
N.N.

A-337 14:00

A. The new MS diagnostic criteria

B. Góraj; *Nijmegen/NL (B.Goraj@rad.umcn.nl)*

Multiple sclerosis (MS) is the most common demyelinating disease. It can affect relatively young people and progressively lead to a serious invalidation and even death. It has been first recognized and described as the clinical entity together with its histopathological substrate in the end of the 19th century. From this time on, diverse variants and forms of the disease have been identified besides the classical MS. The clinical course of MS does not follow the uniform pattern; several possible forms have been distinguished. The diagnosis of MS relied for many years on the clinical assessment and then also on the presence of the CSF findings. Unfortunately, due to the frequently not unequivocal clinical manifestation, mimicking other disorders and to the low specificity of the CSF abnormalities, the diagnosis of MS remained difficult. The advent of MRI has changed this situation dramatically; the new tool has been found, able to depict directly the lesions in the brain. Visualisation of the demyelinated "plaques" has made it possible to diagnose MS on the basis of the presence and typical configuration of the lesions as seen on MRI scans of the brain and spinal cord. MRI techniques enable to document the dissemination of the lesions in space and time - essential for the definition of MS. The combination of clinical, laboratory and imaging parameters are being designed and constantly updated to serve as diagnostic criteria for the diagnosis of MS.

Learning Objectives:

1. To understand the pathomechanisms which lead to different MRI manifestations of MS.
2. To become familiar with diverse forms and variants of MS.
3. To review the current diagnostic criteria for MS.

A-338 14:30

B. Early diagnosis and differential neuroimaging issues in dementia

M.P. Wattjes; *Amsterdam/NL (m.wattjes@vumc.nl)*

The diagnosis of dementia is based on clinical findings within a multidisciplinary diagnostic setting. Clinical neuroimaging is increasingly being used and has become one of the most important paraclinical tools in the diagnosis of dementia. According to current guidelines, neuroimaging should be performed at least once during the diagnostic work-up of patients with suspected or definite dementia. Initially, neuroimaging was used to identify or exclude potentially treatable causes of dementia which accounts only for a small proportion of all causes of dementia. Currently, the role of neuroimaging goes far beyond these purposes. Computed tomography (CT) and magnetic resonance imaging (MRI) are able to identify and quantify the amount regional/global cortical atrophy, hippocampus atrophy as well as detect vascular damage. On structural MRI or CT, we are able to identify certain atrophy patterns which can substantially aid diagnosis in dementia. Particularly in early disease stages, advanced imaging techniques such as positron emission tomography (PET) and single photon emission computed tomography (SPECT) can be valuable tools to further improve the ability to differentiate among different neurodegenerative diseases. Using special tracers such as the Pittsburgh Compound -B (PIB) ligand, we are able to directly detect amyloid depositions in the brain which is helpful to narrow the differential diagnosis and to differentiate between Alzheimer pathology and other neurodegenerative diseases causing dementia. In addition to the role of neuroimaging for diagnostic purposes, MRI and other advanced imaging modalities have already become indispensable tools for treatment and safety monitoring in clinical trials.

Learning Objectives:

1. To learn the additional value of clinical neuroimaging in dementia in terms of the exclusion of curable causes.
2. To discuss the key features of an imaging protocol for patients with dementia on MRI and MDCT.
3. To learn typical atrophy patterns and other imaging findings of neurodegenerative diseases.
4. To learn the diagnostic criteria and imaging findings in vascular dementia.

A-339 15:00

C. Neuroimaging in abnormal movement diseases

B. Gómez-Ansón, E. Granell Moreno; *Barcelona/ES (bgomeza@santpau.cat)*

Movement diseases including Parkinson´s disease, atypical Parkinsonisms, Huntington´s disease, Fragile X Chromosome Tremor Associated Ataxia Syndrome (FXTAS), essential tremor, and spinocerebellar ataxias, among others, have been traditionally described and classified on phenotypical (clinical) features. Recent advances on their underlying genetic, biochemical, pathological and neuroimaging features have produced the necessity for their reclassification. The association of cognitive decline to some of these conditions has produced the emergence of new concepts/entities, such as Parkinson´s Disease Dementia or cognitive decline associated to taupathies. Additionally, novel treatment options, both pharmacological and in functional neurosurgery, have produced the necessity for improving early and precise diagnosis. Although neuroimaging features have been described in groups of patients having various abnormal movement disorders, a challenge still remains for neuroimaging to precisely characterize a single subject´s pathological condition. Neuroimaging methods, including modern postprocessing/anaylysis approaches, such as Voxel based Morphometry (VBM) or pattern recognition, may provide further insights in this regards in the very near future. For this, multicentric, large-scale efforts to create large databanks of multidisciplinary information, aiming at linking the different types, are needed.

Learning Objectives:

1. To give an overview of the current classification of abnormal movement diseases, including clinical, biochemical, and genetic data.
2. To summarise the imaging findings described in these conditions.
3. To present the challenges for neuroimaging in the field for the very near future.

14:00 - 15:30 **Room I**

Physics in Radiology

RC 1313

Radiation dose management

Moderators:
M. Koutalonis; London/UK
J.N. Vassileva; Sofia/BG

A-340 14:00

A. Justification in clinical practice

J.R. Mayo; *Vancouver, BC/CA (jmayo@vanhosp.bc.ca)*

Justification and dose optimization form the foundation of medical radiation dose management. Justification ensures that the benefit derived from the radiologic examination exceeds the risk imparted by: administered radiation, derived information and societal cost. The justification decision can only be completed using data regarding: patient's age, sex, medical condition, psychosocial state; referring

clinician's differential diagnosis, experience, tolerance for diagnostic certainty; radiologist's expertise, experience, tolerance for diagnostic certainty, knowledge of radiation risk; society's provision of equipment, resource balancing perceived need. The weighting of any one factor may determine the final imaging decision. In majority of cases, the information available for the calculation of risk benefit is either; ignored, unrecognized, irrelevant, or nonexistent. Therefore, majority of imaging decisions are arbitrary. The increased utilization of expensive, high radiation dose imaging examinations is forcing the radiologic community to address this problem, with the poster child modality being CT. This review will provide an overview of the estimated extent of unjustified examinations and outline the currently implemented solution, clinical practice guidelines supported by clinical outcome data. The ultimate goal of justification is to provide all parties relevant risk and benefit information at the time of radiologic consultation.

Learning Objectives:

1. To illustrate benefit-to-risk ratios for common CT examinations.
2. To review the evidence that suggests harm may be caused by the radiation dose delivered in medical imaging.
3. To outline a simple method of dose calculation for CT, the conversion of dose length product to effective dose.

A-341 14:30

B. Practical CT dose reduction strategies

W.A. Kalender; *Erlangen/DE (willi.kalender@imp.uni-erlangen.de)*

It is generally known that dose depends on scan parameters such as tube voltage (kV) and time-current product (mAs); the basic relationships will be reviewed briefly. It is less well known and actually a very complex question how a desired image quality level, in particular a specific contrast-to-noise-ratio, can be achieved at minimal dose. Respective optimization efforts also have to take the imaging task into account, i.e. the question if soft tissue, contrast medium or bone is to be imaged. Tube current modulation and especially automatic exposure control which are available on modern CT scanners try and help the user with this task; respective concepts and technical implementations will be reviewed in detail. They allow working at a desired noise and resolution level by adapting the scan parameters automatically. Technical approaches, e.g. new image reconstruction approaches or detector materials, which may help to reduce dose further and which will likely become available routinely in the future, will be covered briefly to indicate their potential.

Learning Objectives:

1. To understand how patient dose relates to the choices of standard scan parameters.
2. To understand the concepts of tube current modulation and automatic exposure control for CT.
3. To learn about new technical approaches to dose reduction.

A-342 15:00

C. Digital vs conventional radiography: What about the dose?

J.R.G. Persliden; *Örebro/SE (Jan.Persliden@orebroll.se)*

Digital radiography gives new possibilities to optimise the radiographic images. The radiation dose in digital radiography can often be substantially reduced. This, however, depends among other factors on the radiation detector used. Using CR (computed radiography), the doses have been shown in several studies to be approximately of the same magnitude as those in film screen radiography. Using flat panel detectors, the dose in some examinations have been reduced by up to 70% compared to the film screen dose. The new detectors dynamic range means that we no longer need to expose the image to the same density as before to avoid over or under exposure. We can now expose the image to the level where the noise no longer is disturbing the interpretation and let the computer adjust the grey scale level. Examples will be given on how to reduce the dose down to an acceptable noise level in lumbar spine and urography examinations. On the other hand, it is also possible to increase the dose without over exposing the image. An example will be given where the use of a digital fluoroscopy system substantially increased the dose. Using digital techniques, it is also possible to process the image, reduce the noise, enhance edges, etc. Factorial experiments have been performed to find optimal exposure and processing settings in, as an example, lumbar spine examinations.

Learning Objectives:

1. To present radiation dose levels associated with digital radiography.
2. To become familiar with practical dose reduction methods in digital radiography.
3. To compare doses of conventional and digital radiography.

14:00 - 15:30 **Room K**

Pediatric

RC 1312

Safety first

Moderator:
S. Ryan; Dublin/IE

A-343 14:00

A. CT in children: Dose reduction strategies

R.A.J. Nievelstein; *Utrecht/NL (R.A.J.Nievelstein@umcutrecht.nl)*

The revolutionary development in multidetector CT (MDCT) technology during the past decade has contributed to a substantial increase in its diagnostic applications and accuracy in children. A major drawback of MDCT is the use of ionizing radiation with the risks of radiation induced side effects, of which the induction of secondary cancer is the most important. Therefore, justification and optimization of paediatric MDCT is of great importance in order to reduce these risks as much as possible („As low as reasonably achievable" principle). Optimization of paediatric MDCT starts with a solid understanding of all technical aspects of CT, including the most relevant scan parameters, dose reduction techniques and technique of IV contrast material administration. Furthermore, due to the smaller size and lack of visceral fat in young children, the interaction and absorption of radiation will be different which will influence the choice of the various technique and scan parameters. Although all these issues are pivotal for a successful CT examination, it may become worthless if the importance of pre-scan issues such as justification and patient preparation are ignored. After a short overview concerning the current knowledge on radiation related risks in children, this lecture will focus on several aspects relevant for MDCT optimization in children. Issues like justification, patient preparation, technique and scan parameters and contrast administration will be addressed. Finally, some guidelines for radiation dose level based CT protocols will be given.

Learning Objectives:

1. To outline the current knowledge on radiation risks in children.
2. To discuss the CT scan and technique parameters that influence radiation dose.
3. To discuss dose reducing strategies in order to optimise CT in children.

A-344 14:30

B. Ensuring safety for infants undergoing MRI

T.G. Maris; *Iraklion/GR (tmaris@med.uoc.gr)*

Purpose: To present an overview of the safety hazards and safety protocols related to infants undergoing MRI examinations.
Methods and Materials: MRI infrastructure dependent safety hazards originating from: (a) static and fringe magnetic fields, (b) gradient subsystems, (c) radiofrequency subsystems and (d) acoustic noise sound pressure will be reviewed and discussed. Safety hazards related to upcoming technological issues and future trends concerning MRI will be presented. The current status of the organizations responsible to the problems of MR safety will be reviewed. An optimized protocol related to a variety of clinical MR sequences in reference to temperature measurements, EMF measurements, SAR and acoustic noise figures using basic commercially available infrastructure will be presented. 2D/3D TSE sequences with different ETLs, 2D/3D GRE, 2D/3D SSFP, SE/GRE EPI sequences with multi-(b) diffusion gradients and 3D TOF MR angiography sequences will be examined. In vitro measurements of SNR, spatial resolution and scan times will be performed for each clinical MR sequence.
Results: A comprehensive MRI equipment operational policy (optima: (ETL, TR, TE, b-value, EPI factor, SAR, SNR, Spatial Resolution, Scan time etc)) for a safety protocol for infants undergoing MRI is proposed. Recommendations for safe infant MRI examinations will be summarized and presented.
Conclusion: MRI equipment can operate safely for infant imaging but require policies and procedures beyond those required for standard diagnostic MRI examinations.

Learning Objectives:

1. To present an overview of the three basic safety hazards related to infants undergoing MRI examinations.
2. To present safety hazards related to upcoming technological issues and future trends.
3. To present a safety protocol that could be applied in MRI examinations for infants.

A-345 15:00

C. Fetal MRI: Attitudes towards safety

D. Price; *London/UK (david.price@uclh.nhs.uk)*

With the development of ultra-fast imaging techniques such as EPI and HASTE, MRI has become a very important tool in the assessment of fetal abnormalities particularly in the brain. However, there a number of potential hazards associated with the use of this technique. The developing fetus will be exposed to both static and time-varying magnetic fields. There is also the potential for raised fetal temperatures due to RF power deposition. Ultra fast MRI scans may also have high acoustic noise levels. Current evidence suggests that RF heating and acoustic noise are the most concerning issues. However, there is a great deal of uncertainty over any possible effects. At present, published follow-up studies of children exposed to MRI in-utero have not shown any strong evidence of detrimental effects. However, these studies have been on a small scale. Various national and international regulatory and advisory bodies have published guidance on MRI safety which include considerations of the pregnant patient and the fetus. Commercial MRI systems also operate to an IEC safety standard. In particular, this aims to restrict temperature rises within the patient through the use of specific absorption rate (SAR) limits. On the basis of our present knowledge, it is prudent to remain within the 'normal' mode of operation with regard to SAR exposure. It is also important, so far as possible, to reduce the maternal stress induced by the examination; for instance, through the provision of adequate hearing protection.

Learning Objectives:

1. To understand the possible hazards to the fetus from MRI including RF power deposition and acoustic noise.
2. To achieve an awareness of the current evidence in the literature as to the extent of the hazards.
3. To achieve an awareness of the current guidance from safety advisory bodies.
4. To understand protective measures that may be considered as part of a risk-benefit analysis for fetal imaging.

14:00 - 15:30 **Room L/M**

Radiographers

RC 1314

CT imaging

Moderators:
M. Golebiowski; Warsaw/PL
D. Pekarovic; Ljubljana/SI

A-346 14:00

A. CT of the GI system

M. Leidner; *Stockholm/SE (Madeleine@Leidner.se)*

CT of the small bowel and the colon is done in our department for many years now. As the technique gets better with the possibility to have thinner slices and shorter scan time, the exams are of course better today than when we started with CT of the GI tract. We started with a 4 slice scanner, then a 16 slice scanner and now with a 64 slice scanner we can really see the difference in images quality. The new technique also gives us nice reformatted images in other plans like coronal and sagital. At first, we used air for the colon and there had to be a doctor to insufflate the air; now we use carbon dioxide and with automated insufflations. This means that we get a much better colonic distention and it is easier for the patient. Now, we have some radiographers doing the examinations. For the small bowel we use negative contrast media, either Guaran (through a tube) or VoLumen to drink. The best is to administrate the contrast trough a nasogastric tube, but that means that there has to be a doctor to insert the tube. Both examinations need intravenous contrast media and we give 500 mg Iodine based on body weight. The delay for the colon is 70 seconds (venous phase) and for the small bowel 50 seconds (enteric phase) to see the enhancement in the bowel wall. We always scan the whole abdomen.

Learning Objectives:

1. To learn about CT of the GI tract, especially the small bowel and colon.
2. To understand the MDCT technique and how to improve image quality using examples from 4, 16 and 64 slice scanners.
3. To become familiar with how to prepare the patient, the use of different contrast media, protocols for scanning and how to present the images for the doctor.

A-347 14:45

B. Introduction to PET/CT: Modalities and patient care

K.J. Thomsen; *Odense/DK*

In this presentation, the basics behind PET/CT will be presented giving an insight in the configuration of the scanner hardware and how the images are made. The technique is not as far away from X-rays as one should think. It is just turned a little upside down. The patient is the part emitting the radiation instead of the X-ray tube, and the PET crystal detects the radiation and converts it into useable images. The challenge in this process is the patient who becomes more or less radioactive. Rule number one: keeping distance very much applies here. And, of course, as little patient contact as possible. Lead is also used in protecting the staff but unfortunately the patient emits 511 KeV and so protective clothing made of lead is not an option. PET is a functional examination much like ultrasound and urography. PET shows metabolic active cells. However, it can be difficult to say exactly which organ is affected. This is where the CT comes in. When the two types of images are fused, it is easier to see which organs are involved and thereby making a more exact diagnosis which will be illustrated.

Learning Objectives:

1. To understand the basics behind PET/CT scanning, hardware configuration etc.
2. To learn about the special problems/challenges when the patient is radioactive.
3. To learn about the advantages in diagnosing diseases with PET/CT.

14:00 - 15:30 **Room N/O**

Genitourinary

RC 1307

Uterus: Imaging and intervention

Moderator:
R. Forstner; Salzburg/AT

A-348 14:00

A. Benign diseases

T.M. Cunha; *Lisbon/PT (tmargarida@netcabo.pt)*

Benign diseases of the uterus can be evaluated by US, MRI, hysterography, hysterosonography and hysteroscopy. Combined transabdominal and transvaginal US is the study of choice for the initial evaluation. The use of MRI appears to be cost-effective in the diagnosis of endometrial thickening following treatment by tamoxifen, selection of candidates for selective myomectomy and the follow-up of medically treated adenomyosis. MRI is helpful in unexplained uterine bleeding with normal ultrasound, before and after embolization and in guiding focused ultrasound. CT has no role in the detection and characterization of benign uterine diseases. The most common diseases of the uterus are leiomyomas, adenomyosis and endometrial polyps. Leiomyomas may be solitary or multiple, and over 90% arise from the uterine corpus. Leiomyomas can be submucosal, intramural, subserosal, or pedunculated. Subserosal leiomyoma can grow to a large size indistinguishable from an adnexal lesion on US. On MRI, leiomyomas can be divided into two categories based on their histological characteristics: nondegenerative and degenerative. Degenerative changes correspond to hyaline, myxoid, hemorrhagic and cystic degeneration, and calcification. Adenomyosis is characterized by the presence of ectopic endometrial glands and stroma within the myometrium, at least 2.5 mm from the endometrial basalis layer and is associated with reactive hypertrophy of the surrounding myometrial smooth muscle. Two forms of adenomyosis are known: a diffuse and a focal type, also known as adenomyoma. MRI is the most accurate noninvasive imaging test for differentiation of leiomyoma from adenomyosis. After imaging, detection of endometrial polyps should be always confirmed by hysteroscopy and pathological evaluation.

Learning Objectives:

1. To recognise US and MRI findings and imaging pitfalls in benign uterine diseases.
2. To understand the indications for MRI.
3. To discuss the different types of uterine leiomyoma degeneration.

A-349 14:30

B. Malignant tumors

J.A. Spencer; *Leeds/UK (johnaspencer50@hotmail.com)*

A recent modification to the FIGO staging system for uterine cancer has been agreed and this will be discussed with emphasis on its implications for imaging. A staging system has been proposed for uterine sarcoma which has previously been staged according to that for uterine carcinoma. This divides sarcomas into leimyosarcoma

where size is an important local staging discriminator from endometrial stromal sarcoma and adenosarcoma where depth invasion is more relevant. Carcinosarcoma is staged as for uterine carcinoma where now local stage is simply stage IA, inner half, all tumour grades vs outer half, stage IB.
Learning Objectives:
1. To review MR imaging protocols and appearance of malignant uterine tumors.
2. To understand the role of MR imaging in staging malignant uterine tumors.
3. To understand current therapeutic strategies for malignant uterine tumors.

A-350 15:00

C. Ultrasound ablation and uterine artery embolisation for treatment of uterine leiomyomas

T. Kroencke; *Berlin/DE (thomas.kroencke@charite.de)*

Uterine artery embolisation (UAE) is a non-surgical intervention for treating symptomatic uterine leiomyomas and represents an alternative to surgical removal (hysterectomy, moymectomy, hysteroscopic resection). The indication for uterine artery embolisation crucially relies on the pre-interventional assessment of symptomology and burden of disease. Especially the location, size, and number of leiomyomas are important to determine treatment options of patients. As a rule, both single and multiple fibroids can be treated by UAE. The number and location of the individual tumors (subserosal, intramural, transmural, submucosal) do not affect the approach, technique or outcome of UAE. MR guided high-intensity focused ultrasound (HIFUS) is a non-invasive treatment option for symptomatic leiomyomata. In contrast to UAE and surgery, it lacks the invasiveness of these procedures since the targeted leiomyoma are ablated by energy transmitted through the skin by focused ultrasound while exact delivery is monitored online by MR imaging. Size, location and number of fibroids are limiting factors for the application of HIFUS. Magnetic resonance imaging (MRI) is superior compared to ultrasound in delineating the extent of fibroid disease and excluding other pathologies or disease processes that may mimic fibroid-related complaints. Further advantages of MRI result from the use of MR angiography and contrast-enhanced imaging in assessing outcome and complications following UAE. This presentation summarizes the current role of UAE and ultrasound ablation (HIFUS) for uterine leiomyomata as well as the role of imaging before and after the procedure.
Learning Objectives:
1. To understand basic principles, indications and contraindications of MR-guided high-intensity focused US (HIFU) and uterine artery embolisation.
2. To understand the role of imaging in patient selection and follow-up.
3. To learn about the role of these treatment options and alternative surgical therapies in light of the current literature.

14:00 - 15:30 **Room P**

Professional Challenges Session

PC 13

The radiologist of the future: Challenges and changes

Moderator:
P.A. Grenier; Paris/FR

A-351 14:00

Chairman's introduction

P.A. Grenier; *Paris/FR (philippe.grenier@psl.ap-hop-paris.fr)*

From training to management, numerous challenges await radiologists in the future. It is necessary to update the curriculum for training in radiology, bearing in mind alarming demographic projections and the need for better representation of some subspecialties. In the face of constant evolution in medicine, the role that radiologists will play in innovative multidisciplinary fields, such as molecular imaging, needs to be discussed now. Although probably involved in the future translational and clinical phases of development, radiologists must absolutely secure their place in the research teams as of today. Radiology could defend itself better in turf battles and to the authorities if it communicated more effectively and efficiently. Although numerous challenges face imaging, there are reasons to be optimistic. Three international renowned experts will address their visions on training perspectives, investment in technologic innovations, and the role of management and communication to reinforce the position of radiology in healthcare systems. Different solutions will be debated during the session, and participants are extremely welcome to present their ideas.
Session Objectives:
1. To become fully aware of the most important strategic issues for the future of radiology.
2. To know the visions of three renowned and highly estimated leaders to take up our professional challenges.
3. To be prepared to develop strategic plans in order to adapt our training programmes, develop new emerging areas of imaging, and improve our ability in management and communication.

A-352 14:05

How to train the radiologists of the 2 1st century

I.W. McCall; *Oswestry/UK (iainwmcc@aol.com)*

The quality of training is a key factor for the future of European radiology. The numbers of radiologists per national population varies across European, often with insufficient trainees to replace let alone expand the specialist work force. The increased percentage of female radiologists influences the available workforce and the working time directive increase the radiologist requirement for a 24/7 service. The training curriculum provides structure for all European training programmes and it must be regularly revised taking into account these demographic factors and future clinical demands reflecting future not past requirements. Developments that are limited to specialist centres or in advanced state of research will become mainstream and new techniques incorporated. Trainees must understand both principles and practice. Techniques that are no longer required are removed. The curriculum must include an understanding of physiology and cell biology for molecular level imaging and function. Imaging is now too extensive for radiologists to be experts in all areas. Subspecialisation is therefore essential, but this must build on a core knowledge and ability to use all available equipment and to deal satisfactorily with all common diseases. The subsequent degree of subspecialisation will depend on the future role of the trainee. Subspecialisation curricula are also essential. Changing methods of delivering training will provide greater European uniformity. The use of computer based teaching programmes and internet access to quality interactive radiological case collections will also bring overall improvements and harmonisation combined with apprentice based experience monitored by a European organisation.
Learning Objectives:
1. To review the demographic perspectives in radiology for the next 10 years.
2. To understand why and how the curriculum for training in radiology has to be updated regularly.
3. To know how to develop professional skills in subspecialties of radiology without leaving the common trunk.

A-353 14:28

Molecular imaging and therapy: Turf battle to lose or to win

G.P. Krestin; *Rotterdam/NL (g.p.krestin@erasmusmc.nl)*

Molecular imaging is expected to be pivotal to early diagnoses, patient stratification, and early response assessment. Although at a first glance it may seem to be of little concern to radiologists, when looking beyond the pretty pictures and sometimes complex vocabulary of molecular imaging publications, it becomes clear that radiologists need to get involved in this emerging field, if they want to maintain their central role in health care. While molecular imaging used to be primarily linked to imaging modalities not commonly associated with radiology departments, i.e. optical imaging, PET and SPECT, technologies such as CT, MRI and ultrasound are becoming essential tools in the field, either as a single modality or in hybrid imaging approaches. It is the role of academic and research institutions to gather knowledge and dedicate resources in this field. The radiological community needs to invest in this future by education and participation in the molecular sciences and by creating relevant research facilities. But it is not only research. Clinical radiologists have to be aware of the ongoing innovations in our profession and support training and education of our next generations. Clearly, molecular imaging is the new frontier in diagnostic imaging, and therefore European radiologists have to be part in this development. But molecular imaging is and will remain a multidisciplinary effort for the years to come. Not only imaging specialists a related basic scientists but also other disciplines are and should be involved in the complex process of translation of fundamental innovation into the clinical environment.
Learning Objectives:
1. To understand molecular imaging is a multidisciplinary field in medicine and science.
2. To make clear that radiologists must be involved in the development of molecular imaging.
3. To know the different steps and constraints in developing a molecular imaging programme in an academic centre.

A-354 14:51

Marketing in radiology: Evil or guardian angel

M. Goyen; *Hamburg/DE (goyen@uke.de)*

Marketing, public relations, customer communication - until recently the meaning of these concepts was unknown in European hospitals. With the incipient predatory competition and the increasing rivalry within the health market, a change of mind has resulted: the hospital on its way to becoming a patient-, quality- and employee-oriented service provider. The process of informing and, not least, specifically addressing internal and external customers plays an important role in this change. This contribution offers an overview over health marketing as a marketing concept for the planning, coordination and control of market-oriented healthcare activities with the focus on radiology.

Learning Objectives:

1. To understand why and how the crucial role of radiology in patient management and clinical outcomes must be more visible.
2. To know how to convince the authorities and healthcare decision makers about the strategic importance of investing in medical imaging innovations.
3. To acquire basic knowledge to improve our communication abilities with our partners and patients.

Panel discussion:
Can we be optimistic? … Yes we can! 17:14

14:00 - 15:30 **Room Q**

Interventional Radiology

RC 1309

Infection and percutaneous drainage

Moderator:
M. Bezzi; Rome/IT

also EPOS

A-355 14:00

A. Empyema

A.G. Ryan; *Waterford/IE (jackoriain@yahoo.ca)*

Guided by the surgical axiom of: "Choose well, Cut well, Get well", I will discuss: a) the diagnosis of empyema using radiographs, ultrasound and CT, b) the treatment options, including the use of adjunctive pharmaceuticals, c) the evidence supporting the optimal catheter and lytic and d) patient-related outcomes evidence for both interventional radiology and surgical techniques.

Learning Objectives:

1. To discuss imaging and indications for drainage.
2. To review technical aspects of catheter drainage.
3. To discuss the use of urokinase.
4. To discuss results of percutaneous drainage.

A-356 14:30

B. Abdominal abscess

V. Válek; *Brno/CZ (vlvalek@med.muni.cz)*

With the new antimicrobial agents and advances in diagnostic imaging and imaging-guided percutaneous procedures has been significantly improved management of pyogenic liver abscess. The advantages of the percutaneous approach include a marked decrease in the invasiveness and cost of abscess drainage. The classic triad of fever, upper right quadrant pain or fullness, and jaundice is rarely seen nowadays. Possible image-based exclusionary criteria for drainage included abscess size of less than 3 cm in diameter, fluid attenuation of more than 40 HU, absence of contrast material-enhanced margins, absence of trapped air in a fluid collection, absence of free intraperitoneal air, and presence of air without fluid in the abscess cavity. The most important is size of less than 3 cm. Possible clinical exclusionary criteria included normal white blood cell count, normal temperature, normal blood pressure, absence of peritoneal signs, lack of relevant medical history and do-not-resuscitate code status. Indications for percutaneous approach to abdominal abscess drainage are a clinical sign of inflammation and fluid collection (abscess) large than 3 cm. Contraindications are today only relative. Percutaneous needle aspiration or catheter drainage guided by CT of sonography, therefore, has become the therapy of choice for abdominal abscess.

Learning Objectives:

1. To discuss common indications for drainage and appropriate imaging work-up.
2. To discuss image guidance, route planning and catheter placement.
3. To review follow-up strategies and results.

A-357 15:00

C. Pelvic abscess

M.A. Funovics; *Vienna/AT (martin.funovics@univie.ac.at)*

Pelvic abscess drainage may employ more difficult acces routes due to amatomic restrictions. The procedure may carry a higher risk of complications compared to simple abdominal drainage. To optimize patient preparation, correction of coagulation deficits, optimization of antibiotic treatment, and sedation or anesthesia may be needed. The usual access routes for deep pelvic abscesses are the anterolateral and the posterior transgluteal approach. In selected cases, a transvaginal or transrectal approach may be the safer and more efficient option. Depending on the viscosity of the drained fluid, the presence of necrotic solid tissue and gas, different sizes of drainage material may be needed. Do not hesitate to employ large drainage catheters if indicated. An overview of the available material will be given. Intestinal laceration is a major complication which can be managed percutaneously in selected circumstances. The postinterventional management after percutaneous drainage is among the most important predictors of success, and most often neglected. It is advocated that the management is actively guided by the interventionalist who ensures that the drainage is properly handled, rinsed, and cleaned, that follow-up imaging is performed at the right intervals, and who ultimately indicates drain removal.

Learning Objectives:

1. To discuss indications and imaging work-up.
2. To learn about transgluteal, endocavitary and other routes of drainage.
3. To review results and follow-up strategies.

16:00 - 17:30 **Room A**

Radiology in Abdominal Emergencies

CC 1417

Inflammation and oedema

Moderator:
J.-M. Bruel; Montpellier/FR

A-358 16:00

A. The three musketeers: Appendicitis, diverticulitis, colitis

J. Stoker; *Amsterdam/NL (j.stoker@amc.uva.nl)*

Appendicitis, diverticulitis and colitis are frequent causes of acute inflammatory bowel emergencies. In many patients, suspected for these conditions the diagnosis is not clear upfront. Imaging plays an important role in identifying the underlying cause. Ultrasound (US) and computed tomography (CT) are readily available and widely used imaging techniques for this work up. US comprises an examination of the abdomen with the graded compression technique. A transducer should be used optimized for the visualization of the bowel. The CT protocol includes the use of intravenous contrast medium, while oral contrast medium will not be routine in many institutions. Findings are bowel wall thickening (or enlarged appendiceal diameter), fat infiltration, free air and fluid collections. The present evidence on the role of imaging in appendicitis and diverticulitis is substantial and has been summarized in systematic reviews. Although US is accurate in diagnosing appendicitis and diverticulitis, CT is more accurate than US. Further advantages of CT are better identification of alternative diagnoses and better comparison between consecutive examinations. Thereby, CT is more helpful in communicating the diagnosis to the referring physician. Cost effectiveness of CT in acute appendicitis has been demonstrated as well as the positive impact on management. For colitis, the evidence is more limited and imaging has here more limitations. Drawback of CT is ionizing radiation exposure. An imaging strategy with initial US and CT only in inconclusive of negative US cases results in the highest sensitivity, reduces ionizing radiation exposure and is cost effective.

Learning Objectives:

1. To know the pros and cons of ultrasound and computer tomography in appendicitis, diverticulitis and colitis.
2. To understand the imaging findings and results in appendicitis, diverticulitis and colitis.
3. To learn the role of imaging in acute inflammatory bowel emergencies.

A-359 16:30

B. Liver and biliary tree

J.A. Soto; *Boston, MA/US (jorgeasoto@aol.com)*

Acute inflammatory and infectious diseases of the liver and biliary tract are often suspected to be the cause of symptoms that require emergent attention. Thus, the hepato-biliary system is frequently the target of imaging studies performed on

patients presenting acutely. Additionally, the gallbladder and bile ducts are commonly found to be the unsuspected source of non-specific complaints, such as fever/malaise or alterations of laboratory tests, such as leukocytosis or elevated acute phase reactant levels. Acute hepato-biliary conditions encountered regularly include acute cholecystitis and its complications, acute biliary obstruction with ascending cholangitis and hepatic abscess. Although these diagnoses can be straightforward in patients with the classic combinations of specific symptoms, signs and abnormal test results, the clinical situation can be atypical, leading to delays in diagnosis with devastating consequences. Ultrasonography has been (and continues to be) the first imaging test used to evaluate the liver and biliary tract in the emergency setting. When sonographic findings confirm the clinically suspected disease, the diagnosis is established and specific therapy can be administered. However, due to the inherent limitations of ultrasonography in some instances and the non-specific clinical presentation of many patients, additional examinations are often acquired during the diagnostic investigation. These include CT, MR/MRCP, scintigraphy (HIDA scan), ERCP and EUS. This course reviews the imaging findings on multiple modalities of these acute hepato-biliary inflammatory processes with reference to the various clinical contexts. Strengths and weaknesses of each modality are emphasized, with special attention placed on causes of false-negative and false-positive results.

Learning Objectives:

1. To learn the etiology and clinical presentation of acute inflammatory liver diseases.
2. To understand imaging strategies using US, CT and MRI.
3. To know typical findings and the spectrum of differential diagnoses.

A-360 17:00

C. Pancreatitis: Common and critical

P.R. Ros; *Boston, MA/US (Pablo.Ros@UHhospitals.org)*

Pancreatitis is an abdominal condition potentially life threatening. Imaging plays a key role not only in the diagnosis but also in the staging and patient management of acute and chronic pancreatitis. Management of interstitial or edematous pancreatitis is supportive. On the other hand, severe or necrotizing pancreatitis requires intense monitoring, specific therapies and has a guarded prognosis, since it may lead to organ failure, infection, pseudocyst formation and extrapancreatic parenchymal and vascular complications. Pancreatic inflammation and necrosis can be easily identified by imaging methods and has prognostic implications. The clinical prognostic criteria in acute pancreatitis have been modified and are currently coupled with imaging criteria. CT plays a central role in the evaluation of patients with known or suspected pancreatitis. A CT based severity index is the main prognostic method to predict outcomes. In addition, MRI and MRCP play increasingly important roles in pancreatitis evaluation. Integrity of the pancreatic duct can be easily evaluated by this last method, particularly if coupled with the use of secretin. We discuss the modern imaging criteria for the diagnoses, staging and patient management in acute pancreatitis and review subtypes such as immunologic and groove pancreatitis. We additionally review the evidence based imaging utilization parameters and published appropriateness criteria for the use of CT and MRI in the setting of pancreatitis.

Learning Objectives:

1. To learn epidemiology and clinical outcome of patients with pancreatitis.
2. To understand typical findings and diagnostic pitfalls.
3. To know the role of radiology in patients with acute and chronic pancreatitis.

16:00 - 17:30 **Room B**

Special Focus Session

SF 14

Imaging in ENT emergencies

Moderator:
B. Verbist; Leiden/NL

A-361 16:00

Chairman's introduction

B. Verbist; *Leiden/NL (b.m.verbist@lumc.nl)*

Many ENT and craniofacial pathologies can be handled electively; however, there are otolaryngological emergencies, both traumatic and non-traumatic, for which proper initial assessment and management are crucial in preserving life and minimizing disabling or disfiguring sequelae. This session will highlight the diagnostic approach and critical imaging findings in patients with facial and temporal bone trauma and infectious or inflammatory disease of the paranasal sinus, neck, mastoid, middle and inner ear.

Session Objectives:

1. To review indications for urgent imaging in head and neck radiology.
2. To provide appropriate imaging protocols for ENT emergencies.
3. To become familiar with imaging findings in acute head and neck pathology.

A-362 16:05

Emergencies of the sinonasal cavities and the anterior skull base

J.W. Casselman; *Bruges/BE (jan.casselman@azbrugge.be)*

Life-threatening emergencies are rare in the anterior skull base and sinonasal and orbital region. In trauma, even the most severe fractures or soft tissue lesions rarely require immediate life saving intervention. However, intracranial bleeding, brain concussion with swelling etc. require immediate care. Therefore, imaging should always include the intracranial structures. A major soft tissue bleeding can also put the patient's life at risk and prompt action by the surgeon is then needed. Severe bleeding can also occur after surgery performed for other reasons (e.g. tumor surgery). Traumatic involvement of the eye and especially the optic nerve should be checked as fast decompression of the nerve is needed to preserve vision. Both CT and MR can play a role here. Infection, especially fungal sinus infection, can reach the orbital intra-conal structures or intracranial structures. This, then, becomes a real emergency and can have a fatal outcome in the absence of adequate treatment. Many other lesions present as "sub-acute" emergencies. Imaging is required to save normal function (e.g. vision, mastication, prevention or reparation of CSF leaks which often make normal daily life impossible etc). In most of the traumatic and bleeding emergencies, CT will be the technique of choice in the early post-traumatic period because of its availability, speed and access (monitoring etc). However, in some cases (e.g. optic nerve compression/edema), MR might be needed in an immediate second stage. Most of the above mentioned emergencies will be illustrated and discussed.

Learning Objectives:

1. To know the traumatic and non-traumatic emergencies in the anterior skull base and orbit.
2. To learn which imaging techniques should be used in the different emergency situations.
3. To learn which information is most important for the clinician and must be reported.

A-363 16:28

Emergencies of the ear

F. Veillon; *Strasbourg/FR (Francis.Veillon@chru-strasbourg.fr)*

The emergencies of the ear are represented by the acute infection of the middle ear with mastoiditis whose extension must be described by the radiologist to the otologist: peripheral abcess, osteitis, fistula of the otic capsule, thrombosis of the lateral sinus, extradural abcess, unique or multiple cerebral abcesses. Infections of the inner ear leading to ossifying labyrinthitis are regarded as an emergency in cases where cochlear implantation is considered. The traumatisms of the round and/or oval windows with or without fracture with a leakage of perilabyrinthine fluid are also discussed with the results of imaging leading, in most of the cases, to an immediate surgery. The fistulas of the inner ear with an important vertigo due to secondary or primitive cholesteatomas, histiocytosis, agranulocytosis, tuberculosis must be operated immediately. Finally, a precise knowledge of anatomy, a good technique of imaging and a close collaboration with the otologist are necessary.

Learning Objectives:

1. To understand what the otologist wants to know from the radiologist in acute mastoiditis.
2. To learn about the different techniques of CT and MRI in emergencies of the ear.
3. To describe a practical approach to reading the images in emergencies of the ear.

A-364 16:51

Emergencies of the neck

M. Becker; *Geneva/CH (minerva.becker@hcuge.ch)*

The purpose of this lecture is to familiarize the radiologist with the most common types of traumatic and non- traumatic emergencies in the neck. A systematic review will include key radiologic features of laryngeal fractures, pharyngeal perforation, traumatic vascular injuries (dissection, occulusion, pseudoaneurysm, perforation and acute bleeding) and trauma of the brachial plexus (streching, avulsion, compression). The review will also focus on non-traumatic neck emergencies with a special emphasis on infectious lesions including suppurative lymphadenitis, cellulitis, neck

abscess, necrotizing fasciitis, pyolaryngoceles, osteomyelitis, septic thrombosis of the internal jugular vein and infected branchial cleft cysts. Typical associated infectious complications of the mediastinum and chest will be discussed with an emphasis on the early detection of lesions. The detection of foreign bodies as a cause of secondary infection will also be briefly addressed. Major emphasis will be put on what the clinician needs to know and on how to report the findings in a comprehensive way.
Learning Objectives:
1. To become familiar with common presentations of traumatic and non-traumatic emergencies of the neck.
2. To describe the pertinent radiologic findings and to identify related complications.
3. To be able to adapt the examination protocol depending on the type of lesion suspected.
4. To learn how to report the pertinent findings to the clinician.

Panel discussion:
Good reasons for performing CT and MRI in emergencies 17:14

16:00 - 17:30 **Room C**

New Horizons Session

NH 14

Hybrid imaging: The radiologic/nuclear sandwich

Moderator:
T.F. Hany; Zurich/CH

A-365 16:00
Chairman's introduction
T.F. Hany; *Zurich/CH (thomas.hany@usz.ch)*

The science of medical imaging has various facets, especially function and morphology, play a major role in oncology as well as non-oncological disease. Even though capable of detecting various functional impairments, radiology is regarded as the main diagnostic field in the detection of morphological pathologies, especially by cross-sectional imaging. Nuclear medicine, on the other hand, has been limited to a certain kind of pure functional studies. The introduction of positron-emission-tomography (PET) at the end of the last decade by using different tracers, among which F-18 Fluorodeoxyglucose proved the most reliable substance for metabolic imaging, has rejuvenated nuclear medicine especially in the field of oncological imaging. Hampered by the lack of a morphological reference frame, addition of morphological cross-sectional image information of computed tomography (CT) to the so-called PET/CT has proved to be one of the most successful stories in medical imaging. This success has carried on further developments to combine different imaging modalities as well as nuclear medicine tracers/technologies like PET/MR or SPECT/CT in oncological imaging and other fields like cardiology or musculo-skeletal disease. This development has been driven by experts of each field; however, further efforts have to be invested to determine how/where to embed this technology and how to train our future users to satiate our ongoing hunger of knowledge, which a sandwich just cannot do.
Session Objectives:
1. To learn technique and daily use of hybrid imaging technology.
2. To enhance the knowledge of new tracers used in hybrid imaging.
3. To have further insight in possible other hybrid imaging technology beyond PET/CT.

A-366 16:05
PET/CT: Lessons learned from a decade
G. Antoch; *Essen/DE (gerald.antoch@uni-essen.de)*

Diagnostic potentials - as well as limitations - associated with morphological cross-sectional imaging on the one hand, and functional imaging on the other, are increasingly well understood. It has become obvious that in many cases both kinds of imaging complement one another. Therefore, hybrid PET/CT imaging must be considered one of the most important new developments in medical imaging in the past decade. However, some questions have to be raised and challenges have to be met to avoid overrating PET/CT in oncology and cardiology. In oncology, PET/CT with [18 F]-2-Fluoro-2-deoxy-D-glucose (FDG) as a radioactive tracer has been reported to be more accurate than either imaging modality alone and sometimes even more accurate than CT and PET read side by side. However, the clinically important question after one decade of PET/CT imaging should rather be the following: Does this higher accuracy have an impact on patient management? Only recently have cardiac PET/CT applications have become feasible with integration of high-end CT systems within the PET/CT scanner. A „one-stop shopping approach" when imaging a coronary artery stenosis with CT-angiography (CTA) and, simultaneously, imaging the corresponding functional effects of the affected myocardium must be considered desirable. However, visual correlation of CTA with PET or SPECT data sets acquired on separate scanners has been performed successfully for years. To address the topic „lessons learned from a decade", this talk will provide an overview on current indications as well as limitations of PET/CT in oncology and cardiology.
Learning Objectives:
1. To become familiar with indications of PET/CT utilizing FDG and other radionuclides.
2. To understand the limitations of PET/CT as currently available in clinical routine.
3. To learn about tumor-specific PET/CT examination protocols.

A-367 16:28
New tracers in hybrid imaging
S. Fanti; *Bologna/IT (stefano.fanti@aosp.bo.it)*

Among molecular imaging procedures, Positron Emission Tomography (PET) is the most diffuse and rapidly growing, and at present it is routinely used in patients affected by a large variety of malignant neoplastic diseases. Many papers in the literature have already demonstrated the utility of this imaging technique whose capabilities have been furthermore developed by the introduction of hybrid scanners, particularly PET/CT. The combination of functional data (given by PET) and anatomic details (by CT) allows to significantly increase diagnostic accuracy, essentially due to a better specificity. The usefulness of PET relies on its capability of investigating molecular processes by means of specific radiotracers, with the most employed being 18 F-DeoxyGlucose (FDG). FDG PET scans give important information about tissues glucose consuption, usually very increased in the great majority of solid malignancies. Despite FDG scans representing more than 90% of all PET scans, other positron emitter tracers are available and each one may be specific for different neoplastic diseases. In fact, some malignancies do not show increase in glucose consumption and are almost invisible with FDG. Tracers already in clinical use include Choline (labelled with 11C or 18 F), a marker of cell membrane metabolism particularly useful for prostate cancer detection; 18 F-Tyrosine and 11C-Methionine, which enable to study proteic metabolism and are successfully employed for CNS neoplastic diseases; 11C-Acetate, used for prostate cancer, hepatocellular carcinoma and other liver lesions; and 18 F-DOPA and 68Ga-DOTA-NOC, useful in neuroendocrine tumors. Other PET tracers are currently undergoing trials to evaluate their potential usefulness in oncology and other fields.
Learning Objectives:
1. To become familiar with new PET tracers beyond FDG recently introduced in hybrid imaging.
2. To understand the potential clinical applications of PET/CT using these new tracers.
3. To speculate on further development of hybrid imaging related to new tracers.

A-368 16:51
Hybrid imaging in 10 years
T. Beyer; *Essen/DE (thomas2@gmx.net)*

Since the 1990s, combinations of imaging systems have become available that allow the intrinsic combination of functional and anatomical imaging within a single exam. With the latest PET/MRI technology, this information can even be acquired simultaneously, thus opening the door to new insight into molecular pathways and to examinations that are affected less by motion artifacts. Though PET/MR is unlikely to replace PET/CT, or any other imaging technology as such in clinical routine, it has nonetheless aroused the interest of many researchers. PET/MR appears particularly appealing in neurology research and some oncology applications. In 10 years from now, we will see all existing dual-modality imaging systems in clinical routine, including PET/MR. These systems will offer patients a maximum accuracy in diagnosis, staging and follow-up. Research on PET/MR together with new advances in therapy strategies for neurodegenerative diseases may help push the importance of PET/MRI. We will witness ultra-fast, whole-body PET/CT staging becoming a modality-of-choice in oncology. SPECT/CT could evolve into a whole-body imaging modality with supplementary use in dosimetry applications. Although desirable, other combinations of imaging systems, such as SPECT and MRI, may have to wait another 10 years to turn into prototype systems for clinical applications. In the interim, a combination of PET and US is lingering around waiting

for first prototype adopters. As exciting as these new hybrid imaging systems, even triple-modality systems, sound we need to remember that these imaging systems need to be technologically feasible, applicable in clinical routine and cost-effective.
Learning Objectives:
1. To review existing hybrid imaging technology in clinical practice (e.g. SPECT/CT, PET/CT, PET/MR).
2. To appreciate the potential of truly combined imaging technology (e.g. anatomical guidance of image reconstruction).
3. To speculate on hybrid imaging technology and applications in the near and distant future.

Panel discussion:
Will all imaging become hybrid? 17:14

16:00 - 17:30 **Room D**

Imaging in Lung Diseases

CC 1418

Is volumetric CT the only way of scanning lung diseases?

Moderator:
J. Rémy; Lille/FR

A-369 16:00

A. Radiation dose and chest CT imaging
D. Tack; *Baudour/BE (denis.tack@skynet.be)*

X-rays delivered by diagnostic and interventional radiology are lower than 100 to 200 mSv and belong to the low level radiation. As no direct carcinogenic effect of low level radiation has been definitely proven, the carcinogenic risk in the range of low-level radiation is calculated by linear extrapolation of the risk observed among atomic bomb survivors. CT is responsible for more than 50% of patient exposure for diagnostic imaging because the number of examination and the dose per examination are both high. Chest is an anatomical region of high risk for radiation induced carcinogenesis because the radio sensitivity of its content is high, in particular in women because of the breast.
Learning Objectives:
1. To understand the current debates on the radiation risks of medical imaging.
2. To describe the relative contribution of CT to radiation dose.
3. To review the relative radiosensitivity of chest organs and the subsequent practical considerations for chest CT imaging.

A-370 16:30

B. Optimisation of volumetric CT protocols
M. Prokop; *Nijmegen/NL (mathias.prokop@gmail.com)*

Volumetric CT protocols have become the de-facto standard for most body CT applications. The „scan thin-read thick“ paradigm is also valid for pulmonary CT: data are acquired with thin collimation (0.5 - 1 mm, depending on scanner type), reconstructed with slightly thicker overlapping sections (0.75 - 1.25 mm) to yield a „secondary raw data set“ from which, depending on the clinical question, thick axial, coronal and sagittal sections can be reconstructed using multiplanar reformations. For most clinical application, 5 mm thick sections reconstructed every 4 mm suffice. For lung embolism and high-resolution imaging of the lung parenchyma, however, thinner sections (1 - 2 mm) yield better results. For the lung parenchyma, in particular, special adaptations have to be considered: by using a 768^2 or 1024^2 matrix and a high-resolution kernel spatial resolution can be improved. By choosing the reconstruction increment close to the relation “field of view/matrix size”, an isotropic data grid is produced that provides excellent quality in all imaging directions. Higher speed will reduce breathing artifacts. Minimum scan durations for the chest vary between 0.7 and 4 s, depending on the manufacturer. Without ECG-triggering, ultrafast scans may cover the heart in systole and suffer from severe cardiac motion artifacts also in the lung parenchyma. Prospective ECG-triggering of ultrafast spiral scans (“flash scanning”) is therefore advisable so that the heart is always covered in diastole. Retrospective gating is only useful in patients with lung disease if cardiac function or pulmonary artery pulsatility is to be evaluated as well.
Learning Objectives:
1. To understand the “scan thin-read thick” paradigm of volumetric scanning.
2. To become familiar with the various techniques to optimise volumetric resolution.
3. To understand the effect of motion and learn about techniques to reduce motion artifacts.

A-371 17:00

C. Alternatives to volumetric CT
S.R. Desai; *London/UK (sujal.desai@kch.nhs.uk)*

Multidetector computed tomography (MDCT) of the lungs offers many advantages: the rapid acquisition significantly reduces or eliminates the movement artefacts that have plagued earlier generations of CT machines. Multiplanar images, once the ambit of magnetic resonance imaging, are now routinely available from MDCT acquisitions. Sophisticated post-processing techniques (including internal/external rendering and maximum/minimum intensity projections) and the ability to generate “high-resolution” images, that simulate conventional high-resolution CT (HRCT), are the other perceived benefits of MDCT technology. Nevertheless, advances in imaging often come at a price and must never be viewed uncritically: aside from the increased radiation burden, the real clinical impact of MDCT images has never been rigorously tested. Indeed, in specific clinical scenarios (for example, in the diagnosis of acute pulmonary embolism), MDCT images appear to offer no clinical or prognostic advantage over CT images acquired using single-slice technology. In many air space diseases, MDCT probably adds little to the diagnostic evaluation particularly after the findings on serial chest radiographs and the key clinical data have been considered. In diffuse interstitial lung diseases (DILD), it is noteworthy that the image quality of a “high-resolution” MDCT study may be inferior to conventional HRCT. Furthermore, the added influence of the larger number of images generated in an MDCT examination on observer confidence and accuracy in DILD has been questioned. In this presentation, the value of volumetric MDCT in thoracic imaging will be critically evaluated.
Learning Objectives:
1. To review the clinical situations in which alternatives to volumetric CT can be reasonably considered.
2. To describe the practical alternatives to volumetric CT.
3. To discuss the necessary collaboration between radiologists and clinicians to implement alternatives to volumetric CT in routine clinical practice.

16:00 - 17:30 **Room E1**

Musculoskeletal

RC 1410

Bone tumors

Moderator:
K. Verstraete; Gent/BE

A-372 16:00

A. Diagnosis: From radiographs to MRI
K. Wörtler; *Munich/DE (woertler@roe.med.tum.de)*

The diagnosis of a bone tumor is based on clinical findings, the age of the patient, the location of the lesion, its radiologic appearance, and, if imaging does not allow for a specific diagnosis, its histopathologic features. Radiography remains the initial imaging modality for evaluation of the localization of the lesion with respect to the longitudinal and axial planes of the involved bone, for the depiction of matrix mineralizations, and for estimation of biologic activity by analyzing the patterns of bone destruction and periosteal response. CT can add „radiographic“ information particularly in regions of complex skeletal anatomy such as the spine, pelvis and shoulder girdle. MR imaging has classically been used to determine the local extent of a bone tumor (local staging). In addition to radiography and/or CT, it can at times also be valuable in establishing the differential diagnosis, especially in cystic bone lesions and cartilaginous tumors. Whole-body applications have recently gained importance in demonstrating the presence and extent of bone (marrow) involvement in benign and malignant systemic/polyostotic tumorous diseases. This course reviews the basic principles of diagnosing bone tumors in a multimodality approach (with an emphasis on conventional radiography). The different steps of morphologic analysis as well as the advantages and disadvantages of the individual imaging techniques are illustrated on the basis of pathologically confirmed cases.
Learning Objectives:
1. To become familiar with the basic principles of diagnosing bone tumors.
2. To learn how to determine the biologic activity of bone neoplasms and tumor-like lesions on the basis of radiographic findings.
3. To understand the role of CT and MRI in the diagnosis of bone tumors.
4. To recognise imaging patterns on the basis of radiologic-pathologic correlation.

A-373 16:30

B. Staging and intervention

S. James; *Birmingham/UK (steven.james@roh.nhs.uk)*

Primary bone tumours require both local staging and the identification of distant metastases to guide management. MR imaging is the modality of choice to determine local disease extent and allows excellent depiction of intra and extra-osseous disease. Chest CT enables pulmonary metastases to be identified and bone scintigraphy allows evaluation of the presence of bone metastases. The roles of whole body MRI and PET/CT in the staging of bone tumours will also be discussed. Whilst imaging may allow a narrow differential diagnosis to be reached, histological confirmation of the nature of the lesion is required pre-operatively to plan appropriate treatment. Image guided biopsy may be performed using fluoroscopy, CT, MRI and occasionally ultrasound guidance. The relative values of each of these techniques will be covered. Percutaneous therapies are increasingly being utilised in the treatment of a number of primary bone tumours. Radiofrequency ablation is the method of choice for osteoid osteoma and is now used in the treatment of chondroblastoma. Alternatives include microwave therapy, cryotherapy and sclerotherapy. These percutaneous techniques may also be used for local disease control where disease recurrence is encountered.

Learning Objectives:

1. To understand the role of radiographs, MRI, CT and bone scintigraphy in the staging of primary bone tumours.
2. To appreciate the principles and techniques of percutaneous bone biopsy.
3. To be aware of the indications, technique and outcome of percutaneous therapies in the treatment of bone tumors.

A-374 17:00

C. New techniques (including DWI)

S. Pans; *Leuven/BE (Steven.Pans@uz.kuleuven.ac.be)*

Magnetic resonance imaging (MRI) has evolved to become the most important diagnostic method for local staging of primary bone tumors and for detecting postoperative tumor relapse. It allows accurate preoperative staging of local tumor extent and helps to obtain adequate safety margins. MRI is a noninvasive technique that can be used to obtain information regarding tumor vascularization, metabolism, and pathophysiology, and allows early assessment of therapeutic effects of cancer drugs. One approach is dynamic contrast-enhanced (DCE) MRI, which measures tumor vascular characteristics after administration of a contrast medium. MRI enhanced with small-molecular-weight contrast agents is extensively used in the clinic to differentiate benign from malignant lesions, as well as to monitor tumor microvascular characteristics during treatment. Diffusion-weighted MRI (DWI) is a more recent technique and it allows noninvasive characterization of biologic tissues based on the random microscopic motion of water proton measurement. Several studies have shown that DWI allows early detection of tumor response to chemotherapy. The use of water diffusion is a surrogate marker used to distinguish highly cellular regions of tumor from acellular and necrotic regions. Whole body diffusion-weighted sequence (WB DWI) is a new promising technique feasible to evaluate multifocal disease. DWI has revealed great potential in the evaluation of patients with cancer or benign disease, as it supplies both quantitative and qualitative information of the whole body. This presentation will focus on the potential role of DWI in combination of DCE MRI in bone tumors as well as on the possibilities of WB DWI.

Learning Objectives:

1. To learn about new techniques in diagnosis and follow-up of bone tumors.
2. To appreciate the integration of DWI in whole-body MRI.
3. To become familiar with diffusion-weighted imaging in bone tumors.

16:00 - 17:30 **Room E2**

Interactive Teaching Session

E³ 1420

Lymphomas: Diagnosis, staging and follow-up

Moderator:
J.A. Verschakelen; Leuven/BE

A-375 16:00

Lymphomas: Diagnosis, staging and follow-up

E. de Kerviler[1], R.M. Mendelson[2]; [1]*Paris/FR*, [2]*Perth/AU*
(richard.mendelson@health.wa.gov.au)

Lymphomas may be of nodal or extra-nodal origin and are broadly classified into Hodgkin's disease (HD) and Non-Hodgkin's lymphoma (NHL). Notwithstanding a sophisticated subclassification, the key issue for the radiologist is differentiating indolent and aggressive lymphomas. Protean imaging manifestations reflect the varied pathology of lymphomas. HD tends to progress contiguously and is limited to nodes and spleen until advanced. NHL often presents as disseminated extranodal disease. Consequently, localized HD is often treated by a combination of chemotherapy and radiotherapy, whereas disseminated HD or NHLs are treated by intensive chemotherapy alone. Distinguishing localized and non-localized disease is therefore critical in HD. Examples of lymphoma in various organ systems will be demonstrated, with emphasis on gastrointestinal lymphomas. Imaging has roles in diagnosis, staging, and assessing treatment response. The advantages and limitations of various modalities will be discussed. Imaging-directed core biopsy including specimen immunohistochemistry should obviate surgery. Relapse requires repeat biopsy to assess possible transformation. Staging, usually by the Ann Arbor classification (or modifications), is primarily by CT, which can also monitor therapeutic response. Other, organ-specific, imaging is performed when clinically indicated - for example, bone scintigraphy or MRI for bone pain; gastrointestinal studies for appropriate symptoms; MRI for suspected CNS lymphoma. ^{18}F -PET or PET/CT are useful for showing occult advanced disease, assessing therapeutic response (by the International Harmonization Project revised response criteria), detecting relapse, and differentiating fibrosis/necrosis from viable tumour. Follow-up imaging for Burkitt's and aggressive lymphoma should be early to assess therapeutic efficiency, or after several chemotherapy courses for more indolent lymphomas.

Learning Objectives:

1. To learn the protean appearances of lymphoma in relation to the organ systems involved.
2. To understand the radiologic-pathologic correlations of the different cell types of lymphoma.
3. To discuss the role of image-guided core needle biopsies in the definitive diagnosis of lymphoma at diagnosis and follow-up.
4. To discuss the roles of imaging in radiological and nuclear medicine techniques in staging, treatment and follow-up of lymphoma with emphasis on the new response criteria.

16:00 - 17:30 **Room F1**

Molecular Imaging

RC 1406

Molecular imaging probes on your doorstep

Moderator:
J.Å. Jakobsen; Oslo/NO

A-376 16:00

A. SPIO and USPIO probes for inflammatory diseases

N. Grenier; *Bordeaux/FR (nicolas.grenier@chu-bordeaux.fr)*

Superparamagnetic iron oxide particles will probably play a major role in future clinical applications of imaging of inflammatory processes. Cardiovascular, neurological, renal and osseous inflammatory diseases are mainly concerned. First generation particles with a short circulating time (SPIO) will have limited applications because rapidly cleared from blood by phagocytosis. However, their incorporation ex vivo into cells is the most efficient for cell labeling and tracking, for example of macrophages. Following generations are smaller particles with longer circulating time (USPIO, MION, CLIO), better devoted to target inflammatory cells in vivo and to be used as molecular probes. Non-specific targeting of phagocytic cells as macrophages has been demonstrated in many experimental inflammatory models and, in humans, for characterizing vulnerable atherosclerotic plaques, active inflammatory renal diseases, and active plaques in multiple sclerosis. Mechanism of cell uptake is complex and its degree and speed depend on many factors as particle size and type of coating. Small particles can be targeted more specifically by attaching specific ligands of biological targets such as integrins overexpressed on surface of cells involved during inflammatory process as macrophages, leucocytes, smooth muscle cells, endothelial cells or activated platelets. Ex vivo labeling of macrophages has recently developed and incorporation of particles also depends on their physical characteristics. This method will make possible to track the macrophages to inflammatory sites and, in the future, could serve as cellular vectors for gene therapy.

Learning Objectives:

1. To understand the working mechanism of SPIO and USPIO probes.
2. To understand how these probes can be used in visualisation of inflammatory diseases.
3. To show the clinical value of these probes.

A-377 16:30

B. Multi-functional MRI for assessing novel therapies: Decision tools or decorations?

A.R. Padhani; *Northwood/UK*

There is an increased opportunity to perform MR imaging using functional imaging techniques at a variety of organ sites in a relatively short examination time acceptable to patients. These techniques yield quantitative information which reflects on specific aspects of the underlying tumour or tissue biology. Many of these techniques are used to provide unique information as surrogate biomarkers for tumour behaviour, including response of tumours to novel treatments. The multi-parametric approach combines the information from different function imaging techniques, which goes beyond what can be achieved using any single functional technique, thus allowing an improved understanding of the biological processes and the biological responses to therapeutic interventions. Multiparametric MR imaging has many potential clinical roles and is useful for pharmaceutical drug development and for predicting therapeutic efficacy.

Learning Objectives:

1. To know that functional MRI bridges the gap between animal and humans in early drug development.
2. To realise that pharmacodynamic information has direct a influence on early drug development.
3. To know the biophysical basis and quantification of multifunctional MRI techniques that probe tumor processes of proliferation, hypoxia and angiogenesis.
4. To learn that imaging findings differ in their onset, duration and magnitude thus reflecting underlying pathophysiological changes and heterogeneity related to therapeutic effects.

A-378 17:00

C. MRI cell tracking

J.W.M. Bulte; *Baltimore, MD/US (jwmbulte@MRI.jhu.edu)*

The clinical development of novel immune and stem cell therapies calls for suitable methods that can follow the fate of cells non-invasively in humans at high resolution. Our lab has developed several methods to label cells magnetically (using tiny superparamagnetic iron oxide nanoparticles) in order to make them visible by MR imaging. Following years of extensive animal research, in 2005, this technology was introduced in the clinic using dendritic cell cancer vaccines. MRI cell tracking is further pursued in animal models of de- and dys-myelination, multiple sclerosis, brain tumors, spinal cord injury, stroke, and cardiovascular disease. Novel reporter genes are also being developed that can provide contrast on MRI scans. Artificial proteins are being designed, cloned, and expressed in mammalian cells that contain specific proton exchangable groups of which the proton signal can be manipulated. Instead of directly labeling cells, we have also shown that semi-permeable alginate microcapsules can be loaded with multimodal contrast agents while offering simultaneous immunoprotection of cellular therapeutics.

Learning Objectives:

1. To understand how cells can be labelled and thus tracked.
2. To introduce the potential clinical indications and applications.

16:00 - 17:30 **Room F2**

Breast

RC 1402

Detection of ductal carcinoma in situ

Moderator:
G. Forrai; Budapest/HU

also EPOS

A-379 16:00

A. Mammography

B. Brancato, R. Taschini; *Florence/IT (b.brancato@ispo.toscana.it)*

Mammography is the leading method for the diagnosis of DCIS. As mammographic signs are sometimes rather subtle, their detection requires optimal technique and skilled radiologists. DCIS very often exhibit microcalcifications, due to either tumoral necrosis (typically, comedocarcinoma) or active cellular secretion; DCIS can also appear as a mass, due to epithelial proliferation, periductal fibrosis and elastosis. Microcalcifications are very often isolated (47% in our series). Less frequently, they are associated with mass (39%). Isolated masses are uncommon (4%). Digital mammography, as it betters conspicuity of microcalcifications, notably improves detection of DCIS. Although mammography is very powerful in detecting early signs of DCIS, it is less effective in differential diagnosis with benign lesions. Fine, linear, branching (casting) calcifications (BI-RADS 5) have the highest positive predictive value (PPV) for malignancy; amorphous, pleomorphic, and granular calcifications (BI-RADS 4) are of intermediate concern and needle core biopsy is always mandatory. Among masses, opacities with high density, irregular shape, spiculate margins have the highest PPV for malignancy, although DCIS usually exhibit low density masses, elongated, with indistinct margins. The PPV increases when a mass is associated with microcalcifications. The distinction is between DCIS and invasive carcinoma is very difficult as the signs are often similar and the two pathologies frequently associated (e.g. microinvasive carcinoma; invasive carcinoma with extensive intraductal component); DCIS is more likely in case of isolated microcalcifications without mass.

Learning Objectives:

1. To review the signs in depicting DCIS.
2. To learn how we can reach this diagnosis with a low PPV.
3. To classify microcalcifications using BI-RADS categories.

A-380 16:30

B. Ultrasound

C.F. Weismann; *Salzburg/AT (christian.weismann@inode.at)*

What can US learn from mammography (MG) in DCIS? In up to 90%, DCIS is diagnosed by MG detecting pleomorphic and irregular clustered microcalcifications (MCs). The US investigator learns from MG the localisation and the distribution (group, linear, segmental, regional) of the MCs in the breast. Depending on mammographical breast tissue density and on morphology of the DCIS, MG may show the combination of MCs embedded in a mass or in an enlarged tubular structure. What are the US criteria of mammographically proven microcalcifications? US-visualisation of the MCs depends on tissue contrast. The tissue contrast is influenced by the US-frequency used. The higher the frequency, the better the spatial resolution, although the tissue contrast may be reduced. Modern US technology permits to alter the frequency during the investigation to optimize the tissue contrast. The individual MC appears as a tiny echogenic dot or spot. It may show reverberations. Usually, acoustic shadowing is not produced by a single MC. Morphologic determination comparable to MG-features is currently beyond resolution. What are the US signs of calcified and non-calcified DCIS? Low echo lesions, well circumscribed with echogenic dots and spots (MCs) are the common type. Low echo lesions with an ill defined margin with or without echogenic dots, irregularly enlarged ducts filled with hypoechogenic structures with or without MCs, lesions in combination with a duct and intracystic solid lesions raise the suspicion of DCIS.

What helps to realize the problem? According to the above questions, some tips conclude the lecture.

Learning Objectives:

1. To compare its value with mammography in DCIS.
2. To discuss diagnostic criteria for DCIS with and without microcalcifications.
3. To learn practical tips in problem solving.

A-381 17:00

C. MR imaging

R.A. Kubik-Huch; *Baden/CH (rahel.kubik@ksb.ch)*

Patients with ductal carcinoma in situ (DCIS) may develop invasive carcinoma in about 60% of cases over a period of 10 years. Therefore, it is important to diagnose and evaluate cases of DCIS properly for better patient management. Dynamic contrast-enhanced MRI of the breast has become a well established method for detecting and evaluating invasive breast carcinoma. There are less scientific data regarding the accuracy of MRI as compared to mammography for in situ carcinoma. In contrast to invasive carcinoma, DCIS usually displays linear of ductal clumped enhancement and focal branching pattern on dynamic contrast-enhanced sequences and delayed, persistent (i.e. benign) dynamics. Therefore, morphology is more reliable than kinetics. Overlap with benign disease, e.g. fibrocystic changes, does exist. MRI was shown to be significantly more sensitive than mammography or ultrasound for the detection of DCIS. The wide range of sensitivities for detection of DCIS published in the literature is in part likely to reflect variations in interpretations, imaging parameters and selections bias. DCIS are a highly heterogeneous group of tumors. Preliminary data indicate that the enhancement patterns may partly also depend on the grading and a normal MRI scan may potentially allow to exclude high grade DCIS. The role of MRI in DCIS is currently not fully established. MRI may play an increasing role in assessing the extent of disease in the breast in women with known or suspected DCIS in the future.

Learning Objectives:
1. To learn about the morphological pattern and signal enhancement characteristics of ductal carcinoma in situ.
2. To discuss whether in situ carcinoma can be differentiated from invasive disease on MRI.
3. To review the current literature on MRI in ductal carcinoma in situ.
4. To discuss the potential impact of breast MRI on the treatment of DCIS.

16:00 - 17:30 **Room G/H**

Neuro

RC 1411

Common disorders of the pediatric brain

Moderator:
P. Eliás; Hradec Králové/CZ

A-382 16:00

A. Fetal MR imaging: More than just T2-weighted images

C. Hoffmann; *Tel Hashomer/IL (chen.hoffmann@sheba.health.gov.il)*

The objective of this talk is to introduce other techniques than SS FSE T2 in use when scanning the fetal brain. The most frequent indications for MRI are ventriculomegaly, asymmetry of the ventricular system, brain malformations, infection and others. Most of the MR scan is done with Single Shot FSE T2 (SSFSET2); this is a sequence allowing the acquisition of slice by slice of the brain, and thus minimizing the effect of fetal movement on the scan. Today, fast FRFSET2 are available; this is a very short T2 sequence in which the white and gray matter junction is visualized very well. T1 or FSPGR are used with limitations due to the fetal movements. It is necessary to perform T1 to demonstrate the myelination. DWI is a very important tool in the understanding the ischemic changes in the adult brain, allowing the diagnosis of acute infarcts. Ischemic insult can occur in fetuses with conditions such as TTTS in twin pregnancies and fetal demise. The living fetus can also suffer from abnormal blood supply to the CNS, and thus showing small or even large hemispheric infarcts. Other diffusion technique, DTI is also used to demonstrate the white matter formation of the fetal brain. MRS is also used in the evaluation of the fetal brain. The values of the NAA, choline and the existence of lactate are different than the values in the pediatric and adult brain.
Learning Objectives:
1. To explore the new imaging techniques for the study of the fetal brain.
2. To study the use of diffusion-weighted imaging in the fetal brain.
3. To focus on an accurate use of T1-weighted sequences in the fetal brain.
4. To explore the possibilities of tractography in the fetal brain.

A-383 16:30

B. Normal findings and pitfalls in pediatric neuroimaging

W. Chong; *London/UK (ChongK@gosh.nhs.uk)*

Neuroimaging of the developing pediatric brain and spine requires the optimisation of imaging equipment and parameters. The radiologist is assisted by a good knowledge of embryology and normal variants as well as an understanding of pediatric disorders. However, even without a thorough knowledge of pediatrics, the application of sound radiological principles, including physics and anatomy, applied logically and rigorously, will allow the radiologist to provide clinically useful interpretations of the images. Pitfall may still occur, and the common ones are usually based on common misunderstandings or even myths about pediatric normal anatomy or the presentation of disease as seen in adults. In a famous quote, 'the child is not simply a small adult'.
Learning Objectives:
1. To understand a different approach to neuroimaging in the developing pediatric brain and spine.
2. To appreciate that, despite the wide and potentially complex spectrum of diseases seen in neuropediatrics, most interpretations can be made through the thoughtful application of basic neuroradiological analytical techniques.
3. To be aware of certain areas where common pitfalls, myths and misunderstandings occur.

A-384 17:00

C. Neuroimaging in the acutely ill child

E. Vázquez; *Barcelona/ES (evazquez@vhebron.net)*

The ability to develop more aggressive treatments of acute neurological disorders in children is nowadays improving; however, infants and children are often uncooperative, clinical signs are not always easily localized, and so diagnosis and therapy may be both delayed. Effective imaging of the central nervous system has assumed an increasingly important role in the evaluation of children with acute neurological disorders. This lecture will review the main indications to perform a neuroimaging procedure in children with a neurological emergency. With didactic purposes, these acute conditions will be classified in traumatic and non-traumatic conditions. In the no traumatic acute setting we will consider children presenting with headache (particularly with those symptoms and signs suggesting underlying neoplasm or haemorrhage), seizures (particular relevance to those cases that need urgent neuroimaging), coma, acute neurological deficits, or acute spinal cord syndrome. Practical algorithms with the preferential use of either CT or MRI (including diffusion and spectroscopy) in each group of pathologies, such as cranial trauma, acute hypoxia, cerebral infarction, venous thrombosis, haemorrhage, shunt malfunction or encephalitis, will be presented following representative didactic cases selected from the daily routine in a paediatric tertiary hospital.
Learning Objectives:
1. To learn the characteristic neuroimaging findings that may be useful in establishing differential diagnoses.
2. To understand the various neurological complications that can occur in the intensive care unit and to become familiar with their most typical imaging patterns.
3. To consolidate the best neuroimaging protocols for the acutely ill child and establish the main indications for the use of MR imaging, particularly diffusion and spectroscopy.

16:00 - 17:30 **Room I**

Physics in Radiology

RC 1413

Clinical audit, accreditation and the role of the medical physicist

Moderators:
A. Del Guerra; Pisa/IT
J. Geleijns; Leiden/NL

A-385 16:00

A. European-wide perspective on clinical audit

H. Jarvinen; *Helsinki/FI (hannu.jarvinen@stuk.fi)*

The Council Directive 97/43/EURATOM introduced the concept of clinical audit to medical RADIOLOGICAL (diagnostic radiology, nuclear medicine and radiotherapy) procedures. Clinical audit is a systematic review of the procedures in order to improve the quality and the outcome of patient care. According to the directive, clinical audits shall be implemented in accordance with national procedures. The review of its implementation in Europe has revealed a high variation of approaches and many practical problems. Therefore, the European Commission has published further guidance on clinical audits in its Radiation Protection series. The purpose is to improve the implementation of clinical audits and to enable the member states to adopt the model of clinical audit with respect to their national legislation and administrative provisions. The guideline points out the importance of both internal and external assessments for clinical audit. It deals with all types and levels of clinical audit and gives practical guidance for application. It defines the list of topics which should be covered, while the actual criteria of good practice are discussed on generic levels only. The borderline between clinical audit and other quality assessments (accreditations, certifications, peer reviews) and regulatory inspections is also discussed. The guideline is addressed to all professional groups, hospital management, auditing organizations and regulatory bodies. It is important to recognize that the guideline is not a legal requirement. Through addressing technical, financial and clinical provision for high quality RADIOLOGICAL procedures, the main beneficiary is eventually the patient.
Learning Objectives:
1. To describe the purpose and essential contents of the European commission guideline on clinical audit.
2. To describe a review of clinical audits in Europe.

A-386 16:30

B. National perspective: Clinical audit inspections

S. Ebdon-Jackson; *Didcot/UK (steve.ebdon-jackson@hpa.org.uk)*

European Council Directive 97/43/Euratom requires under Article 6 (4) that "clinical audits are carried out in accordance with national procedures". Implementation of this requirement across Europe has been varied. This paper will reflect on the experience in the UK and will consider examples of the various initiatives under-

taken in the UK by professional bodies and organisations. This will be contrasted with the role of the regulator and the aims of the inspection process with regard to compliance with the specific regulation addressing clinical audit and the remaining regulations addressing justification, optimisation etc. Examples will be provided of the type of audits undertaken within UK hospitals. A UK perspective of EC and IAEA initiatives in clinical audit will be provided.
Learning Objectives:
1. To describe the approach taken by a national body to perform clinical audit.
2. To describe practical aspects of clinical audit inspections.
3. To describe lessons learned from inspection and suggestions for improvement.

A-387 17:00
C. Hospital perspective on clinical audit
P. Gilligan; *Dublin/IE (PGilligan@materprivate.ie)*

The demand from the public for greater accountability and standards has increased the importance of audit and accreditation in modern healthcare delivery. Success may determine whether the hospital can secure funding or even continue to offer certain services. Specifically, radiology departments participate in audits by a number of entities: 1. National bodies concerned with improving radiation safety particularly under EU 97/43 directives. 2. Hospital wide accreditation surveys from state and private accrediting organisations such as Joint Commission International and ISO. 3. Auditing of standards from within professional bodies. 4. Investigation of specific incidents within radiology departments such as misdiagnosis or radiation concerns. 5. Modality specific standards. Although the specific requirements of the accrediting or auditing body may differ, the processes and practical aspects in demonstrating compliance with standards and quality improvement are similar. In addition to fulfilling basic regulatory requirements, the medical physicist is playing a role in developing performance indices particularly in radiation safety, clinical image quality and equipment management. The medical physicists experience in developing quality assurance programs has also proved useful throughout the whole hospital. The increasing role of the medical physicist in audit underpins the requirement for inclusion of audit and accreditation as part of their education. Recent experience of setting up and participating in EU 97/43 directive based clinical audit in Ireland highlighted the critical need for clarity of roles and ownerships of processes to be communicated to those who are carrying out audit and those who are being audited in hospitals.
Learning Objectives:
1. To describe practical aspects of complying with standards and undergoing audit.
2. To describe the outcomes of the audit.
3. To describe how to implement the results of the clinical audit.

16:00 - 17:30 **Room K**

Pediatric

RC 1412

Imaging in non-accidental injury

Moderator:
R.R. van Rijn; Amsterdam/NL

A-388 16:00
A. CNS trauma
P. Demaerel; *Leuven/BE (philippe.demaerel@uz.kuleuven.ac.be)*

The presentation will focus on the role of the radiologist in non-accidental head injury. The common acute findings will be discussed as well as the long term imaging features on brain CT and MRI. An optimal imaging strategy will be defined. Particular attention will be paid to the role of skull X-ray and ultrasound, to the assessment of generalised brain edema on CT, to the estimation of timing hematoma on CT and MRI, to the role of diffusion weighted MRI, to the differential diagnosis with other entities and to the interaction with the forensic sciences in medico-legal situations. Non-accidental head injury is regularly encountered in large community hospitals and the role of the radiologist is crucial because the clinical presentation is often misleading. Therefore, all radiologists should be aware of the, sometimes subtle, imaging appearances.
Learning Objectives:
1. To stress the role of CT in the assessment of non-accidental cranial injury.
2. To emphasise the contribution of MRI, including diffusion-weighted imaging, in the acute setting.
3. To describe controversies regarding the age of a subdural hematoma.
4. To give advice on how to report on a CNS non-accidental injury.

A-389 16:30
B. Skeletal trauma
M. Alison, R. Azoulay, B. Tilea, G.-H. Sebag; *Paris/FR (guy.sebag@rdb.ap-hop-paris.fr)*

Imaging plays an important role in the detection and documentation of abuse, and failure to make a correct diagnosis may have serious consequences. Fractures are the second most common finding in child abuse after cutaneous findings and the skeletal survey is the cornerstone radiological examination in suspected physical abuse. The skeletal survey protocol should be performed according to the published pediatric radiology guidelines and standards. Careful attention is needed with regard to the quality of the radiographs. Equivocal fractures at all sites should be evaluated with additional projections. The follow-up skeletal survey increases the sensitivity of initial radiographic examination and should be considered in all cases where abuse is strongly suspected. Bone scintigraphy may complement the skeletal survey notably in infants. Although estimation of fracture age should be approached with caution, it is important to differentiate recent from old fractures and when multiple fractures are present to state if the fractures are of similar or different ages. Careful interpretation by radiologists with experience in pediatric imaging is mandatory in order to distinguish abuse from accidental trauma, normal variants, metabolic bone diseases and skeletal dysplasias.
Learning Objectives:
1. To describe the imaging strategy in skeletal non-accidental injury.
2. To determine the technical considerations including quality insurance.
3. To show the imaging features of inflicted skeletal injury.
4. To discuss the differential diagnosis.

A-390 17:00
C. Abdominal trauma
M. Raissaki; *Iraklion/GR (mraissaki@yahoo.gr)*

Child abuse accounts for 10% of all blunt abdominal traumas in patients younger than 5 years. Abuse-related abdominal injuries carry a worse prognosis, with a mortality of up to 50%, due to the severity of injuries, the delay in seeking help and occasionally the misleading provided history. A high index of suspicion should exist for any patient less than 3 years of age with a traumatised hollow or solid viscous especially when the history is not consistent with the clinical presentation or extent of injury. Any abdominal injury pattern may occur in child abuse, the commonest being duodenal or other hollow viscera's hematoma and/or rupture, mesenteric trauma, pancreatic laceration, liver laceration, and adrenal hematomas. Multiple injured organs, combination of solid and hollow viscus injuries may also occur. Rib, pelvis and spinal fractures should be actively looked for. Indications for imaging the abdomen in suspected child abuse include elevated hepatic transaminases and amylase, abdominal bruising, distension, tenderness, bilious vomiting and hematuria. Abused children who have suffered massive trauma should be imaged with the same protocols as the ones following extensive accidental trauma. Following stabilization, CT is considered the test of choice for the identification and documentation of abdominal trauma in suspected child abuse. Ultrasonography is considered a reasonable preliminary study in stable children less than 1 year of age and extremely useful for the follow-up. An upper GI series is indicated for occult or resolving duodenal hematomas.
Learning Objectives:
1. To understand differences between accidental and non-accidental abdominal trauma.
2. To describe the type of abdominal injuries that may indicate child abuse.
3. To discuss the appropriateness of imaging in suspected abdominal non-accidental trauma.

16:00 - 17:30 **Room L/M**

Radiographers

RC 1414

Pediatric imaging

Moderators:
C. Balassy; Toronto, ON/CA
P. Gerson; Paris/FR

A-391 16:00

A. DR system: How to find the best hardware and software to achieve mininum dose and best images

H. Precht, O. Gerke; *Odense/DK (hepr@ucl.dk)*

Purpose: To develop knowledge for informed consideration of dose reduction and image quality in paediatric radiography and to reduce patient dose based on process heat algorithms in Canon's DR system. Options for software optimization were studied in relation to optimal image quality and follow-up examinations, to investigate when it may be possible to accept inferior image quality and thus comply with ALARA.
Methods and Materials: A quantitative experimental study based on experiments with technical and human phantoms. A technical CDRad phantom was used and the pictures were analyzed using CDRad software, giving results as objective IQF values. The human phantom was replaced with a lamb pelvis with femur, which offers absorption comparable to a 5-year-old child according to the report by NRPB. The human pictures were analyzed by 3 radiologists specializing in paediatric bone examinations using the relative VGA scale and the absolute VGA scale.
Results: Software impact on image quality was great, but the dose effect will always influence the experienced quality. CDRad analysis of the software base caused image quality factors, which are important in human images, to be impossible to assess.
Conclusion: Optimal image quality is maintained at a dose reduction of 70%, but the images were diagnostically approved at a reduction of 97% on the basis of the reference value. Control recordings were possible at 0.5 mAs, all based on MLT (S)-optimized images.
Learning Objectives:

1. To learn about possibilities for software processing optimisation in DR systems.
2. To become familiar with possibilities to grade dose and image quality in relation to the indication for the examination.
3. To report a study on the possibilities of improving image quality using different dose levels in pediatric femur examinations using Canons MLT (S) algorithm.

A-392 16:45

B. CT: Cardiac examinations in children

T. Bock-Pedersen; *Copenhagen/DK (tina.bock-pedersen@toshscan.dk)*

We, at the University Hospital in Copenhagen, Denmark - Rigshospital, have gained experience with Cardiac CT, since 2005. We have a 64MSCT and a 320MSCT. We would like to share our considerations and show how we have set up our protocols for Cardiac CT imaging of the pediatric patient. One of the advantages with CT is examination speed, which allows us to perform most all pediatric CT scans without sedation or general anesthesia. Outpatient examination is possible, as it is a non-invasive examination. Dose is a limiting factor, as children are much more sensitive to radiation. Therefore, when possible, non-ionizing modalities should be used (MRI or ECHO). What is essential when imaging a pediatric patient, especially in regards to heart imaging with congenital abnormalities? Triggering can be an issue and we prefer to trigger visually/manually. Continues bolus is made possible with the auto injector. Teamwork and preparation are the key factors! Before the patient arrives, the radiologist/cardiologist and radiographer have to decide what is to be diagnosed, how to reach the diagnose and at what dose i.e. decide on the quality of the scan - can we do a ‚low dose' scan', arteriel phase, with ECG triggering? etc.
Learning Objectives:

1. To learn how to perform a successful diagnostic CT on a pediatric patient.
2. To become familiar with the technical aspects of cardiac CT.
3. To learn about the difference between children and adults.
4. To learn about the importance of teamwork.

16:00 - 17:30 **Room N/O**

Professional Challenges Session

PC 14

Radiology and the law

Moderator:
E. Breatnach; Dublin/IE

A-393 16:00

Chairman's introduction

E. Breatnach; *Dublin/IE (ebreatnach@mater.ie)*

The modern radiologist needs to deal increasingly with European regulations which more and more impacts on every facet of his/her professional life. In addition, malpractice litigation is an increasing force. Many technologies have specific attendant legal issues, e.g. teleradiology, and the increasing workload of radiologists increases their vulnerability to individual malpractice claims. This session will address these topics and will highlight the extent of the problem both in the context of general regulations and individual risk areas. Three speakers representing North America, mainland Europe and the U.K. will present papers outlining the major issues involved. A final question and answer session will deal with specific medicolegal case scenarios and will be audience interactive.
Session Objectives:
Using 'real case' material:

1. To familiarise radiologists with their vulnerability to litigation.
2. Steps to avoid being successfully sued.
3. Items of new European regulations and how they increasingly affect your radiology practice.

A-394 16:05

Radiologic communications: Dilemmas and pitfalls

L. Berlin; *Skokie, IL/US (lberlin@northshore.org)*

Communication is a two-way street. There is often a dispute between the radiologist, who argues that a report was transmitted, and the referring physician, who argues that the report was never received. Radiologists claim that a written report was sent and should have been sufficient. If the ordering physicians did not notice or read the report, then should not the radiologist be free of blame? Unfortunately, the answer is no. It is true that if the referring physician would promptly review written radiology reports, injuries to patients would not occur. Nevertheless, it is the radiologist's breach of the standard of radiologic care - failure to directly communicate significant unexpected findings to the referring physician - that initiates the chain of events that often leads to a patient's injury or death. The radiologist is not relieved of liability. Communicating the results of radiologic examinations has become just as much the duty of radiologists as is the rendering of interpretations. The American courts and the American College of Radiology have clearly stated that radiologists must verbally communicate urgent or significant unexpected findings to referring physicians. There is now evolving in the American judicial system an expansion of the radiologist's duty to include direct communication to patients as well as to referring physicians. Several companies now market direct communication products which may satisfy the requirements for direct communication. Radiologists may wish to investigate them to determine whether or not they would satisfy local needs.
Learning Objectives:

1. To understand the radiologist's responsibility in communication of acute and possibly life threatening radiologic abnormalities.
2. To recognise the radiologist's responsibility in prompt communication of less acute findings.
3. To outline the principles of direct communication of radiological findings to patients.

A-395 16:28

Medical negligence: The lawyer's perspective

G. Loibner; *Vienna/AT (anwalt@ra-loibner.at)*

The basis of treatment of patients is the contract of treatment. Under such contract, the patient is not entitled to a specific result of the treatment but to treatment with due care. Due care is measured by the standard of medical skills and science. In case of damages suffered by the patient from lack of due care, the patient is entitled to compensation. The burden to prove the damage, the malpractice and the causality between malpractice and damage rests with the patient. The burden to prove that due care has been applied rests with the physician. A case example

concerning the missed finding of a malignant breast tumor will be presented. Beside malpractice, the lack of patient's informed consent becomes an increasing source of physicians' liability. Apart from treatment with due care, patients are entitled to information about the risks and consequences of treatment and alternatives thereto. Failure to adequately inform the patient can result in physician's liability for damages resulting from treatment performed lege artis in case risks materialize the patient has not been duly informed of. Information by form sheet only is not considered sufficient. Extent and intensity of information depend on the urgency of treatment. The less urgent the treatment, the more intense information has to be. Proper documentation of information is essential for the avoidance of liability.
Learning Objectives:

1. To learn about the general principles of liability for medical malpractice.
2. To understand the increasing risk of liability despite of lege artis treatment for lack of patient's informed consent.
3. To appreciate the importance of proper documentation of patient's information in order to minimise the risk of liability.

A-396 16:51

European legislation big brother: What the practitioner should know to avoid being sued and what to do if you are

R. FitzGerald; *Wolverhampton/UK (richard.fitzgerald@rwh-tr.nhs.uk)*

1. European Working Time Directive (EWTD): The EWTD was passed in 1993. However there have been many delays in its full implementation by medical practitioners, due to problems of staffing and service provision. Full implementation of EWTD is expected of all doctors in the EU from August 1st 2009. The legal climate will be more hostile for those doctors accused of negligence, with respect of a period of time when they have been in breach of the EWTD. There is increasing literature on the effect of fatigue on safe medical performance. 2. Patient Confidentiality: The European Court of Human Right ruled in 2008 that the Government of Finland had breached Article 8 of the European Convention on Human Rights (the right to privacy) by not securing the patient confidentiality of the plaintiff, a nurse. The Finnish Hospital had only been able to identify the five most recent individuals to access the patient's electronic record and this was considered inadequate by the Court. The I versus Finland case alters the legal context for inadequate audit processes to assure patient confidentiality from inappropriate access to electronic patient records. 3. Medical Regulatory Requirements for Teleradiology Reporting for Patients in the EU: The Directive on the Application of Patient Rights in Cross-Border Healthcare had a comfortable majority in its First Reading in the European Parliament in April 2009. It is now with EU Health Ministers and will go to the new MEPs in the autumn for a second reading. The current wording of Article 16 on e-Health includes provision to regulate telemedicine practitioners.
Learning Objectives:

1. To appreciate the medico-legal consequences of failure to comply with the European Working Time Directive.
2. To understand the precedent set in I versus Finland for patient confidentiality with electronic patient records and PACS.
3. To be familiar with the current medical regulatory requirements for teleradiology reporting E.U./Worldwide.

Panel discussion:
Illustrative cases on: 1. Medico-legal consequences of poor radiology communication. 2. What is an ‚acceptable' error rate for radiologists? 3. Panel advice on how to reduce one's medico-legal vulnerability. 17:14

16:00 - 17:30 **Room P**

Cardiac

RC 1403

Valvular heart disease

Moderator:
F. Cademartiri; Parma/IT

A-397 16:00

A. Echocardiography: Clinical standard with limitations

M.R. Rees; *Gwynedd/UK (m.rees@bangor.ac.uk)*

Transthoracic echocardiography is routinely used in the office setting and acts as a first line diagnostic technique in cardiology. It is a portable, readily available modality but has its limitations. Among the diagnostic limitations of transthoracic echocardiography are diagnosis of the thickened, some types of cardiomyopathy and diseases of the cardiac apex, which is often not well seen. Details of valve morphology and tranoesophageal echo are an invasive investigation where the patient has to swallow the echo probe. The patient often requires sedation for this but the investigation can be carried out as a day case. Trans-oesophageal echo provide greater detail of cardiac anatomy and function and is used frequently as an adjunct to cardiac surgery as an intra-operative procedure. Stress echo-cardiography is used for the diagnosis of myocardial ischaemia when accompanied by increasing doses of intravenous Dobutamine and for the diagnosis of myocardial viability. The principle of this test is that a low dose of Dobutamine will excite function in a non-functional area of myocardium which is viable. All types of echo can utilize the additional facilities of Doppler examination (pulsed and continuous wave) colour and echo contras to make physiological diagnoses. These tests remain more subjective than other competing image tests because of the need for operator experience and skill, patient-based factors and the more subjective nature of interpretation.
Learning Objectives:

1. To discuss anatomy and clinical background.
2. To identify strengths and limitations.
3. To compare a transthoracic vs a transesophageal approach.

A-398 16:30

B. Computed tomography: More than calcification!

A. Lembcke; *Berlin/DE (Alexander.Lembcke@gmx.de)*

In cardiac surgery, heart valve diseases represent the second most common reason for an operation. Different modalities, (i.e. echocardiography, cardiac magnetic resonance imaging and cardiac catheterisation) are currently in use to assess patients with suspected heart valve disease. However, all examination techniques have their own strengths and limitations. Multislice computed tomography (MSCT) has recently emerged as an additional modality that permits functional 4D imaging of the cardiac valves. Beyond the quantification of calcifications, MSCT may allow for the detailed 3D visualisation of the valve morphology. This includes the detection of valvular vegetations and local complications (e.g. paravalvular abscess) in infective endocarditis. Furthermore, MSCT may provide useful information regarding disease severity in valve stenosis and insufficiency by planimetry of the valvular opening and regurgitant orifice area. The ability of MSCT to describe the 3D geometry of the entire aortic root is particularly helpful to plan aortic valve surgery and interventions (e.g. minimally invasive aortic valve replacement using either the transapical or transfemoral approach). Moreover, MSCT may allow for the simultaneous evaluation of the coronary arteries and myocardial function. This presentation will discuss the potential clinical role of MSCT for the evaluation of patients with heart valve disease, the advantages and disadvantages of current MSCT techniques and the differences between MSCT and established modalities used for evaluating heart valve disease (i.e. echocardiography, cardiac magnetic resonance imaging and cardiac catheterisation).
Learning Objectives:

1. To optimise functional 4D-imaging.
2. To quantify valve insufficiency and stenosis with CT.
3. To plan surgery and percutaneous valve replacement, and to map calcification.

A-399 17:00

C. Magnetic resonance: Value of flow measurements

N.L. Kelekis; *Athens/GR (kelnik@med.uoa.gr)*

Cardiac MRI has evolved into an alternative and complementary modality to ultrasonography in assessing patients with valvular heart disease. MRI on state-of-the-art scanners using cine and velocity-encoded gradient echo sequences provides reliable qualitative and quantitative assessment of valvular dysfunction including stenosis and insufficiency. It can also quantify flow through the atrioventricular and ventriculoarterial valves, as well as virtually any vascular structure. MRI provides moreover morphological and functional assessment of both ventricles with objective volumetric measurements throughout the cardiac cycle. With the combination of the above volumetric and flow data, it can quantify stenosis and/or insufficiency in patients with simple or complex valvular disease, as well as Qp/Qs ratio and shunts. MRI is the only modality able to quantify the regurgitant volume, which is of importance in patients with aortic regurgitation or pulmonary insufficiency as in surgically corrected tetralogy of Fallot. The mathematical combination of pulmonary regurgitant and tricuspid flow reflects the diastolic function of the right ventricle. MRI is superior to ultrasonography in situations with poor acoustic windows such as postoperative or obese patients, conduits calcified or not, always providing objective anatomic and functional data. It is, however, a time-consuming and expensive modality and inferior to ultrasonography in the assessment of valve leaflets and small vegetations. Future perspectives include improved anatomic imaging at 3 T, efforts to adequately visualize valve leaflets, real-time velocity-encoded sequences, and whole-heart scanning with flow sequences encoded in the three directions.

Learning Objectives:

1. To optimise imaging protocol.
2. To quantify valve insufficiency and stenosis with MRI.
3. To learn about pitfalls in MR flow measurements.

16:00 - 17:30 **Room Q**

Interventional Radiology

RC 1409

Oncologic interventions in the liver

Moderator:
J.-I. Bilbao; Pamplona/ES

A-400 16:00

A. RF ablation

F. Deschamps; *Villejuif/FR (Frederic.Deschamps@igr.fr)*

Percutaneous radiofrequency ablation (RFA) is a safe and effective treatment for well-selected patients with hepatic tumors such as hepatocellular carcinoma (HCC) and liver colorectal metastase (LCM). An appropriate selection is crucial. It is based on clinical and technical arguments. Clinically, surgical resection of the hepatic tumors remains the gold standard. Indeed, the survival data following RFA are not as good as surgical resection. The only exception seems to be the RFA of the very early HCC (≤2.0 cm) in cirrhosis that is not candidate for liver transplantation. Most often, the RFA offers an alternative for patients with medical comorbidities, poor liver function or prior hepatectomy. Technically, there are three decisive points for complete ablation. The first point is the good visualization of the tumor either under ultrasound or un-enhanced computed-tomography (CT) examination. Metallic coil placement, lipiodol tattoo and virtual CT sonography with magnetic navigation are technical tricks that allow the RFA of "invisible" tumors. The second point is the tumor size: in most series, a diameter less than 25-35 mm is commonly admitted as a prognostic factor. This is probably because the maximal ablation diameter is slightly larger than 40 mm with the electrode needles available now. RFA combined with trans-arterial chemo-embolization might improve the local control by increasing the ablation diameter. The last point is the "heat-sink effect" that requires a temporary occlusion of a large vessel close to the tumor. The quality of follow-up imaging is a key factor for evaluation of the tumor destruction.

Learning Objectives:

1. To discuss indications for RF ablation.
2. To learn about the technique and devices for RF ablation.
3. To discuss results and follow-up strategies.

A-401 16:30

B. New embolisation techniques

F. Orsi; *Milan/IT (franco.orsi@ieo.it)*

While liver resection is still the gold-standard for curative local treatment of liver lesions, several promising local approaches have been developed in the past three decades, such as intra-arterial treatments, percutaneous thermal ablation, stereotactic radiotherapy and more recently high intensity focused ultrasound. There is no consensus on the best local therapy. However, intra-arterial therapies offer great promise based upon the premise that hepatic tumors are fed mainly, if not exclusively, by arteries. Bland embolization, chemoembolization and radio-embolization are some of the most commonly performed local treatments for patients with liver cancers and several embolic agents have been specifically developed for that purpose. Both TACE and TAE may shut-down the arterial blood flow to the tumor, leading for tumor ischemia and, eventually, tumor cell death, if anoxia is induced. Association of local chemotherapy to the embolic effect represents the rationale for TACE. For this purpose, new embolic particles, which may precisely elute drugs, have been introduced. For radioembolization, micro-particles are injected into the feeding arteries as vehicles for delivering interstitial sources of radiation therapy. Small and precisely calibrated micro-particles have been introduced for a deeper a more effective TAE. Because hepatic tumors are supplied by several arterial feeders, complete tumor death may be obtained only if the entire vascular network supplying the tumor will be treated. If even small feeding arteries will be missed, tumor mass will be not completely treated and it will relapse. For this reason, the knowledge of possible vascular abnormality is mandatory for a better outcome.

Learning Objectives:

1. To discuss the uses of drug eluting beads.
2. To review experience with selective internal radiation (yttrium-90, and others).
3. To review the role of hepaspheres in hepatic embolisation.

A-402 17:00

C. Future directions

J. Kettenbach[1], A. Melzer[2]; [1]*Berne/CH*, [2]*Dundee/UK (joachim.kettenbach@insel.ch)*

Image-guidance and imaging fusion techniques represent an integral element in oncologic liver surgery. In addition, several liver planning techniques such as the Virtual Liver Surgery Planer enhance simulation of a proposed liver resection. Using roboter-assistance or navigational guidance, combined with classic tumor ablation techniques such as radiofrequency ablation, significantly enhances accuracy of ablation probe placement and efficacy of ablation necrosis. It has further shown that the local recurrence rate was considerable lower, and the amount of complete tumor ablation was significantly more likely as compared to other studies. Most recent, a European Union-funded project, lead by IMSaT, at the University of Dundee, collaborating with InSightec, Ltd and CapsuTech Ltd will integrate magnetic resonance imaging, focused ultrasound to deliver and activate nano-capsules carrying anti-cancer drugs to effectively target tumors. This project involves drugs being injected into the body in the form of tiny capsules, which are harmless until they are activated by a concentrated focused ultrasound `blast', using devices developed in IMSaT's medical ultrasound laboratories as well as commercial systems. The MRI scanner will be used to track the passage of the drugs, visualize the target and monitor the delivery of the drug treatment. InSightec develops unique commercial MR-guided focused ultrasound systems, and CapsuTech deals with different aspects of a drug delivery platform based on targeted nano-capsules. All this innovative developments may contribute to improved patient outcome, less side effects, and reduced pain medication for patients, with otherwise unresectable tumors.

Learning Objectives:

1. To review new ablation modalities.
2. To review research on targeted embolotherapy.
3. To discuss the use of combined therapies.

Monday, March 8

08:30 - 10:00 **Room A**

Radiology in Abdominal Emergencies

CC 1517

The acute abdomen

Moderator:
N.N.

A-403 08:30

A. The wrong twist: Mesenteric and omental torsion

M. Macari; *New York, NY/US (michael.macari@nyumc.org)*

There are numerous causes of acute abdominal pain. While the clinical history, physical examination, and laboratory results may be helpful in triaging patients with abdominal pain, MDCT has become one of the most important tools in the evaluation of these patients. Twisting of the mesentery is a relatively common cause of acute abdominal pain. This may be due to a primary volvulous, internal hernias through mesenteric rents, or around adhesions. Mesenteric torsion with small bowel volvulous is most often caused by adhesions. Recognizing the CT findings of mesenteric volvulous with resultant closed loop intestinal obstruction and subsequent ischemic bowel are of utmost importance. Omental torsion is not as common as mesenteric torsion and the bowel is usually not affected. This lecture will review the imaging findings and clinical aspects of mesenteric and omental torsion.

Learning Objectives:

1. To understand the pathophysiology of mesenteric and omental torsion.
2. To know the typical presentation on cross-sectional imaging modalities.
3. To learn imaging strategies with focus on MDCT.

A-404 09:00

B. Abdominal hernias

G. Brancatelli; *Palermo/IT (gbranca@yahoo.com)*

Abdominal hernias are common in daily practice and can be divided into: external or abdominal wall hernias, internal hernias; diaphragmatic hernias. External hernias typically involve protrusion of abdominal contents through a defect in the abdominal wall. Internal hernias involve protrusion of viscera through congenital or acquired defects in the mesentery or the peritoneum. Diaphragmatic hernias involve protrusion of abdominal contents into the chest. Among these conditions, the diagnosis of internal hernia is the most challenging. Bariatric surgery and liver transplantation with biliary-enteric anastomosis, with the Roux-en-Y loop placed in a retrocolic position, are recognized predisposing factors for internal hernia development. Symptoms of hernia are nonspecific and vague, and clinical and radiologic diagnosis can sometimes be challenging. Immediate diagnosis is mandatory because misdiagnosis can be complicated by bowel obstruction, volvulus, strangulation, incarceration, or trauma. MDCT with its multiplanar capabilities is widely believed to facilitate this diagnosis, because it is able to delineate hernia type, location, size, and shape and is particularly useful to diagnose unsuspected hernias. It also allows distinguishing hernias from masses of the abdominal wall, such as tumors, hematomas, abscesses. As a result, knowledge of the CT findings of abdominal hernias may allow early and more accurate diagnosis, with a resultant decrease in the mortality rate.

Learning Objectives:

1. To understand the predisposing factors, clinical presentation and complications of abdominal hernias.
2. To be able to recognise abdominal hernias on imaging through multiple examples with an emphasis on MDCT.
3. To illustrate the postsurgical anatomy underlying internal hernias.

A-405 09:30

C. Acute stages in neoplastic diseases

J.A. Guthrie; *Leeds/UK (Ashley.Guthrie@leedsth.nhs.uk)*

After the initial presentation, a patient with cancer enters a phase of active treatment (surgery, chemotherapy, or radiotherapy), and then remission/cure or palliative phases. An „acute abdomen" may complicate any phase. The principle causes are obstruction, perforation, haemorrhage, ischaemia and sepsis. Tumours arising from the GI tract are leading causes but any tumour involving the abdominal cavity or haematological malignancy may be implicated. During treatment with chemotherapy or radiotherapy acute abdominal symptoms are common as a consequence of direct toxicity. Imaging must be used as an adjunct to clinical assessment. Patterns of abdominal involvement are often modified in the later phases of disease. GI tract obstruction may be due to progression or the mechanical consequences of prior surgery and is more commonly at multiple levels. Perforation or fistulation may occur with either progressive disease or tumour lysis in response to therapy. Cancer does not protect against the common inflammatory conditions but poor host response and the use of steroids may mask signs leading to extensive abnormality at diagnosis. Bone marrow suppression increases susceptibility to infection including neutropenic enterocolitis, and haemorrhage. Bone marrow transplantation and consequent graft versus host disease is a potent cause of acute abdominal symptoms. CT is the major imaging technique although MR has an increasing role particularly in the assessment of the female pelvis. Major determinants when considering the differential diagnosis include the nature and initial stage of the primary, any prior anatomical modification (surgery), the nature and relationship to current treatment and the bone marrow status.

Learning Objectives:

1. To be able to list neoplastic diseases that may potentially lead to acute abdominal symptoms.
2. To appreciate the differences in causes and findings of the acute abdomen between the initial presentation with neoplasia and when undergoing treatment.
3. To understand typical CT findings and pitfalls, and the potential role of MRI.

08:30 - 10:00 **Room B**

Special Focus Session

SF 15a

Acute aortic syndrome

Moderator:
J. Lammer; Vienna/AT

A-406 08:30

Chairman's introduction

J. Lammer; *Vienna/AT (johannes.lammer@akhwien.at)*

The acute aortic syndrome is a life-threatening disease. Aortic dissection type A and B, intramural hematoma, penetrating aortic ulcer, traumatic transsection and the rupture of an aortic aneurysm may cause an acute aortic syndrome. Clinically, it usually causes severe chest pain. It can mimic myocardial infarction, pulmonary embolization and it may be followed by neurological symptoms such as hemiplegia or paraplegia. Rupture into the mediastinum and pleural space may cause shock or death. The primary diagnosis is made by contrast enhanced CT. ECG gated CT is mandatory for a detailed diagnosis. A triple rule out protocol is required in clinically unclear cases. The radiologist is the first to make the diagnosis and an important decision maker for the emergency treatment. Acute surgical treatment in type A dissections and endovascular treatment in complicated type B dissections, penetrating ulcers and traumatic dissections is the treatment of choice. Ruptured aortic aneurysms can be treated by open surgery and endovascular techniques.

Session Objectives:

1. To learn about the clinical aspects of acute aortic syndrome.
2. To learn about imaging of acute aortic syndrome.
3. To learn about endovascular therapy of acute aortic syndrome.

A-407 08:33

Technique, advantages and limitations of CTA and MRA

V. Bérczi; *Budapest/HU (Berczi@hotmail.com)*

Technique, advantages, disadvantages of CTA and MRA will be explained. A brief comparison (indications, limitation, advantages, disadvantages) with other diagnostic techniques, like X-ray, transesophageal echocardiography, and catheter angiography, will be presented. Preoperative and follow-up imaging of aortic dissection, intramural thrombus, and penetrating atherosclerotic aortic ulcer as well as aortic dissection, ruptured thoracic aortic aneurysms, and aortic injuries will be discussed. The triple rule-out CTA protocol to prove or exclude acute coronary syndrome, aortic dissection, or pulmonary embolism is crucial, since each year, approximately 6 million patients in the United States alone present to the emergency department with acute chest pain. CTA is considerably faster than MRA in this acute setting. It may exclude deadly causes of chest pain; the higher radiation dose delivered with current techniques is a valid clinical concern. Compared with the usual radiation dose of a standard 64-slice CCTA (10-23 mSv), the effective radiation dose of a „triple rule-out" scan is often increased by 50% (25-40 mSv). However, a recent study demonstrates that the radiation can be a lot less (< 9 mSv) when using tube current modulation. Artery of Adamkiewicz is the largest anterior segmental medullary artery. It typically arises from a left posterior intercostal artery, which branches from the aorta, and supplies the lower two-thirds of the spinal cord via the anterior spinal artery. It can be important to identify the location of the artery before treating aorta diseases with stent-grafts to prevent paraplegia. Its location can be identified with both CTA and MRA.

Learning Objectives:
1. To learn about the technique of CTA and MRA of the thoracic aorta.
2. To understand when to use CTA and when MRA is preferable.
3. To understand when not to use CTA and/or MRA.

A-408 08:51

Key imaging findings that allow distinction among the various aortic pathologies

F. Fanelli; *Rome/IT (fabrizio.fanelli@uniroma1.it)*

Different non-invasive imaging modalities: plain X-ray radiography, multidetector CT-angiography (MDCTA), MR-angiography (MRA), conventional digital subtraction angiography (DSA) and transesophageal echocardiography (TEE) are nowadays available for the evaluation of the acute aortic disease. At the level of the thoracic aorta also, a plain X-ray examination permits to evaluate abnormal findings in 88% of cases: widened mediastinum, abnormal aortic knob contour, tracheal or esophageal deviation, and ring sign with displacement of the aortic margin > 5 cm beyond the calcified aortic intima. An initial non-contrast MDCT scan should be performed to rule out intramural hematoma because intravenous contrast may obscure this diagnosis as a consequence of uniform opacification of luminal structures. Intramural hematoma may appear as a localized thickening of the aortic wall with internal displacement of intimal calcifications. MDCT enables clear visualization of the aortic wall to assess the presence of an inflammatory aortic aneurysm. Additionally, it facilitates accurate detection of aneurysm rupture or contained leakage. In patients with suspected acute aortic dissection, contrast-enhanced MDCT scanning of both the chest and abdomen should be performed because it is particularly useful in detecting intimal flap, the extent of aortic dissection, branch vessel involvement, patency of true and false lumens, potential pericardial effusion, and even the patency of the coronary arteries. MRA with axial images, acquired with "black-blood" sequences, allows a better evaluation of the aortic wall and of any dissection, ulcer or thrombus accumulation. This sequence takes advantage of the lack of signal from blood flowing perpendicular to the imaging plane.
Learning Objectives:
1. To learn about the distinction between type A and type B dissection.
2. To understand the key imaging findings and the correct imaging protocol to diagnose an intramural hematoma.
3. To learn when an aortic ulcer is dangerous for the patient.

A-409 09:09

Endovascular management of acute type B dissection

H. Rousseau; *Toulouse/FR (rousseau.h@chu-toulouse.fr)*

The life-threatening nature of aortic dissection requires that diagnosis and treatment be rapid with the most reliable and least invasive technique possible. Imaging methods are essential with several objectives; accurate description of the lesions, topographical classification, investigation of the extent of the lesions to the supra-aortic and visceral arteries or of involvement of adjacent structures. These extensive investigations provide an evaluation of the severity and potential for progression of the lesions and a guide to treatment. The CT scan is the best method of investigation in an emergency. Treatment and surveillance in the intensive care unit are essential in all cases. Besides medical therapy, schematically, in type B aortic dissection, surgery and endovascular procedures are reserved for complications, principally rupture and visceral ischaemia. In these cases, endovascular techniques have progressed because of their better tolerance. Exclusion of the proximal intimal tear by a stent-graft depressurises the false lumen and predisposes to its thrombosis. Remodelling with reduction of the aortic diameter is observed with reperfusion of the distal vessels. Endovascular fenestration is reserved for problems of perfusion due to a dynamic mechanism. The principle is to create a wide orifice between the true and false lumens in order to reduce pressure in the false lumen. The implantation of bare stents may be useful in the arteries of viscera with ischaemia by a static mechanism. In conclusion, aortic dissection may be treated effectively by endovascular techniques, either alone or as a complement to surgery of the ascending aorta.
Learning Objectives:
1. To understand the indications for treatment of acute type B dissection.
2. To appreciate the difference between complicated and uncomplicated dissection.
3. To understand that the diagnosis of critical organ perfusion is important.
4. To learn about the technique of endovascular management of type B dissection.

A-410 09:27

Endovascular management of thoracic aortic rupture

R. Morgan; *London/UK (robert.morgan@stgeorges.nhs.uk)*

Rupture of the thoracic aorta is a catastrophic event leading to rapid death in the majority of cases. Standard therapy is by open surgical repair. However, many patients can be treated by the insertion of endografts into the aorta across the location of the rupture. Patients who survive initial resuscitation and the journey to hospital should undergo immediate imaging assessment for potential treatment. The optimal imaging strategy is a contrast enhanced CT scan with coverage from the neck to the groins. Suitability for treatment by endografts involves assessment of the images for satisfactory proximal and distal landing zones and iliac arteries of adequate calibre. If patients are deemed suitable for endografting, an endograft of suitable size is inserted across the site of the aortic tear. Generally, only a single endograft is required to cover the tear unless there is coexistent additional pathology (e.g. aneurysm, dissection). It is sensible to keep a supply of devices of appropriate size in stock which may be used in emergency situations. Complications of endografting particular to trauma mainly relate to poor conformability of endografts in the aortic arch. Many patients presenting with aortic trauma are young. Current devices may not adequately conform around the curve of the aorta at the junction of the aortic arch and descending aorta, which is a common site of rupture. In extreme cases, poor endograft conformability may lead to device collapse and severe aortic pseudocoarctation, which may require open removal of the device.
Learning Objectives:
1. To learn about the correct management of patients with aortic rupture.
2. To learn about imaging protocols of aortic rupture.
3. To learn about the technique of endovascular management of ruptured thoracic aortic aneurysms.
4. To become familiar with post-treatment complications in patients with aortic ruptures.

Panel discussion:
When is it time for the diagnostic radiologist to call the interventionalist or surgeon urgently? 09:45

08:30 - 10:00 **Room C**

Abdominal and Gastrointestinal

RC 1501

CT colonography: All the relevant aspects

Moderator:
A.K. Dixon; Cambridge/UK

A-411 08:30

A. State-of-the-art technique

F. Iafrate; *Rome/IT (francoiafrate@gmail.com)*

In this lecture, the most important different technical aspects of CT colonography examination will be discussed. Bowel preparation represents a crucial point of a correct CTC study, necessary to cleanse the bowel of residual stool, which might simulate colonic lesions. Usually, the same preparation scheme as conventional colonoscopy or barium enema (i.e. polyethylene glycol 4000 electrolyte solution) is used. Different preparations (i.e. phospho-soda) have been investigated showing a significant reduction of residual fluids. However, due to patient discomfort, the goal for the next future is the avoidance of any bowel preparation, using a “fecal or fluid tagging” technique. Different approaches of tagging will be discussed. Choice of destending agent (Co_2 versus room air) represents another crucial point of exam and will be discussed. Spasmolytics agents are routinely used by most investigators using CT colonography. The use of these drugs is still controversial as it was showed that glucagon administration does not improve colonic distention. The use of i.v. contrast agents is still questionable. Although it has been demonstrated a mild improvement in polyp detection if i.v. contrast agent is administered, its routine use strictly depends on clinical indications and using fecal or fluid tagging is still questionable. In fact, it is not feasible in a screening population due to higher costs as well as major complexity of the exam, whereas it is mandatory in case of staging neoplastic lesions and in patients undergoing follow-up for colo-rectal cancer. Finally, different formats used for image interpretation (primary 2D versus primary 3D) will be discussed.
Learning Objectives:
1. To review current bowel preparation techniques for CTC from cathartic to “fecal/fluid tagging”.

2. To review options for practical aspects and protocols used (distention, spasmolytic agents, use of I.V. contrast material…).
3. To describe principles of data acquisition at CTC.
4. To describe options for 2D and 3D image interpretation of CTC.

A-412 09:00

B. Avoiding traps or pitfalls

P. Lefere, S. Gryspeerdt; *Roeselare/BE (radiologie@skynet.be)*

Adequate interpretation of CT colonography (CTC) is directly related to the level of experience of the reporting radiologist. To reduce false negative and positive findings to a minimum, awareness and good knowledge of traps and pitfalls is invaluable. Pitfalls in CTC imaging may be related to the CTC technique used, the anatomy of colonic and pericolonic structures and the two- and three-dimensional imaging features. Technique related pitfalls are caused by the different steps of the CTC procedure: preparation, colonic distension and image acquisition. Diagnostic problems are frequently caused by retained stool, spasm, collapse, motion artefacts, and image noise. Anatomy related pitfalls are caused by prominent semi-lunar folds, deep haustrations with hidden zones, tortuosity with flexural pseudotumors, diverticulosis, the valves of Houston, the ileo-cecal valve. Pitfalls related to two- and three-dimensional imaging are caused by thickened folds, polyps close to a fold, polyps mimicking stool, flat lesions and by tagged or non-tagged retained colonic residue, diverticulosis, wall thickening, luminal narrowing, deep haustral folds, spasm v tumor, flat lesions, polyps v stool, flat lesions, respectively. Technique related pitfalls can be overcome by the application of state-of-the-art CTC technique performed by an experienced CTC-team. Anatomy related pitfalls can be avoided by detailed comparison between 2D and 3D images. Special care should be taken when inspecting blind ending structures as the cecum and the rectum. Experience with both two- and three-dimensional imaging aspects is required to adequately interpret CTC. Finally, ongoing quality assurance and¼ a good exam avoid a lot of errors.

Learning Objectives:

1. To describe pitfalls in imaging related to CTC technique and colonic anatomy.
2. To describe typical pitfalls in imaging related to 2D and 3D imaging respectively.
3. To propose a flowchart for avoiding traps and pitfalls in imaging.

A-413 09:30

C. Evidence based results?

S.A. Taylor; *London/UK (csytaylor@yahoo.co.uk)*

It is over 15 years since the technique of CT colonography ("virtual colonoscopy") was first described. Initial single center studies produced very promising results but early multi-center trials produced very mixed data. Sensitivity for 1 cm adenomas ranged from less than 60% to over 90% in these studies. Research then focused on identifying the reasons for this variability in diagnostic performance of CT colonography. In particular, attention focused on optimum data acquisition parameters, bowel preparation, use of faecal tagging, reader training requirements and competence testing, and optimised visualisation techniques (notably primary 2D vs. primary 3D). Recent innovations now include computer assisted detection (CAD). Implementation of the findings from this body of research by the VC community has led to recent successful mutlicenter trial data from both the US and Europe. This presentation will summarise the main trial data reporting the diagnostic performance of CT colonography and highlight potential reasons for discrepancies between studies. In particular, reader training and data analysis methods will be reviewed and the potential role of CAD discussed. Based on the evidence to data, recommendations will be made to optimise CTC dissemination amongst the radiology community.

Learning Objectives:

1. To review the latest CTC performance trial data.
2. To highlight inconsistencies in trial results and explore underlying reasons.
3. To review the evidence for optimised reader performance, focusing on reading technique and training.

08:30 - 10:00 **Room D**

Imaging in Lung Diseases

CC 1518

New interactions between radiologists and endoscopists

Moderator:
M. Boijsen; Gothenburg/SE

A-414 08:30

A. Imaging of lymph nodes: We can do better

C. Mueller-Mang; *Vienna/AT (christina.mueller-mang@meduniwien.ac.at)*

The accurate assessment of lymph node status is essential in selecting the optimal treatment strategy in patients with thoracic malignancies. To date, MDCT is still widely used for this purpose because it provides excellent anatomic information about the lymph nodes of the mediastinum. However, CT evaluation of the lymph nodes is limited by the fact that it yields only presumptive evidence of metastatic disease that is mainly based on size criteria, and studies have shown that it has a relatively low sensitivity for the detection of mediastinal nodal metastases between 64 and 74%. PET imaging with FDG has been shown to be more accurate than CT in mediastinal nodal staging, but the highest accuracy for the differentiation of benign and malignant lymph nodes has been reported with integrated PET/CT (93%). Therefore, MDCT as a stand-alone imaging modality in mediastinal lymph node staging is declining in favor of integrated PET/CT. MR imaging of the chest is being performed more often, and recent studies have shown promising results in the detection of mediastinal nodal metastasis, based on signal intensity and morphologic characteristics, with an efficacy comparable to that of PET/CT. To assess the clinical utility of new MR techniques, such as diffusion-weighted MR imaging and MR imaging with ultrasmall iron oxide particles (USPIO), further studies are required. Considering the increasing concerns about radiation exposure, MR imaging could be a valuable alternative for PET/CT, especially in patients who require long-term follow-up imaging.

Learning Objectives:

1. To consolidate knowledge on the various means of imaging lymph nodes.
2. To describe the current limitations of MDCT in lymph node evaluation.
3. To learn about recent developments in MR imaging of lymph nodes and their clinical impact.

A-415 09:00

B. Direct nodal sampling by echoendoscopy: The clinician's expectations

F.J.F. Herth; *Heidelberg/DE (Felix.Herth@thoraxklinik-heidelberg.de)*

Purpose: There is increasing awareness of minimally invasive endoscopic techniques for mediastinal staging in lung cancer. Traditionally, cervical mediastinoscopy has been utilized. Endobronchial ultrasound-guided fine needle aspiration (EBUS) has recently emerged as a potential alternative.

Methods and Material: EBUS has sensitivity for lung cancer which is at least equivalent (if not superior) to cervical mediastinoscopy. The efficacy and technical aspects of endobronchial ultrasound (EBUS) are reviewed because this technology promises to revolutionise bronchoscopy. Guided biopsies and real-time TBNA have been shown to increase the diagnostic yield over conventional bronchoscopic techniques.

Results: The pooled sensitivity of real-time EBUS-TBNA in lung cancer is 90% but the false negative rate is 20%. However, negative results need either further confirmatory testing or adequate clinical follow-up. Complications are rare with either EBUS modality and are usually related to the underlying biopsy procedure rather than the use of ultrasound. Procedure duration is short enough to be incorporated into an outpatient setting and can be performed under moderate sedation.

Summary: Currently, EBUS can be recommended for initial staging as a minimally invasive option provided negative results are followed by cervical mediastinoscopy. This would also allow cervical mediastinoscopy to be reserved for restaging. Conventional transbronchial needle aspiration has a limited role only as a firstline staging procedure but may aid diagnosis. In the future, EBUS may have a role in presurgical staging of the radiologically normal mediastinum and re-staging if prior staging is done by cervical mediastinoscopy.

Learning Objectives:

1. To describe technological developments that enable direct nodal sampling by echoendoscopy.

2. To review the lymph node sites accessible by echoendoscopy.
3. To learn about the tumoral and non-tumoral disorders that can benefit from this minimally invasive procedure.

A-416 09:30

C. Image-guided endoscopy and biopsy of lung nodules

C.-H. Marquette; *Nice/FR (marquette.ch@chu-nice.fr)*

Transthoracic needle aspiration (TTNA) is the gold standard technique for peripheral lung lesions < 2 cm but the technique is associated with increased pneumothorax rates that range from 23 to 44%. The high diagnostic yield of this method (85%) derives from selected populations that fulfilled in advance clinical and radiologic criteria to undergo TTNA. Thus, in real life, many patients hardly can undergo TTNA due to medical comorbidities such as respiratory insufficiency. These reservations also apply to diagnostic surgery (via video-assisted thoracoscopic surgery or thoracotomy.). Diagnostic yield of blind transbronchial biopsies (TBB) via flexible bronchoscopy (FB) in this situation is very low (<20%) but novel technologies including endobronchial ultrasound (EBUS) and electromagnetic navigation (EN) have been shown to be safe and effective imaging tool for TBB via FB. Not only will EN guidance improve the diagnostic yield of FB but one envision potential therapeutic approach to targeted lung lesions such as placement of fiducial markers for stereotactic radiotherapy or placement flexible radiofrequency probes.

Learning Objectives:

1. To review the principles of image-guided endoscopy and biopsy of lung nodules.
2. To describe the necessary interaction between radiologists and endoscopists for successful tissue sampling.
3. To learn about the advantages and limitations of this approach in comparison with alternative diagnostic tools.

08:30 - 10:00 **Room E1**

Musculoskeletal

RC 1510

Elbow and wrist

Moderator:
J.-L. Drapé; Paris/FR

A-417 08:30

A. Elbow and wrist trauma

M.C. De Jonge; *Amsterdam/NL (M.C.deJonge@amc.uva.nl)*

Trauma to the upper extremity is amongst the most common entities encountered in daily practice conventional radiography and should always be the first step to evaluate the patient followed by HRCT (High Resolution CT) for osseous lesions and MRI/US for the evaluation of soft tissues. Elbow: The supracondylar distal humerus fracture is one of the commonest and most feared fractures in children. Adults more often sustain an olecranon or radial head or neck fracture. Children often dislocate the radial head without fracture. Both adults and children can dislocate their elbow, which is almost always a posterior displacement of the ulna and radius. Soft tissue injuries around the elbow can be muscular, tendinous or ligamentous. The distal biceps tendon rupture is in adults probably the most common injury. Lower arm: Fractures of the mid lower arm are common in children but not in adults. The Galeazzi and Monteggia fracture-dislocation injuries are classic but in fact uncommon. Often in children, it is a 'simple' diaphyseal fracture of the radius and ulna whilst in adults we mostly see isolated injuries to the ulna ("nightstick" fracture). Wrist: Injuries to the wrist are ubiquitous in children, adolescents and adults. Usually, it involves the distal radius. Injuries to the carpal bones (scaphoid - triquetrum) are often seen in adults, but are uncommon in children. Fracture dislocations are not very uncommon but easily missed. Traumatic soft tissue injuries to the wrist usually involve ligamentous structures like the SL ligament or the TFCC.

Learning Objectives:

1. To discuss the relevant anatomy.
2. To provide an overview of common acute injuries and relevant imaging.
3. To review the medicolegal implications of missed injuries.

A-418 09:00

B. Overuse of elbow and wrist

E. Llopis; *Valencia/ES (ellopis@hospital-ribera.com)*

"Overuse may be defined as a level of repetitive microtrauma sufficient to overwhelm the tissues ability to adapt". The purpose of this talk is to highlight the influence of repetive microtrauma causing injuries on the elbow and wrist. We will review the role of the different imaging techniques on diagnosis and management of these lesions. The lecture will be divided into: 1. Overuse tendon injuries of the elbow and wrist: a) lateral epicondylitis, extensor tendinosis, b) medial epicondylitis, flexor tendinosis, c) De Quervain tenosynovitis, d) intersection syndrome, e) extensor cubitus ulnaris tenosynovitis, f) tenosynovitis of the flexor carpi radialis; 2. Posterolateral elbow impingement, posterolateral plica and 3. Ulnar side impaction syndromes. Ulnar side impaction syndrome is a common source of pain and limitation of motion that results from repetitive forced impingement between the distal ulna and the carpal row and the surrounding structures. Depending on the impaction side can be divided into: Ulnar impaction syndrome, carpal-ulnar impaction; Ulnar impingement syndrome, ulna against distal radius; Ulnar styloid impaction syndrome, stylotriquetrum impaction; Hamato-lunate impaction syndrome or combined impaction syndrome.

Learning Objectives:

1. To define the concept of overuse syndrome.
2. To understand anatomical and biomechanical influence on the development of overuse injuries.
3. To review the role of different imaging modalities, with emphasis on MRI and imaging-guided percutaneous treatments.
4. To describe characteristic imaging findings of specific overuse injuries.

A-419 09:30

C. Neuropathy

C. Martinoli; *Genoa/IT (carlo.martinoli@libero.it)*

A variety of peripheral neuropathies can be encountered about the elbow and wrist affecting the median, the radial and the ulnar nerve. Most are entrapment syndromes and include the supracondylar process syndrome, the pronator syndrome, the anterior interosseous neuropathy (Kiloh-Nevin syndrome) and the carpal tunnel syndrome for the median nerve; the posterior interosseous neuropathy and the Wartenberg syndrome for the radial nerve; the cubital tunnel and the Guyon tunnel syndrome for the ulnar nerve. Although clinical examination and nerve conduction studies are the mainstays of the diagnostic work-up of peripheral neuropathies, ultrasound (US) and magnetic resonance (MR) imaging may provide key information about the exact anatomic location of a lesion and the nature of the constricting finding or may help narrow the differential diagnosis. In patients with peripheral neuropathies around the elbow and wrist, US and MR imaging may provide critical information for planning an adequate treatment strategy. A deep knowledge of the normal anatomy and of the possible causes, typical clinical findings, and imaging features of peripheral neuropathies that affect the median, radial, and ulnar nerves allows greater confidence in the diagnosis. Although US and MR imaging have followed parallel paths for nerve imaging with little comparison of the two modalities, US seems to have some advantages over MR imaging, including higher spatial resolution, time effectiveness, the ability to explore long nerve segments in a single study and to examine tissues in both static and dynamic states.

Learning Objectives:

1. To describe the spectrum of US and MR imaging findings of neuropathies around the elbow and wrist.
2. To emphasise the role of imaging in the management of entrapment neuropathies to delineate the nature and extent of the process.
3. To learn to recognise the main clinical picture of entrapment neuropathies.

08:30 - 10:00 **Room E2**

Interactive Teaching Session

E³ 1520

Common clinical problems: Cognitive decline and dementia

Moderator:
A. Platkajis; Riga/LV

A-420 08:30

Common clinical problems: Cognitive decline and dementia

B. Gómez-Ansón[1], F. Barkhof[2]; [1]*Barcelona/ES*, [2]*Amsterdam/NL*
(bgomeza@santpau.cat)

With advances in healthcare and age, the prevalence of dementia increases exponentially, with ~ 20% of subjects over 85 years becoming demented. While the guidelines differ by country, many recommend imaging at least once during the work-up of patients suspected of dementia. Beyond exclusion of surgically treatable disorders (e.g. tumour, subdural hematoma or hydrocephalus), imaging can now be used to positively determine the underlying disorder (e.g. hippocampal atrophy in Alzheimer's disease). While MRI is the modality of choice, multislice CT with multiplanar reformats provides a robust and quick alternative to assess general cortical atrophy, hippocampal atrophy and vascular pathology. SPECT and PET should be reserved for second line investigation, e.g. suspicion of frontotemporal lobar degeneration (FLTD) lacking characteristic atrophy on structural imaging. The advent of amyloid imaging using PIB-PET provides a future tool to secure a diagnosis of Alzheimer through molecular imaging, but its value over CSF examination needs to be determined. Increasing insights are being gained into the aetiology, clinical features and imaging findings in other neurodegenerative diseases, e.g. Lewy-body dementia. Structural imaging plays an essential role in establishing the diagnosis of vascular dementia (VaD), and cases of mixed dementia. Serial MRI is very sensitive to the degenerative process underlying neurodegenerative disorders, providing insights into their pathogenesis and offers a possibility to determine the effects of putative new treatments in randomized clinical trials.

Learning Objectives:

1. To learn about the usefulness of imaging in patients with dementia.
2. To be able to approach conventional CT and MRI examinations for patients with cognitive decline and dementia.
3. To become familiar with the most common types of dementia and their characteristic imaging findings.
4. To appreciate the role of imaging in early diagnosis of dementia and in differentiating the vascular and neurodegenerative disease dementia.
5. To become more familiar with the applications of imaging in research in dementia, especially in providing surrogate markers.

08:30 - 10:00 **Room F1**

Organs from A to Z: Liver

MC 1519

Primary liver tumors

Moderator:
B.I. Choi; Seoul/KR

A-421 08:30

A. Benign liver tumors

F. Caseiro-Alves; *Coimbra/PT (caseiroalves@gmail.com)*

Imaging evaluation of focal liver lesions may be currently addressed by multiple techniques that may provide complementary diagnostic information in order to accurately detect and characterize benign liver tumors. The ultimate goal of imaging is thus to be able to separate the "don't touch me" lesion from those that should be managed more aggressively or by more or less close follow-up. The usual clinical context of benign liver tumors is the fortuitous discovery of a FLL especially by the widespread b-mode US scans. More in-depth analysis becomes necessary when classical radiological criteria are not entirely met or when we are dealing with a new or previously non-reported finding in an oncologic patient. Despite the vast array of benign liver tumors, we will discuss in more detail the imaging findings of cystic lesions, hemangioma, FNH and liver adenoma using current state-of-the-art techniques such as CE sonography, cell-directed contrast agents for MRI and diffusion-weighted imaging. The new classification of liver cell adenoma as well its clinical implications will be also addressed. Finally, a strategy for the characterization of the incidental liver lesion will be provided based on the concurrent or complementary information delivered by the different imaging techniques, focusing on their pros, cons and also, when applicable, the role of biopsy in order to secure the proper diagnosis.

Learning Objectives:

1. To learn the classification and natural history of benign liver tumors.
2. To become familiar with the imaging findings with reference to tissue characterisation.
3. To learn about the imaging strategy in the assessment of an incidental focal liver lesion.

A-422 09:00

B. Imaging of hepatocellular carcinoma

C. Bartolozzi; *Pisa/IT*

In the setting of a cirrhotic patient, a solid nodular lesion found during ultrasound (US) surveillance has a high likelihood of being a hepatocelluar carcinoma (HCC). However, hystology demonstrates that many small nodules detected by US in cirrhotic livers do not necessary correspond to HCC. The differential diagnosis between small HCC and non-malignant hepatocellular lesions may be very challenging. Actually, nodules detected during US surveillance are further investigated with dynamic imaging techniques, such as contrast enhanced US, contrast-enhanced multidetector computed tomography (MDCT), and contrast-enhanced magnetic resonance imaging (MRI). Dynamic imaging allows in fact detecting the major clue for suspecting malignant degeneration that is represented by the peculiar vascular supply. Through the progression from regenerative nodule, to low-grade up to high grade dysplastic nodule (DN), and finally to overt HCC, new arterial vessels, termed nontriadal arteries develops, and become the dominant nodular blood supply, with the decrease of portal venous flow. However, two further parallel processes take place during the carcinogenetic pathway: a) the progressive loss of biliary polarization of the hepatocyte and the derangement of the microscopic secretory structure, and b) the progressive nodular depletion of Kupffer cells. MRI, performed with hepatobiliary contrast media, may give an insight on this "grey area", in which significant hystological changes already occurred, without an evident arterial supply: whereas moderately/poorly differentiated lesions fail to take up the agents, appearing hypointense to liver on T1-weighted images, well-differentiated tumor may show as hyperintense, because of the uptake and trapping of the agent within neoplastic cells.

Learning Objectives:

1. To understand the process of hepatocarcinogenesis.
2. To know how to differentiate dysplastic nodules and early-stage hepatocellular carcinoma, by means of different imaging modalities.
3. To learn the appropriate strategy in case of small nodules detected in a cirrhotic patient.

A-423 09:30

C. Other primary malignant liver tumors

R. Manfredi; *Verona/IT (rmanfredi@univr.it)*

Cholangiocarcinoma is a malignant tumor arising from the epithelium of the bile ducts. The relative incidence of cholangiocarcinoma among primary liver cancer reported in autopsy series ranges from 5 to 30%; it is, however, the most common primary malignancy of the biliary tree. Most of these tumors are adenocarcinomas. The Liver Cancer Study Group of Japan has proposed a new classification based on growth characteristics, with tumors being identified as mass-forming, periductal-infiltrating, and intraductal- growing types. This classification is considered to be the most reasonable because it describes the gross appearance, growing characteristics, biologic behavior, and prognostic implication for patients and because it is helpful for radiologic interpretation. The imaging evaluation of patients with hilar cholangiocarcinoma has traditionally included computed tomography and sonography or a combination of the two techniques for diagnosis and preoperative assessment of resectability. In recent years, MR imaging in conjunction with MR cholangiopancreatography (MRCP), has proved to be helpful in diagnosing hilar cholangiocarcinoma and in determining resectability. Cholangiocarcinoma appears as a moderately irregular thickening of the bile duct wall (> 5 mm), with symmetrical upstream dilation of the intrahepatic bile ducts. Sometimes, it may be difficult to differentiate the periductal-infiltrating type of cholangiocarcinoma, encompassing the bile duct confluence and the proximal segment of the common bile duct, from the intraductal-growing type, especially when the lesion is small. Less frequent primary liver neoplasms are represented by hepatoblastoma, fibrolamellar carcinoma, transitional cell tumor, embryonal sarcoma, angiosarcoma, hepithelioid hemangioendothelioma, and germ cell tumor.

Learning Objectives:
1. To learn the spectrum of primary liver tumors, excluding HCC.
2. To learn about imaging findings in cholangiocarcinoma, and clues for staging and deciding treatment.
3. To become familiar with imaging findings of other less frequent, primary malignant tumors of the liver.

08:30 - 10:00 **Room F2**

Special Focus Session

SF 15b

Diffusion-weighted imaging of the CNS beyond stroke

Moderator:
S. Sunaert; Leuven/BE

A-424 08:30

Chairman's introduction
S. Sunaert; *Leuven/BE (Stefan.Sunaert@uz.kuleuven.ac.be)*

Within this session, state-of-the-art diffusion-weighted MRI applications other than stroke will be reviewed. New developments, such as diffusion tensor imaging, will be covered. The benefits and challenges of DWI in the diagnosis of CNS pathology will be compared to other imaging techniques. Finally, we will debate whether diffusion-weighted imaging provides a window on histology and pathophysiology.
Session Objectives:
1. To review state-of-the-art diffusion-weighted MRI applications beyond stroke.
2. To evaluate the benefits and challenges of DWI in the diagnosis of CNS pathology in comparison to other imaging techniques.
3. To debate whether diffusion-weighted imaging provides a window on histology and pathophysiology.

A-425 08:35

DWI in focal non-ischemic brain lesions
M. Law; *Los Angeles, CA/US (meng.law@usc.edu)*

Diffusion weighted and diffusion tensor imaging is now widely utilized in the research and clinical settings beyond its clinical applications in stroke. In the clinical setting, qualitative, semi-quantitative and quantitative methods are being utilized to evaluate DWI and DTI data. There are a number of pitfalls with all of these approaches. The role of diffusion weighted and diffusion tensor imaging characterization of tumor biology and different pathologies will be reviewed. Differentiating between recurrent tumor and therapeutic necrosis is often a challenge. We will review the role of advanced imaging and also the effects of anti-angiogenic therapies on tumor microvasculature/microenvironment resulting in changes in diffusion, perfusion and MRS. As patients are being treated with new anti-angiogenic agents such as Bevacizumab (an anti-VEGF antibody), an entity called "pseudo-response" has also been described where patients demonstrate an MRI response. Lastly, to combine and apply these different imaging techniques in a complete imaging protocol and a multi-parametric algorithmic fashion in the clinical setting can be shown to increase our diagnostic specificity and confidence.
Learning Objectives:
1. To apply diffusion-weighted imaging in the characterisation of focal non-ischemic brain lesions.
2. To differentiate between tumoral and non-tumoral disease such as glioma, metastases, lymphoma, infection and demyelinating disease.
3. To differentiate recurrent tumor from therapeutic necrosis in the post-therapeutic brain.
4. To combine DWI in a multi-parametric algorithmic fashion with other advanced MRI tools such as MR spectroscopy and perfusion/permeability imaging in the characterisation of focal brain lesions.

A-426 08:58

DWI in diffuse non-ischemic brain and spine pathology
M. Mascalchi; *Florence/IT (m.mascalchi@dfc.unifi.it)*

Hardware and software developments have determined an explosion of the clinical applications of diffusion weighted (DW) and diffusion tensor (DT) MR imaging for assessment of diffuse diseases of the brain and spine. These applications are based on either simple visual assessment of tissue signal intensity in DW images or sophisticated quantitative analyses performed using ROI, histogram, tractography or voxel-wise techniques on the maps of apparent diffusion coefficient, mean diffusivity or fractional anisotropy. Due to the sensitivity to extracellular edema or microstructural changes both determining increased proton diffusion, DWI and DTI are the techniques of choice for assessment of the diffuse white matter involvement in inherited or acquired metabolic diseases and in age-related small vessel leukoencephalopathy. In particular, they enable detection of significant changes also in the normal appearing white matter which are closely correlated to the clinical and laboratory findings and can be used to monitor brain involvement or to serve as a surrogate marker of these diseases. DWI demonstration of areas of restricted diffusion in the cortical grey matter is a sensitive diagnostic feature of herpes encephalitis and Creutzfeld-Jakob disease. Finally, DWI and DTI have been increasingly used to map WM tract damage in neurodegenerative diseases of the gray matter such as movement disorders and dementias. The application of DWI and DTI to spinal pathology and, in particular, their potential contribution in the differential diagnosis between benign bone marrow edema and metastatic involvement has been controversial. The adoption of lower b values (typically b=300-600 s/mm^2) are recommended for such a purpose.
Learning Objectives:
1. To show the main results obtained in diffuse white matter and grey matter diseases of the CNS using DWI and DTI.
2. To illustrate the possible integration of DWI and DTI with other MR techniques providing structural and functional evaluation of the brain.
3. To appreciate the main results obtained with spinal DWI and DTI in spinal pathology.

A-427 09:21

DWI: Use of advanced diffusion markers in non-infarct lesions
W. Van Hecke; *Antwerp/BE (wim.vanhecke@ua.ac.be)*

Diffusion weighted imaging (DWI) is a relatively new method in which the image contrast is produced by the random microscopic motion of water molecules in different tissues. DWI consists of a DW image and an apparent diffusion coefficient (ADC) map. By acquiring at least 6 DW images in different spatial directions, a diffusion tensor (DT) can be estimated in every voxel. This DT describes the three dimensional diffusion process in that voxel can give an insight into the white matter fiber architecture. Local quantitative measures are derived from the diffusion tensor, such as the fractional anisotropy (FA), which is a normalized measure for the degree of anisotropy, and the mean diffusivity (MD), i.e., the averaged diffusion. Recent DTI studies of different pathologies are starting to use these quantitative measurements, demonstrating the potential of this in vivo and noninvasive imaging technique for detecting microstructural pathological alterations. Quantitative DW and DT measures can give an insight into different non-infarct lesions of the brain, such as for example infectious, neoplastic and demyelinating diseases.
Learning Objectives:
1. To become familiar with the different types of advanced diffusion markers calculated from DWI and DTI.
2. To become familiar with the visualisation and interpretation of diffusion tensor images.
3. To apply advanced diffusion (tensor) markers in non-infarct lesions.

Panel discussion:
DWI: A window on histology and physiopathology? 09:44

08:30 - 10:00 **Room G/H**

Neuro

RC 1511

Interventional neuroradiology

Moderator:
M. Forsting; Essen/DE

A-428 08:30

A. Endovascular management of intracranial aneurysms
A. Krajina; *Hradec Králové/CZ (krajina@fnhk.cz)*

Endovascular therapy of intracranial aneurysms has become the first line treatment option, whenever this option is available. The neurointerventionalist performing the procedure should have appropriate radiographic equipment, training and regular workload of patients. This can be better accomplished in a high-volume neurovascular center where appropriate neurosurgical care can be instituted promptly. There are two endovascular strategies to treat cerebral aneurysms. The first is occlusion

of the aneurysmal sac with metallic coils preserving the parent artery, and second is occlusion of the parent artery in order to exclude the otherwise untreatable aneurysms from the blood circulation. Controlled coil intrasaccular delivery is the prerequisite for their widespread and safe use. The technology allows for the withdrawal and exchange of incorrectly sized or unstable coils prior to deployment. The International Subarachnoid Aneurysms Trial was a large randomized, prospective study of endovascular coiling versus surgical clipping for a selected group of patients with bleeding aneurysms deemed suitable for both types of therapy. The study revealed an absolute risk of death or independency reduction 8.7% for coiling over clipping in one year after treatment. Coiling is followed by annual delayed rebleeding rate of 1%. Permanent procedural complications occurred in 3.7%. The most frequent procedural complication was cerebral ischemia. Unruptured aneurysms are a heterogeneous entity with extreme variation in reported rupture risk. The critical size of the aneurysm is more than 7 mm. Posterior circulation location, multilobularity and aneurysms in young, hypertensive, smoking patients were found to be in increased risk of hemorrhage.

Learning Objectives:

1. To review the principles and technique of endovascular management of intracranial aneurysms.
2. To review the results of endovascular treatment.
3. To learn about the management of treatment complications.
4. To discuss ruptured and unruptured aneurysm treatment strategies and follow-up.

A-429 09:00

B. Endovascular treatment of acute ischemic stroke

L. Castellan; *Genoa/IT (lucio.castellan@hsanmartino.it)*

In Europe, stroke represents the third cause of death and the first cause of disability, with an enormous social and economic impact. Prompt treatment with thrombolytic drugs can restore blood flow in occluded intracranial arteries before major brain damage has occurred. Over the past 2 decades, the management of stroke has progressed significantly due to intravenous and intraarterial trhombolysis. The efficacy of intravenous approach with tissue plasminogen activator within 4.5 hours since symptoms onset has been proven in large, well-designed studies. Intraarterial thrombolysis was first studied as an alternative to intravenous thrombolysis, with the particular intent to increase the time window, to rapidly deliver the thrombolytic agent with high concentration at the site of occlusion and to obtain mechanical clot disruption. The interventional treatment options available today are the intraarterial administration of tissue plasminogen activator and newer antiplatelet agents, mechanical thrombectomy by means several different intravascular systems, and intracranial angioplasty and stent placement. These techniques should lead to improved recanalization and reduced hemorrhagic complications. Moreover, all the mechanical procedures could allow to bring the time window up to 8 hours or to try the recanalization also after unsuccessful intravenous thrombolysis. Nevertheless, because of the differences in stroke severity, time to treatment and occlusion locations, direct comparisons among different thrombolytic therapies have been difficult and currently many of these approaches have yet to prove their benefits in controlled clinical trials, although they offer new hope for a very large population of patients with stroke.

Learning Objectives:

1. To point out patient selection criteria for new mechanical thrombectomy and other endovascular procedures of intracranial revascularisation.
2. To investigate the efficacy of intravenous thrombolysis.
3. To become familiar with the practical applications of mechanical embolectomy devices in the treatment of acute ischemic stroke.
4. To discuss integration of stroke centres of different levels in a territorial network of emergency care systems as well as the potential impact of well-organised systems for stroke care.

A-430 09:30

C. Stent-based technologies in the treatment of intracranial aneurysms and atherosclerotic disease

I. Szikora; *Budapest/HU (h13424szi@helka.iif.hu)*

Stent technology is presently applied in the endovascular treatment of atherosclerotic stenosis and that of aneurysms. For intracranial atherosclerotic disease, self and balloon expandable stents are used to decrease the incidence of procedural complications and to improve the long term results by reducing the incidence of restenosis. Recent studies demonstrate that the complication rate of intracranial angioplasty has been reduced from 15 to 3%. Up to now, significant restenosis rate remains as high as 28% and is symptomatic in 4.1%. For aneurysms, self-expandable stents deployed across the aneurysm neck are used to make intrasaccular packing feasible or support tighter packing and to improve long-term results by promoting endothelial growth over the aneurysm orifice. More recently, high mesh density flow diverting devices became available that are capable of inducing aneurysm thrombosis without intrasaccular packing by significantly reducing flow across the orifice. Published results demonstrate that using coil supporting stents recanalization of completely occluded aneurysms can be reduced to 4.3% and progressive thrombosis in incompletely occluded lesions can be achieved in 14% of the cases. Using new generation flow diverting stents, complete, lasting occlusion of large, giant and broad neck aneurysms can be achieved in over 90% of cases. At present, stent angioplasty is an inherent part of the treatment of intracranial atherosclerotic disease. Intracranial stent implantation is an important adjunctive technique for some aneurysms and offers an entirely new avenue for the primary treatment of some previously difficult or impossible to treat lesions.

Learning Objectives:

1. To understand the technical possibilities, limitations, potential complications, mid-term results and current indications of using stent-assisted angioplasty in atherosclerotic intracranial arterial stenosis and acute ischaemic stroke.
2. To understand the technical possibilities, limitations, potential complications mid-term results and current indications of using stent-assisted coil packing and stent-based flow modification in the treatment of ruptured and unruptured intracranial aneurysms.

08:30 - 10:00 **Room I**

Physics in Radiology

RC 1513

Visualisation, perception and image processing

Moderators:
L. Donoso; Barcelona/ES
W.J.M. van der Putten; Galway/IE

A-431 08:30

A. Visualisation and perception

A.G. Gale; *Loughborough/UK (a.g.gale@lboro.ac.uk)*

Radiological interpretation always incurs some degree of error due to the nature of disease presentation coupled with the difficulty in diagnosis, especially where early signs of disease need to be identified such as in medical screening. Early research studies of radiologists' performance concentrated upon the chest radiograph but more recent work has studied breast screening extensively, as well as MRI and CT. As radiology is now almost fully digital, research has also examined observer behaviour with a range of digital images, viewing conditions, and image display presentations. It is possible that radiological interpretation will never be accomplished without some errors occurring; however, it is important that steps are taken to minimise any causes of errors as far as possible. The reported error rates found in numerous investigations across different radiological domains will be reviewed and the reasons for these elucidated. Appropriate reporting conditions will be highlighted for different image viewing scenarios. A theoretical framework for understanding error causation, especially where abnormalities are missed, will be detailed. Furthermore, the underlying visual, perceptual and cognitive processes which lead to errors will be detailed and approaches to minimise error occurrence will then be proposed. The relationship between human perceptual and cognitive skills and computer imaging processing will be discussed and the usefulness of CAD systems outlined as how they can best aid the radiologist from the human performance viewpoint.

Learning Objectives:

1. To review the basic principles of perception, detection and detectability.
2. To learn about specifics of perception in medical imaging.
3. To learn how image processing can help us with the perception process.

A-432 09:00

also EPOS

B. Image processing and perception

B.M. ter Haar Romeny; *Eindhoven/NL (B.M.terHaarRomeny@tue.nl)*

The need for quantitative image analysis in radiology is universal: computer-aided detection, segmentation for 3D volume visualization, image enhancement, pattern recognition etc. All need effective, robust and preferably generic (not 'ad hoc') algorithms for the computer. How to design such algorithms? A good inspiration source is the functionality of the visual system; the best investigated brain structure today. In this talk, we will explain how we think the brain calculates features in images, why the retina measures at a wide range of resolutions and how we can exploit

this in multi-scale analysis, and how we can learn to understand and exploit the Gestalt Laws. The visual system is strongly adaptive and self-learning. New optical recording techniques have given new insight in how the cells in the visual cortex are functioning. We will go through these functionalities step-by-step. What we discover is quite amazing. We recognize huge amounts of filter banks in the first stages of vision: many filters analyse each pixel of the incoming image at a range of scales, orientations, derivative order, for each colour, and also as a function of time. We programmed these filters into the computer and were able to build many interesting applications for (bio-) medical imaging: detection of catheters at seriously reduced levels of fluoroscopy X-ray radiation dose, automatic detection of polyps in the colon, quantitative analysis of ischemic heart ventricle deformation, breast cancer CAD, pulmonary emboli CAD and analysis of in-vivo microscopy images now so abundant in modern life-sciences research.

Learning Objectives:

1. To gain insight into modern computer vision techniques for computer-aided diagnosis.
2. To learn how the first stages of human visual perception process information.
3. To learn a range of application areas of image processing techniques for medical imaging.

A-433 09:30

C. Clinical application of image processing

A. Persson; *Linköping/SE (anders.persson@cmiv.liu.se)*

The practice of medical image diagnosis is currently undergoing a fast transformation. Vast amounts of data can be generated in standard examination and focus is shifting from improving the collection of relevant data for diagnosis to development of effective methods to analyze, visualize, navigate, and interact with medical information. It is now becoming generally accepted in the medical community that one of the most important keys to manage the increasing information flow is the use of 3D and 4D applications. This talk will take its starting point in state-of-the-art medical visualization and then discuss the need for a research agenda that focuses on the development of the next generation of medical visualization tools, emphasizing the fact that these tools must be based on medical user requirement and work flow studies as well as on new technical developments.

Learning Objectives:

1. To learn how to use adequate reconstructions/image sequences in CT/MR.
2. To learn when to use transverse, sagittal and coronal displays.
3. To learn when to use 3D displays.

08:30 - 10:00 **Room K**

Pediatric

RC 1512

Chest imaging: What to use and when to use it

Moderator:
A.E. Healey; Liverpool/UK

A-434 08:30

A. US: When and how?

I. Gassner; *Innsbruck/AT (i.gassner@i-med.ac.at)*

Diseases of the chest are commonly evaluated by means of the three dominant imaging modalities: conventional chest radiographs, CT and MR. Thorax ultrasound is not often performed mainly because bone and air are traditionally considered natural barriers for the ultrasound beam. However, the unique thoracic anatomy of neonates and children as well as certain pathologic conditions provides many acoustic windows into the chest. Only little effort is needed to evaluate and diagnose a wide range of clinical problems in the thorax without the radiation exposure from frequent chest radiographs and CT, or the need for sedation often required for MR imaging. In particular, ultrasound is quickly implemented in the remote intensive care situation where patients can be examined in any given position and location minimising the need to move or transfer patients, who are on life support devices. Ultrasound is particularly useful in differentiating between pulmonary and pleural lesion, in visualising diseased parenchyma hidden by pleural effusion in chest radiographs, to detect and characterise pleural fluid collections, to delineate anomalies of mediastinum and great vessels, and last but not least, to assess malposition and complications of central vein catheters.

Learning Objectives:

1. To demonstrate imaging approaches to the mediastinum, pleura, diaphragm, and lung.
2. To review sonographic features of thoracic disorders.
3. To illustrate the use of chest US in neonatal intensive care.

A-435 09:00

B. CT: What you really need to know

C. Owens; *London/UK (owensc@gosh.nhs.uk)*

This presentation will discuss applications of CT in the evaluation of chest disease in children. The advent of fast acquisition thin collimation volumetric CT has revolutionized thoracic CT imaging in children. The majority of children requiring thoracic CT fall in to three basic categories; hence, three basic protocols suffice for most chest CT examinations in children. Metastatic disease, focal lung pathology or mediastinal mass/adenopathy allows scanning with thicker beam collimation and lower pitch factors preserving risk from inappropriate over dosage. Vascular or airways disease may require thinner collimation and higher pitches. MRI may, therefore, be more appropriate in these patients. In Diffuse lung disease, sequential scans with thin collimation and high spatial frequency reconstructions are the established optimal technique. Tube current (MA) and kilo voltage KV should be kept to the lowest allowing diagnostic quality images and depend on patient size and weight. Enabling automated dose modulation will override set parameters and so understanding of manufacturers' settings is imperative. There are many controversial issues within applications of paediatric chest CT and it is vital that the radiologist is constantly questioning the added diagnostic role of CT over the other alternative non-ionizing examinations (e.g. MRI) when available and appropriate. The presentation will discuss areas of potential controversy within the assessment of children undergoing thoracic CT.

Learning Objectives:

1. To discuss specific customised protocols used in pediatric chest CT imaging.
2. To discuss strategies for pediatric CT dose reduction.
3. To illustrate the strength of chest CT using case-based illustrations.

A-436 09:30

C. MRI: The icing on the cake. Are we really there yet?

M.U. Puderbach; *Heidelberg/DE (m.puderbach@dkfz.de)*

Diseases of the respiratory system are of great importance in paediatrics. Early detection and follow-up of infectious, congenital and environmental diseases in young patients is crucial for adequate treatment and improved outcome. Here, imaging techniques play an indispensable role. In the past, the interest was focused on morphological aspects of pulmonary tissue. Here, computed tomography (CT) serves as the gold standard. In the course of the development of MRI, MR imaging of the lung played a subordinate role. This was caused by several technical problems: 1. low signal to noise ratio because of low proton density of the lung, 2. artefacts because of cardiac and breathing motion, 3. susceptibility artefacts because of air-soft tissue transition. Despite these inherent difficulties of MRI of the lung, significant progress has been made recently. Although spatial resolution is lower than at CT, MRI allows for the visualisation of the lung parenchyma by using ultra short echo time (TE). Furthermore, MRI has the advantages to evaluate different tissue aspects (T1w, T2w, fat suppression) and to improve lesion characterization. Additionally, MRI is capable to assess lung function, e.g. perfusion, angiography, ventilation and respiratory mechanics. Using up to date scanner systems, a complete study of the chest including morphological and functional imaging can be performed in less than 30 minutes. Especially, diseases that go along with pulmonary structure augmentation and/or involve vascular structures can be studied by MRI.

Learning Objectives:

1. To describe the various techniques available for MRI of the chest in children.
2. To illustrate specific clinical scenarios where MRI is helpful.
3. To illustrate the strengths and weaknesses of chest MRI with case-based illustrations.

08:30 - 10:00 **Room L/M**

Special Focus Session

SF 15c

Vascular ultrasound imaging: When and how

Moderator:
B. Brkljacic; Zagreb/HR

A-437 08:30

Chairman's introduction

B. Brkljacic; *Zagreb/HR (boris.brkljacic@zg.htnet.hr)*

Ultrasound has fundamentally transformed vascular medicine. It offered new and profound insight into vascular physiology, early detection became possible, and its high diagnostic accuracy permits optimal therapeutic management. US is unfortunately underused among radiologists; often, CTA and MRA are preferred even when they do not offer real advantages. Ultrasound is noninvasive, cheap, easily and widely available, provides morphologic and physiologic information, with direct hemodynamic data obtained at the site of pathologic lesion, and proximally and distally, and is highly accurate. It is also useful during many vascular interventional procedures. It requires experience, manual dexterity and is highly operator-dependent. In the session the role of US in the quantification of vascular disease will be described, with the emphasis on physiological measurements. State-of-the art performance and interpretation of carotid US examinations and the role of US and US contrast media for the characterization of plaque will be presented. The role and advantages of US over other imaging methods in planning of endovascular procedures and follow-up will be emphasized. Finally, deep venous thrombosis is a common and important condition potentially resulting in pulmonary embolism. US is the major imaging modality used for accurate diagnosis and to prevent thromboembolic complications; major aspects of US diagnosis of DVT will be presented. Additionally, alternative conditions that clinically mimic DVT and their US findings will be presented. Vascular ultrasound should be utilized by radiologists to complement CTA and MRA, since it provides a quick, inexpensive and accurate way to diagnose major arterial and venous diseases.

Session Objectives:

1. To present the role of US in the evaluation of hemodynamics and quantification of vascular disease.
2. To describe the role of US in the planning and follow-up of endovascular procedures.
3. To discuss the role of US in the diagnosis of DVT and its mimics.

A-438 08:33

Not only imaging: A window on physiology

C. Deane; *London/UK (colin.deane@kch.nhs.uk)*

Ultrasound is established in the diagnosis of arterial disease. The morphological information from B-mode, together with colour flow imaging of the residual arterial lumen, is complemented by Doppler measurement of arterial velocity and the flow waveform. This not only gives a measure of the geometrical severity of the lesion but is also indicative of the pressure changes through the stenosis and its effect on the local circulation. Changes to flow waveform show the effects proximal and distal vascular changes. The combination of local changes through a renal artery stenosis with flow waveform changes within the kidney is, for example, arguably valuable in assessing both the artery stenosis level and the intrarenal circulation. Ultrasound has an important role to play in the evaluation of early disease. It provides inexpensive screening for aortic aneurysm. Measurement of intimal thickening in the carotid arteries has been used as a predictor of increased cardiovascular disease. Ultrasound can also be used in the measurement of arterial stiffness which has shown to be an early indication of arterial disease. Lastly, transcranial Doppler is an inexpensive technique for examining cerebral haemodynamics. Clinically effective in, for example, screening children with sickle cell disease, it has extensive research applications. The use of TCD techniques to measure small microemboli has been shown to offer possibilities to identify patients at risk from stroke from carotid stenoses with the potential to enable refinement of treatment options.

Learning Objectives:

1. To present the role of US in the quantification of vascular disease.
2. To provide an overview of US measurement techniques in vascular disease and flow measurement, the role of US in vascular physiological measurement including arterial compliance, and the use of transcranial Doppler techniques for cerebral hemodynamics and embolus detection.

A-439 08:53

also EPOS

Carotid stenosis and vulnerable plaque

D. Gaitini; *Haifa/IL (d_gaitini@rambam.health.gov.il)*

Identification of carotid stenosis and differentiation stenosis from occlusion may enable selection of the most appropriate candidates for endarterectomy or stent implantation. Carotid ultrasound (CUS) has become an important means to reach these goals thanks to advances in CUS performance and interpretation driven by technological improvements in gray scale, color and spectral Doppler. Intima-media thickness, plaque location and characterization, flow disturbance and flow velocities for the diagnosis of carotid stenosis are obtained by CUS. The degree of diameter stenosis of internal carotid artery is the main parameter used for therapeutic approaches. Plaque rupture is the most common type of plaque complications, accounting for almost 70% of fatal acute myocardial infarctions and cerebral strokes. Microbubbles contrast media (CMUS) injection may demonstrate neovessels in the atherosclerotic plaque. A high density of neovascularization diagnosed by CMUS corresponds to a vulnerable plaque, with higher propensity to rupture and clinical manifestations. CUS is a unique imaging method for the investigation of carotid stenosis. Non-invasive, accurate and cost-effective, it provides morphological and functional information. It is increasingly becoming the first and often the sole imaging study before treatment, where costly and invasive procedures are reserved for special cases. State-of-the-art in the performance and interpretation of CUS examinations and the role of CMUS for plaque characterization are presented.

Learning Objectives:

1. To describe the technique of US Doppler examination, correlation of US Doppler results with stenosis degree, and advantages and limitations compared to other imaging tests.
2. To present the patterns of atheroslcerotic plaques and the role of US contrast media in the characterisation of the vulnerable plaque.

A-440 09:13

also EPOS

Planning and follow-up of endovascular procedures

Z. Morvay; *Szeged/HU (mzita@radio.szote.u-szeged.hu)*

Ultrasound is effective in imaging and measuring disease in large arteries although the skill and equipment required varies. For example, the abdominal aorta can easily be visualized but renal arteries require more skill and high specification equipment. Carotid, femoral, popliteal, brachial arteries are easily accessed and criteria for determining the severity of steno-occlusive disease are well-established. Small arteries in the arm and leg can be imaged although those in the leg may present difficulties, especially in diabetic patients with high prevalence of multiple lesions in tibioperoneal arteries. In this case, other image modalities are often required. Successful imaging requires careful manipulation of colour flow and Doppler controls, gain, transmit frequency, PRF, beam steering and angle correction. It is important to be confident of flow direction and measures velocities; good scanning techniques can limit errors. Velocity criteria can be used to grade stenoses into categories. Absolute values are helpful although velocity ratios are useful to compensate for physiological variables; for example, in the peripheral circulation. Ultrasound is effective in determining the presence and extent of aneurysms, pseudoaneurysms, fistulas, dissections and has in important role in follow-up of surgical and radiological vascular interventions. Fortunately, stents and grafts placed into vessel are "transparent" for ultrasound; after such procedures, the same measurements can be performed in vessels as for native vessels. Diagnostic criteria will be presented together with limitations as to their use in clinical scanning.

Learning Objectives:

1. To describe indications, technique, pitfalls and general yield of Doppler US for the diagnosis of arterial stenosis.
2. To present the role and advantages of US over other diagnostic procedures in the diagnosis and therapy of post-procedural complications.

A-441 09:33

DVT diagnosis and mimics

G. Ivanac; *Zagreb/HR (gordana.augustan@zg.htnet.hr)*

Deep venous thrombosis (DVT) is extremely common and pulmonary embolism remains major killer of inpatients. Although the risk factors for DVT are known, prophylaxis is not universal. False diagnosis results in unnecessary anticoagulant therapy and the risk of bleeding. Clinical diagnosis of DVT alone is unreliable; only 20-30% of those with symptoms have DVT and 90% of patients with fatal PE are asymptomatic for DVT. Accurate diagnosis and prompt therapy are essential to reduce risk of thromboembolic complications. Ultrasound is the major imaging method to diagnose DVT and follow-up the patient during and after the therapy. The goals of venous ultrasound are: to diagnose the presence or absence of thrombus,

to evaluate the thrombus extent and characterize whether it is fresh or organized, free-floating or attached, partially or totally occlusive, and finally to establish the alternative diagnose to DVT in patients with similar symptoms. Examination technique and criteria to diagnose acute and chronic DVT will be presented. The role of US in the follow-up of patients will be discussed. Controversial and difficult issues will be discussed, regarding the selection of patients for imaging, screening of asymptomatic high-risk patients, imaging of isolated calf DVT, and the need to provide permanent hospital US service for suspected DVT. Clinical diagnosis of DVT is difficult, and the majority of thrombi are clinically silent; ultrasound enables recognition of alternative pathology with similar clinical symptoms in more than 15% of patients; many examples of alternative pathologic conditions will be presented.
Learning Objectives:

1. To describe goals, technique, pitfalls and accuracy of Doppler US in diagnosis of DVT and post-thrombotic syndrome.
2. To discuss controversial issues and strategies to refine the selection of patients for imaging.
3. To present the advantages of US in diagnosing alternative conditions that clinically mimic DVT.

Panel discussion:
Why is vascular US underutilised in radiology departments 09:53

08:30 - 10:00 **Room N/O**

Head and Neck

RC 1508

Common pains in the head and neck

Moderator:
L. Akesson; Lund/SE

A-442 08:30

A. Salivary colic
T. Beale; *London/UK (timothy.beale@royalfree.nhs.uk)*

This lecture will demonstrate a multimodality approach to the imaging of salivary colic. The relevant US and MRI salivary anatomy will be highlighted and the ultrasound, computed tomography and magnetic resonance appearances of salivary colic will be shown and techniques for optimising the imaging of salivary colic given. The use of US, CT, MRI, and both MRI and conventional sialography in the imaging of salivary colic will be discussed. The role of interventional sialography and minimally invasive techniques in benign salivary gland obstruction will be demonstrated.
Learning Objectives:

1. To review the role of imaging in the evaluation of salivary colic.
2. To understand the advantages and limitations of the different available imaging techniques.
3. To become familiar with MR sialography technique and how it compares with conventional sialography.
4. To learn the indications and limitations of interventional sialography.

A-443 09:00

B. Trigeminal neuralgia
B.F. Schuknecht; *Zurich/CH (image-solution@ggaweb.ch)*

Trigeminal neuralgia is defined as recurrent episodes of intense lancinating pain most common in the second (V_2) or third division (V_3) of the trigeminal nerve. The pathogenesis is a neurovascular conflict by an artery or vein associated with focal demyelination of sensory fibers at the glia schwanncell junction. Apposition of demyelinated fibers induces abnormal generation and transmission of impulses. MR Imaging is based on high resolution sequences: CISS with coronal and sagittal oblique MPR and 3D TOF sequences with a thin MIP reconstruction to delineate the cisternal course of the trigmenial nerve, the root entry and glia schwanncell junction and the course of vessels along the trigeminal nerve. The brainstem and brain are assessed by T2, Flair and 3D isotropic Gd enhanced sequences, and the viscerocranium is examined by a noncontrast and coronal T1 Gd fat suppressed sequence. Analysis of images is focused on recognition of displacement and distortion of the proximal trigeminal nerve by the SCA, rarely by the AICA, BA or petrosal vein. Inflammatory CNS disorders and peritrigeminal tumours are scrutinized as well as neoplastic or inflammatory lesions along the course of the V_1 - V_3 division from the root entry to the exit foramina. Correlation of the circumferential site of distortion at the root entry zone with the somatopic representation of fibers increases the in general low specificity of the neurovascular contact. Ruling our compressive tumours and delineating a marked neurovascular conflict may stratify patients in case of failure of antiepileptic medication to microvascular decompressive surgery.
Learning Objectives:

1. To review the clinical diagnostic criteria and pathophysiology of trigeminal neuralgia.
2. To learn how to tailor MR imaging technique.
3. To become familiar with the most common causes.
4. To understand the value of imaging in patient management.

A-444 09:30

C. Painful swallowing
M. Becker; *Geneva/CH (minerva.becker@hcuge.ch)*

The purpose of this lecture is to provide an overview of the key imaging features of painful swallowing with or without associated mucosal pathology. In the presence of a mucosal lesion, painful swallowing is most often caused by infectious, neoplastic or traumatic lesions of the pharynx itself, whereas in the absence of mucosal alterations, painful swallowing is the result of functional disorders (dysfunction of the cricopharyngeus muscle), infectious, inflammatory or neoplastic diseases affecting adjacent neck spaces (retropharyngeal and paraphyrngeal space), neurologic impairment (glossopharyngeal neuralgia), carotidodynia and Eagle's syndrome. The indications for CT, MRI, US and videofluoroscopy will be reviewed and their respective role in the detection and precise description of the underlying cause. Major emphasis will be placed on how to report the findings in a comprehensive way.
Learning Objectives:

1. To recognise the most common causes of painful swallowing in patients with an abnormal pharynx at clinical examination.
2. To recognise the most common causes of painful swallowing in patients with a normal pharynx at clinical examination.
3. To review the role of different imaging techniques in the diagnosis and treatment of painful swallowing.
4. To review the key imaging features of the most common causes of painful swallowing as seen on the respective imaging techniques.

08:30 - 10:00 **Room P**

Cardiac

RC 1503

Imaging coronary artery disease (CAD)

Moderator:
G.H. Roditi; Glasgow/UK

A-445 08:30

A. CT of coronary arteries: Luminography and beyond
H. Alkadhi; *Zurich/CH (halkadhi@partners.org)*

Coronary CT angiography has entered daily clinical practice. Increasing robustness for non-invasive coronary artery imaging could be achieved through the implementation of CT systems equipped with dual-source technology and/or providing a wider Z-axis coverage (128 slices and more). In addition, an increase in temporal resolution has diminished the dependency of image quality on the patients' heart rate. Cardiac CT is particularly useful in patients having an intermediate pre-test likelihood of coronary artery disease based on their history, cardiovascular risk factors, symptoms, and the results of ECG or stress tests. In these patients, CT is a clinically useful tool and may obviate the need for invasive diagnostic procedures. The contrast-enhanced CT scan for coronary angiography also includes qualitative information about the extent and composition of coronary plaques. These can be characterized by CT into calcified, non-calcified or mixed. Particularly, non-calcified plaques represent an early stage of atherosclerosis and mixed plaques carry some risk for rupture which makes their identification an important adjunct to a purely luminographic coronary artery assessment. Whereas MR continues to fall short of imaging the cororary arteries in a clinically robust manner, it has recently shown great promise in the detection and characterization of coronary artery plaques. This is mainly achieved through its excellent soft-tissue resolution that generally outperforms that obtained from CT.
Learning Objectives:

1. To review the performance of CT for diagnosing CAD.
2. To highlight the importance of non-invasive imaging of coronary plaques.
3. To define the current and future role of CT for plaque imaging.

A-446 09:00

B. MRI: What can it provide in CAD?

L. Natale; *Rome/IT (lnatale@rm.unicatt.it)*

MRI is a powerful tool in cardiac imaging, because of its morphological, functional and perfusion information, due to its high spatial, contrast and temporal resolutions. In CAD, MRI has very strong clinical indications in ischemia detection, acute and chronic myocardial infarction assessment, and viability assessment. Many techniques can be employed: Fat sat T2 imaging is very useful in edema detection, first pass sequences can be used at rest and stress to detect perfusion defects and ischemia, delayed enhancement sequences are considered gold standard for necrosis and/or scar recognition and quantification and viability assessment. Furthermore, other information can be obtained by MRI; in treated and untreated acute myocardial infarction, microvascular obstruction presence represents a major prognostic factor. Different approaches can be used: Rest first pass imaging, so-called early late enhancement, conventional late enhancement. Risk stratification is another important field where MRI can be employed. Ischemia presence/absence still remains a major prognostic factor in patients with suspected CAD. Rest and stress perfusion MRI is more feasible than rest and stress cine-MRI for ischemia recognition, with many advantages compared to nuclear perfusion imaging. More than important technical development, future of cardiac MRI can be represented by emergency room applications, such as T2 imaging in acute chest pain and perfusion imaging in atypical chest pain.

Learning Objectives:

1. To review the scientific evidence of MRI in CAD.
2. To discuss various techniques for assessing function, perfusion and viability in CAD.
3. To define the current and future role of MRI in risk stratification of patients with CAD.

A-447 09:30

C. MRI and MDCT: Complementary or competitive?

K. Nikolaou; *Munich/DE (konstantin.nikolaou@med.uni-muenchen.de)*

High-field-strength clinical magnets, high-performance gradient hardware, and ultrafast pulse sequence technology are rapidly making the vision of a comprehensive cardiac MR imaging examination a reality. This examination is poised to have a significant effect on the management of coronary artery disease by means of assessment of myocardial function and regional wall motion with tagging and pharmacologic stress testing, evaluation of the coronary microvasculature with perfusion imaging, and with MRI having been established as the gold standard of myocardial viability analysis. On the other hand, the direct visualization of the coronary arteries has been the main clinical application for multislice CT. With ever faster multislice-CT scanners at hand and with growing indications for cardiac imaging and imaging in ischemic heart disease also using CT, the appropriate use of each imaging modality in patients with suspected and known coronary artery disease is under ongoing discussion.

Learning Objectives:

1. To understand the strengths and weaknesses of MRI and MDCT.
2. To discuss clinical indications for both modalities.
3. To review CAD cases.

08:30 - 10:00 **Room Q**

Interventional Radiology

RC 1509

Minimally invasive treatment of uterine fibroids

Moderator:
R. Pietura; Lublin/PL

A-448 08:30

A. Choice of embolic agent

N. Hacking; *Southampton/UK (nigel.hacking@virgin.net)*

1. To learn which embolic particles may be used for uterine fibroid embolisation (UFE): p-PVA, s-PVA: the longest use of any product for UFE, relatively cheap and effective in RCTs. Most commonly used embolic in UK and Canada. s-PVA introduced to allow deeper penetration and less clumping. Gelfoam: the cheapest embolic and effective, with long term studies showing safety and efficacy. Widely used in the Far East, UK, India and the Caribbean. Embospheres (ES), Beadblock (BB), Embozenes (EZ): three further spherical agents. Available in a wide range of sizes, colours and with different physical characteristics. Less catheter occlusions than with PVA. Easier to deliver through a micro-catheter. Agents of choice in the USA and much of Europe.
2. To discuss criteria for selection of particles: The ease of use, volume of embolic required, complication rates and cost all vary between embolic agents. Depth of penetration into the fibroid, the inflammatory response, uterine artery occlusion rates and fibroid infarction rates also show some variation. All the above agents have been used effectively and safely in UFE. The costs of the embolics vary significantly.
3. To review evidence for and against available embolic particles: Fibroid re-growth and recurrence of symptoms have been shown to be related to fibroid infarction rates and this is the most accurate way of predicting long term outcomes following UFE with differing embolic agents. Comparative fibroid infarction rates with these different agents will be presented.

Learning Objectives:

1. To learn which embolic particles may be used for uterine fibroid embolisation (UFE).
2. To discuss criteria for selection of particles.
3. To review the evidence for and against available embolic particles.

A-449 09:00

B. Recurrence of fibroids after embolisation

C. Binkert; *Winterthur/CH (christoph.binkert@ksw.ch)*

Uterine fibroid embolisation (UFE) has shown a similar clinical outcome after two years compared to hysterectomy in the EMMY trial. However, there is a higher reported rate of re-intervention after UFE compared to hysterectomy. In the REST trial, the re-intervention rate was 20% for UFE vs. 2% for the hysterectomy population during a median follow-up of 32 months. MRI has become the modality of choice to assess the outcome after UFE. Youselfi et al. (JVIR 2006) showed that the large majority of recurrent fibroids occurs from re-growth after incomplete fibroid infarction and only a minority (12%) are new fibroids. Therefore, the key question is: what are the factors to prevent complete embolisation. Basically, the problem is that not enough particles get to the fibroids. One reason is an arterial supply other than the uterine arteries. The most common additional supply is the ovarian arteries. If parts of the fibroid are only supplied by the ovarian artery, a complete embolisation through the uterine arteries is not possible. Another reason is either the inability to catheterise the uterine artery or the impairment of flow before or during particulate embolisation such as spasms or dissection. In order to minimize incomplete fibroid infarction, the ovarian arteries should be assessed during UFE and in case of substantial supply to the fibroids embolised. Also, subtle catheter technique should be applied with the use of small catheters (4 F or microcatheters). Overall, it should not be forgotten that only symptomatic recurrences need further treatment.

Learning Objectives:

1. To discuss factors affecting the incidence of fibroid recurrence.
2. To discuss methods of avoiding recurrence.
3. To review the current evidence regarding recurrence.

A-450 09:30

C. UAE and HIFUS: What the radiologist needs to know

T. Kroencke; *Berlin/DE (thomas.kroencke@charite.de)*

Uterine artery embolisation (UAE) and MR guided high-intensity focused ultrasound (HIFUS) are minimal-invasive therapies for treating symptomatic uterine leiomyomas (fibroids) and represent alternatives to surgery (hysterectomy, moymectomy, hysteroscopic resection). The indication for treatment of uterine leiomyoma depends heavily on symptomatology and burden of disease. Chronic fibroid related symptoms fall into three major categories: bleeding symptoms (hypermenorhea, dysmenorrhea), bulk-related symptoms (urinary frequency, obstipation, bloating, pelvic pain), and infertility. With the exception of infertility, patient expectations are centered on the efficacy of currently available treatment options regarding freedom of symptoms, quality-of-life and invasiveness of therapy. Validated questionnaires are available to assess symptom severity and impairment of quality-of-life in a standardized manner. The burden of disease is dependent on the location, size, and number of leiomyoma. However, as opposed to many malignant tumors, no unique classification system is available to date to determine the extent of disease and help to stratify treatment options. Non-invasive imaging such as transvaginal ultrasound (TVUS) and magnetic resonance imaging (MRI) play a crucial rule in detection of uterine leiomyoma and differentiation from other uterine and ovarian pathologies. This presentation summarizes current treatment options in the light of the current literature. Especially, the role of interventional radiological treatments like HIFUS and UAE for uterine leiomyoma is discussed in a case-based approach. The role of imaging with a focus on key information requested by the treating interventional radiologist, typical imaging features before and after these procedures as well as a common differential diagnoses will be discussed.

Learning Objectives:
1. To discuss the role of HIFUS and UAE as an alternative to surgery.
2. To learn about the role of MR imaging prior to UAE and HIFUS.
3. To differentiate typical versus atypical findings after UAE and HIFUS.

10:30 - 12:00 **Room E2**

Interactive Teaching Session

E³ 1620

Imaging in common clinical problems: Neck mass

Moderator:
M.G. Mack; Frankfurt a. Main/DE

A-451 10:30

A. Above hyoid

S.J. Golding; *Oxford/UK (stephen.golding@nds.ox.ac.uk)*

The face and neck offer some of the most complicated anatomy with which the radiologist has to deal, and also a particularly wide range of pathology, making cervicofacial imaging a complex area of clinical practice. Further, imaging signs in the face and neck can frequently be difficult to elicit. Many general radiologists prefer to avoid practicing in this area if possible but a basic knowledge of neck masses is fundamental to general radiology practice. A simple approach to the complexity of the suprahyoid neck may be taken on the basis of anatomical compartments. Knowledge of and ability to analyse these is fundamental to differential diagnosis and provide the radiologist with a useful guide to establishing the pathological basis of imaging signs. In this area, it is also important to correlate imaging with clinical examination, as lesions may have identical imaging signs but radically different pathophysiology. Imaging signs are rarely specific but provide a good guide to further clinical management, including local staging of both benign and malignant disease. In radiology generally, knowledge of the clinical treatment options is fundamental to providing a meaningful radiological report. This is particularly true of cervicofacial disease where therapeutic options are generally not well understood by radiologists, and where clinicoradiological liaison becomes paramount.

Learning Objectives:
1. To learn about diagnostic imaging signs in the suprahyoid neck.
2. To appreciate the importance of correctly localising disease and how this helps in the differential diagnosis.
3. To understand the strengths and weaknesses of characterising suprahyoid lesions on the basis of imaging signals and characteristics.
4. To understand the importance to patient management of precise evaluation and staging by imaging.

A-452 11:15

also EPOS

B. Below hyoid

N.J.M. Freling; *Amsterdam/NL (n.j.freling@amc.uva.nl)*

The infrahyoid neck is an anatomical area between the oral cavity, the submandibular space and the entrance of the thoracic cage, which may serve as a highway, connecting different areas. It contains mainly longitudinal structures: muscles, blood vessels, nerves, esophagus and only a few horizontal structures, e.g. the hyoid bone, the thyroid gland, and the vocal cords. When examining this region at a digital workstation, it is important to use a rigid systematic analysis to avoid diagnostic failures: larynx - upper airways, hypopharynx - esophagus - blood vessels - lymph nodes - muscles - thyroid gland - spine - skin. Few clinical issues regarding the infrahyoid neck will involve this anatomic area only. For example, esophageal cancer of the cervical esophagus needs to be staged before treatment planning, including the neck nodes, chest and upper abdomen. Extension of a deep parapharyngeal neck abscess beyond the hyoid bone may involve the infrahyoid neck before extending into the mediastinum. But a lateral neck cyst is usually in an infrahyoid location. The choice of imaging depends on clinical information: should we use US, CT, MRI, PET/CT or shall the patient immediately be transported to the radiology intervention department? The radiologist should be aware of the acute (trauma, haemorrhage, vascular occlusion), semi-acute (infection) or non-acute situation (staging cancer, analysis slowly growing mass lesion). Pathology differs between children and adults and to know the incidence of the most common diseases in the infrahyoid neck is extremely rewarding in daily practice.

Learning Objectives:
1. To learn what structures are located in the infrahyoid neck (excl. the larynx).
2. To know what a cystic lesion might represent in children and in adults.
3. To know how to diagnose a solid lesion and what its nature could be.
4. To learn how to recognise vascular lesions.
5. To understand how to use the best of different imaging modalities to obtain a diagnosis.

12:15 - 13:45 **Room B**

ESR meets Saudi Arabia

EM 4

Saudi radiology

Presiding:
C.J. Herold; Vienna/AT
S.S.A. Lingawi; Jeddah/SA
M. Szczerbo-Trojanowska; Lublin/PL

A-453 12:15

Introduction

S.S.A. Lingawi; *Jeddah/SA (dr_lingawi@yahoo.ca)*

The Radiological Society of Saudi Arabia (RSSA) is a young society. It was established in January 2004 and is now in its 6th year. About 400 radiologists work in Saudi Arabia, a third of whom are Saudi nationals and the rest are expatriates from different nationalities including North America, Europe, North Africa, East Mediterranean counties and the Indian subcontinent. The ratio of women to men is almost 1:6. RSSA also servers radiographers, whose number is triple that of radiologists. As the field of radiology is evolving and the recognition of its importance is becoming a fact in all physicians' minds, it is expected that the number of physicians seeking radiology certification will increase. In our local training program, this has been noticed over the past five years with equal number of applicants among men and women. As the rest of the word, radiology in Saudi Arabia is met with the following main challenges: 1. High medical demand and shortage of enough qualified radiologists. 2. Need for high quality RIS/PACS systems at a national level. 3. Need for reliable national and international Teleradiology systems. 4. Need for physician education to improve appropriate radiological investigation referral pattern. Certain endemic diseases are present in Saudi Arabia such as: tuberculosis and brucellosis, and parasitic infestations. Similarly, due to various genetic and social factors other diseases are prevalent such as congenital anomalies, diabetes mellitus, and sickle cell anaemia. Among the various oncological diseases, lymphoma seems to be prevalent.

Session Objectives:
1. To introduce the practice of radiology in Saudi Arabia.
2. To highlight the role of the Radiological Society of Saudi Arabia.
3. To demonstrate some of the common health issues in Saudi Arabia.

A-454 12:23

also EPOS

Peculiar musculoskeletal infections and infestations

M.E. Abd El Bagi; *Riyadh/SA (drm_bagi@hotmail.com)*

Saudi Arabia emphatically surpassed hardship days, which left behind residual peculiar infections, to prosperity which provided accurate imaging facilities for diagnosing those infections. The most peculiar and most sinister is mycetoma. It is a mimicker of all bone diseases which may be misdiagnosed. Mycetoma can look like osteomyelitis, simple or aneurysmal bone cysts, fibrous dysplasia, enchondroma, osteosarcoma, Ewing's tumour, osteoid osteoma or neurofibromatosis. Mycetoma is painless. It burrows deeply before it becomes clinically manifest and may require amputation or re-amputation. The bidirectional travel between tropical and temperate countries and the global warming may cause spreading of human parasites. No country is exempt. The musculoskeletal system could be the transit route or the graveyard of certain parasites. These include cysticercosis, hydatid disease, guinea worms and filariasis. Such parasites may be discovered accidentally on radiographs as calcifications and may present with rheumatism or bizarre symptoms. Acute bone pain in sickle cell diseases patients is a common clinical dilemma with great morbidity. It could be due to an infection, an established infarct or a transient vasculopathy. Differentiation is difficult clinically and management is diverse. Plain films are usually negative. Ultrasound is neither sensitive nor specific. Radioisotopes may require multiple studies with technetium scan, WBC scan or colloid bone marrow scan with a significant radiation dose. MRI is the modality of choice but is expensive and may require heavy sedation for children. Future use of MR perfusion studies may help to differentiate among infection, infarct and transient vasculopathy to avoid invasive procedures.

Learning Objectives:
1. To summarise the peculiar infections of the musculoskeletal system.
2. To demonstrate the spectrum of the radiologic signs of peculiar musculoskeletal infections.
3. To describe how can these peculiar musculoskeletal infections mimic other bone diseases.

A-455 12:46

also EPOS

Brucellosis in Saudi Arabia from head to toe

N.A. Al-Nakshabandi; *Riyadh/SA (nizar.nakshabandi@ksu.edu.sa)*

Human brucellosis is notoriously a multisystem disease. Brucellosis is endemic in Saudi Arabia. Morbidity in humans in the Saudi population continues to be reported with increasing frequency from various regions of the country, particularly from the rural areas, and human infection is in the range of 1.6 - 2.6%. The disease presents in both sexes and in all ages with varied manifestations. It can involve any part of the body. In the brain, it can present with meningitis, encephalitis, MRI can be normal, abnormal enhancement of the meninges, from inflammation, white matter changes and vascular changes. Involvement of the spine can be diffuse or focal with most cases seen in the lumbar spine region. Erosions as well as sclerosis are in the endplates of the vertebra. Changes of inflammation can be seen on MRI. Osteomyelitis of adjacent vertebra is with or without involvement of the disc space and an epidural mass in diffuse spondolitic brucellosis. Sacroiliac joint is a favorite location for the disease. Most bone/joint involvement was normal on plain radiographs but evidence of osteomyelitis and septic arthritis was seen on MRI. In the body, there is hepatosplenomegaly and lymphadenopathy along with ileitis in rare cases. Colitis and spontaneous peritonitis have can be seen on CT scan. Sacular mycotic pseuoaneurysms of the aorta from direct extension of vertebral body osteomylitis can be seen on CT. Epididymo-orchitis is the most common genitourinary complication visualized on ultrasound.

Learning Objectives:
1. To summarise the full extent of Brucella infection in various body systems.
2. To demonstrate the spectrum of the radiologic signs of Brucella infection.
3. To understand the importance of imaging in the diagnosis of Brucellosis.

A-456 13:09

Role of imaging in discovery and characterisation of genetic diseases

I.A. Alorainy; *Riyadh/SA (alorainy@ksu.edu.sa)*

Historically, imaging has significantly contributed in the discovery and understanding of many genetic diseases. With the recent imaging advances, the role of radiology and medical imaging is not any more limited to the study of gross alteration in structure, but rather extends to the study of microstructure and function of body organs, tissues, and cells. Today, there is a great opportunity for imaging to have stronger impact on knowledge about genetic diseases. In Saudi Arabia, genetic diseases are prevalent partly due to high percentage of consanguineous marriages resulting in high frequency of autosomal recessive disorders and increased frequencies of homozygosity for autosomal dominant traits. Such genetic diseases are either rare by Western standards or are unknown. This presentation will address the role of imaging in the discovery and characterization of genetic diseases in Saudi Arabia with emphasis on neurological diseases. Examples of such diseases and syndromes include: HOXA1 mutation in Bosley-Salih-Alorainy syndrome, ROBO3 mutation in horizontal gaze palsy with progressive scoliosis (HGPPS), C2orf37 mutation in Woodhouse-Sakati syndrome, RELN mutations in autosomal recessive lissencephaly with cerebellar hypoplasia, CC2D2 A mutation in Joubert syndrome, intragenic deletion in the LARGE gene causes Walker-Warburg syndrome, TDP1 mutation in spinocerebellar ataxia with axonal neuropathy, MRE11 mutation in ataxia telangiectasia-like disorder, and Dincsoy-Salih-Patel syndrome. From a local Saudi perspective, imaging had a pivotal role in the discovery and/or characterization of these disorders, and with the advent of imaging techniques, including functional and molecular imaging, we expect to experience a further role of imaging in understanding genetic diseases.

Learning Objectives:
1. To learn how imaging has contributed to the discovery and understanding of genetic diseases.
2. To appreciate the great opportunities for advanced imaging techniques to play a fundamental role in discovering new genetic diseases and characterising the existing ones.
3. To understand the importance of taking a lead position in multidisciplinary genetic research.
4. To recognise the importance of observation of structural or functional derangement in discovering and understanding diseases.

Panel discussion 13:32

14:00 - 15:30 **Room E2**

Interactive Teaching Session

E³ 1720

Imaging in common clinical problems: Hemoptysis

Moderator:
E. Castaner; Sabadell/ES

A-458 14:00

Imaging in common clinical problems: Hemoptysis

S. Diederich[1], M.-L. Storto[2]; [1]*Düsseldorf/DE*, [2]*Chieti/IT*
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Hemoptysis is a potentially life-threatening condition requiring an urgent and comprehensive evaluation of the lung parenchyma, airways, and vessels. Bronchiectasis, chronic bronchitis, malignancy, and chronic infections (particularly tuberculosis and aspergillosis) are well-known causes of hemoptysis. Less common causes include pulmonary embolism with infarct, vascular anomalies such as pulmonary arteriovenous malformations and bronchial artery aneurysms, vasculitis, and iatrogenic conditions. “Cryptogenic” hemoptysis, a diagnosis of exclusion, should also be considered since it is responsible for 3-42.2% of episodes of hemoptysis, particularly in smokers. Standard diagnostic algorithms have been based on a combination of conventional radiography, bronchoscopy, CT, and thoracic angiography. In recent years, the development of multi-detector CT has introduced a comprehensive, noninvasive method of evaluating the entire thorax. Moreover, multi-detector CT can be used to detect bronchial arteries and, less frequently, nonbronchial systemic arteries causing hemoptysis. In this session, we will review different causes of hemoptysis and illustrate typical cases using an interactive modality of presentation. We will also discuss the role of multi-detector CT and other imaging modalities in the evaluation and management of patients with hemoptysis together with a proposal of a diagnostic algorithm.

Learning Objectives:
1. To describe the potential etiology of hemoptysis.
2. To understand the information provided by different imaging modalities in hemoptysis.
3. To demonstrate typical imaging findings in patients with hemoptysis from different etiologies.

16:00 - 17:30 **Room A**

Radiology in Abdominal Emergencies

CC 1817

When time matters

Moderator:
R.A. Novelline; Boston, MA/US

A-459 16:00

A. Emergency room: When radiologists can save lives

O. Chan; *London/UK (zaideotto@blueyonder.co.uk)*

The advent of major new technological advances in radiology has dramatically changed the role of the ER radiologist. ER radiologists should now play a central role in delivering a comprehensive 24/7 service. ER radiologists should be key figures in The Emergency Team and have the opportunity to save lives - “stop imaging patients to death” and “stop examining patients to death”. In effect, the combination of early imaging, accurate and fast diagnosis and therefore avoiding unnecessary delays, will almost certainly lead to a reduction in the rate of unnecessary complications and deaths. In order to be able to effect change, ER radiologists will have to be central in the design of new Emergency departments, help to decide on new imaging strategies and protocols for different clinical scenarios and help to draw up the response to a major incident.

Learning Objectives:
1. To know the radiologist’s task in the emergency room.
2. To understand examples of diseases in which fast-track imaging plays a role.
3. To learn how radiologists can be part of the emergency team.

A-460 16:30

B. Rupture of solid organs

J. Cazejust; *Paris/FR (julien.cazejust@sat.aphp.fr)*

In abdominal trauma, spleen and liver are the most frequently affected organs. Initial Ultrasonography is helpful in providing an overview of potential lesions, as proposed with the FAST-US. This is especially dedicated to patient with hemodynamic instability, in which the presence of a massive hemoperitoneum prompts for surgery without any further examination. In other cases, the management of the patient is more and more conservative, associating supportive care and interventional radiology, while surgery is seldom performed. The severity of the injury is best assessed by multidetector CT. Hepatic or splenic lesions range from simple contusion or minor laceration to organ fracture (linear lesion> 3 cm) and vascular avulsion, according to the AAST classification. Grade V splenic lesion is "completely shattered spleen" or "hilar vascular injury which devascularized spleen", whereas "hepatic avulsion" is the most severe lesion (grade VI). MDCT can only be performed in a patient with controlled hemodynamic parameters. MDCT protocol should adapt to the Purpose: thin slices allow multiplanar reconstruction, especially dedicated to bone trauma, iodine injection provides detection of bleeding, as well as road mapping when intervention is necessary. Arterial phase is mandatory, although bleeding can sometimes be more conspicuous on venous phase. Intervention might be necessary shortly after CT when active bleeding is seen, and if the patient is hemodynamically unstable. However, detection of active bleeding does not mean that intervention is systematically done because some lesions may resolve spontaneously. In that case, a close follow-up is necessary, as well as multidisciplinary concertation with regard to potential recurrence.

Learning Objectives:

1. To know organs at risk in typical trauma situations and to be able to quantify lesions and hierarchise the potential risk.
2. To learn imaging features and their diagnostic importance.
3. To understand potential pitfalls and limitations of US, CT and MRI.

A-461 17:00

C. Intestinal haemorrhage

N. Elmas; *Izmir/TR (nevraelmas@gmail.com)*

Gastrointestinal haemorrhage has been accepted as an important admission cause to emergency departments. Mortality and morbidity ranges due to gastrointestinal haemorhage point out high incidence potentially. Diagnostic and therapeutic approaches are different in upper and lower intestinal tract bleeding. Type of haemorrhage depends on the origin of the bleeding. Clinical examination with history is essential for the selection of investigation. Etiologic causes can be encountered as gastric ulcer, diverticulosis, inflammatory and ischemic bowel diseases, varices due to the portal hypertension, arteriovenous malformation, neoplastic changes etc. Endoscopic procedures have been used as primary examination modality in intestinal bleeding especially upper intestinal tract. However, endoscopic techniques may result with negative or failed examination in detection of bleeding source. Under these circumstances, additional examination techniques are necessary such as catheter angiography, radionuclide red cell labeling technique. These techniques have some disadvantages such as time-consuming, invasive and low sensitivity or specificity ranges. In recent years, computed tomography has become the first imaging technique with advances in speed, multiphasic imaging capacity, multiplanar visualization, angiographic ability and high spatial resolution in gastrointestinal bleeding.

Learning Objectives:

1. To know the classification of intestinal haemorrhage types according to their location and causes.
2. To understand how to perform and interpret imaging in patients with acute and chronic intestinal bleeding.
3. To know the factors affecting therapeutic alternatives.

16:00 - 17:30 **Room B**

Multidisciplinary Sessions: Managing Patients with Cancer

MS 1821

Colorectal cancer

A-462 16:00

Chairman's introduction

R.G.H. Beets-Tan; *Maastricht/NL (r.beets.tan@mumc.nl)*

This course is relevant for all radiologists who are dealing with CRC staging. The impact of imaging on treatment-stratification is significant. It is important to have in-depth knowledge of what clinicians want to know from imaging and how radiologists can provide these answers. With the worldwide adoption of preoperative radiotherapy in rectal cancer surgery, primary-staging is necessary to accurately select patients who only need surgery from those who will have an unacceptably high risk for local failure unless aggressive neoadjuvant treatment is given. CT and MRI are being more widely used in local and distant staging, respectively. Their roles in primary staging will be discussed. The relevant surgical anatomy of the pelvis that will be useful for radiologists to better report MR pathology will be provided as well as the relevant biology of rectal cancer to understand local and distant recurrences and its prognostic-risk-factors. Imaging also influences tailoring of the radiotherapy fields that uses planar imaging for planning. To understand how your imaging findings on tumor extent determine the radiation-treatment-volumes will be dealt with in this course. New treatment options like local excision or even wait and see to those who achieve a pathological good response (ypT1-2) or complete response (ypCR) following preoperative chemoradiotherapy have improved long-term outcomes in local control rates, independent of their initial TN-stage. Restaging with imaging may contribute in selecting these good responders. To understand how treatment decisions can be tailored according to the tumor responses after completion of radiotherapy, what conservative surgical treatments exist and what is the role of imaging in restaging are other important goals of this course.

Learning Objectives:

1. To understand the increasingly important role of the radiologist in the multidisciplinary management of rectal cancer patients.
2. To understand the clinical background of different treatment options and its impact of imaging on treatment outcome.

A-463 16:05

What the surgeon needs to know

G.L. Beets; *Maastricht/NL (g.beets@ah.unimaas.nl)*

Rectal cancer treatment has changed from a monodisciplinary surgical disease to a disease that often requires a multidisciplinary approach. In different countries and institutions, different approaches are used, but the common theme is that in early disease surgery only is the preferred treatment, and in more advanced cases neoadjuvant radiotherapy or chemoradiation. Prognostic factors that can be used in these choices are: the T stage, the N stage, the distance of the tumour to the mesorectal fascia, and the distance of the tumour to the anorectal ring. The information required in a particular institution is dictated by the treatment strategies that are used, and radiologists should be aware of this through a good communication and collaboration with the clinicians. Specific surgical questions that imaging can address are: the exact relation of the tumour to: 1) the mesorectal fascia 2) the surrounding organs and 3) the anal sphincter. Repeated staging after chemoradiation is not yet standardised, and the clinical relevance is again related to the change in strategy the clinicians are willing to make, such as: sphincter or organ saving surgery after a good response where this was not feasible before the chemoradiation or a local excision instead of a standard rectal resection in a good responder. This field is evolving, and no standard recommendations can be made.

Learning Objectives:

1. To understand the anatomy that is relevant in treating patients with rectal cancer.
2. To understand the treatment options used in your institution, and how patients are selected.
3. To understand what surgeons will do with the images and information.

A-464 16:25

also EPOS

What the radiation oncologist needs to know

V. Valentini; *Rome/IT (vvalentini@rm.unicatt.it)*

With the worldwide adoption of preoperative radiotherapy in rectal cancer for patients who will have an unacceptably high risk for local failure, images contribute to tailor radiotherapy fields and treatment decisions according to tumor responses during and after completion of radiotherapy. Nowadays, innovative techniques using 3D conformal treatment planning are recommended for radiotherapy treatment. The most important contribution of 3-D treatment planning was the ability to plan and localize tumour target and normal tissues at all levels of the treatment volume. Based on the predominant locations of local recurrences and the lymph node involvement, guidelines for definition and delineation of the pelvic volumes to irradiate in rectal cancer are proposed. The choice of pelvic volumes to irradiate take also into account the height of the tumour, the definition of the local tumour extent and the nodal status at clinical stage by imaging. Many series report that patients who achieve a pathological complete response (pCR) following preoperative radiotherapy + concurrent chemotherapy have improved long-term outcomes in terms of excellent local control rates, independently of their initial clinical T and N stage. After treatment, imaging contributes to detect favourable patients who could be cured with less surgery. Sequential PET/CT data (before, during and after radiochemotherapy) in combination with clinical variables seem to increase the performance of prediction models for pathologic complete response significantly. Based on these imaging modalities, new early response modulated treatments can be tested in the following years.

Learning Objectives:

1. To understand how your imaging findings on tumor extent determine the radiotherapy treatment volumes.
2. To understand how treatment decisions can be tailored according to the tumor responses during and after completion of preoperative radiotherapy.

A-465 16:45

Imaging in colorectal cancer

R.G.H. Beets-Tan; *Maastricht/NL (r.beets.tan@mumc.nl)*

The assessment of the local spread of the tumor includes the determination of the depth of tumor growth in the rectal wall, the circumferential resection margin at TME, the depth of tumor invasion in surrounding pelvic structures, and the nodal status. For superficial rectal cancer, that can be treated with surgery only (transanal resection or TME), endoluminal ultrasound is the most accurate staging method to assess tumor ingrowth in the muscular rectal wall. For the remaining mobile and fixed rectal cancer a high resolution MRI with a dedicated phased array coil is at present the most reliable technique to evaluate the mesorectal fascia and the circumferential resection margins. Despite the identification of lymph nodes even as small as 2-3 mm on high resolution imaging, reliable detection of nodal metastases is presently not possible, because planar imaging only rely on morphological criteria. However promising results have been reported with the use of LN MR contrast in MRI and new functional MRI techniques. State of the art imaging and the role of MRI as well as the relevant role of the radiologists in the multidisciplinary decision making team will be discussed. After preoperative chemoradiation most advanced tumors shows phenomenal response so new treatment dilemmas and new questions arises for MR of rectal cancer. The lecture will not only provides evidence in staging but also in restaging with imaging and will discuss the role of MRI as well as other modalities such as EUS and PET/CT.

Learning Objectives:

1. To understand how imaging can identify low and high risk groups of rectal cancer patients and how it may influence the treatment choice.
2. To understand the evidence for the use of EUS, CT, MRI and PET/CT in local and distant staging of rectal cancer.
3. To know the right MR protocol, typical MR features and pitfalls when interpreting MRI.

Panel discussion and case presentation 17:05

16:00 - 17:30 **Room D**

Abdominal and Gastrointestinal

RC 1801

Crohn's disease: Techniques and results

Moderator:
F. Maccioni; Rome/IT

A-466 16:00

A. Role of US

V. Válek; *Brno/CZ (vlvalek@med.muni.cz)*

The ultrasound examination (US) we do without any preparation; it is not necessary to be empty. We examine patients in supine position, first small bowel, then mesentery and large bowel. We complete the examination in some cases with the application of the intravenous contrast (CEUS). CEUS is a useful method to assess the therapeutic effectiveness of specific medical anti-inflammatory treatment in patients with Crohn's disease. Using high-resolution linear transducer mural perfusion, changes in active Crohn's disease can be appreciated applying contrast harmonic imaging with quantitative time intensity curve analysis. This technique could be an effective dynamic imaging modality for diagnosis and especially follow-up examination to monitor treatment in CD. At least four studies have prospectively compared the diagnostic accuracy of US with radiological studies, endoscopy or surgery in suspected Crohn's disease at diagnosis. In these studies, the sensitivity of US ranged between 84 and 90% and its specificity reached 98 and 100%. In our prospective study, we compared 102 patients with Crohn´s disease. The activity of the disease was assessed correctly in 91% patients by ultrasound. In the largest series, the overall sensitivity of US was 93% and the specificity was 97%. US reach highest sensitivity (95%) when the disease involved the terminal ileum. US compares very well with radiological techniques and surgery, mainly in the detection of strictures and abscesses, while for fistulas data are more conflicting and less satisfactory, with sensitivity values ranging from 50 to 87% and specificity values from 90 to 95%.

Learning Objectives:

1. To describe the strategy of small bowel US in Crohn's disease.
2. To present keys for diagnosis and follow-up of US in Crohn's disease.
3. To discuss the pros and cons of US including CEUS in Crohn's disease.
4. To discuss the accuracy, objectivity and usefulness of US in Crohn's disease.

A-467 16:30

B. MRI and MR-related tools

S. Gourtsoyianni; *Iraklion/GR (sgty76@gmail.com)*

Over the years, several different oral contrast agents have been tested for luminal distention of small bowel when assessing Crohn's disease with MRI. For consistency of imaging findings, accurate wall thickness measurements and depiction of even subtle changes of bowel mucosa, MR Enteroclysis (MRE) performed after duodenal intubation and administration of a maximum amount of 2 lt of contrast agent, while the patient is lying prone inside the MR scanner were performed with excellent results. MRI examination protocol should include true FISP and HASTE sequences for anatomical delineation of mesenteries and bowel as well as post gadolinium 2D/3D T1 weighted fat saturated sequences for lesion characterization, lymph node enhancement measurements and evaluation of bowel wall enhancement pattern. Normal intestinal wall exhibits moderate homogeneous enhancement while abnormal wall presents either with multilayered, in case of active Crohn's disease, inhomogeneous-diffuse, in case of chronic inflammation and fibrosis, or homogeneous marked, enhancement pattern in case of moderate inflammation. With the utilization of various MR-related tools such as multiple contrast mechanisms and cine true FISP sequences, accurate disease subtype classification may be achieved based on morphology and motility imaging features. MRI not only allows demonstration of transmural nature of disease but also „sees" beyond obstructed bowel loops in contrast to direct examination methods such as capsule endoscopy. Stenotic lesions may be further characterized since differentiation between edema and fibrosis is possible with T2 weighted images in which fibrosis presents with a typical low signal intensity appearance, while inflammation or edema presents with high signal intensity.

Learning Objectives:

1. To describe an advanced comprehensive MR examination protocol for diagnosis and differential diagnosis of Crohn's disease.

2. To discuss the potential of MR enteroclysis in characterising and differentiating inflammation from fibrosis in assessing Crohn's disease activity and in defining different disease subtypes.
3. To review strengths and weaknesses of the application of MRE in view of other direct and indirect sensitive techniques available.

A-468 17:00

C. CT vs MRI

M.A. Patak; *Berne/CH (michael.patak@insel.ch)*

The aim of this lecture is to give an overview of the techniques and typical findings for imaging Crohn's disease (CD) with either multirow detector computed tomography (MDCT) or with magnetic resonance imaging (MRI) and compare the two different modalities. Optimal imaging of CD begins with the preparation phase. The small bowel has to be distended for a concise examination. This can be done either invasively, i.e. enteroclysis or orally, which is named enterography. There is much debate on which of these two preparation methods is better. For the administered intraluminal contrast, the best is water with some additives, which are neutral in CT and biphasic in MR. Imaging in MDCT is done 40 and 70 sec after IV administration of iodinated contrast with a thin collimation. All image data are reconstructed in axial, coronal and sagittal planes. The aim of imaging in CD should be to establish the following: 1) presence, severity, and extent of the disease; 2) its activity; and 3) extra-intestinal complications. Both modalities have proven to be a good tool to evaluate the extent, the activity of the disease and the presence of extraluminal complications. Both are also able to identify the type of the disease, being the active/inflammatory, the fistulizing /perforating, the fibrostenosing or the reparative/regenerative type. The challenge for MRI is mostly the in-plane resolution of the image data whereas radiation dose is for CT.

Learning Objectives:

1. To describe the possible techniques of CT in Crohn's disease.
2. To consider the pros and cons of CT and MRI in Crohn's disease.
3. To compare the diagnostic accuracy of CT versus MRI in Crohn's disease.
4. To determine the role of CT and MRI in the radiological work-up for Crohn's disease.

16:00 - 17:30 **Room E1**

Special Focus Session

SF 18

Renal cancer: Old problems, new solutions

Moderator:
A. Magnusson; Uppsala/SE

A-469 16:00

Chairman's introduction

A. Magnusson; *Uppsala/SE (anders.magnusson@radiol.uu.se)*

Not many years ago, renal cancer was detected on excretory urography as a space occupying lesion. The further diagnostic work up included a few tools, fluoroscopically guided biopsies and renal angiography. Most tumours were large and symptomatic; often patients presented with the classic triad, including haematuria, flank pain and a palpable mass. The only tool, which was available for treatment, was radical nephrectomy. Today, a majority of renal tumours detected are incidental tumours. This is due to the increasing use of modern imaging techniques, CT, MRI and ultrasound. An incidental tumour is, by definition, discovered when the patient is investigated for symptoms not related to a renal tumour, it is asymptomatic and generally small in size and localized. In parallel, the tools which are available for diagnosis and treatment has expanded, CT- or ultrasound guided biopsy, nephron-sparing surgery, either open, laparoscopic or robotic and ablative therapies, cryo- or radiofrequency ablation. The incidence of renal cell cancer, especially small renal tumours, is increasing and survival is improving. With an increasing number of small renal tumours, many of them benign lesions, a number of questions are raised: When to biopsy and can we trust the result? Which therapeutic strategy should be chosen, surgery or ablation? Are we overtreating some patients, or maybe a larger number should simply be followed?

Session Objectives:

1. To review the imaging of renal cancer and the impact of new imaging methods.
2. To learn about the new developments in the staging of renal cancer on both CT and MRI.
3. To review the role of RF ablation in comparison with other treatments.

A-470 16:05

MDCT of renal cancer

A. Cieszanowski; *Warsaw/PL (andrzej.cieszanowski@wum.edu.pl)*

The superb spatial resolution of MDCT has resulted in higher detection rate of renal masses and better visualization of their morphology. MDCT allows discrimination between most of benign and malignant renal tumors, although its ability for correct characterization of some lesions is still limited (i.e. oncocytoma, low-fat angiomyolipoma, fat-containing RCC, solitary renal lymphoma, focal inflammation). According to a revised Bosniak classification, cystic lesions can be divided into 5 types: simple cysts (I), minimally complicated cysts (II), minimally complicated cysts that need follow-up (IIF), possibly malignant cysts (III), and definite cystic neoplasms (IV). MDCT allows depiction of detailed morphology of cystic lesions (i.e. density, contrast enhancement, septa, calcification), allowing correct classification in majority of the cases. Recent classification of renal cell carcinoma includes the following histological subtypes: conventional (clear cell), papillary, chromophobe and collecting duct carcinoma (with renal medullary carcinoma variant). Hypovascular tumors (i.e. papillary RCC) have better prognosis than hypervascular lesions (i.e. clear cell RCC). Involvement of collecting system, along with infiltrative growth, suggests the diagnosis of collecting duct carcinoma, which carries the worst prognosis of all RCC subtypes. MDCT also enables accurate staging of RCC, which has consequences for prognosis and therapy. Evaluation includes tumor relation to perinephric tissues, venous structures, adrenal s, Gerota's fascia, as well as, involvement of regional lymph nodes and distant metastases.

Learning Objectives:

1. To discuss the characterisation of cystic renal masses by CT.
2. To learn about pathologic subtypes of renal cell carcinoma and correlate them with CT findings.
3. To review the staging of renal cell carcinoma with CT.

A-471 16:30

US and MRI

N. Grenier; *Bordeaux/FR (nicolas.grenier@chu-bordeaux.fr)*

US and MRI are useful tools to help in characterizing solid and cystic renal tumors. The main advantage of these techniques is their sensitivity to light contrast enhancement when subtle or localized. Papillary carcinomas are often hypoperfused requiring contrast-enhanced MRI or US, with delayed images, to detect their enhancement making it possible to separate solid and cystic tumors. Diffusion-weighted MR sequences can also help for that purpose. In cystic masses, the same is true for detection of enhancement of small areas as septas, capsule and small nodules, with an impact on Bosniak classification. The main indications of these techniques in that field are 2 F and non-classified cystic lesions. MRI may also show the fat and lipid contents of solid tumors by using chemical shift-weighted sequences (in-phase and opposed-phase), mainly to separate angiomyolipomas with small fat content and renal cell carcinoma. Unfortunately, no reliable threshold is able to accurately separate these two entities yet. Renal staging can also be performed with MRI, but with little advantages, when compared to CT.

Learning Objectives:

1. To learn how to distinguish benign and solid lesions.
2. To review the Bosniak classification as it pertains to US and MRI.
3. To review the staging of renal cancer with MRI.

A-472 16:55

Tumor ablation

A. Adam; *London/UK (andy.adam@kcl.ac.uk)*

Radiofrequency ablation (RFA) is increasingly being used to treat small renal tumours in patients who are not candidates for surgery. The main indications are renal insufficiency, a single kidney, multiple tumours and hereditary conditions associated with renal neoplasms. The procedure is usually guided by CT or ultrasound imaging and is tolerated well in most patients. Follow-up is mainly by imaging, the immediate goal of which is to assess whether complete necrosis has been achieved. Ultrasound does not usually provide useful information, as the echogenicity of fibrosis and neoplastic tissue overlap. Contrast enhanced-MRI and contrast enhanced-CT are capable of demonstrating residual viable tumour requiring treatment. Effective ablation is achieved in approximately 90% of patients in a single session of therapy. However, tumours larger than 3 cm in diameter are more difficult to eradicate at the first attempt, often requiring a second RFA session. Combining RFA with percutaneous ethanol injection (PEI) increases the area of coagulation. RFA is particularly helpful in patients with solitary kidneys and impairment of renal function. In such patients, partial nephrectomy can lead to renal failure and the need for dialysis in up to 10% of patients. RFA enables most patients to be treated with minimal loss

of function and avoids the need for dialysis in the vast majority. Combined PEI and RFA is a safe and effective alternative treatment for patients with renal tumours and is likely to replace partial nephrectomy in many patients with small neoplasms.
Learning Objectives:
1. To review technical challenges and criteria for patient selection.
2. To discuss methods and results of tumor ablation as well as various imaging problems that may be encountered in patients previously treated either by percutaneous methods or by partial surgery.
3. To describe and compare tumor ablation and nephron sparing surgery and discuss how best to follow-up patients.

Panel discussion:
1. How should we image and stage the patient with suspected renal cancer? 2. Is tumor ablation here to stay? 17:20

16:00 - 17:30 **Room E2**

Interactive Teaching Session

E³ 1820a

Imaging in common clinical problems: Acute chest pain

Moderator:
G.A. Krombach; Aachen/DE

A-473 16:00

A. Cardiac

A. de Roos; *Leiden/NL (A.de_Roos@lumc.nl)*

Cardiac and pericardiac causes for acute chest pain will be reviewed as shown by MDCT and MRI. MDCT is well suited to evaluate coronary artery disease by demonstrating stenoses and plaques. The utility of MDCT for assessing myocardial perfusion is currently under development. MRI is well accepted for imaging of ischemia and infarction. Pericardial disease can be depicted by both MDCT and MRI. MDCT is the preferred first-line technique for evaluation of large vessel disease, especially in the acute setting. Gated MDCT is advocated for imaging aortic dissection, especially when the ascending aorta is involved. There is a broad differential diagnosis in the setting of acute chest pain. Many of the possible diagnoses can be assessed by cross-sectional imaging. The capabilities of MDCT and MRI are getting more and more similar. The indications for MDCT and MRI are dependent on diagnostic performance, availability, expertise and local preference.
Learning Objectives:
1. To learn CT and MRI methods for cardiac imaging.
2. To learn indications for acute cardiac disease evaluation.
3. To review acute cardiac disease presentations.

A-474 16:45

B. Non-cardiac

L.R. Goodman; *Milwaukee, WI/US (lgoodman@mcw.edu)*

Acute chest pain, whether traumatic or non-traumatic, involves multiple organ systems including the thorax, the pleura, the lung, the mediastinum, the pulmonary vessels, and the upper abdomen. Interactive cases will stress the radiographic diagnosis of many of these diseases: how to determine whether additional imaging is needed, and if so, which images? As time is often the essence in these patients, imaging efficiency will be stressed. Basic clinical parameters, such as onset of pain, duration of pain, distribution of pain, etc. will be integrated into the diagnostic approach. The primary emphasis will be emergency room and outpatient problems but inpatient problems will also be included.
Learning Objectives:
1. To learn CT and MRI methods for evaluating acute chest pain.
2. To understand the appropriate indications for CT and MRI.
3. To review the most common pathologies in acute chest pain.

16:00 - 17:30 **Room F1**

Interactive Teaching Session

E³ 1820b

Imaging in common clinical problems: Jaundice

Moderator:
C. Roche; Galway/IE

A-475 16:00

Imaging in common clinical problems: Jaundice

C. Matos[1], C. Becker[2]; [1]*Brussels/BE*, [2]*Geneva/CH (cmatos@ulb.ac.be)*

In this interactive session, the authors will conduct the audience through the different questions a radiologist needs to answer to choose the appropriate combination of imaging techniques when evaluating a patient with jaundice. Different clinical scenarios will be illustrated emphasizing the different steps to make a differential diagnosis between benign and malignant causes of jaundice. Guidelines for a multidisciplinary approach will be provided according to the likelihood of bile duct obstruction, to the accuracy of non-invasive and of invasive imaging modalities and to the therapeutic options available.
Learning Objectives:
1. To describe the imaging techniques used for investigating a patient with jaundice.
2. To discuss key points of interpretation of benign and malignant causes of jaundice.
3. To provide imaging guidelines for investigating a patient with jaundice.

16:00 - 17:30 **Room F2**

Professional Challenges Session

PC 18

Radiation protection

Moderator:
E. Vaño; Madrid/ES

A-476 16:00

Chairman's introduction

E. Vaño; *Madrid/ES (eliseov@med.ucm.es)*

Radiological Protection (RP) is a key topic in the modern radiology. Ionizing radiations are used for most of the diagnostic and interventional procedures and radiologists and other health professionals involved in these techniques should know the radiological risks to be able to make a good balance between benefit and risk when deciding the appropriateness of the examinations (justification) and the best way to perform the procedure (optimization). Several European Directives deal with RP, but two of them have significant regulatory impact in radiology: 97/43/Euratom (on RP of patients) and Directive 96/29/Euratom (on RP of professionals). These directives (together with others) are now in a process of simplification and updating by the European Commission (EC) ("recast" process) to follow the 2007 Recommendations of the International Commission on Radiological Protection (ICRP) and other International Organizations. It is expected that the new directive on "Basic Safety Standards" will improve the RP aspects in medical exposures and this will mean a professional challenge for the European radiologists and allied professionals. During the last three years, the EC has promoted many meetings and workshops to discuss and receive inputs from the scientific societies and from the Member States on the benefits and inconveniences of the existing Directives, to have the opportunity to improve the legislation. Several research programmes in the area of radiology and contracts (including networking) to help in the applications of the Directives have been funded by the EC. Contacts with the ESR are considered relevant in this process.
Session Objectives:
1. To underline the importance of radiation protection in diagnostic and interventional radiology.
2. To inform on the work made by the European Commission and other International Organisations to improve radiation safety in medical exposure.
3. To introduce the networking work on radiation protection promoted in Europe and the role of the ESR.

A-477 16:05

New European Directive on basic safety standards

E. Vaño; *Madrid/ES (eliseov@med.ucm.es)*

Several European Directives dealing with radiation protection (RP) are in a process of simplification and updating by the European Commission. The new Directive called "Basic Safety Standards" will improve the RP aspects in medical exposures now regulated by the Directives 97/43/Euratom (for patients) and 96/29/Euratom (for public and workers). "Protection of patients and other individuals submitted to medical exposure" will be Title VIII of the new Directive. The "medico-legal" exposures, now called "Non Medical Imaging Exposure" will not be considered a medical exposure. The course on radiation protection in medical and dental schools will be mandatory. Procedures on asymptomatic individuals, for early detection of disease but not as part of a health screening programme, will require specific justification. The radiation detriment of the medical radiological staff will be considered during justification and optimization of medical exposures. The use of Diagnostic Reference Levels will be also required for interventional procedures. Patient dose information for practitioner will be mandatory for interventional and CT procedures. Other radiodiagnostic equipment shall also have this information after the publication of the directive. Patient radiation dose will be part of the clinical report on the examinations. A registration and analysis system of events involving or potentially involving accidental or unintended exposures will be mandatory. All these changes will require member states, the radiology community and the industry, to adapt national regulations, quality assurance programmes and X-ray systems, to the new requirements. The goal will be a high standard of radiation safety in the European radiology.

Learning Objectives:

1. To know that a new European Directive including aspects of radiation safety in medical exposures is in progress.
2. To become familiar with the changes in the new Directive in comparison to the 97/43/EURATOM.
3. To appreciate the potential impact of the new Directive on radiation safety aspects for patients and professionals in diagnostic and interventional radiology.

A-478 16:28

also EPOS

EMAN - The European Medical ALARA Network

P. Vock; *Berne/CH (peter.vock@insel.ch)*

New ICRP recommendations, basic safety standards, European Directives and national regulations, in order to become effective for the patient, have to be applied by the medical practitioners (radiographers, radiologists, and other medical doctors) during their daily work. Building up a sustainable network among the different stakeholders is, therefore, an important step for an open discussion and exchange between different professionals trying to apply the ALARA principle in medicine. Seven partner organizations - among them the European Society of Radiology (ESR) and the European Federation of Radiographer Societies (EFRS) - have jointly founded the EMAN consortium to support the EC in promoting radiation safety in medical diagnostics and intervention. During the 3-year project, two working groups will concentrate on CT and interventional radiology, respectively, the most critical sources of individual patient and occupational exposure. One working group will specifically analyze and act on X-ray applications outside the department of radiology where training has historically been less well established. Dissemination of information and coordination will be enhanced by the EMAN website and a steering committee. Towards the end of the project, a European EMAN workshop will summarize the results and present them to the profession, and in parallel measures will be taken to maintain a sustainable EMAN rendering services to the medical practitioners and bringing feedback and suggestions to the EC regarding radiation protection in medicine.

Learning Objectives:

1. To understand the importance of building a network on radiation protection for radiologists and radiographers.
2. To know the effort made by the European Commission to promote radiation safety in diagnostic and interventional radiology.
3. To recognise the objectives and workplan of the medical ALARA network.

A-479 16:51

Radiation protection training and practice: Bridging the gap

M.M. Rehani; *Vienna/AT (m.rehani@iaea.org)*

Not even a week passes without a paper getting published in peer reviewed journals on radiation protection in imaging technologies. Few years ago, the change in technology was faster than adoption of radiation dose management but currently even the development of dose reduction techniques is faster than its adoption. International organizations are seized with this issue and are working to cope with this challenge. Conventional training methodologies that deal with principles are inadequate as people are looking for specific information delivered to them at their desk or home on periodic basis. The amount of information currently available through internet is leading to "information pollution" and professionals look for information from authentic sources. International organizations such as International Commission on Radiological Protection (ICRP) and International Atomic Energy Agency (IAEA) are rising to the occasion to attend to the need and fill the gap. ICRP is an independent body that provides recommendations on radiological protection. IAEA develops safety standards and applies them in member states. The talk, while presenting the need, is going to create awareness about information that is available from ICRP and IAEA, the experience gained in making vast training material developed in collaboration with International Society of Radiology (ISR), International Society of Radiographers & Radiological Technologists (ISRRT), International Organization of medical Physics (IOMP) and WHO available free through website (http://rpop.iaea.org) and through CDs containing power point slides, conventional training courses and sending focused and condensed information from professional societies and academic publications through monthly emails.

Learning Objectives:

1. To understand the need for good knowledge of radiation protection (RP) principles in the practice of diagnostic and interventional radiology.
2. To know the existence of recommendations issued by the International Commission on Radiological Protection.
3. To highlight the role and the existence of websites and training material for RP produced by different scientific societies and international organisations.

Panel discussion:
What do radiologists need to know about the new recommendations of the ICRP and the new European Directive? 17:14

16:00 - 17:30 **Room G/H**

Neuro

RC 1811

Basic MR spectroscopy

Moderator:
K.-O. Løvblad; Geneva/CH

A-480 16:00

A. MRS in daily practice made easy

A. Urbanik; *Krakow/PL (aurbanik@mp.pl)*

The presentation includes a discussion of magnetic resonance proton spectroscopy (HMRS). It shows the methods for MR signal acquisition and its processing. It presents technical as well as clinical factors which impact the quality of. An analysis includes a normal brain spectrum, as well as the function of specific metabolites. It lists examples of HMRS application in clinical procedures.

Learning Objectives:

1. To present normal spectrum of the brain and meaning of the particular metabolites.
2. To explain the technical requirements and possibilities of MR spectroscopy of the brain.
3. To present the most common applications of MR spectroscopy of the brain.

A-481 16:30

B. MRS in metabolic CNS disorders

P.C. Maly Sundgren; *Lund/SE (pia.sundgren@med.lu.se)*

Neuroimaging might play an important role in the timely diagnosis of metabolic disorders and in some disease be helpful in therapeutic decision making such as adrenoleukodystrophy (ALD). Combined with conventional MRI, magnetic resonance spectroscopy (MRS) adds additional information and is considered helpful for the final diagnosis of some metabolic disorders. The interpretation of MR spectroscopy in children must be done with judgment. A range of factors can influence the profile of 1H-MR spectrum including magnetic field uniformity, poor shimming that may result in reduced resolution, broadening of resonances and distorting metabolic ratios to inter-patient variability due to age and development. Relative ratios of detectable metabolites and the detection of metabolites normally not present in the pediatric spectral profile have shown to be valuable in the evaluation and work-up of metabolic disorders in children. For example, an abnormal elevation of NAA is classically seen

in Canavan's disease, the absence or significant reduction of the creatine peak is the hallmark for different creatine deficiency diseases and a detectable presence of lactate in the basal ganglia supports the clinical and laboratory diagnosis of a mitochondrial disorder. The purpose of the present lecture is to describe the current MR spectroscopy techniques for evaluation of metabolic disorders, emphasizing key pathological metabolic spectra and typical brain MRI findings that can help in the diagnosis of some of the more common metabolic diseases, and to outline the strengths, weakness and applications of MR spectroscopy in the work-up and diagnosis of metabolic disorders.

Learning Objectives:

1. To learn the imaging protocol for MRS in the study of metabolic disorders.
2. To discuss the clinical features of neurometabolic disease.
3. To discuss the MRS features of these disorders.
4. To discuss the differential diagnosis.

A-482 17:00

C. MRS in brain tumors

M. Essig; *Heidelberg/DE (m.essig@dkfz-heidelberg.de)*

Proton magnetic resonance spectroscopy (MRS) and spectroscopic imaging (CSI) are becoming common clinical tools in neurooncology since they allow for functional tissue information. Spectroscopic characterization of brain abnormalities has relied mostly on the calculations of ratios between the main proton spectrum metabolites, notably N-acetylaspartate (NAA), a neuronal marker, choline-containing compounds (Cho), a marker of membrane turnover, and creatine-phosphocreatine (Cr), and on the presence of lipids and lactate. Brain tumors typically present with a loss of NAA and an increase in the Cho content. MRS has also been used to differentiate non-tumoral lesions like hamartomas from gliomas and to assess the grade and aggressiveness of a tumor. In several studies, it has been reported that hamartomas did not differ significantly from the normal brain, while gliomas had lower NAA/Cr, Cr/Cho, and NAA/Cho ratios. Follow-up assessment of cerebral tumors is another promising field for MRS and CSI. Increase in size and enhancement are typical findings for progression but also reflect therapy induced changes. Both techniques provide supplementary information about the possible extent and nature of changes on a routine MRI scan by analyzing the presence and/or ratio of the tissue metabolites NAA, creatine, choline, and lactate. The ratio of choline to normal creatine level usually is significantly elevated in those areas consistent with tumor compared with those containing predominantly treatment effect. In fact, treatment effect is generally indicated by a marked depression of all the intracellular metabolites. CSI proved to be helpful in mixed histologic findings comprised of necrosis and tumor.

Learning Objectives:

1. To present normal and tumorous spectra of the brain.
2. To learn how to use MR spectroscopy in the differential diagnostics of brain tumors.
3. To learn how MR spectroscopy can help to distinguish tumor progression or recurrence from therapy induced changes.

16:00 - 17:30 **Room I**

Vascular

RC 1815

Aortic imaging

Moderator:
W. Cwikiel; Ann Arbor, MI/US

A-483 16:00

A. Aortic dissections: New insights into an old disease

F. De Cobelli; *Milan/IT (francesco.decobelli@hsr.it)*

Aortic dissection (AD) is an emergency, critical and life-threatening disease. The mortality of this condition is high, with major complications including rupture and end-organ ischemia. The estimated mortality increases at the rate of 1% per hour once the diagnosis of aortic dissection is made. The DeBakey and Stanford classifications are usually adopted by radiologists to accurately classify AD using computed tomography (CT) or magnetic resonance imaging and angiography (MRI and MRA) and to indicate the appropriate therapeutic treatment. Both imaging techniques have different advantages and drawbacks in the evaluation of aortic dissection: usually, multidetector-CT is the preferable imaging technique in emergency condition such as in case of ascending aorta dissection. However, CT, usually involve acquisition of static images. Motion artifacts of ascending aorta itself or of an intimal flap, which causes cardiac pulsation, impair image quality in AD. Therefore, electrocardiogram (ECG)-gated CT acquisitions are recommended for evaluation of AD, to eliminate the influence of motion artifact by cardiac pulsation. Furthermore, in ECG-gated CT acquisition, it is possible to obtain volume data at any cardiac phase and in four-dimensional images and, therefore, it is possible to differentiate between pulsating type and static type dissection; this evaluation is important because allows to show aortic motion and reduction of elasticity. Both of the phenomena lead to an increase of vessel wall shear stress, which is in turn considered to be the underlying biomechanical factor for intimal detachment and chronic aortic expansion.

Learning Objectives:

1. To review the current classification of aortic dissections and their variants.
2. To learn about the respective roles of MRA and CTA.
3. To learn how to differentiate between dynamic and static dissection.

A-484 16:30

B. Imaging requirements prior to endovascular aneurysm repair

T. Pfammatter; *Zurich/CH*

While ten years ago endovascular aortic treatment planning relied on a combination of measuring catheter angiography and axial CT- or MR- images, nowadays multi-detector CT angiography (MDCT) is the default modality before treatment of both acute and chronic aortic conditions. MRA is a valuable alternative particularly for younger patients in order to reduce the cumulative radiation exposure as a fair number of these patients will require long-term postoperative imaging follow-up. As associated aortic pathologies occur in up to 25% of patients therefore the entire aorta, in addition to the iliac and femoral access arteries have to be included in the imaging volume. For diseases affecting the thoracic aorta the brachiocephalic branches (internal carotid disease, vertebral arteries before over-stentgrafting of left subclavian artery) have also to be imaged. Preoperative protocol generally include nonenhanced and first-pass arterial scans. 2D and 3D post processing algorithms such as multiplanar reformation (MPR), maximum intensity projections (MIP) and semi-automated center-line measurements on curved planar reformations allow anatomical patient selection for endovascular treatment and the choice of the appropriate stent-graft. Due to accordion and bow redundancy the in-situ length of the stentgraft tends to be underestimated on center-line measurements particularly in tortuous aortas or large aneurysms. Diameters, tortuosity and extent of calcification determine the choice of the insertion access. Evaluation of length, configuration and morphology of the stentgraft landing zones is very important as stent-graft fixation is crucial for short- and long-term exclusion of an aneurysm. Clinical relevance of time-resolved data acquisition (dynamic imaging, 4D-imaging) for endovascular treatment planning has not been proven yet. Automated mathematical analysis of CT data has been shown to be reliable for complex endovascular reconstructions (side-branched stent-grafts) and is likely to be adopted for these cases in the near future.

Learning Objectives:

1. To learn about optimised imaging strategies prior to endovascular aortic aneurysm repair.
2. To become familiar with specific diagnostic requirements for treatment planning.
3. To discuss prognostic factors for successful endovascular aortic aneurysm repair.

A-485 17:00

C. Detection of complications after aortic stent grafting

E. Brountzos; *Athens/GR (ebrountz@med.uoa.gr)*

Lifelong surveillance after EVAR is recommended using imaging, focusing on three parameters: aortic diameter, endoleaks, and endograft's integrity. The ideal follow-up modality should be inexpensive, widely available, reproducible, accurate, and without radiation exposure. Contrast medium-enhanced multidetector computer tomography angiography (MDCTA) is the most established follow-up modality for EVAR patients. The AAA diameter can be measured with 100% sensitivity and specificity, while MDCTA has a 92% sensitivity and 90% specificity for endoleak detection. Biphasic CTA is the most widely used technique, but there is no universal agreement on the ideal protocol. Magnetic resonance angiography (MRA) has a role in young patients. Aortic diameter measurement and endoleak detection are very accurate using MRA. MRA however, is not applicable for stainless steel endografts. Radiographs can detect structural abnormalities of the endograft. However, CTA can also provide sufficient information regarding the integrity of the endograft. Color Doppler ultrasonography (CDUS) performs poorly in the detection of endoleaks: pooled sensitivity rates were 66-69%. The recent introduction of contrast enhanced US (CEUS) significantly improved the detection of endoleaks: sensitivity (97.5 vs 62.5%), and specificity (81.8 vs 63.6%). Investigators have

already suggested substituting CTA with CEUS for patients with low likelihood for complications. Current strategies and modalities for the follow-up of the patients after EVAR are far from satisfactory. The medical community is still on an ongoing quest for the ideal follow-up method.
Learning Objectives:
1. To learn about typical findings after aortic stent grafting.
2. To become familiar with typical imaging pitfalls.
3. To learn about the most common complications.

16:00 - 17:30 **Room K**

Computer Applications

RC 1805

PACS: Evolution

Moderator:
J. Chabriais; Aurillac/FR

A-486 16:00

also EPOS

A. How to improve PACS with open source software
O. Ratib; *Geneva/CH*

Open source software is a new paradigm in software development that has proven to be cost effective and successful in many general applications (Linux, Firefox, Joomla, etc). It is now penetrating vertical markets such as medical applications, and that is changing all the rules. It is particularly promising in advanced image display and analysis applications where the rapid increase in demand cannot be matched by traditional expensive commercial solutions. The evolution of radiology imaging modalities from 2D sectional acquisition to a 3D volumetric acquisition and even higher dimensions with functional data and the emergence of multimodality scanners such as PET/CT scanners calls for new and innovative display and visualization tools. By combining multiple new technologies and open-source projects, it is today possible to develop a new generation of high-performance 3D DICOM viewers for personal computers. These 3D visualization tools were traditionally only accessible on expensive 3D workstations restricting their use to specialist radiologists. An example of such an Open Source project is the OSIRIX software for multimodality image analysis and processing. It provides the necessary tools for navigating and processing very large datasets of multimodality imaging. It can be implemented outside radiology departments and provide a solution for increasing needs and requirements of clinicians, surgeons and other specialists. It can also be easily integrated with existing PACS and RIS legacy systems. Open source component can provide cost effective and efficient ways for deploying advanced PACS workstations outside radiology in specialized clinical wards and conference rooms in large academic hospitals.
Learning Objectives:
1. To learn why proprietary PACS solutions have advantages and restrictions.
2. To know how open source solutions could be implemented in PACS environment.
3. To learn about specific open source tools.
4. To understand legal aspects in clinical applications of open source software.

A-487 16:30

also EPOS

B. How PACS is useful for eLearning
P. Pokieser; *Vienna/AT (peter.pokieser@meduniwien.ac.at)*

The term “eLearning” includes all forms of learning, where digital media or communication tools are involved in the presentation, distribution or communication of learning content. To be familiar with the spectrum of eLearning strategies enhancing radiological education with PACS, didactic basics of modern eLearning will be presented. A modern PACS without any additional tools can be used for many excellent eLearning strategies. Although, there are many different tools available, providing useful features for dedicated use. The lecture will focus on the integration of teaching files into PACS, explaining the use of IHE related tools (TCE), promising interoperability for sharing cases with other institutions. An overview of other useful features and some representative tools as examples will be discussed. One of the most important tasks of clinical radiology is the written report of a study. The various images and series of a study combined with a written report are the most fruitful basis for cultivating case based radiological eLearning. Structured reporting does not only facilitate communication of reports in daily routine; furthermore, it helps to transform routine work into teaching files easily. An example of a pertinent work flow will be presented; a demonstration of case series can be tested by participants of the ECR 2010 at the ePACS booth.
Learning Objectives:
1. To learn how to integrate teaching files into PACS (e.g. IHE TCE).
2. To know about differences in eLearning tools.
3. To know why structured reporting is important regarding eLearning.

A-488 17:00

C. What radiologists should know about the use of PACS in surgical procedures
E. Neri; *Pisa/IT (neri@med.unipi.it)*

Surgical procedures are more and more dependent on a deep pre-operative imaging assessment, and it is particularly evident in the planning of a minimally invasive surgical interventions. PACS (Picture Archiving and Communication System), developed in the Radiology Department, represents the natural working environment of the radiologist, but the strong demand of surgeons to access images for treatment planning is pushing radiology to develop the proper image sharing strategies. Radiologists should be aware about which images are required to plan the surgical procedure (non-contrast, contrast-enhanced, arterial, portal phase or both), how many images (full datasets or only those obtained at the level of the surgical field?), how to provide the datasets (CDs, network) and finally they should know how to structure the report in the prevision of a surgical procedure. Do radiologists have enough knowledge about the above issues to be effective in the surgical planning? Probably most of them know the surgical demand, but are not yet aware about how to provide the information required. The presentation is aimed to cover these issues and provide to the radiologist an update on the surgical planning tools.
Learning Objectives:
1. To learn about developments in planning therapy with imaging.
2. To know how these developments change PACS evolution.
3. To learn about consequences for diagnostic imaging.
4. To be familiar with the different therapeutic applications (e.g. planning, volumetry, registration, guidance, robotics, ...).

16:00 - 17:30 **Room L/M**

Radiology of the Spine in 2010

CC 1816

Spinal intervention: A new level of success

Moderator:
M. Serrallonga; Barcelona/ES

A-489 16:00

A. Image-guided pain management
B.A. Johnson; *Minneapolis, MN/US (bjohnson@cdirad.com)*

Neck and back pain represents one of the most common and costly medical problems affecting developed nations. For example, low back pain currently affects up to 40% of adults in Western Europe, resulting in massive medical costs and lost productivity. Evaluating and treating these patients is challenging, due to the presence of a number of potential pain generators in the spine, multiple levels that can be responsible for pain, and the overlap of clinical symptoms that result from the various structures in the spine. The facet joints, vertebral bodies, nerve roots and local nociceptors represent potential sources of pain. The clinical evaluation of potential pain generators is mostly using physiologic tests to selectively anesthetize specific structures. A comprehensive history, targeted physical exam, and imaging studies help determine which structures are the best candidates for testing. In this session, we will review techniques for evaluating and treating spine-origin pain. Several techniques for the assessment and treatment of specific pathologic conditions affecting the spine will be reviewed as an introduction to dedicated lectures on cement augmentation and other interventions. The benefits and disadvantages of these procedures will also be reviewed, in addition to the expanding role of neuroradiologists in pain management.
Learning Objectives:
1. To understand the etiology and pathophysiology of spine-origin pain.
2. To review indications for image-guided, minimally invasive spine procedures.
3. To learn about equipment, materials and techniques utilised for spine procedures.

A-490 16:30

B. Cement augmentation: Patient and treatment selection

G.H. Zoarski; *Baltimore, MD/US (gzoarski@umm.edu)*

Appropriate patient selection is essential in achieving clinical success in performing any type of percutaneous vertebral augmentation. The primary indication for treatment is pain associated with a vertebral compression fracture caused by osteoporosis, hemangioma, or tumor invasion. Some argue that there may be a role for prophylactic treatment in patients at extremely high risk for compression fracture (e.g. patients with kyphosis due to prior osteoporotic compression fractures, or patients on chronic steroid treatment with sentinel pain or imaging findings). Prophylaxis, however, is not a generally accepted indication for vertebroplasty, and no controlled studies have been undertaken to substantiate the utility of performing vertebroplasty for prophylaxis. Best success is generally achieved with patients in whom pain and tenderness on palpation is localized to the level of radiographic compression fracture. In early published and unpublished treatment series, most patients had been allowed to fail conventional medical therapy of analgesics and bed rest prior to treatment. More recent series have advocated treatment as early as a few weeks, and even within days of the acute event. Late treatment (greater than six months) is less likely to be successful in relieving pain; however, numerous investigators have anecdotally reported symptomatic improvement with vertebral augmentation performed even years after the initial injury.

Learning Objectives:

1. To learn about the benefits and risks of spinal height restoration.
2. To review the experience with cement augmentation.
3. To describe a safe approach for cement delivery systems into vertebral bodies.

A-491 17:00

C. Spinal interventions beyond vertebroplasty

A. Gangi; *Strasbourg/FR (gangi@rad6.u-strasbg.fr)*

Interventional procedures of spine are performed under fluoroscopic, CT and MRI guidance. A combination of CT and fluoroscopy has been established in difficult spinal procedures. The MR imaging is used more and more in spinal interventions with the great advantage of absence of radiation, capacity of thermal monitoring, real time imaging, and multiplan capability. Spinal biopsy: biopsy of spinal lesions is one of the major indications in skeletal interventional radiology. Therapeutic joint injection: facet-joint injection in lumbar spine is a simple and safe procedure. Periradicular infiltration consists of an injection of steroids and anaesthetic into the epidural space at the level of the pathological disk. Percutaneous laser and radiofrequency (RF) disk decompression: percutaneous laser and RF disk decompression are used to treat patients with radiculalgia caused by disk herniations. Percutaneous management of bone tumours: percutaneous thermal ablation of spinal tumours with radiofrequency, laser, and cryoablation is an efficient technique for ablation. The major indication is palliative treatment of spinal metastases and pain management. Curative ablation is performed in some selected cases. Thermal ablation of bone metastases is promising in pain management. Osteoid osteoma is a benign neoplasm of bone. Curative treatment of these tumours by thermal ablation is well established and considered as standard treatment of this tumour. The interventional radiologist with an efficient imaging guided technique can increase the precision of the above described procedures allowing an improvement of the results and reduction of the complications. A multidisciplinary team work is mandatory for a successful practice.

Learning Objectives:

1. To present an update of spinal interventions.
2. To understand the technique and the mechanism of action of percutaneous spinal tumor management.
3. To learn about risks and benefits of spinal interventions.

16:00 - 17:30 **Room N/O**

Head and Neck

RC 1808

Reporting and staging head and neck tumors

Moderator:
S.J. Golding; Oxford/UK

A-492 16:00

A. Paranasal sinuses

D. Farina; *Brescia/IT (nappaje@yahoo.it)*

Sinonasal neoplasms encompass a large number of different histotypes, thus, accounting for the peculiar density of anatomical structures and tissues present in this restricted area. Adenocarcinoma, squamous cell carcinoma and olfactory neuroblastoma are more frequent, with the maxillary sinus (about 80%) largely prevailing on the ethmoid as the site of origin. MRI is generally regarded as the best imaging modality for its high contrast resolution. Characterization of the lesion is beyond the scope of imaging as substantial overlapping between different histotypes exists; yet, MRI proves helpful in separating the lesion from retained inflammatory secretions in blocked sinus cavities. Different TNM classifications are applied to maxillary sinus and nasal cavity/ethmoid tumors. Beyond TNM, correct treatment planning requires precise assessment of tumor spread towards three crucial areas, i.e. orbit, anterior cranial fossa and pterygopalatine fossa/masticator space. Moreover, detection of perineural spread is essential as this pattern of tumor growth can be clinically unsuspected whilst it conveys the tumor cells beyond the surgical and radiation fields of treatment. Thus, the FOV of any MRI study should encompass the cavernous sinus and Meckel's cave and, if necessary - as may be the case in adenoid cystic carcinoma - follow perineural spread even further. Neck nodes are not routinely studied in sinonasal tumors although this issue needs thorough care when tumor extends to the skin or posteriorly to the pharynx.

Learning Objectives:

1. To review the most common sinonasal malignancies.
2. To become familiar with the TNM staging of sinonasal neoplasms.
3. To understand the role of imaging in treatment planning.
4. To learn how to issue a valuable report.

A-493 16:30

B. Oral cavity

F.A. Pameijer; *Utrecht/NL (f.a.pameijer@umcutrecht.nl)*

Head and neck cancer commonly originates from the oral cavity as well as from the oropharynx. As in most head and neck sites, squamous cell carcinoma is by far the most prevalent histology. Correct pretherapeutic TNM-staging is an important factor in the treatment planning of oropharyngeal neoplasms. This is a multidisciplinary effort. While the otolaryngologist uses endoscopy to evaluate the mucosal surface, it is the radiologist's role to show the deep extent of a lesion. CT or MRI has become essential for pre-therapeutic staging of oropharyngeal tumors. In this era of cost concern, it seems to be a good principle to do one cross-sectional study that accurately answers the clinical questions. The relative value of CT and MRI in this aspect will be discussed. To be an effective consultant, the radiologist's report should contain information needed by the surgeon. To supply this information, it is helpful if the radiologist is aware of the spread patterns observed in oral cancer. The typical spread patterns from the various subsites in the oral cavity will be shown. Based on the imaging finding, it is (usually) possible to conclude the report with a 'radiological' TN (M)-stage. This approach will be demonstrated using clinical examples from daily practice.

Learning Objectives:

1. To become familiar with the TNM staging of SCC.
2. To understand the advantages and limitations of available imaging techniques.
3. To learn what the surgeon needs to know for preoperative planning.
4. To provide a template for a valuable imaging report.

A-494 17:00

C. Larynx

A.D. King; *Hong Kong/CN (king2015@cuhk.edu.hk)*

Primary tumour (T Stage): MRI or CT is used to stage the primary; in general, MRI is slightly more sensitive to tumour spread but less specific and more likely to be degraded by motion. Mucosal tumour extent in the supraglottis, glottis and subglottis

is assessed endoscopically (T1 and T2), aided by imaging in the subglottis. Deep tumour invasion into the pre and para-epiglottic spaces (T3), Extralaryngeal sites (T4) and cartilage (T3 or T4) is assessed by imaging. Treatment options vary widely and so the lecture will highlight some of the more important clinical implications of tumour spread into these (SPEC) sites. Nodal metastases (N Stage): Nodes are imaged by MRI or CT (according to modality for the primary) and may be supplemented by ultrasound. The sites of nodal spread are dependent on the primary tumour, being more common in supraglottic or deeply invasive tumours, and rare in early glottic tumours. Imaging identifies metastatic nodes and then stages the disease (single node ≤ 3 cm = N1, any node > 6 cm = N3, other combinations = N2). Patients without nodes (N0) who are candidates for surgery may undergo less extensive neck dissection or, in very selective cases, a conservative management approach. Distant metastases (M Stage). Distant metastases (M1) are uncommon in laryngeal cancer, patients being at greater risk from second primaries (especially lung). Chest radiograph is performed in all patients and thoracic CT in those at high risk. The role of FDG PET in distant metastases and second primaries is under investigation.

Learning Objectives:

1. To become familiar with the TNM staging of laryngeal SCC.
2. To recognise the best imaging modality for staging.
3. To understand the required information to decide upon the best treatment option.
4. To provide a template for a valuable imaging report.

16:00 - 17:30 **Room P**

Chest

RC 1804

Non-small cell lung cancer

Moderator:
C.K. Atasoy; Ankara/TR

A-495 16:00

A. Update in TNM classification

S. Diederich; *Düsseldorf/DE (s.diederich@marien-hospital.de)*

The aim of precisely staging lung cancer with imaging techniques is to allow selection of the optimum therapeutic strategy and avoid unnecessary therapies that cause harm to the patient or cost to the health system. As many other malignancies, lung cancer staging is performed using the T (Tumor)-, N (Node)- and M (Metastasis)- classification to describe local tumor extent and the presence or absence of lymphatic or haematogenous metastases. According to potential therapeutic strategies, different combinations of TNM-categories are grouped in stages (stage I -IV). Radical surgery - if possible - is most likely to result in cure of the disease. Therefore, separation of resectable versus unresectable tumor manifestations by means of imaging studies is of utmost importance in order not to deny a potentially lifesaving operation to a resectable patient and simultaneously avoid unnecessary surgery in an unresectable patient. Using analysis of outcome in patients with different T-, N- and M-stages, the previous staging system has been modified recently. The aim of this course is to present the current staging system and give examples of different stages at imaging.

Learning Objectives:

1. To understand the principles of T-, N- and M-classification in lung cancer.
2. To understand the effect on therapeutic strategies and prognosis of different tumor stages.
3. To understand the recent changes in the TNM-staging system in lung cancer.

A-496 16:30

B. PET/CT in lung cancer

N. Howarth; *Chêne-Bougeries/CH (nigel.howarth@grangettes.ch)*

Integrated PET/CT imaging has an established role in the management of cancer patients and is now recommended for all patients with curative non-small cell lung cancer. PET/CT provides information essential for staging and prognosis, for choice of management and monitoring of treatment and for the detection of recurrence. Recent technical developments in PET/CT permit rapid examinations with improved resolution. Compared with standard CT or stand-alone PET, the added value of fused imaging is uncontested. The clinical influence of preoperative PET/CT is currently undergoing extensive evaluation. Radiologists should benefit from an understanding of important aspects of molecular imaging to improve their contribution to patient management. With the increasing use of PET/CT in the management of cancer patients, imaging pitfalls must be recognized to avoid both false-positive and false-negative interpretation. The principles and good practices of PET/CT will be explained. Normal distribution of FDG, pitfalls and normal variants will be presented. Specific examples will be discussed to demonstrate how the combined information of images of human anatomy upon which biological information within body structures is added improves delineation of disease, can guide surgical and radiation planning and biopsy. Advances in technology result in new training requirements for radiologists who should promote close collaboration with nuclear medicine specialists.

Learning Objectives:

1. To understand how the combination of functional and morphologic data provides added-value, helping patient management.
2. To learn the common pitfalls important for PET/CT interpretation in lung cancer.
3. To emphasise the importance of a strong collaboration between nuclear medicine specialists and radiologists.

A-497 17:00

C. Radiofrequency ablation of NSCLC: Current status

T. de Baère; *Villejuif/FR (debaere@igr.fr)*

RFA provides 70 - 90% of complete ablation in small size lung tumors. The rate of complete ablation at 2 years for tumors less than 2 cm is 80 to 90% in most reports. The rate of complete ablation is highly dependent on the volume of ablation relative to the tumor. In 75 primary stage I NSCLC median survival was 29 months, with 78, 36, and 27% at 1, 3, and 5 years, respectively. Better survival was reported for tumors 3 cm or smaller with a survival rate close to 50% at 5 years. Radiation therapy combined with RFA in 41 NSCLCC patients improved with 57% survival at 3 years. The survival was 34.6 ± 7 months for tumors > 3 cm and 44.4 ± 5.4 months when ≤3 cm. CT follow-up induced some delayed discovery of incomplete treatment, 4 to 12 months (mean±SD = 7.66 ±2.77) after RFA in our experience. PET/CT appears promising to provide early evaluation of treatment response but timing of PET after ablation is a key factor because G6PD uptake is highly increased 1 to 3 weeks after ablation with an SUV ratio of 5 and higher between RF ablation zone to muscle. After RFA, there is no changes in post-ablation respiratory test and, consequently, a major benefit of lung RFA to treatment of NSCLC is that it allows curative treatment in non-surgical early NSCLC. Moreover, this excellent tolerance allows safe treatment of single lung patients.

Learning Objectives:

1. To be able to define the best candidates for lung radiofrequency ablation.
2. To know the results of radiofrequency ablation for primary tumours and lung metastases.
3. To know different imaging patterns of a radiofrequency ablated tumor.

16:00 - 17:30 **Room Q**

Organs from A to Z: Liver

MC 1819

Liver tumors and management

Moderator:
P.L. Pereira; Heilbronn/DE

A-498 16:00

A. Liver metastases

A. Palkó; *Szeged/HU (palkoand@gmail.com)*

Metastasis is the spread of tumor cells via the lymph, blood, or body cavities to near or distant sites where new secondary tumors are formed. Most patients succumb to their metastatic disease; therefore, controlling the spread and growth of malignant cells at metastatic sites is an important challenge. Liver is the parenchymal organ most often affected by metastases, not only because of its rich, dual blood supply but also because of humoral factors that promote cell growth. Most common primary tumor sites are the colon, stomach, pancreas, breast and lung. 90% of the metastases are multifocal and can occur anywhere in the liver, their size ranges from macromorphologically undetectable seeds to several centimeters. Beyond this, the appearance of metastases depends on their homogeneity, vascularity, shape, contour, age of the filiae (presence and age of degenerative changes: necrosis, bleeding, calcification, scars) and tumour border (liver tissue surrounding the metastasis with compression, desmoplastic reaction, inflammatory changes). The role and responsibility of imaging diagnosis in detecting and characterizing these lesions is paramount. The task of this presentation is to summarize the techniques

and diagnostic algorithm of imaging modalities (with particular emphasize on the use of special MRI techniques), and to identify the typical imaging findings, but also the differential diagnostic difficulties encountered during the everyday activity of radiologists.

Learning Objectives:

1. To understand the different consequences of the onset of liver metastases according to cancer type and clinical situations.
2. To appreciate the role of different imaging modalities and their respective accuracy for detection and characterisation.
3. To learn about the imaging criteria for assessing the response to systemic chemotherapies.

A-499 16:30

B. Staging of liver tumors and treatment planning: When and how to treat

A.R. Gillams; *London/UK (alliesorting@googlemail.com)*

The choice of therapy depends on tumour type, the number, size, location and distribution of liver tumours, the status of the background liver parenchyma, the patients overall status and the extent of disease elsewhere. Percutaneous ablation is indicated in patients with limited numbers of small-moderate sized tumours typically < 5 metastases, < 5 cm in diameter or in cirrhosis, 3 HCC nodules, < 3 cm or < 5 cm solitary HCC. In indolent neuroendocrine tumours, larger numbers of smaller tumours can be treated at sequential sessions. Ablation can be used in most parts of the liver, if appropriate imaging guidance is available. Vulnerable structures must be displaced away from the ablation to prevent collateral damage. Lesions next to the common bile duct should only be treated during intraductal cooling. Radiofrequency ablation is superior to percutaneous ethanol injection with the exception of exophytic HCC. In breast cancer, it is acceptable to treat patients with controlled extra-hepatic disease but generally, the best results are achieved in patients with liver-only disease. Percutaneous ablation is minimally invasive and well tolerated even in patients who are not sufficiently fit to undergo surgery. Percutaneous ablation is readily combined with other treatments e.g. resection or cyberknife. Chemoembolisation has a long track record in HCC and has been shown to improve survival in meta-analyses. Generally, chemoembolisation is used in conjunction with ablation or in patients who cannot undergo ablation. Chemotherapy is used to downsize patients who are not initially suitable for ablation or as an adjunctive treatment.

Learning Objectives:

1. To learn about the spectrum of treatment options in liver tumors.
2. To appreciate the importance of tumor characteristics and spread for selecting the suitable treatment.
3. To understand indications, contraindications, and complications of intra-arterial and percutaneous interventions in the treatment of primary and metastatic liver tumors.

A-500 17:00

C. Evaluation of tumor response to treatment

T.K. Helmberger; *Munich/DE (thomas.helmberger@kh-bogenhausen.de)*

Staging and re-staging before and after therapy in malignancies are integral and crucial components of the comprehensive diagnostic and therapeutical concept of tumour treatment. For assessing tumor response to treatment, the WHO had established guidelines which were transformed in a more simplified evaluation system, the Response Evaluation Criteria in Solid Tumours (RECIST) now available in the even more simplified version 1.1. These criteria, which are primarily based on gathering data of presence and size of malignant lesions, are applied widely in oncology, and maybe reasonably meet the needs in follow-up of chemotherapy. However, with the advent and increasingly widespread use of multimodal therapy regimens including the huge variety of minimal invasive procedures and biologicals RECIST alone is not sufficient for evaluating treatment response. The often more complex tissue reaction to local or targeted treatment necessitates a more comprehensive assessment of response to cope with a specific therapy success. Therefore, extended criteria as type of perfusion of the index tumour (s), seemingly increased size of an ablation zone and its change over time, degree of uniformity or potential irregularity in the shape of an ablation zone, and changes in vascularisation, but also complications (e.g. bleeding, damage to biliary ducts) that might alter subsequent image interpretation) have to be incorporated into the response assessment. Modern cross-sectional imaging mainly by contrast-enhanced CT and MRI, but also by ultrasound and PET/CT, offers beyond pure morphological evaluation a deep insight into changes of vascularization, fibrotic regression, residual or new tumor growth and complex concomitant phenomena.

Learning Objectives:

1. To understand why tumor response evaluation is critical for the treatment strategy and to learn the different imaging criteria provided by international recommendations.
2. To understand which criteria are adapted for the evaluation of tumor response after ablation.
3. To learn about the latest developments in imaging assessment of tumor response.